CHITTENDEN SOLID WASTE DISTRICT
1021 Redmond Road • Williston, VT 05495-7729
802-872-8100 • Fax: 802-878-5787 • Web: www.cswd.net

TO: Executive Board
FROM: Sarah Reeves
DATE: Thursday, November 2, 2017
RE: Executive Board Meeting

D- Discussion Only, E- Enclosure, H- handout at meeting

The Executive Board will meet on:

DATE:	**Monday, November 6, 2017 – Please note this is one week earlier than normal**
TIME:	**4:30 P.M.**
PLACE:	**CSWD Administrative Office**

MEETING AGENDA

1. **Agenda**

2. **Public Comment Period**

3. (E) **Minutes of October 18, 2017** – Board Action Requested: Approve minutes

4. (E) **FY 18 License Application** – Board Action Requested: Accept/Conditionally Accept License Applications

5. (E) **GMC Business Analysis Review** – Discussion Only

6. (D) **Budget Allocation/Architecture** – Discussion Only

7. (E) **Program Updates**

8. **Other Business**

9. **Executive Session – GMC Business Analysis Discussion**

Possible action could occur on any agenda item, although not initially noted.

Please call if you are unable to attend! Thank You!

UNAPPROVED
CHITTENDEN SOLID WASTE DISTRICT
EXECUTIVE BOARD MINUTES
CSWD Administrative Office
Wednesday, October 18, 2017 – 4:30 p.m.

EXECUTIVE BOARD PRESENT: Paul Stabler, Rob Green, Michele DaVia, Alan Nye

CSWD STAFF PRESENT: Sarah Reeves, Brian Wright, Amy Jewell, Katherine Decarreau, Josh Tyler, Michele Morris, Jonny Finity, Jen Holliday

OTHERS PRESENT: Bert Lindholm

AGENDA ITEM:

1. **Agenda**
2. **Public Comment Period**
3. **Minutes of September 11, 2017** – Board Action Requested: Approve minutes
   Minutes of September 27, 2017 – Board Action Requested: Approve minutes
4. **Legislative Activity Update**
5. **Hinesburg Drop-Off Center Update**
6. **Food Scraps at DOCs/GMC Update**
   i. **anaerobic Digestion Update**
   ii. **Food Scrap Program Update**
7. **Program Updates**
8. **Other Business**

Agenda #1. Agenda – Add update on MRF commodities under Other Business

Agenda #2. Public Comment Period - There were no public in attendance.

Agenda # 3. Motion by A. Nye, Second by R. Green to approve the minutes of September 11, 2017. VOTING: unanimous; motion carried
Motion by A. Nye, Second by R. Green to approve the minutes of September 27, 2017. VOTING: unanimous; motion carried

Agenda # 4. Legislative Activity Update – S. Reeves noted that she and Jen Holliday have continued to meet with members of the Chittenden County legislative delegation to introduce herself to them and to discuss items that we see cropping up in 2018, and to ensure they have our contact information and see CSWD as a resource. To date, they have met with nearly a dozen members of the delegation. Conversations have revolved around Act 148 and organics and to let them know the important pieces to pay attention to. Other discussions have been the discussion about glass and bottle bill material. S. Reeves said that Jen Holliday continues to work hard in getting more products into an EPR system which would include funding to pay for that program. This could expand to other solid waste districts and that would satisfy their need to fulfill their SWIPS. Jen feels that this it is very likely this will move forward in the first half of the session. S. Reeves noted that a few Representatives expressed concern about plastic bags and film and we could see further discussion on that. Also, questions regarding recycling markets and what we sell and don't sell. S. Reeves noted that the invitation is still out to meet with legislators.

Agenda #5. Hinesburg DOC Project Update – S. Reeves reported that she, Brian, and Josh, met with Hinesburg Select board Chair Phil Pouech, project architect Steve Smith, and CSWD Board Rep Lynn Gardner.

All agreed that closing on December 2, 2017 is the best solution during their construction project. They have expressed concern that we won't come back. S. Reeves has let them know that it is the intention of the Board to be back in Hinesburg, but did inform that there are variables that need to be considered including the remaining space available, the service that will be provided and the frequency and cost of the service. CSWD will be sending a mailer to all residents and businesses in Hinesburg explaining the closing. We will be advertising in Front Porch Forum and the local papers. We will include information about our Williston DOC and will include incentives for a raffle for those that use that facility. We will have copies at the town hall and the packet at the DOC's. A. Nye noted that it will depend on the final cost on whether we return to Hinesburg. P. Stabler asked Brian that once construction plans on are in place will we be made aware and will have an idea of the final cost. B. Wright said that we already know the basic plan and that we will have a smaller footprint and we should have the discussion on the strategy for building future Drop-Off Centers. A. Nye asked if a fast-trash service similar to Jericho's is more cost effective and are we accommodating 60-70% of the people it might be something to consider. S. Reeves we are letting them know that the smaller foot print won't look the same as what we have now, so fast trash may be all we can provide. M. DaVia have we thought about talking about privatizing the DOC's. B. Wright said that should be part of the big picture conversation. J. Holliday said that the hauler's issue with not being able to charge for recycling will most likely come up with the Legislature.

Agenda #6. Food Scraps at DOC/GMC Update –

J. Finity presented a PowerPoint on the feedback that has been received regarding the charge for bringing just food waste to DOC's that went into effect July 1st, 2017. He noted that there was a spike in negative solicited and unsolicited comments in June and July and a sharp decline since. The number of complaints has been low and some customers do acknowledge why the fee was implemented but do feels it's a disincentive to compost. He also noted the decline of food scraps collected in those two months (although a large increase from the previous year's months) and pointed out the increase at GMC. A. Nye pointed out that is desired outcome is to have customers go directly to GMC. S. Reeves said that we'll edit the presentation to provide the revenues received at the DOCs from the new fee. This presentation will go to the full board as information only.

B. Wright handed out an updated graph showing the 12-month running average for food waste at GMC and noted we are currently at 5,100 tons/year with projections to increase about 7% per year. He noted that in July 2014, it became mandatory to compost of food residuals for generators of more than 104 tons/year, followed by 52 tons/year in July 2015, 26 tons per/year in July 2016, and 20 tons per/year in July 2017. He also noted that in 2020 the landfill ban for all food residuals will be in place. In the past we felt that we could process about 6500 tons per year of food waste, be we are re-evaluating that capacity and feel that we may be close to our capacity presently. The DSM Compost Business Analysis will also shed light on our capacity question.

B. Wright noted that back in December 2016 he presented eight possible options to expand or change the compost program to accommodate the anticipated 10,000 tonnage of food waste that will be coming in with Act 148. B.Wright commented that from the eight possible options to expand or change GMC, there were four possible options that were evaluated and presented at the April 2017 Board meeting. These four options included pre-processing food waste, compost windrows, compost hybrid ASP/windrow, and dry anaerobic digester. In April it was recommended that we take a closer look at a food waste only anaerobic digester and the possibility for a public private partnership.

B. Wright said that he and J. Tyler went to see two food waste only anaerobic digestion facilities (Stop & Shop/Divert in Massachusetts and a Pre-processing/Anaerobic Digestion facility in Rhode Island). Stop & Shop/Divert facility is a pre-consumer, de-packaging, anaerobic digestion facility that backhauls spoiled organics from regional stores. It is staffed with highly trained employees with advanced degrees in multiple technical fields, quite advanced technologically, and very efficient in waste management, data analysis and landfill diversion. The Rhode Island facility was a very large, very expensive pre-processing, de-packaging, anaerobic digestion facility that also had its own wastewater treatment system and in vessel composting system for solid residual removal and marketing. Both systems are very complex, expensive and require a large highly trained staff to operate. These options, based on price alone, are not viable for an operation of our size.

The possibility for a public-private partnership does not offer any cost savings and would still have all of the risks associated with periodic problems at on-farm digesters. The risk would be shared with the private, but the costs would be somewhat more than our pre-processing option from April. The best option for processing more food waste, based on cost and operational risk, is to expand our composting operation. However, we will wait on the results of the DSM Compost Business Analysis before we make any recommendations.

Agenda # 7. Program Updates – No further discussion was held.

Agenda #8. Other Business – MRF Markets – S. Reeves informed the board of the change in the MRF Markets, which includes China essentially closing their doors to imported scrap materials. Casella has been working on the shift to domestic markets for a while. J. Tyler noted that the MRF is having trouble keeping labor on the picking lines but has increased their rate to $15/hour so that should no longer be an issue. S. Reeves said that the domestic price for recycling markets will drop and we'll evaluate how long we can weather the storm.

AJOURNMENT

Motion by C. Abrahams SECOND by R. Green to adjourn the meeting. VOTING: unanimous; motion carried.

The meeting was adjourned at 5:25 p.m.

Amy Jewell, Recording Secretary

I agree that this is an original copy of minutes and they have been approved by the Executive Board at the 11/6/17 meeting held in Williston.

Alan Nye, Secretary/Treasurer

#4

CSWD

CHITTENDEN SOLID WASTE DISTRICT
1021 Redmond Road • Williston, VT 05495-7729
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MEMORANDUM

To: Executive Board
From: Jeannine McCrumb, Compliance Specialist
Date: November 2, 2017
Re: Request for Acceptance FY18 License Application

We received a complete Hauler's License application from Jamie Strotmeyer of Me and My Truck on October 25, 2017.

Executive Board Action Requested:
Approve Resolution: BE IT RESOLVED that the Board of Commissioners accepts the license application for Me and My Truck.

GREEN MOUNTAIN COMPOST BUSINESS ANALYSIS

Final Draft | Nov 2, 2017 | Internal Review Only

DSM ENVIRONMENTAL SERVICES, INC.

Resource Economics
Environmental Scientists

DSM ENVIRONMENTAL SERVICES, INC.
Resource Economists
Environmental Scientists

GREEN MOUNTAIN COMPOST BUSINESS ANALYSIS

Final Draft | Internal Review Only | November 2, 2017

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DSM ENVIRONMENTAL SERVICES, INC.

Executive Summary

Introduction

The Chittenden Solid Waste District (CSWD) is a municipality created to manage solid waste generated in Chittenden County, VT. CSWD assumed operations of Intervale Compost Products in 2011, and constructed the Green Mountain Compost (GMC) facility in Williston. GMC is now the largest composting facility in Vermont. It is the primary processing facility for both food waste and yard waste in Chittenden County, composting roughly 5000 tons of food waste and 5000 tons of yard waste in FY 2017, of which 90 percent originated within the County.

The Vermont Legislature unanimously passed Act 148 – The Universal Recycling Law - in 2012. The organics portion of the law bans food scraps from landfill disposal in 2020. As of the date of this report, businesses generating 18 tons or more of food scraps a year must divert this material from disposal if there is an organics processing facility within 20 miles of the generator.

Chittenden County represents about one-quarter of the total residential population of Vermont, and an even a greater percentage of commercial food waste generation. As such, GMC's ability to process large quantities of organic material is seen as critical to the success of Act 148. If GMC did not exist, or were to be closed without a viable alternative facility in Chittenden County, it would send a strong signal to the Vermont Agency of Natural Resources and to the Legislature to reconsider the food waste ban included in Act 148. In addition, the CSWD would have to find an alternative way to manage yard waste generated in the District.

However, from the beginning of its existence, GMC has required an annual subsidy from CSWD. In FY 2017 the subsidy was $388,949 out of a total expenditure of $1.363 million (excluding any transfer to the facilities improvement fund, or capital reserve). Because of the continued need for a subsidy, the CSWD Board has questioned the viability of continuing the operation under its current business model.

DSM Environmental Services, Inc. (DSM) was contracted by the CSWD to conduct a comprehensive Business Analysis of GMC. The primary goal of the business analysis was to determine whether it is possible for GMC to achieve financial sustainability, as measured by eliminating the subsidy to GMC from the CSWD. DSM was provided technical support by professionals at WeCare-Denali, LLC to complete this analysis.

As stated in DSM's scope of services, elimination of the subsidy could be accomplished through one, or a combination of the following:

- Increased revenues from tipping fees by either increasing throughput or increasing GMC tipping fees;
- Improved operational efficiency, which could include reducing costs and/or increasing throughput for revenue producing materials without concomitant increases in operating costs; and,

- Increased product sales revenue for bagged and/or bulk products.

DSM's conclusions are summarized below.

Market Strengths

GMC is well positioned to continue to be the largest processor of food waste in Vermont, with the capacity to accept reasonable levels of contamination – which many of the other existing composting facilities cannot accept, and with the capacity to process most of the yard waste generated in the CSWD.

In addition, GMC has built exceptional brand recognition in Chittenden County for its Class A bulk and bagged products, which allows these products to be sold at a higher price point, and with lower retail margins than its primary competitors. This allows GMC to achieve the bulk of its revenues (over 65 percent) from sale of product instead of from tipping fees, which typically represent 60 to 70 percent of total revenues at most composting facilities. This has made it possible for GMC to accept yard waste at no cost, and to price their food waste tipping fees at the current reported statewide average, even though GMC accepts higher levels of contamination than other facilities operating in Vermont.

Limits to the Viability of GMC

As presented in the body of this report, because product sales prices are already at the top of the price range for comparable products, increased tipping fees are key to improving GMC sustainability. However, it is critical that CSWD recognize that there are limits to tipping fees for food waste. If these limits are exceeded, then a series of potential alternatives to GMC for food waste begin to become feasible including:

- Decisions by food waste generators to not participate in food waste diversion unless forced to do so by State or District regulatory enforcement;
- On-site processing of food waste at the large food waste generator level, with discharge to waste water treatment plants;
- Installation of food depackaging equipment at one or more transfer stations, with diversion of the slurried food waste to either a manure or sewage sludge digester; and,
- Small generator contracts with competing facilities which require very clean food waste but at competitive collection prices.

The trend in the industry is to focus food waste diversion on co-digestion with manures or waste water treatment plant sludges. While GMC is a potentially viable food waste processing facility, increased tip fees above some threshold will trigger active pursuit of anaerobic co-digestion alternatives.

Any detailed feasibility analysis of the potential to expand GMC processing capacity, or to close GMC, must include a comparison with the potential to slurry food waste with delivery to alternative organic waste digesters.

Operations

GMC produces and markets a high-quality compost. In addition, it appears that GMC has substantially reduced the likelihood of another herbicide contamination issue; and, to date, there have been minimal complaints regarding off-site odors. These are significant achievements for a composting facility of this size and complexity, especially given the setbacks that the herbicide contamination issue presented to this operation.

However, the current site is less than ideal due to both an inefficient configuration available for processing and composting incoming materials, and the soils on which the equipment must operate. And, it is evident from several metrics that the facility is operating at, or above capacity given site and equipment limitations.

Based on a detailed analysis of operations and key operational parameters it is DSM's opinion that GMC operated at, or above capacity in FY 2017. Meeting the projected FY 2018 throughput will require significant improvements to the site including:

- Conversion of all six Aerated Static Pile (ASP) bays to Phase 1 processing only, to meet pathogen reduction requirements, with final composting occurring outside in windrows;
- Replacement of the inefficient excavator currently used for pile turning with a dedicated windrow turner; and
- Significant site improvements to allow for the orderly turning of compost piles and the placement of curing piles and final product screening and storage at the sequential end of the process.

Although beyond the scope of DSM's analysis, DSM estimates that these improvements might cost $2 million assuming the site improvements were made on the existing footprint. This would add approximately $127,000 annually in amortized costs to GMC's budget.[1]

If these investments are not made, GMC will be constrained to a throughput of roughly 4,500 to 5,000 tons per year of solid food waste. This is insufficient to meet the demand for food waste diversion from the CSWD if Act 148 is fully implemented.

Just as importantly, it is DSM's observation that even without long term improvements there is a need to provide GMC with increased authority and access to funds to repair and replace critical equipment in a timely manner.

For example, one of the two Front End Loaders has 18,000 hours on it, which is well above the normal replacement interval.

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[1] CSWD staff believe that the cost to expand outside of the existing footprint might cost between $3 and $5 million. Assuming that CSWD decides to pursue expansion, a detailed engineering analysis would be necessary.

In addition, the Mixer has sat idle for over two years forcing GMC to resort to inefficient mixing and moisture addition, and double handling of materials, which has contributed to higher cost operations than would have occurred if the Mixer had been repaired as necessary.

Business Analysis

GMC finished FY 2017 with the need for a transfer of $388,949 of solid waste management fees to GMC[2]. To achieve sustainability, it would be necessary for GMC to either cut operating costs or increase revenues to cover this transfer.

Based on DSM's analysis of GMC's operational costs, tipping fees and price points for products sold, the following conclusions can be drawn.

- GMC cannot achieve sustainability by significantly increasing throughput of revenue generating materials (primarily food waste) without new investments in equipment and site improvements;
- GMC's staffing levels are consistent with other facilities of this size and complexity, therefore there is limited ability to cut costs to achieve sustainability;
- GMC is selling its bulk and bagged product at or near the high end of price points for comparable products, and therefore is unlikely to achieve sustainability by increasing the price of the products it is selling;
- GMC's source of revenues is essentially the opposite of most composting facilities, with roughly 65 percent of revenue coming from the sale of product and 35 percent from tipping fees – most compost facilities receive most of their revenue from tipping fees;
- As such, the keys to sustainability for GMC rest primarily on changes to tipping fees, and changes to internal transfers between CSWD and GMC, as discussed in more detail below.

Increase Food Waste Tipping Fees

It is DSM's professional opinion that it is possible to increase the food waste tip fee from the current $52 per ton to $62 per ton without triggering significant diversion to other food waste processing opportunities. This would add roughly $50,000 in revenue at current food waste throughput, and would substantially increase revenues if GMC were capable of processing up to 7,500 tons per year of food waste.

Charge for Yard Waste Processing

A key component of sustainability will be to begin to charge for delivery of yard waste to the facility. Externally, DSM is recommending a charge of $10 per yard for all direct deliveries of yard waste to GMC.

[2] An additional $117,588 is listed as "Facility Improvement Fees" which DSM understands represents a transfer for capital improvements.

This could raise an additional $42,000 per year based on reported direct deliveries in FY 2017. While a limited survey of landscapers conducted by DSM indicates that they would be willing to pay for yard waste deliveries, it is likely that there would be some fall-off in deliveries once the charge was put in place, so total new revenues might be less than the $42,000 estimated.

In addition, DSM does not believe that GMC should be charged internally for the cost of transporting and processing yard waste from CSWD drop-offs to GMC. CSWD would have to find an alternative if GMC did not exist, and there would be a cost associated with that alternative. This charge should be borne by the drop-offs, not GMC.

There are two components to this charge. The first is the cost that CSWD charges to GMC for trucking of yard waste from the drop-offs to GMC. GMC carried a cost of $28,000 on its books for FY 2017 for this trucking charge.

More importantly, if GMC did not exist, CSWD would have to process yard waste dropped off at its facilities at one or more other locations. DSM believes that costs to operate a well-run yard waste composting facility would be $20 per ton, and therefore CSWD should be paying GMC this tipping fee for delivery of yard waste to GMC.

Bagging

It is possible that GMC could save money by contract bagging, which would also free up space in the current equipment maintenance building. A rough estimate is that GMC could save roughly $25,000 in bagging costs, although GMC needs to investigate this further before entering into a contract.

Table ES-1, below provides a line item summary of these proposed changes to GMC pricing and operations. Two columns are presented, the first based on FY 2017 actuals and assuming a similar throughput for FY 2018, and the second assuming new capital investments are made allowing GMC to accept 7,500 tons of food waste (and a concomitant increase in carbon sources).

Summary

Table ES-1 illustrates that it is possible to increase revenues by roughly $210,000 (rounded) based on FY 2017 inputs, and by $310,000 (rounded) at a throughput of 7,500 tons of food waste – assuming site improvements occur on the existing footprint. In both cases, financial sustainability comes primarily by increasing tipping fee revenues, not by increasing product sales revenues.

Just as importantly, even with these recommended changes, it is likely that the CSWD will have to continue to provide a subsidy, albeit at a lower rate, if the CSWD determines it is in its best interest to continue to operate GMC.

Table ES-1 – Potential Changes in Revenues and Throughput Necessary to Achieve Financial Sustainability

Revenue Enhancements	Units	Proposed Tip Fee Increase	Current Throughput	Increased Throughput
Capital Improvements to Increase Throughput				
Windrow Turner (10 years @3.5%)	$200,000		NA	($24,048.27)
Site Improvements (20 years @3.5%)	$1,800,000		NA	($126,649.94)
Additional Operational Costs With Capital Improvements				
Add One Full-Time Staff				($75,000.00)
Additional Maintenance Costs				($9,498.75)
Increased Revenues				
Current Tons (Increase by $10/Ton Over Current)	5,000	$ 10.00	$ 50,000	$ 50,000
New Tons (@$62/Ton)	2,500	$ 62.00		$ 155,000
Per Yard Charges for Yard Waste				
Current Tons	1,400			
Cubic Yards (@ 3 yards per ton)	4,200	$ 10.00	$ 42,000	$ 42,000
Per Ton Charge for Processing CSWD Drop-Off YW	3,192	$ 20.00	$ 63,840	$ 63,840
Elimination of Payment for Transport of CSWD YW			$ 28,920	$ 28,920
Increasee Product Sales (Based on FY 2018 Projected)				$ 170,000
Projected Savings From Contract Bagging			$ 25,000	$ 35,000
Total			**$ 209,760**	**$ 309,563**

DSM ENVIRONMENTAL SERVICES, INC.

Resource Economists
Environmental Scientists

I. Introduction

DSM Environmental Services, Inc. (DSM) with technical assistance from WeCare-Denali, LLC (formally WeCare Organics) was contracted by the Chittenden Solid Waste District (CSWD) to assess the operations, financial position and sustainability of the Green Mountain Compost (GMC) facility. This report addresses the key tasks of DSM's Business Analysis, with the primary goal to determine whether it is possible for GMC to achieve financial sustainability, as measured by eliminating the subsidy to GMC from the CSWD.

As stated in DSM's scope of services, this might be accomplished through one, or a combination of the following changes:

- Increased tipping fee revenues from increasing throughput, increasing GMC tip fees for food waste and adding a tip fee for some or all yard waste;
- Improved operational efficiency, which could include reducing operating costs and/or increasing throughput for revenue producing materials without concomitant increases in operating costs (and in turn reducing the cost to produce a ton of compost product); and,
- Increased product sales revenue for bagged and/or bulk products through increasing sales volume and/or prices per unit.

As part of DSM's analysis, the following activities were conducted:

- Met with CSWD and GMC staff to fully understand the current operation and costs;
- Conducted five site visits at GMC to better understand the operation, material flow, labor and equipment used and to examine key operational parameters;
- Reviewed past and proposed budgets and detailed cost data, and then allocated costs by activity to better understand where costs are incurred and how they compare with revenues received;
- Surveyed other similar compost facilities in operation to benchmark against GMC;
- Analyzed GMC's product sales including product price points to compare against other competing compost and soil products;
- Contacted haulers and others in Vermont knowledgeable about food waste collection and processing costs and tipping fees to discuss options, challenges and costs of managing food waste in Vermont; and,
- Surveyed landscapers in Chittenden County to learn about their options for disposal of leaf and yard waste.

II. Operations Assessment

Summary

GMC produces and markets a high-quality compost. In addition, it appears that GMC has substantially reduced the likelihood of another herbicide contamination issue; and, to date, there have been minimal complaints regarding off-site odors. These are significant achievements for a composting facility of this size and complexity, especially given the setbacks that the herbicide contamination issue presented to this operation.

However, the current site is less than ideal due to both an inefficient configuration available for processing and composting incoming materials, and the soils on which the equipment must operate. And, it is evident from several metrics that the facility is operating at, or above capacity given site and equipment limitations.

A complete operational assessment is included as Appendix A to this report. The following section summarizes the key findings by operational step based on the Process Flow diagram and Mass Balance presented in Figure 1 and 2, below.

Figure 1. Process Flow Diagram

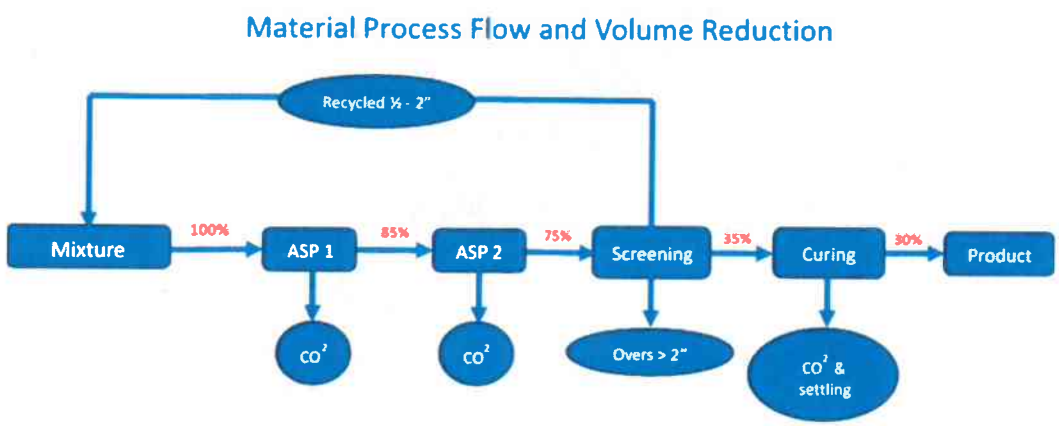
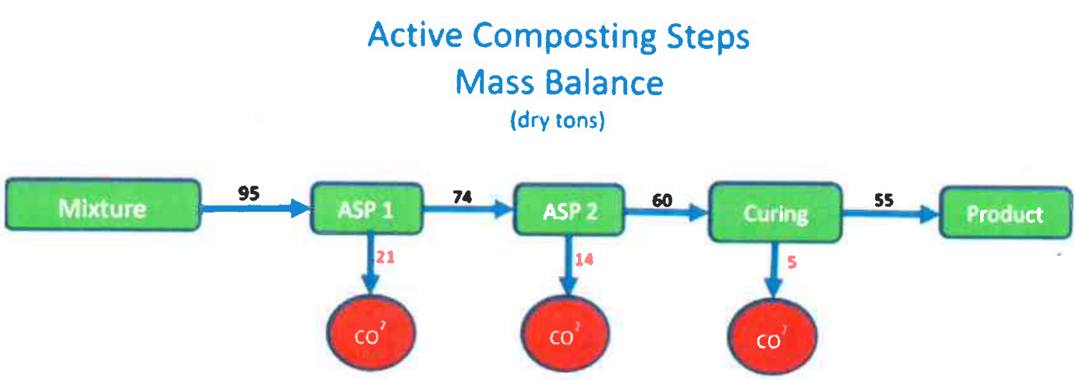


Figure 2. Mass Balance



Site Configuration

The site is laid out from west to east in a step by step process from aeration to screening to curing and blending (Figure 3). Drop-off of incoming material occurs at the same point of ingress and egress as the sales of bulk material and the screening and load-out of pallets of the bagged material.

Both the curing process step and post-production product blending occurs on the remnants of a borrow pit. The soil material is a sand-silt mix that when wet makes it very difficult for trucks to get through, especially in wet periods.

Ramifications of the current site plan include:

- A poor flow of ingress and egress of delivery of feed stocks due to both public car and pedestrian traffic;
- The constant movement of loaders either moving material to blending, bringing material to bulk sales storage bins, or moving material from temporary storage to either curing, bagging or additional screening;
- Bagged material is placed wherever there is available space (as shown in Figure 4), with the majority placed between the bagging and curing area, although pallets are being put in areas behind the Phase 1 aeration bays and outside the fence adjacent (to the south) of the curing area;
- The excessive distance from the blending location to sales and bagging areas increases materials handling;
- The bagging and maintenance area is constrained due to its shared use;
- There are seasonal limitations to how well material can be moved and processed at this location; and,
- Overall, these constraints could be perceived by the public as a poorly managed facility due to the large rutting, pooling water and general state of organic material being driven over.

Figure 3. Site Layout

Initial Mixing

Food waste is high in nitrogen and often has a high moisture content. To efficiently compost food waste, it is necessary to blend the high nitrogen food waste with materials that have a high percentage of biological available carbon (BAC). This is typically referred to as the Carbon/Nitrogen ratio (C:N). The resulting blend must also have an optimum moisture content.

Typically, a facility of this size composting both food waste and yard waste would use a mechanical mixer to blend and add water to incoming materials. However, GMC has been blending using a front-end loader because the mixer has not been operational for several years.

Ramifications for mixing with a front-end loader are:

1) Unequal distribution of C:N throughout the composting mass, reducing the decomposition rate;

2) Not all organic material delivered in plastic bags is separated from the bags, which reduces the rate of food waste decomposition and can lead to pockets of anaerobic decomposition;
3) There is double handling of the material when adding water without the use of the mixer;
4) Watering with the pump truck is not as accurate as when metered into the mixer, resulting in a mix that can be too wet or too dry;
5) Pump-truck watering results in some percentage of water being shed by the pile and not incorporated; and,
6) Some material gets compacted in the process which increases the insulating capacity of the piles and enables pockets of the pile to reach excessive temperatures for extended periods, slowing decomposition.

Watering

There are two watering steps. The first is after blending and before the material is placed in the Phase 1 Aerated Static Pile (ASP) bay. Because aeration is under positive pressure, by the end of the two-week Phase 1 process, there is a need for a second watering before the material is placed in the Phase 2 ASP bay.

Water (under normal weather conditions) comes from two sources. The first watering step uses water from an underground 20,000-gallon tank, capturing water coming off the watering pad and percolating down through the composting piles into the drainage pipes. This water can only be added to the first phase of composting since it has possible contamination from pathogens. These pathogens are controlled through the time-temperature regime created in the Phase 1 ASP bay.

The second source of water is from the storm water receiving pond and is only added to the post-Phase 1 piles. This addition of storm water, as opposed to the contaminated underground tank water, allows the facility to avoid continued monitoring of the Phase 2 pile temperatures to meet regulatory requirements to further reduce pathogens.[3]

Water is added using a tanker truck, which sprays water onto the top of a windrow. For the Phase 1 pile, the watering truck adds an average of 4,000 gallons to a bay's worth of material, which is substantially greater than what the recipe requires. This is increased to approximately 8000 gallons for the second watering as material is transferred from Phase 1 to Phase 2 aerated piles.

.Ramifications for this current watering regime are:

1) The first watering using the pump-truck and front loader results in doubling handling of the material before placing the material into the Phase 1 ASP bay;
2) Material needs to be handled twice during moving the material from Phase 1 to Phase 2 aeration, with the intermediate need of creating a windrow in the composting pad so it can be watered again by the pump-truck;[4]

[3] The facility is required to follow procedures and document pile temperatures over time to show they are meeting a process to further reduce pathogens (PFRP). The facility meets its PFRP requirement in the first phase of the aeration process.
[4] When timing watering, it took up to 105 minutes to water a Phase 1 Pile, and 140 minutes for Phase 2.

3) The underground tank water source can be accessed by a stand pipe, but storm water can only be accessed by the pump truck from the north end of the storm water receiving pond. This requires that the pump truck enter an area accessible by the public (those dropping yard waste off), and because facility operators do not have a commercial operator's license (CDL), the operator must first put up a temporary barrier to separate the public from the watering operation;
4) Both because the GMC operator lacks a CDL and therefore cannot drive on a public road and because of the time it requires, during dry summer months supplemental water must be brought in by a contracted hauler to keep the storm water pond filled;[5]and,
5) During wetter times of year, the amount of water entering the underground storage tank exceeds the 20,000-gallon capacity, resulting in tank water needing analysis, hauling and disposal at a waste water treatment facility (WWTF).[6]

Aerated Piles

Aerated static pile composting depends on adequate air delivery and distribution throughout the pile to both maximize decomposition and avoid odors.

Temperature monitoring is used as an indirect proxy for pile aeration. This is because temperature reflects the heat within the pile which is a combination of heat generation from biological activity of the decomposing organisms, and heat retention due to the insulating capacity of the pile.

Temperature is also used to meet the regulatory standards for pathogen control. This is a time-temperature standard (PFRP) with temperatures needing to reach at least 55°C (131 ° F) for at least 72 hours. After the desired initial increase to high temperature the most ideal subsequent temperature level should be kept below 140°F to allow for the greatest rate of decomposition.

An analysis of GMC temperature data indicates that temperatures are not only meeting PFRPs, but also reaching elevated temperature above 155°F for extended periods of time. Extended periods of higher temperatures slow down decomposition, and in some cases, can stop it in specific areas within the composting mass. Elevated temperatures can be controlled by reducing the insulating capacity of the pile (using smaller piles), and/or controlling the rate and duration of the pile aeration.

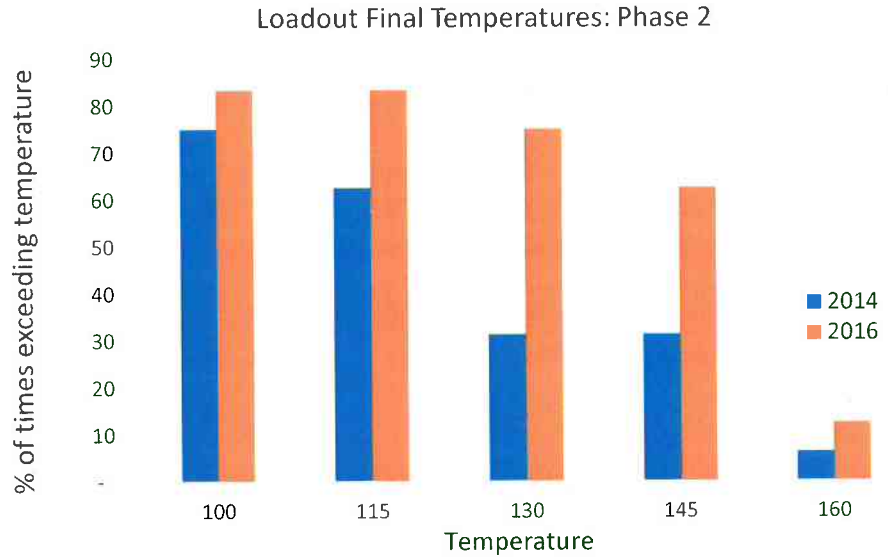
Indication that active composting has ended – which should occur at the end of Phase 2 ASP composting - is when pile temperatures trend towards ambient temperatures. Figure 4 compares loadout temperatures from Phase 2 from a random set of data from the years when the mixer was used to blend and add water (2014) as opposed the loader and tanker truck (2016)[7]. In both cases, most batches were still in the active compost phase at loadout from the Phase 2 ASP bays indicating that material was moving through the ASP bays too quickly, and that the curing time will need to be extended. <u>This outcome illustrates the facility is at or above throughput capacity.</u>

[5] The proposed FY 2018 budget lists $ 18,600 for hauling supplemental potable water.

[6] According to D. Goossen (6/30/17), the previous weeks required diversion of approximately 7000 gals/week of leachate to the WWTF. In 2016, leachate hauling ran over $10,000 excluding testing and treatment.

[7] In review of preliminary data from 2017, the piles are still ranging in the higher temperatures at time material is moved to screening.

Figure 4. Comparison of Loadout Temperatures from the Phase 2 ASP Bays



Screening

When the facility initially moved to its current location, screening was completed with two used rotary screens (trommels). These were quite inefficient, both because they were often down for repair and because the throughput rate was low - around 40 cy/hour.[8] Recently the facility has been utilizing both a leased Komptech Multistar S-3 Screener as well as a Neuenhauser 3F. The S-3 is no longer on site, and GMC has indicated it has purchased a used Komptech Multistar L-3 Screen.

The (used) Komptech Multistar L-3 Screener has a throughput rate which is more than twice the throughput of the formerly leased S-3. In addition, the L-3 has the feed-hopper size and out-load conveyer height that will make screening more efficient.

Other than ensuring that screening throughput rates are high, the greatest operational challenge is that screening is occurring before curing. Screening reduces the porosity of the curing piles which delays the rate at which material reaches a stable state. While screening occurs at this stage to remove plastic pieces that might blow from curing piles to the gravel operation, this also increases the amount of time the compost must remain in the curing piles.

Curing

The curing area is to the east of the ASP bays and screening operation. The material sent to the curing pile is the 3/8- to 1/2" fraction from the screening process. This product is placed in large pyramidal

[8] According to D. Goossen (6/30/17)

piles (approximately 12' high by 30' at the base). The piles are turned with a 1 CY excavator that can turn piles up to the 12 feet high.

These piles are turned 5-6 times over a 6 to 8 - month period.[9] Then the cured material is either brought back directly to a bulk compost bunker to the north and east of the aeration pads, or moved to a blending location to the south east of the curing area.

Ramifications of the current curing process are:

- The curing area is estimated to hold 15,000 cubic yards of material if stacked in large pyramidal formations;
- The large piles of finely screened material results in a tight compression of the material in the lower parts of the pile, eliminating adequate aeration for curing, which slows down the stabilization process;
- Due to the challenges outlined in previous composting steps, the material entering the curing area may not be adequately decomposed, which exacerbates the need for proper mixing and aeration during curing; and,
- Turning using a 1 CY bucket is very time-intensive.[10]

[9] According to D. Goossen (6/30/17), this may be as long as 12 months.
[10] In timing the turning (6/30/17), it took up to 45 seconds per bucket.

Staffing

Table 1A below outlines current staffing assignments associated with operation of GMC and marketing of GMC compost.

TABLE 1A – Current GMC Staffing Levels

Position	Employee Category	Projected Hours per year	Overtime Hours
Compost Manager	S	2,080	-
Compost Sales Coordinator	FT	2,080	-
Senior Equipment Operator	FT	2,080	60
Equipment Operator & Maintenance Lead	FT	2,080	15
Administration & Production Coordinator	FT	2,080	40
Delivery Driver	FT	520	10
Field Supervisor (open as of 7/1/17)			
Equipment Op - 2 days/week	PT	1,248	60
Office Assistant/Production Assistant	FT	1,920	20
Equipment Operator & Production Assistant (some bagging)	FT	2,080	25
Bagging Assistant (PT)	PT	880	
S = Salaried F = Full time hourly PT = Part time hourly		**17,048**	**230**

Considering the size of the GMC operation in comparison with other ASP facilities, GMC's three operators are appropriate for the scale of this operation, given site constraints and the production of multiple, post-blended product lines, and marketing of bagged product.

Currently the Field Supervisor position is not filled, with activities of the Field Supervisor covered by a combination of the Manager and operators. It is DSM's observation that there are several places where the Manager should be focusing time to improve throughput rate, manage temperature regimes, and ensuring compost quality; but these are taking on a secondary priority in dealing with day-to-day site operations.

Being one employee down, an operator is being diverted from their primary duties of screening and post–production blending to assist with equipment maintenance. But this is exacerbating the back-log of material sitting on site, reducing available time to keep up with required maintenance, which increases the amount of time equipment is down for repairs.

Based on the stock of mobile equipment, there is a need for a mechanic solely dedicated to equipment maintenance for at least a full day each week –, as well as the need for a dedicated equipment maintenance shed adequate for heavy equipment maintenance.

Mobile Equipment

Table 1B below lists mobile equipment currently on site (September 2017).

TABLE 1B – Current GMC Facility Equipment (September 2017)

Equipment	Purpose	Capacity
2008 SUPREME ENVIRO MIXER 900T	Recipe blending	
2003 MACK PUMP TRUCK (4500 GAL TANK)	Watering	
2004 VOLVO EXCAVATOR EC160BLC	Turning curing piles	1 yd
1997 FORD F350 PICKUP TRUCK	On-site maintenance	
2006 KENWORTH T300 DUMP TRUCK	Materials movement & deliveries	10 yd
2006 Ford F550 with added dump body	Materials movement	5 yd
2007 JD 644J LOADER	ASP Phase 1 & 2	8 yd
2011 JD 524K LOADER	Screening/ Material movement	4 yd
TROMMEL SCREEN 1995	post-production blending	30-40 cy/hr
2012 Komptech L3	Screening	180-200 cy/hr
JCB 527-55 LOADALL TELEHANDLER	Material movement and out-load	
NEUENHAUSER 3F SCREENER, W/WIND SIFTER	Retired	

As discussed above, GMC is expected to have the mixer and water pumping system up and running shortly, which should improve initial mixing and moisture content and free up some front loader time.

In addition, the recently purchased L-3 multi-star screener should significantly increase throughput rates and allow for the processing of backlogged material currently stockpiled.

The two loaders are being utilized 100% of the time. The JD 644 is allocated almost solely to the ASP phase of the composting process, while the JD 524 is utilized for screening, post-production blending and movement of material to and from curing.

Because the facility is operating at capacity, any additional acceptance of material will require the ability to more efficiently turn and move material on site.

In addition, the JD 644 has 18,000+ of operating hours, exceeding the maximum 10,000 hour extended warranty and increasing the likelihood that it will be down more often for repair. This will hamper operations, since it is utilized every day, all day.

The Volvo excavator, with a one cubic yard bucket, inefficiently turns the curing piles. While a front loader would speed up the process, current site constraints would make it difficult to use. Ultimately,it is DSM and WeCare's opinion that GMC should be utilizing a windrow turner for this operation.

Conclusions Concerning the Operational Review

The site's shape and soils contribute to an inefficient composting process. Given these site constraints, it is commendable that GMC has been able to achieve current material throughput, and produce and market such a high-quality compost.

However, several factors indicate that the facility is being operated either at, or above, capacity. These include:

- Excess pile heights in all ASP bays;
- High temperatures within the piles, which slows down the rate of decomposition;
- Temperature data at the end of the ASP process indicating that material is being moved to curing before it is completely composted, resulting in an extended curing phase, stretching the capacity of the approximately two acres dedicated to the curing phase of the operation;
- The screened curing piles are too high, resulting in compacting of the material which increases curing time, and further pushes the site limits;
- Bagged material is stored throughout the site because there isn't enough free space to efficiently organize the storage of bags;
- The equipment maintenance building is too small for the equipment requiring maintenance, and is further constrained by the bagging equipment and operation; and,
- Public traffic and GMC operations are occurring in the same space, which is a safety hazard.

Being at capacity now has significant implications for the financial sustainability of GMC (as discussed below) because one area to increase revenues is to accept more food waste as Act 148 requirements ramp up.[11]

Recommended changes in operation to improve sustainability can be divided into two areas:

- Relatively lower cost changes, which may improve efficiency and reduce costs slightly, but will, in DSM's opinion only increase throughput marginally, if at all; and,
- High cost capital improvements which could improve the site significantly allowing for increased throughput and therefore increased revenue.

[11] DSM understands that GMC is projecting an increase in food waste deliveries for FY 2018. Part of the increase is expected to be in liquid waste, and part in additional food waste. It is DSM's opinion that it will be difficult to meet the projected deliveries of new food waste without the recommended changes to equipment and operations.

Short-Term, Low Cost Operational Changes to Improve Efficiency

The following are relatively lower cost changes to operations that will improve efficiency in the short term.

1) Repair and utilize the Mixer to create a more consistent blend, and more importantly porosity, which in turn will allow for more efficient watering before material is put into the Phase 1 ASP bay.
2) Meter water into the initial blend to avoid excess water addition and handling. If the Mixer is operating, the addition of metered water volumes becomes that much more feasible.
3) DSM understands that there are conceptual plans (and cost estimates) to increase underground storage of process water and/or develop a well on site. This capacity may allow GMC to accept additional liquid wastes, which could increase tip fee revenues and reduce costs of contract hauling of potable process water and leachate transfer to the wastewater treatment facility.
4) Reduce the excessive temperature regimes in the Phase 2 ASP bays through more optimal use of the mixer and metered water additions.
5) Move material directly from ASP Phase 2 bays to curing, without screening.
6) Turn curing piles with the loader, rather than with the excavator. By using a loader, with a "loader-rake" bucket, the windrows piles can be aerated more effectively than the current procedure.
7) Configure the turning of the piles so they migrate towards a designated screening area by the end of the curing phase. This strategy avoids excessive material handling of moving material long distances on site.
8) Reconfigure the location of bagging and bagged compost storage to minimize movement of material from post production blending to bagging and from bagging to load-out.
9) Separate the bagging operation from the maintenance garage to free up room in the maintenance garage for equipment maintenance.
10) Configure operations for better flow of ingress and egress to avoid intermingling of citizen drop-off and purchase with commercial waste delivery and facility operations and material handling.
11) Create a single area for bagged compost storage, so that load-out is facilitated and there is less congestion of traffic around active composting operations.
12) Develop a contamination strategy to address contaminants (primarily plastics) that impact the efficient operation of the facility and can impact the final end-product quality.

Longer Term Capital Improvements

It is DSM's opinion that the short-term improvements discussed above will increase efficiency and result in some cost savings. However, they will not lead to sufficient increases in throughput and/or reductions in operational costs to significantly reduce current subsidies.

Reduction of subsidies will require a combination of increased/new charges for yard waste deliveries (see Cost Analysis Section), and increased throughput and charges for food waste. Significantly increasing food waste acceptance will require new capital investments.

First, and foremost, to significantly expand throughput and markedly improve process efficiency, the site needs to be reconfigured and the operable area expanded. The current site configuration presents numerous process inefficiencies (as noted) as well as safety concerns for both customers and GMC employees. Ideally, the site would look more like a rectangle and not like an arc. Expansion into areas south and west of the facility ("South Field" and adjacent "Velco Land") or possibly the Hinesburg Sand & Gravel sand reserves east of the compost screening area would provide the space needed to accommodate more and smaller windrows.

Of equal importance, DSM believes that significantly expanding throughput on the current site will require the purchase and use of a dedicated windrow turner. This would speed the turning of the curing piles and in doing so increase aeration, allowing the piles to reach the point of final curing faster, freeing up space for more piles. This would allow the use of all ASP bays for initial composting, eliminating the need for moving material from the Phase 1 bays to the Phase 2 bays, thereby increasing the overall capacity of the ASP bays.

The first alternative for pursuing this change would be to locate the windrow turning phase in the location of the current curing location. This would require both designing the appropriate windrow lay-out scheme, as well as estimating the maximum volume of material that could be processed during this phase, which would be a combination of site capacity and degradation rate (volume reduction) of the organic material.

If the curing area were reconfigured for this purpose, GMC should consider re-grading the area to maximize windrow construction and turning areas, and possibly make improvements to the pad on which the material will be turned. The output of this step would have material moved to larger, continuous storage piles in the location where post-production processing takes place.

If the screening and bagging operations were then logically located adjacent to the storage piles, a gravel road to this area would need to be constructed so that customers and trucks can pick up material even in wet seasons.

It is likely that regrading and surfacing the existing curing area, the purchase of a windrow turner, improved access roads, a new building for bagging, and site work to maximize the efficiency of curing might cost around $2 million to $ 4 million.[12]

A second alternative is utilizing the parcel to the southwest of the aeration bays (Figure 4). There may be 6 to 8 acres that could be utilized for windrow, curing and screening operations at this location, which would free up the current curing area for bagged pallet storage and load-out.

The disadvantage of this alternative is that it would bring the active composting phase in closer proximity to neighbors on Redmond Road and Ledgewood Drive. Prior to active consideration of this alternative, this area would need to be surveyed for wetlands and a determination of the sub-soil made to determine what would be required to establish a pad for the windrow composting operation.

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[12] DSM is not an engineering firm and cautions that these are preliminary level feasibility estimates that would need to be confirmed following an engineering analysis. DSM's estimates are on the low end of the range and CSWD staff estimates are on the high end of the range presented.

Figure 5. Potential New Location for Windrow Composting

In conclusion, while it is beyond the scope of DSM's business analysis of current conditions, we believe that any significant increase in throughput will require new investments in site work and a windrow turning machine, as well as an adequate equipment maintenance and replacement fund to assure that key pieces of equipment, like the mixer, screen and rolling equipment are operational in a timely manner.

III. Business Analysis

Introduction

DSM's business analysis is designed to address the Financial Position and the Sustainability/Opportunity Assessment contained in the CSWD RFP Scope of Services. It consists of five primary areas of analysis:

- A detailed review of GMC's 2017 actual, and 2018 adopted program budgets, allocating costs and revenues by specific activities, such as bagging, to determine added value/profit and loss;
- Analysis of revenues from tipping fees including discussions with haulers and compost operators to determine current market tipping fees to compare against GMC tipping fees;
- Survey of wholesale and retail market prices for bagged and bulk compost products to compare against GMC products;
- Modeling of tipping fees, throughput, and product sales to evaluate the most likely scenario for achieving sustainability; and,
- A review of the potential for, and threats to growth, to achieve future sustainability.

Analysis of Program Budgets

CSWD maintains detailed program budgets for all CSWD programs, including GMC. This allowed DSM to perform activity based cost accounting for the GMC facility for the past year (FY 2017, actual) and the current year (FY 2018, proposed). Activity based cost accounting divides the overall program budget into key activities included in the program budget, allowing for a more precise evaluation of the costs and revenues associated with each of those activities.

The goal was to determine the actual cost to operate and produce compost, and to bag and market composted product. Revenue from the sale of bulk compost and bagged compost could then be compared against the cost to produce it to determine net revenues for both bulk and bagged product to better determine the value added by bagging and marketing bagged compost.

Table 2 (on the next page) presents FY 2017 actual and FY 2018 budgeted costs by category.

As shown in Table 2, the budget for FY 2018 is roughly $1.5 million, with a projected deficit of roughly $227,000 (rounded) for the current year, which is 15 percent of the total budget. The deficit is planned to be covered (subsidized) by CSWD solid waste management fees.

By comparison, actual costs and revenues for FY 2017 resulted in a deficit of roughly $388,949 which was higher than projected at the beginning of FY 2017.

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Table 2 - FY 2017 Actual, and FY 2018 Proposed Budget

ACCOUNTS - EXPENSES	FY 2017 ACTUAL (1)	*Percentage of Total (%)*	FY 2018 PROPOSED	*Percentage of Total (%)*
TOTAL 5100 - Salaries & Wages	$375,287	*28%*	$405,775	*27%*
TOTAL 5200 - Personnel Benefits	$140,247	*10%*	$195,194	*13%*
Subtotal, Personnel:	$515,534	*38%*	$600,970	*41%*
TOTAL 5300 - Education & Training	$6,057	*0%*	$7,542	*1%*
TOTAL 5400 - Contracted Prof Svc	$50,194	*4%*	$64,524	*4%*
TOTAL 5500 - Contracted Other Svc	$281,666	*21%*	$239,088	*16%*
TOTAL 5600 - Insurance	$16,724	*1%*	$18,679	*1%*
TOTAL 5700 - Printing & Advertising	$83,567	*6%*	$95,298	*6%*
TOTAL 5800 - Utilities	$35,049	*3%*	$36,964	*3%*
TOTAL 5900 - Computer Equip, Systems	$545	*0%*	$4,040	*0%*
TOTAL 6000 - Office Supplies/Equip	$6,232	*0%*	$6,526	*0%*
TOTAL 6100 - General Supplies (1), (2)	$220,143	*16%*	$258,389	*16%*
TOTAL 6200 - Interdepartmental	$137,149	*10%*	$152,727	*10%*
TOTAL 6300 - Other Charges	$10,609	*1%*	$16,651	*1%*
Total Expenses:	**$1,363,468**		**$1,501,397**	
REVENUES - FROM OPERATIONS				
Tipping Fees	$230,596	*24%*	$358,617	*28%*
Delivery Fee Revenue	$51,235	*5%*	$68,995	*5%*
Sale of Materials	$686,318	*70%*	$847,048	*66%*
Other	$6,370	*1%*	$0	
Total Revenues:	**$974,519**	*100%*	**$1,274,660**	*100%*
Net:	**($388,949)**		**($226,737)**	

(1) In FY 2017, increased Line Item 6114 by roughly $2,070 to match final cost of actuals, then decreased Line Item 6112 by $58,500 for topsoil purchased but not used in FY 2017.

(2) In FY 2018, increased Line Item 6113 by $1,500 to reflect additional expected costs (Inputs to Seed Starter) as well as by $29,250 to reflect 50% of the topsoil expected to be used in FY 2018 (but purchased in FY 2017).

(3) Net excludes any transfers from Capital Reserves.

As illustrated by Table 2, 38 percent of the budget in FY 2017 was made up of labor costs in FY 2017 rising to 41 percent in FY 2018. In addition, 10 percent are from Interdepartmental Charges in both FY 2017 and 2018, of which 90 percent of this (or roughly 9% of the budgets) are charged from other CSWD operations. These charges include administrative and finance department overhead as well as the cost for CSWD to deliver yard waste from the CSWD drop-offs to the GMC facility.

As discussed below, while GMC needs a source of carbon, which yard waste provides, the CSWD would have to haul and dispose of yard waste at an alternate location if the GMC were not available, with that cost then assigned to the drop-offs instead of GMC.

Other large expense categories are Contracted Services (21% in FY 2017, failing to 16% in FY 2018) - primarily made up of equipment leases and maintenance costs - and General Supplies (16%) which include the cost of materials required to make many of the compost, topsoil and bagged products, and the cost of diesel and gasoline.

On the revenue side, material sales made up 70 percent of revenues for FY 2017 and are projected to make up 66 percent of revenues in FY 2018. *It should be noted that this is the opposite of most composting facilities* where tipping fee revenues make up the bulk of needed revenues with material sales accounting for the balance.

Capital Reserve Fund

In addition to the expenses and revenues shown in the FY 2017 and 2018 budgets (Table 2), the CSWD maintains an aggregate capital reserve fund from which capital is withdrawn to make improvements to CSWD facilities. Monies are transferred into the Fund, and out to cover capital expenses in various years and to various facilities. In FY 2017, $117,588 was transferred into the GMC "Facilities Improvement" Fund, and $120,000 in Facilities Improvements is included in the FY 2018 proposed budget. For the two prior years (FY 2015 and FY 2016), roughly $82,00 and $95,000 were transferred in respectively.

It is important to note that If these transfers were accounted for in the year they were transferred, the deficits shown in Table 2 would increase. Given the scale of GMC operations, and the amount of rolling stock involved processing material that can be difficult on equipment, it is DSM's opinion that a more robust capital reserve fund be set up specifically for GMC, with the cost accounted for in GMC's program budget on an annual basis.

As discussed in this report, it is critical to the long-term efficient operation of GMC that GMC not be required to wait for approval to repair major pieces of equipment (like the Mixer) when they require maintenance.

Activity Based Cost Accounting to Allocate Costs

Line items within the GMC program budget were analyzed to allocate 2017 actual and 2018 budgeted expenses. This included a review of time sheets and hourly labor accounting kept by GMC to better understand how GMC personnel spend their time. The results of this line item review were used to allocate labor, overhead, operating, maintenance, supplies and contracted costs to the major activities undertaken by GMC.

Each line item expense was allocated to the following major activities:

- **Composting Operations** – All labor and expenses associated with operating the GMC facility, receiving feedstock, handling material, producing compost and creating the different products, including bagged, bulk and mulch products. Expenses were allocated to creating compost or producing the bagged products.

- **Product Marketing and Sales** – Any labor or other expenses associated with marketing and selling GMC products, including print and media advertising, participation in trade or retail marketing events and sales calls. These were also allocated to sale of bulk or compost in general vs sale of bagged products.
- **Product Delivery** – The cost to deliver any GMC products sold either by GMC employers using GMC trucks or though contracted trucking services allocated to bulk or bagged product delivery.
- **Other Services** – These included Administration/Overhead costs from GMC employees time spent on administrative related tasks, CSWD overhead allocated to the GMC facility (based on CSWD's allocation methodology), as well as education and other services. Education expenses are GMC labor and expenses directly attributed to educational activities focused on organics and backyard composting (as opposed to selling compost products). Other Services covers the costs of CSWD services or sponsored projects that may be related to composting but not essential to the operation of the GMC facility, such as transferring food waste from CSWD drop-offs to the GMC facility or operating the Burlington Electric Department (BED) wood drop-off program.

The goal of performing the cost allocation was to:

- Isolate the actual costs to produce compost and calculate added costs to create bagged products;
- Estimate the added cost to produce and sell bagged products over and above the costs to produce and sell the bulk compost;
- Determine the net cost after tip fees to create the bulk compost;
- Compare revenues from the sale of bulk product with the net cost to produce the bulk product;
- Compare revenues from the sale of bagged product to the added cost to produce and market the bagged product; and,
- Determine what tipping fees and increase in sales might be necessary to take the place of the subsidy provided by CSWD.

Tables 3A and 3B present DSM's analysis of these costs by activity.

TABLE 3A –FY 2017 Activity Based Cost Allocation

ACCOUNTS - EXPENSES	FY 2017 ACTUAL (1)	COMPOST OPERATIONS *Compost*	COMPOST OPERATIONS *Bagged*	PRODUCT MARKETING/SALES *Compost*	PRODUCT MARKETING/SALES *Bagged*	DELIVERIES *Compost*	DELIVERIES *Bagged*	*Educatio*
TOTAL 5100 - Salaries & Wages	$375,287							
TOTAL 5200 - Personnel Benefits	$140,247							
Subtotal, Personnel:	**$515,534**	$235,027	$41,020	$30,942	$45,022	$20,776		$4,5
TOTAL 5300 - Education & Training	$6,057	$3,058						
TOTAL 5400 - Contracted Prof Svc	$50,194	$21,294	$3,785	$7,891	$7,914			
TOTAL 5500 - Contracted Other Svc	$281,666	$229,668	$13,683			$26,276	$12,039	
TOTAL 5600 - Insurance	$16,724	$16,724						
TOTAL 5700 - Printing & Advertising	$83,567			$51,127	$32,440			
TOTAL 5800 - Utilities	$35,049	$31,443	$540					
TOTAL 5900 - Computer Equip, Systems	$545							
TOTAL 6000 - Office Supplies/Equip	$6,232				$3,194			
TOTAL 6100 - General Supplies (1)	$220,143	$148,908	$53,774			$1,433	$358	$15,6
TOTAL 6200 - Interdepartmental	$137,149	$12,029						
TOTAL 6300 - Other Charges	$10,609							
Total:	**$1,363,468**	**$698,151**	**$112,803**	**$89,959**	**$88,570**	**$48,485**	**$12,397**	**$20,2**

REVENUES - FROM OPERATIONS		*Percent Of Revenues (%)*
Tipping Fees	$230,596	24%
Delivery Fee Revenue	$51,235	5%
Sale of Materials	$686,318	70%
Other	$6,370	1%
Total:	**$974,519**	100%

Net Operating Revenues (2): **($388,949)**

(1) Increased Line Item 6114 by roughly $2,070 to match FY 2017 Actuals, and decreased Line Item 6112 by $58,500 (topsoil purchased but not used in FY 2017).

(2) Excluding transfer from Capital Reserve Fund of $117,558.

SUMMARY - ACTIVITY BASED COST ACCOUNTING

Activity	***Compost Ops***	***Bagging Costs***	***Other Costs***	**Total**	***%***
Composting Operations	$698,151	$112,803		$810,953	***59%***
Product Marketing and Sales	$89,959	$88,570		$178,529	***13%***
Product Delivery	$48,485	$12,397		$60,882	***4%***
Administration/Overhead			$256,579	$256,579	***19%***
Education			$20,268	$20,268	***1%***
Other Services (1)			$36,257	$36,257	***3%***
Subtotal:	**$836,595**	**$213,769**	**$313,103**	**$1,363,468**	***100%***

TABLE 3B –FY 2018 Activity Based Cost Allocation

ACCOUNTS - EXPENSES	FY 2018 PROPOSED	COMPOST OPERATIONS *Compost*	COMPOST OPERATIONS *Bagged*	PRODUCT MARKETING/SALES *Compost*	PRODUCT MARKETING/SALES *Bagged*	DELIVERIES *Compost*	DELIVERIES *Bagged*	*Educatio*
TOTAL 5100 - Salaries & Wages	$405,775							
TOTAL 5200 - Personnel Benefits	$195,194							
Subtotal, Personnel:	**$600,970**	$273,976	$47,818	$36,070	$52,484	$24,219	$0	$5,
TOTAL 5300 - Education & Training	$7,542	$4,100						
TOTAL 5400 - Contracted Prof Svc	$64,524	$22,419	$2,760	$5,635	$9,399			
TOTAL 5500 - Contracted Other Svc	$239,088	$184,684	$8,430			$31,548	$14,427	
TOTAL 5600 - Insurance	$18,679	$18,679						
TOTAL 5700 - Printing & Advertising	$95,298			$57,988	$37,310			
TOTAL 5800 - Utilities	$36,964	$28,747	$445					
TOTAL 5900 - Computer Equip, Systems	$4,040							
TOTAL 6000 - Office Supplies/Equip	$6,526				$3,456			
TOTAL 6100 - General Supplies (1)	$258,389	$198,878	$50,956			$2,044	$511	$6,
TOTAL 6200 - Interdepartmental	$152,727	$17,820						
TOTAL 6300 - Other Charges	$16,651	$1,000			$3,900			
Total:	**$1,501,397**	**$750,303**	**$110,409**	**$99,693**	**$106,548**	**$57,812**	**$14,938**	**$11,**

REVENUES - FROM OPERATIONS		*Percent Of Revenues (%)*
Tipping Fees	$358,617	28%
Delivery Fee Revenue	$68,995	5%
Sale of Materials	$847,048	66%
Total:	**$1,274,660**	100%
Net Operating Revenues (2):	**($226,737)**	

(1) Includes an additional $1,500 in Line Item 6113 for Inputs to Seed Starter as well as additional $29,250 to account for 50% of $58,500 spent on topsoil purchased in FY 2017 but that will be used in FY 2018.
(2) Total is $30,750 greater than proposed budget to recognize additions to General Supplies - 6100, as noted above.

SUMMARY - ACTIVITY BASED COST ACCOUNTING

Activity	*Compost Ops*	*Bagging Costs*	*Other Costs*	Total	%
Composting Operations	$750,303	$110,409		$860,711	***57%***
Product Marketing and Sales	$99,693	$106,548		$206,241	***14%***
Product Delivery	$57,812	$14,938		$72,750	***5%***
Administration/Overhead			$306,354	$306,354	***20%***
Education			$11,360	$11,360	***1%***
Other Services (1)			$43,980	$43,980	***3%***
Subtotal:	**$907,808**	**$231,895**	**$361,694**	**$1,501,397**	***100%***

Tables 4A and 4B then total the costs to run the compost operation, but subtract out the costs to produce and market a bagged product as well as any delivery charges, to isolate the costs to produce a bulk compost product. They then go one step further to show the cost to run the GMC facility *without* any of the interdepartmental charges assigned to the facility, and without the cost of other non-essential facility expenses such as: the cost to transport yard waste from the drop-offs to the GMC facility; the subsidy for the BED wood drop-off; and costs to educate and sell bins for backyard composting.

This results in two sets of calculations – the cost to produce a cubic yard of compost and an average bag of compost based on the total budget (first column) and then based on the essential GMC facility costs only (second column entitled GMC Only).

TABLE 4A – Net Cost to Produce Bulk and Bagged Compost, Per Cubic Yard, FY 2017

From Table 3A (FY 2017)	**Total Budget**	**GMC Only**
Compost Ops Except Bagging and Delivery	$1,101,213	$926,258
Revenues		
Tip Fees	$230,596	$230,596
Misc. Revenues	$6,370	$6,370
Subtotal:	$236,966	$236,966
Net Cost, Compost Production:	$864,247	$695,662
Bulk Cost		
Estimated Volume Produced (yds.)	12,038	12038
Bulk Cost/Yard	**$72**	**$58**
From Table 3B - Bagging Costs		
Estimated Volume Bagged (yds.)	1000	1000
Operations Cost	$112,803	$112,803
Cost Per Yard to Bag	$113	$113
Product Marketing and Sales	$88,570	$88,570
Total Cost/Yard to Bag	**$201**	**$201**
Total Cost/Yard in Bags	**$273**	**$259**

(1) Based on the cubic yards of finished bulk and bagged product, which includes all additives.

TABLE 4B – Net Cost to Produce Bulk and Bagged Compost, Per Cubic Yard, FY 2018

From Table 3B - FY 2018	Total Budget	GMC Only
Compost Ops Except Bagging and Delivery	$1,211,690	$1,011,038
Revenues		
Tip Fees	$358,617	$358,617
Misc. Revenues	$12,392	$12,392
Subtotal:	$371,009	$371,009
Net Cost, Compost Production:	$840,681	$640,029
Bulk Cost		
Estimated Volume Produced (yds.)	**15,505**	15,505
Bulk Cost/Yard	**$54**	**$41**
From Table 3B - Bagging Costs		
Estimated Volume Bagged (yds.)	1,225	1,225
Operations Cost	$110,409	$110,409
Cost Per Yard to Bag	$90	$90
Product Marketing and Sales	$106,548	$106,548
Total Cost/Yard to Bag	**$177**	**$177**
Total Cost/Yard in Bags	**$231**	**$218**

(1) Based on the cubic yards of finished bulk and bagged product, which includes all additives.

Table 4A illustrates that in FY 2017 based on ***all of the costs allocated to the GMC facility*** minus delivery and bagged product costs, it cost $72 per cubic yard of compost products produced, including mulch products. In FY 2018 (Table 4B), this is projected to drop to $54 based on the budgeted costs, increased throughput (roughly 2,200 additional yards) and the increased tip fee revenues (roughly $150,000).[13]

Table 4A and 4B also show the total cost per yard to produce the bagged product which adds the isolated bagging costs (shown in Tables 3A and 3B) and divides by the total yards of bagged product sold. As shown, the average cost to bag products in FY 2017 was $113 per yard. Including the marketing and sales costs for bagged products, the total cost per yard excluding the compost equaled $201 per yard, for a total cost of bagged product at $273 per yard. These bagging costs are estimated to be about the same for FY 2018 budget but are projected to be divided by more product which equates to an expected lower cost per yard bagged.

Costs are also presented comparing the average costs for bulk and bagged products based on the total budget (first column) and isolating GMC facility only costs (second column). In FY 2017, it cost $58 per

[13] As discussed in the Operational Analysis section of this report, DSM does not believe it is possible to add significant quantities of material to the GMC facility given current site and operational limitations.

yard when only GMC facility costs are included, but $72 per yard when all CSWD charges are include. Similarly, the cost to produce bagged product is $259 per yard for GMC facility costs only, and $273 per yard to produce the bagged products when all CSWD allocated costs are included.

FY 2018 costs are projected to drop based on an assumption of increased volume of bulk and bagged product sold with only marginal increases in costs to produce these products. However, as stated above, it is not clear that GMC will be able to push that much more material through the facility without significant changes to the facility.

Finally, Table 5 uses the average bagging costs per cubic yard in FY 2017 to estimate the average cost to produce of a bag of GMC product in FY 2017.

TABLE 5 – Average Estimated Cost to Produce Each Bag of Finished Product (FY 2017)

Estimated Cost Per Bag	Total Budget	GMC Only
Average Bags Per Cubic Yard (1)	*40.4*	*40.4*
Cost Per Yard For Compost	$72	$58
Per Bag	$1.78	$1.43
Cost Per Yard to Bag	$113	$113
Per Bag	$2.79	$2.79
Cost Per Yard to Market/Sell Compost	$89	$89
Per Bag	$2.19	$2.19
Total Cost Per Bag	**$6.76**	**$6.42**

(1) Note that this is an average of all bagged products sold and includes all additives to GMC compost.

As shown in Table 5, it is estimated that in FY 2017 it cost between $6.42 and $6.76 on average to produce and sell a bag of GMC product. This can be compared against the weighted average revenue for bagged products sold in FY 2017 of roughly $4.20. This indicates that GMC lost roughly $2.50 per bag (when including all allocated CSWD costs) or roughly $2.20 per bag (excluding CSWD allocated costs).

For Bulk Product, at an estimated cost between $58 and $72 per ton, GMC lost money on product as well in FY 2017 as the average revenue per cubic yard solid was roughly $42 per ton.[14]

Potential for Contract Bagging

As shown in Table 5, the operational cost to bag compost was estimated to be $113 per yard in FY 2017. At 40.4 bags of product produced per yard of material, the cost per bag is estimated to be $2.79. This can be compared against the cost to contract out bagging operations.

Based on WeCare's costs of roughly $2.50 per 30-quart bag, which includes trucking bulk material to a contract bagger and trucking pallets of bagged product back to the compost facility, contract bagging

[14] The retail sales price averaged $55.88 in FY 2017, closer to the cost to produce compost but also at the high end of what bulk compost can be sold for as discussed further in the next section.

might save GMC some money, compared with FY 2017 costs. This calculation is shown in Table 6 and estimates costs of $2.34 per bag assuming GMC contracts out 50,000 bags.

GMC costs are slightly lower since GMC would ship 73 bags per pallet and vs 60 bags per pallet of 30-quart bags.

TABLE 6 – Rough Estimates of Contracting Bagging Operations

Assumptions	**Bagging Costs**
Transport to Bagging Facility	$935
Cubic Yards	35
Tons	21
Return to GMC	
Pallets/load	22
Bags/pallet	73
Total Bags/Load	1606
Tranport (RT)	$1,870
Per Bag:	**$1.16**
Bagging Costs	
Bagging	$0.87
Film	$0.22
Art Work	$0.09
Per Bag:	**$1.18**
Total Per Bag	**$2.34**

As shown in Table 6 with savings of roughly 45 cents per bag at 50,000 bags, GMC might save roughly $23,000 assuming they receive contracted bag prices, including transportation costs, as shown.

Another area for savings in FY 2018 is marketing. If bag sales are doubled, and marketing costs hold constant, the per bag costs to market would be cut in half to roughly $1.20 per bag (from $2.19 per bag). This appears feasible if the increased bagged sales are to existing retailers and within the current sales region.

However, if GMC must go outside of the Chittenden region and attempt to penetrate new markets further from Chittenden County it seems likely that GMC would have to increase its marketing budget and offer larger wholesale discounts, as reviewed in the next section.

Market Prices for Bagged Compost

In FY 2017, GMC received roughly $500,000 in sale of bulk product averaging $41.56 in revenue per cubic yard of product sold and selling just over 12,000 cubic yards. GMC sold roughly 90 percent of the compost produced bulk with the other 10 percent sold as bagged product.

Bulk compost sales are typically locally constrained by transport costs, and are roughly similar throughout the region, ranging from $20 per cubic yard wholesale to $35 - $45 per yard retail when picked up at a facility. GMC retail bulk sales average $55.88 per yard. Since GMC sells most of its bulk product at the top of this range, it is DSM's opinion that there is not much room for significantly increasing pricing, and therefore revenues, from bulk sales.

Instead, GMC has concentrated on increasing sales of bagged product which can be sold at significantly higher prices per cubic yard, and transported longer distances expanding the market area.

DSM's analysis consisted of the following:

- A comparison of GMC bagged product sale prices (wholesale and retail) with Vermont Natural Ag Product prices – the local competitor to GMC;
- An analysis of bagged product prices in the Upper Valley of Vermont and New Hampshire (White River Junction/Lebanon/Hanover area); and,
- An analysis of the potential to expand sales to Massachusetts, Connecticut and New York

Comparison of GMC and Vermont Natural Ag (Moo Doo) prices in the Chittenden Region

Tables 7A and 7B compare GMC compost bagged product wholesale and recommended retail prices against publicly available prices for comparable Vermont Natural Ag, Moo Doo products.[15]

As illustrated by Tables 7A and 7B, suggested GMC bagged product prices are significantly more expensive than similar Vermont Natural Ag products – especially when compared on a unit basis since most GMC bagged products are sold in 20-quart bags while Moo Doo is sold primarily in 30-quart bags.

It is clear from DSM's analysis that GMC has done an excellent job of building brand loyalty and demand in Chittenden County, allowing for relatively high retail prices when compared with both their logical competitor and even more so with prices at the big box stores.

[15] It can be argued that there are differences in product quality between the two companies. While this may be the case since the nutrient analysis of the products are not reported on the bags, the average consumer is unlikely to know the difference. More importantly, according to a large grower in the Upper Valley, Vermont Natural Ag products are high quality.

Table 7A – GMC Bagged Product Prices (2018)

Product Catergory	Name	2018 Wholesale ($)	2018 Garden Center Pricing ($)	2018 Wholesale @17% ($)	Bag Size (QT)	Recommended Retail ($)	Moo Differential ($)	Margin per bag ($)	Margin per QT ($)
Top Soil	*Premium Topsoil*	$3.14	$2.99	$2.48	20	$4.49	$0.50	$2.01	$0.101
Compost	*Complete Compost*	$4.53	$3.69	$3.06	20	$6.49	$0.01	$3.43	$0.172
Potting Soil	*Premium Potting Soil*	$6.64	$5.14	$4.27	20	$9.49	-$3.24	$5.22	$0.261
Seed Starter	*Premium Seed Starter*	$6.99	$5.40	$4.48	20	$9.99	-$0.49	$5.51	$0.276
Raised Bed	*Raised Bed Mix*	$6.29	$4.87	$4.04	20	$8.99	-$2.74	$4.95	$0.248
Compost (Manure)	*Premium Compost*	$5.59	$4.55	$3.78	20	$7.99	-$2.00	$4.21	$0.211

Table 7B – Vermont Natural Ag (Moo Doo) Pricing

Product Catergory	Name	2017 Wholesale ($)	Bag Size (QT)	Observed Retail ($)	GMC $ Differential	Margin per bag ($)	Margin per QT ($)
Top Soil	*Moo Dirt*	2.46	30	$4.99	-$0.50	$2.53	$0.084
Compost	*Moo Compost*	3.59	30	$6.50	-$0.01	$2.91	$0.097
Potting Soil	*Moo Grow*	3.43	30	$6.25	$3.24	$2.82	$0.094
Seed Starter	*Moo Start*	5.36	30	$9.50	$0.49	$4.14	$0.138
Raised Bed	*Moo Grow*	3.43	30	$6.25	$2.74	$2.82	$0.094
Compost (Manure)	*Moo Doo*	3.49	30	$5.99	$2.00	$2.50	$0.083
Planting Mix	*Moo Plant*	3.72	30	$5.99 NA		$2.27	$0.076

What was most notable was the retailer price variance at non-box store local retailers in the Burlington area when compared with the same products in similar stores in the Upper Valley Region (see below). For example, Gardener's Supply in Burlington retails Coast of Maine Lobster Compost at $10.99. The exact same product retails at Lebanon Feed & Supply for $8.49 (New Hampshire retailer). Smaller, but significant, pricing variances were noted across several products. This suggests that the Burlington market does not experience the same price sensitivity that is experienced in the Upper Valley.

Chittenden County's tolerance for a higher price point niche, being a local product, and offering organic bagged compostable products all contribute to GMC's success in gaining market share and strong retailer sales relationships. However, the lower size bags and higher than average retail and wholesale price points, when combined with a more price sensitive sales region, may result in a more difficult sales environment outside Chittenden County. Deep wholesale price discounting, free delivery, and reduced retail price points would likely need to be utilized to gain market share in an area where alternative products such as Moo Doo and Coast of Maine all enjoy high brand loyalty and are already perceived as both local and organic.

Expanding Bagged Product Sales

According to Dan Goossen, GMC believes that they have come close to saturating the local bagged product market, and that significant increases in bagged product sales would need to come from expanding the sales area. This may be evidenced by the high number of individual customers GMC sells to with relatively low sales per customer. The median customer bought 292 bags of compost last year and roughly 88% of customers bought less than 800 bags.

One logical area for expansion is the Upper Valley Area of Vermont and New Hampshire. In addition to being located adjacent to DSM's office, and therefore relatively easy to survey, Gardner's Supply is reported to have entered into an agreement with Longacres Nursery Supply in Lebanon to purchase their facility. If this were to occur, then it would be logical for Longacres to begin to sell GMC bagged products in the Upper Valley. Therefore, DSM conducted a detailed survey of bagged compost retail prices and types in the Upper Valley.

In addition, DSM conducted a detailed interview with one of the larger market farms in the Upper Valley that sells Vermont Natural Ag products and uses these products in their greenhouses.

Based on this research in the Upper Valley the following conclusions can be made:

- Large box store retailers (Home Depot & Tractor Supply) are not carrying local products (including Vermont Natural Ag), but they do carry other compost products labeled organic;
- Small and medium-sized retailers in the Upper Valley are carrying both organic and local products;
- GMC products are only carried by a small number of retailers in the Upper Valley, while Vermont Natural Ag products are readily available;
- The primary bag size sold in the Upper Valley is 1 Cubic Foot or 1.5 Cubic Foot – which is larger than most GMC bagged products;
- Only one product came in bags smaller than the typical GMC 20-quart bag (Vermont Natural AG, "Moo Doo" .5 cubic foot);
- At 2018 GMC retail price points GMC would have been the most expensive on the shelf at all Upper Valley locations per bag; and,
- At 2018 GMC retail price points GMC would have also been the most expensive on the shelf at all locations per quart.

The primary conclusion that can be drawn from DSM's analysis of Upper Valley retailers is that it would take a combination of deep discounts and a significant marketing effort for GMC to penetrate the Upper Valley market in any significant way. This is especially the case because unlike Chittenden County, there is not broad recognition of the GMC brand in the Upper Valley, and Vermont Natural Ag products are already available and carry the Vermont name brand.

Expansion into High Income Urban Markets

According to Dan Goossen, GMC has had some success in expanding retail sales into Cape and island communities in Massachusetts. This is potentially a logical area for increased compost sales because of sandy soils and relatively high-income households.

While DSM believes this expansion strategy has merit, it is likely that GMC will have to reduce prices and increase marketing expenses to significantly expand bagged product sales in this market – or similar markets in southern Connecticut and the NYC metro area. This is for three reasons:

First, WeCare estimates that trucking costs to these markets would add about 50 to 70 cents per bag. Given the high price points for GMC in Chittenden County, it is unlikely – at least initially – that GMC could add this trucking charge to the existing wholesale price and still provide retailers with sufficient mark-up to make GMC a desirable product to stock.

Second, GMC will have to compete against other similar products from compost producers in Massachusetts and New York. One large, and similar, competitor will be McEnroe Farms which already has a presence in all New England states – including Vermont. In addition, there are many Massachusetts compost facilities that either already do, or may begin selling bagged compost in these same markets.

Third, the GMC brand will not be known, requiring initial steep discounts and new advertising campaigns to build both brand recognition and sales. As such, DSM does not believe that GMC's existing marketing costs and pricing strategy will be sufficient to expand into major new markets. Instead, it will take discounts and increased spending to expand, which will increase costs and reduce sales revenue in the near term. This investment might be recouped if production increased significantly, which is unlikely to happen in the short term.

Tipping Fees

As discussed above, DSM believes that there is limited room for increased pricing of bagged products, or for doubling bagged product sales at current prices. In addition, as discussed in detail in the Operational Analysis, DSM does not believe that there is room for significant changes in throughput, or efficiency gains, given current site constraints, to sufficiently reduce the per ton operational costs to eliminate the subsidy. This leaves increased tipping fees as a potential solution.

Most compost facilities familiar to DSM earn the bulk of their revenues from tipping fees (typically 60% – 70%) with the remaining revenues coming from product sales. *This is the opposite of the current revenue distribution for GMC.* As such, DSM has evaluated the potential to increase tip fees for material delivered to GMC.

Food Waste Tipping Fees

DSM contacted the majority of other in-state compost facilities accepting food waste to discuss throughput, operational challenges, and current tip fees. DSM also discussed with one of the largest waste haulers in the District potential consequences associated with increasing the tipping fee for food waste deliveries.

In general, there are two ways that food waste processing fees are set. The first model, which is prevalent throughout much of central Vermont, as well as for the Exeter (Maine) Agri-Energy Facility which sources food waste from throughout northern New England, is to embed the cost of food waste processing in the per cart cost of collection. In this case it is difficult to determine the actual processing cost, because food waste collection costs overwhelm the processing cost. This is important because it allows the firm to integrate collection and processing into a single price, and to price food waste collection on a per cart or per stop basis as opposed to on a per ton basis. As with commercial collection of dumpsters, the generator typically does not know the total per ton cost for collection and processing, only the per stop or container cost.

The second pricing model is a stand-alone tipping fee for processing model. Because GMC is not in the waste collection business, GMC does not have the opportunity to integrate collection and processing, and must instead price food waste processing as a stand-alone service

For those compost facilities that do charge directly for food waste processing in Vermont, the prevailing tipping fee for food waste is roughly $50 per ton. That means that GMC's recent price increase to $52 per ton is in line with other facilities.

However, there is an important difference between GMC and all other Vermont facilities accepting food waste, in that GMC accepts food waste with some contamination while all other Vermont facilities essentially require clean food waste with close to zero contaminants.

This distinction is important now, and will become increasingly important if Vermont retains the July 1, 2020 ban on disposal of food waste to landfills. As Vermont begins to enforce the landfill ban on food waste disposal, food waste generators who are not currently required or committed to food waste diversion will be forced to separate food waste. In many cases they will be less committed to keeping food waste separate from contaminants, which will make it difficult to deliver their collected food waste to any facility except GMC. This will inevitably increase GMC composting costs, requiring more manual separation of plastics, increasing screening costs, and reducing the amount of compost that can be labeled organic.[16]

For this reason, DSM believes that there continues to be some room to increase tipping fees for food waste to compensate for the higher level of contamination GMC will have to accept. However, there are limits to how high GMC can increase tip fees before other alternatives become feasible. Both WeCare and DSM believe that this limit is probably in the range of $60 to $65 per ton.

What is clear from conversations with haulers in Vermont is that unless the ban on disposal of food waste is strictly enforced, many larger generators of food waste will continue to attempt to opt out of participating in separate food waste collection. Increasing the tipping fee will further exacerbate the problem because the increased tipping fee will be passed through from the hauler to the customer.

At some point, increased tip fees will also put pressure on haulers to consider alternative solutions for food waste processing. These might include:

- Purchase and use of a food depackaging machine at one or more private transfer stations in Chittenden County with transfer of the resulting slurry to a farm or waste water treatment plant digester. Casella has already permitted a facility in Rutland County that will manually remove

[16] An aspect not analyzed here, but perhaps worthy of discussion, is whether moving away from the "organic" label would decrease costs for GMC by allowing acceptance of less-than-perfect food wastes.

contaminants, grind the resulting food wastes, and transport the slurry to a farm in Bridport, Vermont. It is possible that Casella could deliver slurried food waste from Chittenden County to this same, or another farm digester, although there are issues associated with phosphorous loading that may make this difficult.

- Integrated food waste haulers/processors such as Grow Compost of Vermont may decide to market a combined service in Chittenden County like the service they currently offer in central Vermont and plan to offer in the Upper Valley.
- Larger food waste generators could move toward in-house treatment systems using package equipment, with the resulting slurries discharged directly to existing WWTP's.
- One or more of the WWTP's in Chittenden County could make modifications allowing them to accept slurried food waste for digestion along with sewage sludge. This is basically the model that Waste Management is pursuing throughout the country.

Yard Waste

GMC also receives just under 5,000 tons of yard waste per year. As illustrated in Table 8, roughly 65% of total yard waste deliveries come from CSWD drop-off facilities, for which the GMC budget covers the trucking fee. The other largest source of yard waste deliveries is direct deliveries from households and small landscapers. These direct deliveries are currently not charged a tipping fee.

Table 8 – Yard Waste Deliveries by Customer (FY 2017)

Entity	Tons	% of Total
CSWD	3192.11	65%
Burlington	260.84	5%
Casella	38.92	1%
Direct	1419.42	29%
Total	4911.29	100%

A key component of sustainability will be to begin to charge for delivery of yard waste to the facility.

DSM conducted a telephone survey of landscapers who deliver material to GMC, based on a list provided by GMC. Of the list of 15 businesses provided to DSM by GMC, one was deemed to be no longer operating, five completed the survey and nine did not respond to the survey after three telephone calls and an e-mail message. In general, of those who responded, four out of five said that they were willing to pay a nominal fee ranging from $5 to $20 to dispose of yard waste at the facility. This indicates that there is some room for increased revenues from the delivery of yard waste to GMC.

Externally, DSM is recommending a charge of $10 per yard for all direct deliveries of yard waste to GMC. This could raise an additional $42,000 per year based on reported direct deliveries in FY 2017. While a limited survey of landscapers conducted by DSM indicates that they would be willing to pay for yard waste deliveries, it is likely that there would be some fall-off in deliveries once the charge was put in place, so total new revenues might be less than the $42,000 estimated.

Another way to enhance revenues (or reduce the CSWD subsidy) would be to stop charging GMC for delivery of yard waste from CSWD drop-offs. If GMC were not available the CSWD would have to find an alternative location to dispose of yard waste, or would have to manage the material at the drop-off facilities, and both options would cost CSWD.

Finally, GMC could also post an internal tip fee charge to cover CSWD yard waste drop-off deliveries at GMC. This may be reasonable and posted against any subsidy since the CSWD drop-offs would need to pay to deliver yard waste to another permitted facility if GMC were not available, or would have to compost the material on-site, adding costs to the drop-offs.

IV. Compost Facility Survey Results

During June and July (2017) Michael Simpson, a DSM Associate and Core Faculty member at Antioch University, New England worked with a graduate student to conduct a survey of composting facilities similar to GMC. The results are summarized below, followed by a comparison of GMC to the surveyed facilities.

The survey was conducted to collect information about operational practices at commercial composting facilities processing food waste and yard waste though use of aerated windrows or aerated static pile (ASP) systems. The questionnaire focused on eight main themes: (1) site size and layout, (2) revenue streams, (3) recipe formulation, (4) active composting process, (5) curing process, (6) screening process (7) finished product attributes, and (8) facility staffing and roles

A total of 22 composting facilities were targeted nation-wide. Preference was given to facilities similar to GMC in methodology and/or feedstocks processed. Of the 22 facilities identified, eight voluntarily agreed to participate in the survey. Table 9 lists the facilities who participated, comparing annual volumes processed, types of materials processed, facility ownership and locations.

Table 9 - Facilities Participating in Survey

Facility	Annual Volume Processed *(tons unless noted)*	Materials Processed	Method	Facility Ownership	Location
Anonymous Facility	84,000	YW, Biosolids, FW	ASP	Private	Southeast US
Dirthugger	30,000	YW, FW	TAP	Private	WA
GMC	12,594	YW, FW	ASP	Public	VT
Hirzel Farms	20-22,000 (cy)	YW, M, FW	Aerated Windrow	Private	OH
New England Compost	5,000 (cy)	YW, M, FW	ASP	Private	CT
OCRRA	17,283	YW, M, FW	ASP	Public	NY
SET Empire	28-30,000	YW, FW	ASP	Private	MN
Silver Springs Organics	65,000	YW, M, FW	ASP	Private	WA
WLSSD	5,600	YW, FW	ASP	Public	MN

Summary of Results

The survey results are detailed in Appendix B and summarized below.

- Of the eight surveys, four had a two-step ASP process similar to GMC.
- The majority of revenue comes from tip fees at the surveyed facilities with one facility reporting equal revenues between tip fees and sales, and another reporting that half of cash flow was supported by tax/fee subsidies.
- Tip fees ranged from $10 - 65, with a mean of $39 per ton.
- The charge for finished bulk product ranged from $20 - 65, with a mean of $29 per cubic yard.
- The charge for finished bagged product ranged from $5 - 15, with a mean of $8 per cubic foot, and a common bag size of 1 cubic foot.

- Only one facility was subsidized by a district-wide fee, although only two of the six facilities were publicly operated.
- The facility footprints ranged from 3 to 25 acres, with a mean of 11 acres.
- Four respondents used front-end loaders to blend, resulting in a bulk density of 1200-1600, with an average of 1400 lbs./CY.
- Four respondents used shredder/mixers to blend resulting in a bulk density of 850-1500, with an average of 1091 lbs./CY.
- For Phase 1 ASP composting, the range of residence time was 15-30 days and for the three that replied to the question on Phase 2, the residence time ranged from 20-30 days.
- All facilities expressed that maintaining moisture content, especially during summer months, was a challenge.
- Most of the facilities cure between 1 and 2 months and 75 percent screen after curing.
- The number of staff ranged from 3-10, with an average of 6.
- Most facilities have a low tolerance for contamination and will charge steep fees for high-contaminated loads or reject the loads out-right.

Key observations that can be made from the information obtained through the survey are as follows:

- Tipping fees, not product revenues are the key to financial sustainability at the majority of facilities;
- Curing times are much lower for most ASP facilities when compared to GMC, which indicates that material in the ASP bays at GMC is not fully composted before being moved to curing;
- The lack of proper turning equipment, coupled with high pile heights impedes curing – much of this due to GMC being over capacity; and
- Average staffing is very similar to GMC staffing levels.

Major Challenges Noted

Every facility interviewed noted the challenges of dealing with plastic film and working with generators to keep contamination to a minimum. In most cases, food waste is delivered to these facilities via third party haulers. Therefore, the facilities don't have a direct line of communication with the generators, but more often work with haulers on any issues. Most facilities interviewed have a very low tolerance for garbage and will charge steep fees for excessive contamination or will outright reject loads. Some facilities, like Dirt Hugger have hired dedicated quality control staff who manually pick out contamination as loads are dumped. They also provide haulers with periodic contamination reports.

Like GMC, some of these facilities have struggled with compostable utensils and flatware. Silver Springs Organics receives residential food scraps but no longer allows flatware or plastic bags. In their experience, residents had a hard time telling the difference between compostable bags and non-compostable bags, and many of the products did not fully break down (ASTM standard is 60%

breakdown in 120 days, but Silver Springs has a 45-day process from start to finish). The anonymous facility echoed issues of dealing with compostable ware and additionally noted problems with broken glass.

Nuisance odors was another concern among several of the facilities surveyed. OCRRA mentioned that part of the reason they screen material after curing is to minimize release of unpleasant odors. Most facilities at the very least use a 6 to 1- inch layer of finished compost on ASP's to act as a biofilters.

V. Sustainability/Opportunity Assessment

Overview

Based on DSM's analysis presented above, the following conclusions about the potential to achieve sustainability of the GMC operation – as defined by elimination of the annual CSWD subsidies – are outlined below.

First, while DSM recognizes that GMC's budget for FY 2018 assumes receipt of 7,053 tons[17] of food waste, it is DSM's opinion, as documented in the Operational Assessment, that GMC is already at or above the capacity of the site unless significant investments in new equipment and site improvements are made. As such, DSM's sustainability assessment is based on FY 2017 actuals, not FY 2018 projections.

It is DSM's opinion that if new investments are made, GMC could process up to 7,500 tons of food waste annually. New investments are predicated on the fact that the process steps would be changed to free up ASP bay capacity by requiring a single ASP step to meet PRFPs. This would be followed by a windrow-turn active composting second step before screening.

Given the site constraints discussed above, a self-propelled, windrow turner should be used to accomplish this proposed process change, which would replace the inefficient excavator currently being used to turn the post-ASP phase piles. Concurrently, requisite site improvements should include: significant site grading/paving and roadway improvements to facilitate efficient windrow turning and handling of materials; additional water and liquid waste storage capacity; and, streamlining the material handling by moving the product bagging and storage area directly adjacent to where cured compost is stored, which would also free up the equipment maintenance shed for equipment maintenance.

While it is beyond the scope of this analysis, a rough estimate is that these improvements might cost between $2 million and $4 million. However, it should be noted that this estimate is not based on any engineering assessment, and assumes that sufficient space is available to reorganize the site to accommodate a windrow turner.

It would take a detailed engineering and economic analysis to prove out the capital costs and benefits. However, even without investments in capital to expand the facility, it appears possible to reduce the annual subsidy at current throughput if GMC works to significantly increase tipping fees for material processed, and CSWD re-evaluates inter-departmental charges for yard waste currently assessed against GMC. These changes are discussed below.

One key observation that the CSWD should keep in mind when evaluating the sustainability of GMC is (as discussed above) that GMC does not have the ability to integrated collection and processing charges into a single per cart charge. A model that integrates collection allows for a much greater capacity to price the service to assure that collection and processing are fully covered under a single per cart charge.

[17] DSM recognizes that some portion of the new tons represents liquid wastes and not food wastes.

For this reason, GMC is at a distinct disadvantage since GMC relies on delivery of material collected by private companies who can realize a profit on the collection side of the equation.

Public Needs Assessment

Chittenden County represents about one-quarter of the total residential population of Vermont, and probably an even greater percentage of commercial food waste generation. As such, if GMC were to be closed, shutting down one-third of current food waste processing capacity in the State (90% of which is generated in Chittenden County), would send a strong signal to ANR and to the Legislature to reconsider the food waste ban included in Act 148.

Reconsidering the food waste ban would necessarily lead to reconsideration of Vermont's landfill diversion goals as stated in ANR's Vermont Materials Management Plan because food waste and other organic materials comprise approximately 30% of material disposed in Vermont.

Potential Measures to Achieve Sustainability

Increase Food Waste Tipping Fees

It is DSM's professional opinion that it is possible to increase the food waste tip fee from the current $52 per ton to $62 per ton without triggering significant diversion to other food waste processing opportunities. This would add roughly $50,000 in revenue at current food waste throughput.

Charge for Yard Waste Processing

An important reason that GMC is not sustainable is that GMC realizes roughly 70 percent of total revenue from product sales and only 25 percent from tipping fees (with the balance delivery fee revenue). This is the opposite of most composting facilities. As such, a key component of sustainability will be to begin to charge for delivery of yard waste to the facility.

Externally, DSM is recommending a charge of $10 per yard for all direct deliveries of yard waste to GMC. This could raise $42,000 per year based on reported direct deliveries in FY 2017. While a limited survey of landscapers conducted by DSM indicates that they would be willing to pay for yard waste deliveries, it is likely that there would be some fall-off in deliveries once the charge was put in place, so total new revenues might be less than the $42,000 estimated.

More importantly, DSM does not believe that GMC should be charged internally for the cost of transporting and processing yard waste from CSWD drop-offs to GMC. CSWD would have to find an alternative permitted site if GMC did not exist, and there would be a cost associated with that alternative. This charge should be borne by the drop-offs, not GMC.

There are two components to this charge. The first is the cost that CSWD charges to GMC for trucking yard waste from the drop-offs to GMC, carried at a cost of $28,000 for FY 2017.

More importantly, if GMC did not exist, CSWD would have to process yard waste dropped off at its facilities at one or more other locations. DSM believes that costs to operate a well-run yard waste composting facility would be $20 per ton, and therefore CSWD should be paying GMC this tipping fee for delivery of yard waste to GMC.

Bagging

It is possible that GMC could save money by contract bagging, which would also free up space in the current equipment maintenance building. A rough estimate is that GMC could save roughly $25,000 in bagging costs, although GMC needs to investigate this further before entering into a contract.

Product Sales

As discussed in detail in the report, DSM does not believe that there is any real potential to increase product price points over and above current levels. And, unless there are significant increases in bagged product sales without concomitant increases in marketing costs and/or wholesale price reductions, the fully allocated cost to produce bulk and bagged product will continue to exceed sales prices. As such, while GMC and CSWD have focused much attention on product sales, this is not likely to be an important way to further GMC sustainability goals, over and above the excellent job that GMC is already doing creating and selling a high-quality product.

Conclusion

Table 10, below provides a line item summary of these potential changes to GMC charges/pricing and operations. Two columns are presented, the first based on FY 2017 actuals and assuming a similar throughput of FY 2017 (Current Throughput), and the second (Increased Throughput) assuming new capital investments are made allowing GMC to accept a total of 7,500 tons of food waste (and a concomitant increase in carbon sources).

Table 10 illustrates that it might be possible to cut the subsidy in half based on FY 2017 actuals, and that it might be possible to increase revenues significantly if new capital investments are made. However, in both cases, the move toward financial sustainability comes primarily by increasing tipping fee revenues, not by increasing product sales revenues. And, in both cases, it would still be necessary for GMC to receive a subsidy from the CSWD.

Table 10 – Potential Changes in Revenues and Throughput Necessary to Achieve Financial Sustainability

Revenue Enhancements	Units	Proposed Tip Fee Increase	Current Throughput	Increased Throughput
Capital Improvements to Increase Throughput				
Windrow Turner (10 years @3.5%)	$200,000		NA	($24,048.27)
Site Improvements (20 years @3.5%)	$1,800,000		NA	($126,649.94)
Additional Operational Costs With Capital Improvements				
Add One Full-Time Staff				($75,000.00)
Additional Maintenance Costs				($9,498.75)
Increased Revenues				
Current Tons (Increase by $10/Ton Over Current)	5,000	$ 10.00	$ 50,000	$ 50,000
New Tons (@$62/Ton)	2,500	$ 62.00		$ 155,000
Per Yard Charges for Yard Waste				
Current Tons	1,400			
Cubic Yards (@ 3 yards per ton)	4,200	$ 10.00	$ 42,000	$ 42,000
Per Ton Charge for Processing CSWD Drop-Off YW	3,192	$ 20.00	$ 63,840	$ 63,840
Elimination of Payment for Transport of CSWD YW			$ 28,920	$ 28,920
Increasee Product Sales (Based on FY 2018 Projected)				$ 170,000
Projected Savings From Contract Bagging			$ 25,000	$ 35,000
Total			**$ 209,760**	**$ 309,563**

Growth Opportunity

The biggest growth opportunity for GMC is to invest in the capital necessary to expand operations, and actively market acceptance of new food waste. According to a July 2017 analysis by Vermont DEC, GMC currently composts 35% of the total food waste processed in Vermont. Just as importantly, the Chittenden District was the biggest advocate in Vermont for the enactment of Act 148, which placed Vermont as the first state in the country to ban food waste disposal in landfills from all generators (not just commercial generators over a certain threshold).

Investments in new equipment to enable a significant increase in the volume of food waste accepted at GMC would provide the CSWD with a facility capable of managing much of the food waste generated in Chittenden County. This would allow GMC to reduce its annual subsidy from CSWD through increased revenue from tipping fees and product sales, with continued marketing of the GMC compost brands into a wider region outside of Chittenden County.

Threats to Growth

It is DSM's opinion based on the Operational Assessment that GMC is at or above capacity at the current time. DSM is not convinced that the projected increase in food waste deliveries budgeted in FY 2018 is sustainable without investments in new equipment and site improvements, as well as repair and maintenance of the existing Mixer.

Based on current customers and sales, the market analysis for bagged product, and representations by GMC, expansion of bagged product sales will have to occur primarily outside of Chittenden County. DSM believes this will initially require lowering the wholesale and suggested retail prices to be competitive in more price sensitive areas, or against other well marketed compost products – especially Vermont Natural Ag and McEnroe Farms.

Both competitors start with an important advantage of having access to large supplies of manure generated on the farm which can be relatively easily composted when compared to the difficulties associated with accepting food waste, removing contaminants and having to purchase manure inputs.

Therefore, one important threat to growth will be the failure of CSWD to provide GMC with the necessary resources and autonomy to make timely investments in equipment repairs and replacements in equipment necessary to more efficiently process the current incoming material (and increasing volumes of food waste).

As documented in the Operational Assessment, it is detrimental to GMC to allow major pieces of equipment such as the Mixer to remain idle because of lack of funds or staff to repair it in a timely manner.

A second threat to growth would be to decide not to invest in new equipment and site improvements necessary to expand liquid food waste acceptance. These investments include additional water and liquid waste storage tank capacity to reduce leachate hauling and treatment costs, and the potential to accept more high value liquid waste during drier times of the year.

Equally important is the need to invest in a windrow turner and necessary site improvements to more efficiently process additional food waste. Without these investments, DSM does not believe it is possible to grow GMC, and it will continue to be challenging to sustain the existing operation without continued CSWD subsidies.

Finally, it is equally critical that GMC recognize limits to tipping fees for food waste. If these limits are exceeded, then a whole series of potential alternatives to GMC for food waste begin to become available including:

- On-site processing of food waste with discharge to waste water treatment plants for large food waste generators;

- Installation of food depackaging equipment at one or more transfer stations, with diversion of the slurried food waste to either a manure or sewage sludge digester; and,
- Small generator contracts with competing facilities which require very clean food waste but at competitive collection prices.

The trend in the industry is to focus food waste diversion on co-digestion with manures or waste water treatment plant sludges. While GMC is a potentially viable food waste processing facility, increased tip fees above some threshold will trigger active pursuit of anaerobic co-digestion alternatives.

Any detailed feasibility analysis of the potential to expand GMC processing capacity as proposed above must include a comparison with the potential to slurry food waste with delivery to alternative organic waste digesters.

Niches

GMC is well positioned to remain the largest processor of food waste in Vermont, with the capacity to continue to accept reasonable levels of contamination – which many of the other existing composting facilities cannot accept.

In addition, GMC has built exceptional brand recognition for its bagged products which allows these products to be sold at a higher price point, and with lower retail margins than its primary competitors.

Appendix A | Operations Assessment

Summary

GMC is producing a high-quality compost that is being effectively marketed through bulk and bagged sales. In addition, it appears that GMC has implemented the change in recipe and on-going product monitoring that substantially reduces the likelihood of another herbicide contamination issue; and, to date, there have been minimal complaints regarding off-site odor or excessive vector (birds, insects, rodents) presence on site. These are significant achievements for a composting facility of this size and complexity, especially given the setbacks that the herbicide contamination issue presented to this operation.

However, the current site is less than ideal, both for the efficient configuration of process steps necessary to compost the incoming materials, and due to the type of soils on which the equipment must operate. And, it is evident from a number of different metrics that the facility is operating at full capacity given site and equipment limitations, and that current operating procedures are stretching both the site capacity and the current mix of equipment use.

The following sections walk through the process steps, and present observations that should be assessed with respect to changing standard operating procedures in order to improve processing efficiency.

Initial Mixing

Food waste is high in nitrogen and often has a high moisture content. To efficiently compost food waste it is necessary to blend the high nitrogen food waste with materials that have a high percentage of biological available carbon (BAC) to maximize the decomposition process and avoid potential odor emissions.

GMC has found a number of sources of BAC that allow for a biologically optimum carbon-nitrogen(C:N) ratio when incorporating nitrogen rich food waste. Table 1, below is a typical GMC recipe of input materials. The resulting blend is showing a C:N ratio in the range of 30:1, with a moisture percentage in the low 60 percent range. This is in the ideal range for C:N, but is at the higher end of acceptable moisture content, but preferred when utilizing an aerated static pile (ASP) composting methodology.

In this recipe, the woodchips come from a combination of fresh woodchips (purchased) and recycled woodchips after screening. However, since the compost operation began, the method for screening of woodchips has changed from a trommel to a star screen. This appears to result in more fines – and therefore, greater BAC recycled back into the pile than is captured in the recipe in Table 1.

More importantly, the water used to wet the Phase 1 ASP is pumped from a 20,000-gallon underground storage tank (Figure 1). This water is recycled water that has drained from the watering location and, subsequently from the ASP Phase 1 covered bays. As illustrated by Figure 1, this added water appears to contain a lot of suspended sediments[1], which increases the BAC going into the pile, and which does not appear to be taken into account in the recipe illustrated in Table 1.

TABLE 1 - Typical GMC Material Recipe (GMC 6/19/17)

	Water		Carbon		Nitrogen		C:N
	(%)	(tons)	(%)	(tons)	(%)	(tons)	Ratio
Feedstocks							
Leaf & Yard Waste (Loose)	46	1.14	29.00	0.39	0.60	0.008	48
Horse Manure	55.00	0.31	64.40	0.16	2.30	0.006	28
Woodchips (available portion)	43.00	0.04	50.40	0.03	0.09	0.000	560
Foodscraps	70.00	1.72	37.50	0.28	2.50	0.02	15
Woodash	2.00	0.00	64.33	0.12	0.07	0.00	975
Water	100.00	1.23	0.00	0.00	0.00	0.000	0
Subtotal	**63.40**	**4.44**	**37.92**	**0.97**	**1.26**	**0.032**	**30.0**

Figure 1. Phase 1 Watering from Underground Tank Water

When the facility began, blending of the initial recipe was done with a mixer with moisture metered in from the underground process-water storage tank. But the mixer has not been operational since 2015.[2] As such, mixing is accomplished by a front-end loader requiring multiple steps. First, after each load of food waste arrives the material is blended with the front loader, then it is blended again as the watering

[1] This was observed on two separate site visits, but according to subsequent communication from GMC (9/21/14), there times when this is not the case for this water source.

[2] It is DSM's understanding that the Mixer is being repaired and is scheduled to come back on line during 2017

windrows are formed. Finally, the loader turns the watered windrow over twice before loading into the Phase 1 ASP bay.

Figure 2.

Mixer (out of service since 2015)

Figure 3. Blending (each time food waste is delivered)

Figure 4, below shows the blended material set out on the pad in preparation for watering using a tanker truck. Clearly, blending/mixing the pile and adding water would be significantly more efficient using the mixer.

Figure 4. Blended Pile Prepared for Watering

As illustrated by Figure 5, the inability to use the mixer also results in the material not being ideally mixed; with some material still inside plastic bags (and thus isolated from the composting process) and neither density (porosity) or moisture content equally distributed within the mass.

Figure 5. Illustration of Blended Pile Showing Food Waste Still in Bags and Portions of the Pile Dry

An indication of the impact of not using the mixer is that the bulk density of the blended material was averaging 1031lbs/CY, with a relatively tight range from 970 to 1092 lbs/CY when using the mixer[3]. In contrast, recent grab-sampling of the material blended using the loader showed material bulk density ranging from 557 to 1385 lbs/CY[4] This wide range of bulk density from the grab sampling is due to incomplete blending. The bagged food waste isolated within the pile having higher densities and those areas where lower density material, such as bedded manures and yard waste not completely mixed equally throughout the mass.

It should be noted that by turning the watering pile twice before loading the ASP bay, many of the bags are broken. But the resulting blend does not have a standardized porosity that maximizes water retention, and materials such as plastic bags and compacted leaves act as barriers to the positive pressure aeration system, thus causing an uneven distribution of oxygen through the pile. This, in turn, can lead to anaerobic pockets within the composting mass, which slows the decomposition process and can be a potential source for odors.

In summary, plans are to have the mixer back in service in 2017, but the ramifications for this current front-end loader mixing regime are:

1) There is not an equal distribution of C:N throughout the composting mass, reducing the decomposition rate;
2) bagged materials are isolated from both appropriate C:N and moisture mixture optimums, which also reduces the rate of food waste decomposition;
3) the bags themselves constrain proper aeration, which can lead to pockets of anaerobic conditions, increasing the potential for odor generation;
4) there is double handling of the material needs to add water without the use of the mixer;

[3] Data from D Goossen, 6/30/17
[4] Field data collected 7/21/17

5) watering with the pump truck is not as accurate as having water metered into the mixer, resulting in a mix that can be too wet or too dry;
6) the pump-truck watering method always results in a percentage of added water that is shed by the pile and does not get incorporated; and,
7) mixing with the front-end loader results in compacted material and material left in un-opened bags increasing the insulating capacity of the piles, so pockets of the pile can reach excessive pile temperatures for extended periods, which slows the rate of the decomposition process.

Watering

There are two watering steps, the first after blending and before the material is placed in the Phase 1 ASP bay. Second, since aeration is under positive pressure, by the end of the two-week Phase 1 process, there is a need for a second watering before the material is placed in the Phase 2 ASP bay. This is due to a combination of water loss through decomposing organisms' respiration process, and drying as air is forced up through the pile from the aeration plenums[5].

Water (under normal weather conditions) come from two separate sources. Water for the first watering step comes from an underground, 20,000-gallon tank capturing water coming off the watering pad and percolating down through the composting piles into the drainage pipes associated with the aeration trenches. This water can only be added to the first phase of composting since it has possible contamination from pathogens. These pathogens are controlled through the time-temperature regime created in the Phase 1 ASP bay.

The second source of water is from the storm water receiving pond. This source of water is only added to the post-Phase 1 piles. This addition of storm water, as opposed to the contaminated underground tank water, allows the facility to avoid continued monitoring of the Phase 2 pile temperatures in order to meet regulatory requirements to further reduce pathogens[6].

As discussed in the mixing section above, currently the watering method is utilizing a tanker truck, which sprays water onto the top of a windrow. For the Phase 1 pile, the watering truck adds an average of 4000 gallons to a bay's worth of material, which is substantially greater than what the recipe requires. This is increased to approximately 8000 gallons for the second watering as material is transferred from Phase 1 to Phase 2 aerated piles.

[5] Site operator 7/21/17

[6] The facility is required to follow procedures and document pile temperatures over time to show they are meeting a process to further reduce pathogens (PFRP). The facility meets its PFRP requirement in the first phase of the aeration process.

Figure 6. Pile Watering (H_2O source: storm water pond)

Windrow before watering　　　　Windrow after watering

The Table 1 mixing recipe (see Mixing, above) indicates 1.23 tons of supplemental water be added to obtain an optimal moisture content per batch. For this representative recipe, there were 19 batches or 23.37 tons of water required for one 350 cu yds of material going into an aeration bay. This weight of water translates to approximately 5,631 gallons of water needed to be added to the blend.

It would seem that the current water addition method is less efficient at adding required water amounts since it is hard to calibrate watering with a water truck and it appears that a portion of the water is shed off the piles during this watering process.[7]

The ramifications for this current watering regime are:

1) The initial moisture addition using the pump-truck and front loader results in doubling handling of the material before placing the material into the Phase 1 ASP bay;
2) the material needs to be handled twice during moving the material from Phase 1 to Phase 2 aeration, with the intermediate need of creating a windrow in the composting pad so it can be watered again by the pump-truck;[8]
3) the underground tank water source can be accessed by a stand pipe, but the storm water can only be accessed by the pump truck from the north end of the storm water receiving pond (due to topography)- this results in the pump truck having to enter an area accessible by the public (those dropping yard waste off), and because facility operators do not have a commercial

[7] This may be corrected once the mixer on site is repaired and water can be added in incremental metered amounts for each batch being loaded in the mixer. And it should be noted that without doing continuous moisture analyses of pre-blended material (which is very time consuming and expensive), moisture addition is more an art than a science, which depends on the experience of the loader operator to make a determination of conditions as ambient moisture conditions, the amount of liquid wastes in the delivered material, etc.

[8] In timing the watering, it took up to 105 minutes to water a Phase 1 Pile, and 140 minutes to water a Phase 2 piles. Currently, on average, two watering events occur going to Phase 1 and watering events occur going to Phase 2 bays are watered weekly which translates to 425 hrs for watering a year or 53.1 employee days.

operator's license (CDL), the operator must first put up a temporary barrier to separate the public from the watering operation;

4) both because the GMC operator lacks a CDL and therefore cannot drive on a public road, and because of the time it requires, during dry summer months supplemental water must be brought in by a contracted hauler to keep the storm water pond filled;[9]and,
5) during wetter times of year, the amount of water entering the underground storage tank exceeds the 20,000-gallon capacity, as result the tank water needs to be analyzed, hauled and disposed at a waste water treatment facility (WWTF).[10]

Aerated Piles

Aerated static pile (ASP) composting methodology is dependent on adequate air delivery and distribution throughout the pile to both maximize the decomposition rate and avoid potential odor generation. Phase 1 of the ASP process utilizes aeration trenches to blow air up through the piles. Phase 2 aeration is through pipes along the surface of the bay floor.

The air flow is generated by ½ horsepower blowers distributed through four aeration pipes per bay. The pipes have air holes along the plastic piping through which the air flow is created. These pipes are protected in the Phase 1 bays by grates that sit over the aeration trenches.

Figure 7. Aeration of the ASP Bays

Phase 1 aeration trenches

ASP Phase 2 ½ HP blowers

[9] The current budget shows $ 18,600 for hauling supplemental potable water

[10] According to D. Goossen (6/30/17) the previous weeks have seen approximately 7000 gals/per week of leachate being diverted to the WWTF. Since this requires leachate testing, hauling and disposal costs, the 2016 actual expense shows this to a total of $11,617 for that year.

When building the compost pile in the ASP bays, it is important to ensure that the initial layer of material placed immediately over the aeration pipes has high porosity and is structurally strong enough to support operating equipment without compressing, which avoids reducing the even distribution of the air flow.

Fresh word chips are an ideal material for this application (Figure 8, below). However, the availability of fresh woodchips is currently limited requiring the use of recycled wood chips to create this initial air plenum layer. While the operator is careful to lay down these recycled wood chips and avoid directly driving over the material immediately over the aeration pipes, this material is laterally compressed on either side of the pipes. In addition, due to the high percentage of fines in the recycled chips, the fines can migrate down and clog the screening over the aeration pipes or even close-off the aeration holes in the pipes.

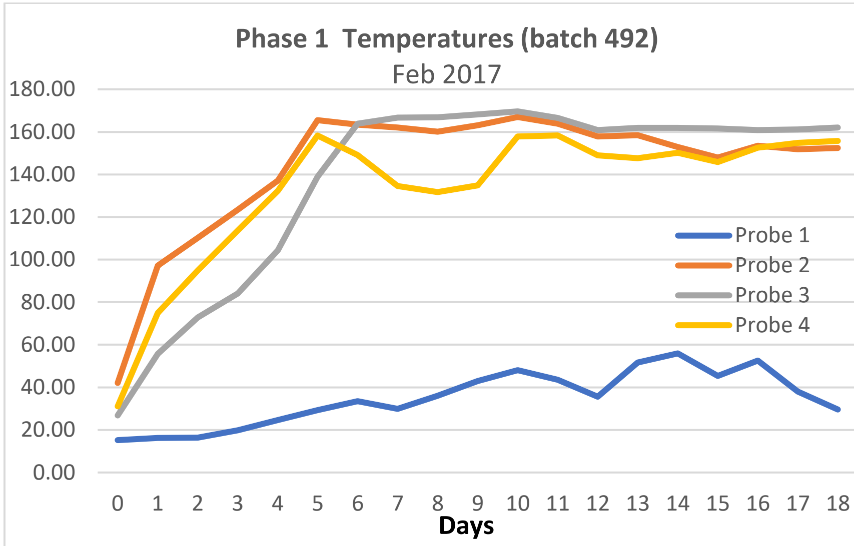
Figure 8. Clogged Aeration Pipes and Clean Wood Chips

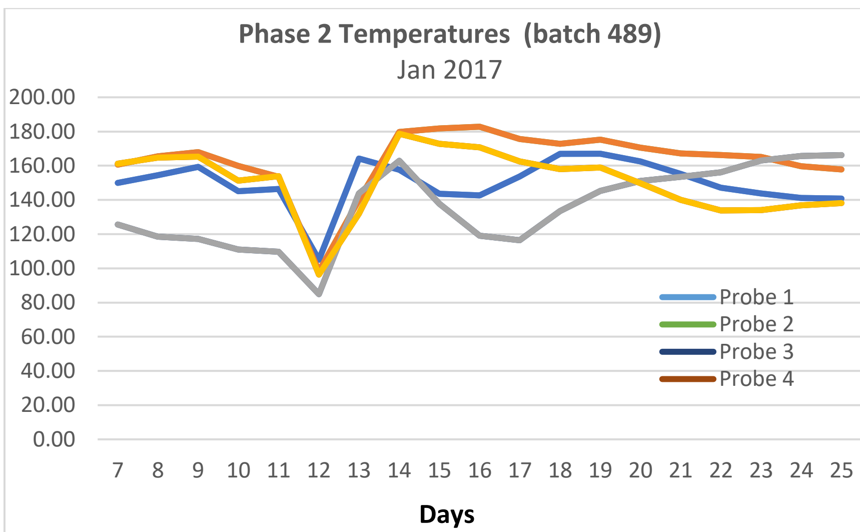
Clogged aeration hole | Recommended plenum material

Once the piles are constructed, temperature monitoring is an indirect proxy for pile aeration. This is because temperature reflects the heat within the pile which is a combination of heat generation from biological activity of the decomposing organisms, and heat retention due to the insulating capacity of the pile.

Temperature is also used to meet the regulatory standards for pathogen control. This is a time-temperature standard (PFRP) with temperatures needing to reach at least $55^{o}C$ ($131^{o}F$) for at least 72 hours. Figure 9 presents a representative sample of temperature and time from Phase 1 and 2.

Figure 9. Example of Monitored Temperature Over Time, Phase 1 and 2





As illustrated by Figure 9, it is evident that temperatures are not only meeting PFRPs, but also reaching elevated temperature above 155^{o}F for extended periods of time. Extended periods of higher temperatures slow down the decomposition rate, and in some cases, can stop it all together in specific areas within the composting mass. Such elevated temperatures can be controlled by reducing the insulating capacity of the pile (smaller piles), and/or controlling the rate and duration of the pile aeration. For the latter, there is a trade-off of aerating a pile to cool it down and loss of pile moisture due to the extended air flow. If pile moisture drops below 40%, the decomposition rate will be severely curtailed.

In looking at the historic data, it appears that extreme pile temperatures were better managed before the mixer[11] was out of commission and the current blending and watering process was instituted[12] - see Figures 10 and 11. After a desired initial increase to high temperatures for a minimum of 72 hours to control pathogens, the most ideal subsequent temperature level should be kept below 140°F. This allows the greatest rate of decomposition.

Figure 10. Comparison of Pile Temperatures, Phase 1, 2014 and 2016

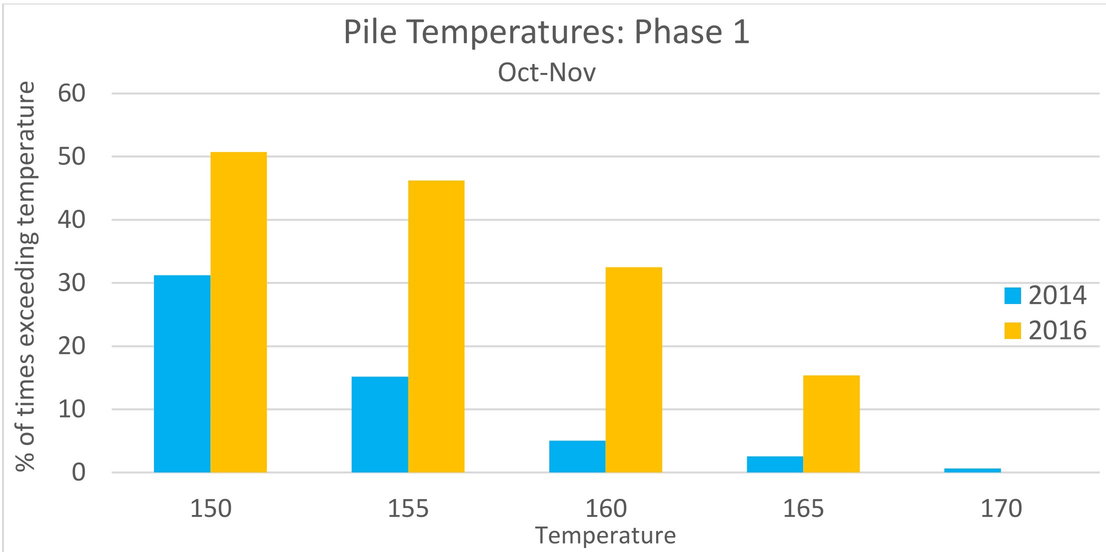
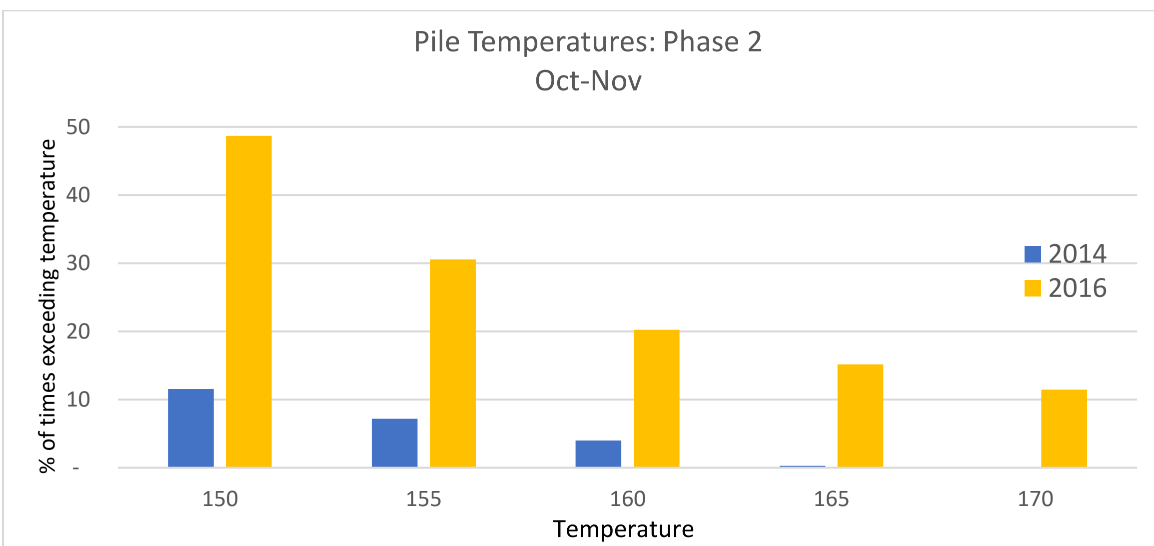


Figure 11. Comparison of Pile Temperatures, Phase 2, 2014 and 2016

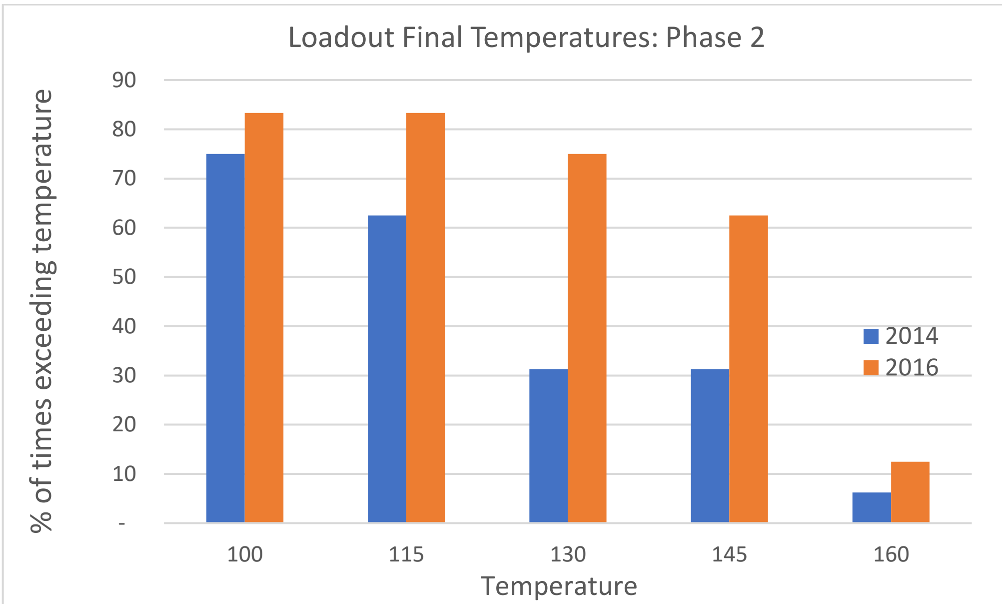


[11] 2014 data

[12] 2016 data

Indication of the end of active composting – which should occur at the end of Phase 2 ASP composting - is when pile temperatures trend towards ambient temperatures. Figure 12 compares loadout temperatures from Phase 2 from a random set of data for the years when blending and water addition was associated with the mixer (2014) as opposed to blending with a loader and adding water with a tanker truck (2016)[13]. In both cases, the majority of the batches were still in the active compost phase at loadout from the Phase 2 ASP bays. This indicates both that material is moving through the ASP bays too quickly, and that the resulting curing time will be extended – both illustrating a facility that is at or above throughput capacity.

Figure 12. Comparison of Loadout Temperatures from the Phase 2 ASP Bays



Screening

When the facility initially moved to its current location, screening was completed with two used rotary screens (trommels). These were quite inefficient, both because they were often down for repair and because the through-put rate was only around 40 cy/hour[14]. Recently the facility has been utilizing both a leased Komptech Multistar S-3 Screener as well as a Neuenhauser 3F. The S-3 is no longer on site, and GMC has indicated it is in the process of purchasing a used Komptech Multistar L-3 Screen.

The formerly leased S-3 is considered an entry-level screener for composting facilities designed for low-to moderate volumes of materials to be screened.

The throughput rate of a S-3 can be up to 130 CY/h, but this depends on moisture content of the input material. Currently screening averages approximately 100 CY/hr[15], which is an approximately 250

[13] In review of preliminary data from 2017, the piles are still ranging in the higher temperatures at time material is moved to screening.
[14] According to D. Goossen (6/30/17)
[15] Conversation with Brandon Lapsys, Komptech America (Biocycle '17, Baltimore, MD)

percent improvement over the former trommels' throughput rate. On the other hand, the star-screen appears to be adding more fines into the recycled woodchips than the previous use of the trommels[16], which may impact the blending recipe calculations.

The (used) Komptech Multistar L-3 Screener being purchased has a throughput rate which is more than twice the throughput of the formerly leased S-3. In addition, the L-3 has the feed-hopper size and out load conveyer height that will make the screening process more efficient, because loading of input material and removal of screened material could be accomplished with a single loader, where the S-3 definitely required two loaders to maximize the throughput rate of that size machine. But in reality, there will often be two loaders used to move material through the L-3 in an efficient manner, but the overall time for processing material with this screen will be significantly quicker because of its higher through-put capacity.[17]

Currently the screening step, translated to an aeration bays' worth of material (approximately 350 cy) is screened into:

- 110 CY fines (3/8 – 1/2") sent to curing phase
- 212 CY (1/2 - 2") recycled back into pre-Phase 1 blending
- 28 CY (>2") as residue[18]

Operational challenges with the screening phase of the operation include:

1) Due to the less than ideal blending and watering regime in aeration phases of the process, the material may not have undergone the same decomposition by the time the material needs to be removed from the Phase 2 aeration bay (to make room for incoming material) - this can result in a higher fraction of >2" minus material, requiring additional screening.
2) Due to the backlog of material, GMC is running the material through the screen at an increased rate, thus having less opportunity to allow for good fractionation of the materials into the <2"fraction. This results in (possibly multiple) screenings of the >2" fraction.
3) Screening is occurring before curing, reducing the porosity of the curing piles, which results in delay in material reaching a stable state.

Curing

The curing area is to the east of the ASP bays and screening operation. The material sent to the curing pile is the 3/8- to 1/2" fraction from the screening process. This product is placed in large pyramidal piles (approximately 12' high by 30' at the base). The piles are turned with a 1 CY excavator that can turn piles up to the 12 feet high.

[16] Site operator 7/21/17. But this was explained in a subsequent communication (9/21/17), that these extra fines are the result of utilizing a rented screen to catch up on a back-log of poorly composted material.

[17] 9/21/17 communication from GMC

[18] This material is often screened a second time and possibly a 3rd time resulting in < 5% of the initial bay volume ending up being clean fill material.

These piles are turned 5-6 times over a 6 to 8 - month period[19]. Then the cured material is either brought back directly to a bulk compost bunker to the north and east of the aeration pads or moved to blending location to the south east of the curing area.

Figure 13. Curing Piles

There is an outload ramp at the eastern end (lower end) of the curing area that allows for direct loading of material purchased by the truckload.

Some considerations regarding the curing process are:

1. the curing area is estimated to hold 15,000 cubic yards of material if stacked in these large pyramidal formations;
2. the size of such piles of 3/8 to 1/2" material results in a tight compression of the material in the lower parts of the pile, eliminating adequate aeration for curing, which slows down the stabilization process;
3. due to the challenges pointed out for the previous composting steps, the material entering the curing area may not be adequately decomposed, which only exacerbates the need for proper mixing and aeration during the curing phase;
4. the 1 CY bucket is a very time-intensive method for turning;[20] and,
5. transport of the cured material brought back to bulk-sales bins and screening location is a time-consuming distance for transport by loader.[21]

[19] According to D. Goossen (6/30/17), this may be as long as 12 months.
[20] In timing the turning (6/30/17), it took up to 45 seconds per bucket.
[21] According to D. Goossen (6/30/17), they use front-end loaders, and sometimes a 10 Cy truck to move material back.

Site Configuration

The site is laid out from west to east in a step by step process from aeration to screening to curing and blending (Figure 14). Drop off of incoming material occurs at the same point of ingress and egress as the sales of bulk material and the screening and load-out of pallets of the bagged material.

Figure 14. Site Layout

Both the curing process step and post-production product blending occurs on the remnants of a borrow pit. The soil material is a sand-silt mix that when wet makes it very difficult for trucks to get through.

Ramifications of the current site plan include:

1 a poor flow of ingress and egress of delivery of feed stocks due to both public car and pedestrian traffic and the continued movement of loaders either moving material to blending, bringing material to bulk sales storage bins, or moving material from temporary storage to either curing, bagging or additional screening;

2 bagged material is placed where there is viable space (Figure 15), with the majority placed between the bagging and curing area, although pallets are being put in areas behind the Phase 1 aeration bays and outside the fence adjacent (to the south) of the curing area;

Figure 15. Bag Product Storage

3 the distance from the blending location to sales and bagging areas creates a time-consuming materials handling process;
4 the bagging area is quite constrained because it also serves as a maintenance garage;
5 there are seasonal limitations to how well material can be moved and processed at this location; and,
6 the overall result of these site constraints is a site that could be perceived by the public as poorly managed due to the large rutting, pooling water and general state of organic material being driven over.

Conclusions Concerning the Operational Review

The natural conditions of this site and its impact on the compost process contributes to an inefficient composting process. It is commendable that within these site constraints GMC is able to process the amount of material currently being processed and produce and market such a high-quality compost end-product.

However, as illustrated above there are a number of indicators that the facility is being operated at capacity, and possibly over-capacity. These include:

- Excess pile heights in all ASP bays;
- High temperatures within the piles, which slows down the rate of decomposition;
- Temperature data at the end of the ASP process indicate that the material is being moved to curing before it is completely composted, which results is an extended curing phase, stretching the capacity of the approximately two acres dedicated to the curing phase of the operation;
- The screened curing piles are too high, which compacts the material, again slowing down the curing phase, resulting in increased curing time, further pushing the site limits;
- Bagged material is stored in every possible location throughout the site because there isn't enough free space to efficiently organize storage;

- The equipment maintenance building is too small for the equipment requiring maintenance, and is further constrained by the bagging operation and equipment; and,
- Public traffic and GMC operations are occurring in the same space, which is a safety hazard.

Being at capacity now has significant implications for the financial sustainability of GMC because one area where increased revenues are possible is to accept more food waste as the requirements of Act 148 ramp up. However, that is not going to be possible without significant changes to the operation.

These changes in operation can be divided into relatively low-cost changes, which may improve efficiency and lower costs slightly, but will, in DSM's opinion only increase throughput marginally, if at all; and, high cost capital improvements which could improve the site significantly allowing for increased throughput and therefore increased revenue.

Short-Term, Low Cost Operational Changes to Improve Efficiency

1) Re-address the recipe in creating the initial blend by better assessing the available carbon coming from recycled wood-chips and the high BOD water used to wet the pile before it is put in the Phase 1 ASP bays.

2) Repair the Mixer and return to a better blending methodology that creates a more consistent blend, and more importantly porosity, which in turn will allow for more efficient water addition before material is put into the Phase 1 ASP bay.

3) Meter water into the initial blend to more accurately meter water addition. If the Mixer is operating, the addition of metered water volumes to the initial blend becomes that much more feasible.

4) It was communicated that there are conceptual plans, with associated cost estimates, for increasing underground storage of process water and/or developing a well on site. For the former, there is the potential to take in additional liquid wastes which can increase the tipping fee revenue and reduce costs for contracted hauling of potable process water and the transfer of leachate to the wastewater treatment facility.

5) Consider experimenting with *in-place* watering strategy for the Phase 2 ASP bays. However, this should be done in both summer and winter seasons to determine if it is a feasible option during colder months. If successful[22], this would significantly reduce time-consuming double-handling of material and would allow for more optimal moisture content and temperatures as the material is moved to the curing area.

6) Utilize clean wood chips to cover the aeration trenches and pipes prior to placing on blended material.

7) Reduce the excessive temperature regimes in both Phases of the ASP stage. The historic data has shown that pile temperatures were more optimal when the mixer and metered watered addition was utilized for blending. However, there is room for improvement here

[22] The method chosen should attempt to minimize short circuiting of water through the composting mass.

since at times the temperatures are still higher than optimal levels that would maximize the decomposition rate.[23]

8) Move material directly from ASP Phase 2 bays to curing, without screening. This would allow better management of the active composting process and reduce the time material takes to reach stability. By not screening out the coarser material before moving material to a windrow in the curing area, there will be better porosity to keep the pile in an aerobic state, and thus enhance this stage of the decomposition process.

9) Reduce the size and increase porosity of curing piles. The current process creates curing piles of 3/8 – ½ inch material. These small particle-size materials easily get compressed in the lower parts of the piles. The result is a post-screening decomposition process that lacks the requisite porosity to maintain aerobic conditions, which is a necessary condition for efficient decomposition and moving towards a stable end-product.

10) Turn curing piles with the loader, rather than with the excavator. By using a loader, with a 'loader-rake" bucket, the windrows piles can be aerated more effectively than the time-consuming current procedure with the 1 cubic yard excavator bucket. This will enhance the decomposition rate and reduce curing time freeing up space[24].

11) Configure the turning of the piles so they migrate towards a designated screening area by the end of the curing phase. This strategy avoids excessive material handling of moving material long distances on site.

12) Reconfigure the location of bagging and bagged compost storage to minimize movement of material from post production blending to bagging and from bagging to load-out. Bagging and bagging storage should be subsequent to any post-curing screening. If the curing piles are migrated back towards the current bagging operation location, this will enhance operational efficiency. But there are other considerations of moving the bagging operation from the current maintenance shed.

13) Separate the bagging operation from maintenance garage needs. Considering the need to continually maintain and repair mobile equipment, having such maintenance occur under cover is preferred, especially during inclement weather. Removing the bagging equipment from the maintenance garage frees up much needed space in the maintenance garage.

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[23] Currently, high temperatures are being attempted to be controlled with increased aeration (both force and duration). The trade-off is that utilizing such a method exacerbates the drying of the piles and thus, slowing down the decomposition rate of the material. A better solution is to reduce the insulation factor of the composting pile (especially during the warmer months) but to do so would further limit the throughput capacity of the facility.

[24] In order to implement such a change in processing procedure, a site capacity feasibility study needs to be completed that would take into account the additional material that would be taken on to the curing location, the appropriate sizing of the curing piles, the rate of decomposition, thus volume reduction of the material, and the projected time for material to reach stability. In addition, this windrow-turn operation would need a composting pad that is much more stable than the current silty-sand/compost surface currently found at the existing curing pile.

14) Better configure operations for better flow of ingress and egress so to avoid intermingling of citizen drop-off and purchase with commercial waste delivery and facility operations and material handling. The intermingling of the public with facility operational equipment increases the liability for GMC.

15) Create a single area for bagged compost storage, so that load-out is facilitated and there is less congestion of traffic in the area of active composting operations.

16) Develop a contamination strategy to address that material that impacts the efficient operation of the facility and can impact the final end-product quality**.** Currently this is primarily film plastic. At a minimum, standards for rejecting loads need to be developed and provided to those bring waste to the facility. Concurrently, the facility can apply a surcharge to tipping fees based on visual inspection of contamination of incoming loads. Alternatively, is the purchase of de-packaging equipment

Longer Term Capital Improvements

It is DSM's opinion that the short-term improvements discussed above will increase efficiency and result in some cost savings. However, they will not lead to sufficient increases in throughput, and will not result in sufficient reductions in operational costs to eliminate the current subsidies.

Significant reduction of subsidies will require a combination of increased/new charges for yard waste deliveries, and increased throughput of food waste, which already carries a tipping fee. Significantly increasing food waste acceptance will require new investments.

First, and foremost DSM believes that significantly expanding throughput on the current site will require the use of a dedicated windrow turner. This would speed up the turning of the curing piles, and in doing so increase aeration and the speed at which the piles reach the point of final curing, freeing up space for more piles. Just as importantly, this would allow the use of all ASP bays for initial composting, eliminating the need for moving material from the Phase 1 bays to the Phase 2 bays, and increasing the overall capacity of the ASP bays.

In essence, completion of the composting operation would occur in outside piles utilizing a windrow-turn methodology. While it is outside the scope of this project, DSM estimates that the capital cost of a windrow turner is roughly $200,000.

The first alternative for pursuing this change would be to locate the windrow turning phase in the location of the current curing location. This would require both designing the appropriate windrow lay-out scheme, as well as estimating the maximum volume of material that could be processed during this phase, which would be a combination of site capacity and degradation rate (volume reduction) of the organic material.

If the curing area were reconfigured for this purpose, GMC should consider re-grading the area to maximize windrow construction and turning areas, and possibly make improvements to the pad on which the material will be turned. The output of this step would have material moved to larger, continuous storage piles in the location where post-production processing takes place.

If the screening and bagging operations were then logically located adjacent to the storage piles, a gravel road to this area would need to be constructed so that customers and trucks can pick up material even in wet seasons.

A second alternative is utilizing the parcel to the southwest of the aeration bays (Figure 16). There may be 6 to 8 acres that could be utilized for windrow, curing and screening operations at this location, which would free up the current curing area for bagged pallet storage and load-out.

The disadvantage of this alternative is that it would bring the active composting phase in closer proximity to neighbors on Redmond Road and Ledgewood Drive. Prior to active consideration of this alternative, this area would need to be surveyed for wetlands and a determination of the sub-soil made to determine what would be required to establish a pad for the windrow composting operation.

Figure 16. Potential New Location for Windrow Composting

In conclusion, while it is beyond the scope of DSM's business analysis of current conditions, we believe that any significant increase in throughput will require new investments in site work and a windrow turning machine, as well as an adequate equipment maintenance and replacement fund to assure that key pieces of equipment, like the Mixer and the screen are operational in a timely manner.

Appendix B | Survey of Comparable Facilities

During June and July (2017) Michael Simpson, a DSM Associate and Core Faculty member at Antioch University, New England worked with a graduate student to conduct a survey of composting facilities similar to the GMC facility.

The survey was conducted to collect information about operational practices at commercial composting facilities processing food waste and yard waste via aerated windrows or an aerated static pile (ASP) system. The questionnaire focused on eight main themes: (1) site size and layout, (2) revenue streams, (3) recipe formulation, (4) active composting process, (5) curing process, (6) screening process (7) finished product attributes, and (8) facility staffing and roles

For this survey, 22 composting facilities were targeted nation-wide. Preference was given to facilities similar to GMC in methodology and/or feedstocks processed. Of the 22 facilities selected, 8 voluntarily agreed to participate in the survey, as shown in Table 1.

Table 1 – Facilities Surveyed Compared with GMC

Facility	Annual Volume Processed *(tons unless noted)*	Materials Processed	Method	Facility Ownership	Location
Anonymous Facility - Southeast US	84,000	YW, Biosolids, FW	ASP	Private	Southeast US
Dirthugger	30,000	YW, FW	TAP	Private	WA
GMC	12,000	YW, FW	ASP	Public	VT
Hirzel Farms	20-22,000 (cy)	YW, M, FW	Aerated Windrow	Private	OH
New England Compost	5,000 (cy)	YW, M, FW	ASP	Private	CT
OCRRA	17,283	YW, M, FW	ASP	Public	NY
SET Empire	28-30,000	YW, FW	ASP	Private	MN
Silver Springs Organics	65,000	YW, M, FW	ASP	Private	WA
WLSSD	5,600	YW, FW	ASP	Public	MN

Survey respondents were asked to estimate approximate breakdown of site area devoted to various operational tasks. Tipping & preprocessing includes any space devoted to tipping of incoming material, stockpiling of feedstocks. grinding and mixing. Because most facilities utilize a high-throughput ASP system, the area used for active aeration is relatively small.

The exceptions would be Hirzel Farms (uses slower windrow method and piles are cured in place) and Silver Springs Organics, whose aeration process involves a 2-phase system but no further curing afterward. WLSSD does not have a dedicated, separate space for screening because it is done right on the active pad with a mobile screener that moves material over to the curing area. In most cases, “other space” included leachate ponds, buildings, storage of finished product, retail space, biofilters, etc.

Table 2, on the next page, provides data on the Facility’s Sites as compared to GMC.

Table 2 – Site Size and Layout

Facility	Site Size *(acres)*	Tipping/ Preprocessing	Aeration	Screening	Curing	Other
Anonymous Facility - Southeast US	10	15%	10%	5%	10%	60%
Dirthugger	9	15%	20%	10%	35%	20%
GMC	11.1	5%	5%	8%	9%	73%
Hirzel Farms	25	15%	60%	10%	n/a	15%
New England Compost	3	33%	33%	10%	20%	4%
OCRRA	5	12%	10%	5%	10%	63%
SET Empire	19	32%	10%	11%	10%	37%
Silver Springs Organics	9	10%	45%	16%	n/a	29%
WLSSD	7	9%	20%	n/a	14%	57%

Table 3 details revenue streams and their percentage of total operating costs. Most respondents indicated that the majority of their revenues come from tipping fees. A few specifically mentioned that operational costs are covered with tip fees, while sale of finished product provides profit. One notable exception is WLSSD, whose operations are largely subsidized by a district-wide solid waste management fee added to local property taxes as well as a volume-based surcharge on curbside services.

Table 3 - Revenue Streams (By Percentage and unit)

Facility	Tipping Fees	Product Sales	Tax/Fee Subs
Anonymous Facility - Southeast US	unknown	unknown	n/a
Dirthugger	65%	35%	n/a
Hirzel Farms	50%	50%	n/a
GMC (Based on FY 17 Actuals)	15%	48%	37%
GMC (Based on FY 18 Budget)	22%	58%	20%
New England Compost	40%	60%	n/a
OCRRA	57%	43%	n/a
SET Empire	75%	25%	n/a
Silver Springs Organics	60-65%	35-40%	n/a
WLSSD	15%	35%	50%

The tip fees charged by the facilities interviewed varied widely; those facilities charging upwards of $50/ton tend to be located in regions with more expensive MSW markets. Most facilities negotiate tip rates depending on quantity and level of contamination.

The price of finished bulk product seemed to fall mostly between $20 - $30 per cubic yard, with a few facilities selling at $50 or higher depending on product and application. Most facilities sell a large portion of their product at contracted rates below retail or provide wholesale discounts. Table 4 shows these data points.

Table 4 – Tips Fees Charges and Average Charges for Finished Bulk and Bagged Product

Facility	**Tip Fee** *(per ton)*	**Charge for Finished Product** *(per yard)*	**Charge for Finished Product** *(cf, bagged)*	**Tax/Fee Charge**
Anonymous Facility - Southeast US	$25-$35	unknown	n/a	n/a
Dirthugger	$35-40	$45	$8	n/a
GMC	$52	$42 Blended Average	$6.10 (Blended Average) (1)	
GMC		$59 Compost Retail	$9.70 (Average Retail)	
Hirzel Farms	$25-45	$25-50	$6	n/a
New England Compost	$50-65	$40-65	$10/5-gal	n/a
OCRRA	$40	$20	$5	n/a
SET Empire	$50	$20	n/a	n/a
Silver Springs Organics	$54	$24	n/a	n/a
WLSSD	$10	$30	$5	$25/hh/yr

(1) This is a price for all bagged products sold shown (for comparison purposes) on a cubic foot basis. The Blended Average for compost products is $6 which rose to $6.10 (per cf) for all products sold. Finally, direct retail prices for GMC bagged products were at $9.70 per cubic foot.

As shown in Table 4, four respondents provided information of revenues from bagged compost – which ranged from a low of $5 per cubic foot to a high of $8 per cubic foot. This can be compared with an average of $9.71 per cubic foot for reported retail revenues from GMC, which would indicate that the unit price for GMC bagged sales are on the high side of those reported from other facilities.

Next, Tables 5A and 5B shows data collected on recipes. It was difficult to get many respondents to share specific recipe information, either because of proprietary concerns or because of variability in available feedstocks. In general, however, most respondents seem to follow at least a 1:1 yard waste to food waste ratio. OCRRA noted they use a 3:1 ratio as a general rule (3 parts shredded yard waste/horse manure to 1-part food waste). Hirzel Farms seems to follow a similar method. Dirt Hugger's recipe is also closer to the 3:1 ratio, especially when dealing with high-nitrogen orchard wastes.

Interestingly, Silver Springs Organics said they do not typically follow a recipe, but instead use the bulk density of initial blends as a general guide; they find that blends above 975 lbs./cy tend to be too heavy with nitrogen-rich feedstocks, while blends under 950 lbs./cy tend to have too much carbon (this facility primarily handles fresh yard wastes; food waste is ancillary).

Like Silver Springs Organics, OCRRA also pays close attention to initial bulk density. Every time a new batch is mixed, they sample bulk density with 5-gallon buckets, targeting no more than 30 lbs. per 5-gal bucket (1200 lbs./CY) with an ideal of 980 lbs./CY.

Table 5A - Recipe Data (By Weight)

Facility	FW (%)	YW (%)	Manure (%)	Wood Chips (%)	Other (Type, %)
Anonymous Facility - Southeast US	*Proprietary Blend*				
Dirthugger	15%	60%		10%	15% cherry sludge, fruit matter
GMC	32%	32%	7%	11%	Wood ash added
Hirzel Farms	30-40%		0-20%		50-60% corn silage, ag waste
New England Compost	*Proprietary Blend*				
OCRRA	34%	55%	11%		
SET Empire	50%	50%			
Silver Springs Organics	4%	90%	5%		
WLSSD	50%	50%			

Table 5B – Other Recipe Information

Facility	Density of Initial Blend (lbs./cy)	YW Grinding Onsite	Blending Method
Anonymous Facility - Southeast US	unknown	Limited	bucket blend
Dirthugger	1,200-1,300	Y	bucket blend
Hirzel Farms	1,500-1,600	Y	bucket blend
New England Compost	unknown	N	bucket blend
OCRRA	950-1,200	Y	slow speed shredder
SET Empire	1,500	N	feed mixer
Silver Springs Organics	950-975	N	slow speed shredder
WLSSD	850	Y	feed mixer
GMC	557-1385[2]	N	bucket blend

1) Prior to 2015, a mixer was used to blend the material with the bulk density averaging 1031 lbs./cu yd; the mixer is currently being repaired and is projected to be in use again by Fall 2017.

About half of these facilities have the ability to process bulky/woody wastes on site. Silver Springs and the anonymous facility reported they have little need for onsite grinding/preprocessing because most of the material they receive arrives pre-processed (i.e. yard woody yard waste that has already been chipped/shredded at other facilities prior to delivery). Other facilities, like SET Empire and New England Compost, do not deal with significant quantities of bulk woody waste to require a grinder.

About half of the facilities make their recipes using some sort of mechanical mixing equipment. The other half use bucket blending.

Table 6 - Active Composting Process

PHASE 1

Facility	**Duration** (days)	**Volume Reduction**	**Covered**	**Water Addition**
Anonymous Facility - Southeast US	15-30	30-60%	Y	N
Dirthugger	12 - 15	15-30%	N	Y
GMC	15 - 18	20-25%	N	Y
Hirzel Farms	120-210	33%	N	N
New England Compost	20-30	30-50%	N	Y
OCRRA	25-30	25%	N	Y
SET Empire	45	15-20%	N	N
Silver Springs Organics	15	0%	Y	Y
WLSSD	30	50-60%	Y	Y

PHASE 2 - If present

Facility	**Duration** (days)	**Volume Reduction**	**Covered**	**Water Addition**
Anonymous Facility - Southeast US	n/a			
Dirthugger	n/a			
GMC	22-25	10%	N	Y
Hirzel Farms	n/a			
New England Compost	20-30	10-20%	N	Y
OCRRA	25-30	15%	N	Y
SET Empire	n/a			
Silver Springs Organics	30	50-55%	Y	Y
WLSSD	n/a			

Most respondents utilize ASP, with the exception of Hirzel Farms (windrows) and Dirthugger (Turned Aerated Pile). Among these facilities, the duration of the active composting phase ranges from 15-60 days (including both phases, if present), with 30-45 probably most typical. Dirthugger and Silver Springs Organics both utilize optimized reversing aeration systems to keep their initial treatments on the shorter end of the spectrum.

Almost all facilities noted challenges maintaining moisture seasonally, especially in the warmer summer months when piles have greater risk of drying out. The one exception to this was the anonymous facility, which uses a proprietary, completely enclosed ASP system. Virtually none of the respondents seemed to be able to quantify water addition practices in gallons per cubic yard. The three facilities that utilize a second phase have the ability to re-wet material as necessary after completion of the first phase.

Table 7 - Curing Process

Facility	Duration *(weeks)*	Forced Aeration	Volume Reduction	Turning Method	Specialized Equipment
Anonymous Facility - SE	4-8	Y	5-10%	n/a	
Dirthugger	7-12	N	5%	Windrow Turner	Vermeer CT1010
GMC	20-50	N	5-10%	Excavator	
Hirzel Farms	16-24	N	10-15%	Windrow Turner	Komptech Topturn X53
New England Compost	8-24	N	5-10%	Bucket Loader	
OCRRA	4-6	N	5-10%	n/a	
SET Empire	8-12	N	15%	Bucket Loader	
Silver Springs Organics	4 (same step as 2nd phase ASP)	Y	50-55%	Bucket Loader	
WLSSD	4-12	N	10%	Bucket Loader	

Most respondents indicated they will turn curing piles only as necessary to avoid unnecessary handling. OCRRA and the anonymous facility do not turn curing material at all. Dirthugger cures in mass piles and turns every 3 weeks with a Vermeer side-turner.

Interestingly, Silver Springs Organics does not have a discrete curing step as part of their process – their curing reportedly occurs as part of the second ASP phase and is turned by bucket loader only as necessary. Most of these facilities seem to cure material for at least 1-2 months, depending on season and desired finished product.

Table 8 – Screening

Facility	Equipment	Screen Size(s)	Throughput Rate - wet / dry *(cy/hr)*	Overs	Trash	Screen Before Curing
Anonymous Facility - SE	*unknown*	*unknown*	*unknown*	10-15%	<1-2%	N
Dirthugger	Terra Select W70 Terra Select T60	3/8"	20-30 / 40-50	38%	2%	N
GMC	Komtech L3	3/8" + 1/2"	75 / 1850	10% (or 60%)	< 2%	Y
Hirzel Farms	Varies (rented for bagging only)	3/8"	unknown	unknown	unknown	N
New England Compost	McCloskey 512R Trommel	1" & 3/8"	10-20 / 30-80	10%	5-10%	Y
OCRRA	McCloskey 621 Trommel	1/2" & 1/4"	20-40 / 60-80	0%	10-20%	N
SET Empire	Komptech Starscreen & Trommel	1/2"	75 / 125	25%	10%	N
Silver Springs Organics	Komptech Multistar L3	5/8" & 3/8"	n/a	25%	3-5%	N
WLSSD	Varies (rented)	1" & 5/8"	50 / 90	15-20%	5-10%	Y

The majority of these facilities screen after curing, not before. Almost all own their own screening equipment (in some cases multiple types), but a couple rent as needed.

Throughput rates reported by respondents varied greatly. Most seemed able to achieve 50-80 cubic yards per hour on the higher end, with 20-40 on the lower end. Some facilities, such as WLSSD and New England Compost have limited space to work with, and typically screen material as soon as possible (whether wet or dry). Other facilities, such as OCRRA, indicated they will wait for material to dry as much as practical before screening. Most facilities indicated that they use different size screens to produce coarser and finer products.

Less than 10% trash and 15-20% overs appears to be typical among these facilities. In the case of OCRRA, they reportedly dispose of overs due to heavy plastic contamination. On the other hand, Dirt Hugger tends to let their overs decompose further and rescreen to produce a coarse "Orchard Compost." All other facilities tend to recycle the overs back into the process.

Table 9 - Finished Product

Facility	Volume Reduction (1)	Bulk Density *(lbs./cy)*	Post-blending	Bagging	Bag Size	Bag Price ($)
Anonymous Facility - So	35-70%	unknown	Y	N	n/a	n/a
Dirthugger	20-35%	1,200-1,400	Y	Y	1 cf	$8
GMC	40-50%	1550	Y	Y	.78 cf (5 gal)	$6.50 - $8.00 (retail)
Hirzel Farms	40-50%	1,400	N	Y	1 cf	$6
New England Compost	50%	unknown	Y	Y	5-gallon	$10
OCRRA	45-50%	unknown	N	Y	1 cf	$5
SET Empire	30-35%	1,700	Y	N	n/a	n/a
Silver Springs Organics	50-55%	800	N	N	n/a	n/a
WLSSD	60-70%	900-1,100	N	Y	1 cf	$5

(1) Volume reduction from initial input.

On the whole, it appears most facilities are able to achieve around 40-50% reduction in volume from start to finish. Estimates of finished product bulk density varied widely, and several respondents were not able to provide estimates.

About half of the respondents make specialty blends and/or sell compost by the bag. Typical bag pricing ranged from $5-8 per cubic foot. New England Compost sells their product in 5-gallon (20-quart) bags at $10 per bag (equates to roughly $15 per cubic foot).

Table 8 – Staffing

Facility	Number of Staff	Roles
Anonymous Facility - Southeast US	8	1 plant manager, 1 supervisor, 3-4 operators, 1 scale master, 1 admin staff
Dirthugger	10	2 owners/business dev., 1 scale master/admin, 1 logistics foreman, 3 operators, 1 quality control, 1 commercial driver, 1 mechanic
GMC	10 (8.2 FTE)	1 manager, 3.5 operators, 1.5 admin, 1 sales, and seasonal delivery driver, bagger and office asst.
Hirzel Farms	3	1 supervisor, 1 operator, 1 quality control
New England Compost	3	1 supervisor, 1 operator, 1 quality control
OCRRA	5	1 supervisor, 3 operators, 1 mechanic
SET Empire	8	1 supervisor, 1 scale master, 5 operators, 1 quality control
Silver Springs Organics	8	1 supervisor, 1 scale master/admin, 3 operators, 2 laborers, 1 mechanic
WLSSD	3	1 operator, 1 public communications (PT), 1 yard waste management (PT)

Most facilities seem to have at least a manager and one or more operators. Some may have a dedicated scale master or mechanic. More advanced operations have additional quality control staff to monitor loads, pick out contamination and perform finished product testing. Dirt Hugger seems unique in that they perform their own hauling.

Major Challenges Noted

Every facility interviewed noted the challenges of dealing with plastic film and working with generators to keep contamination to a minimum. In most cases, food waste is delivered to these facilities via third party haulers. Therefore, the facilities don't have a direct line of communication with the generators, but more often work with haulers on any issues. Most facilities interviewed have a very low tolerance for garbage and will charge steep fees for excessive contamination or will outright reject loads. Some facilities, like Dirt Hugger have hired dedicated quality control staff who manually pick out contamination as loads are dumped. They also provide haulers with periodic contamination reports.

Like GMC, some of these facilities have struggled with compostable utensils and flatware. Silver Springs Organics receives residential food scraps but no longer allows flatware or plastic bags. In their experience, residents had a hard time telling the difference between compostable bags and non-compostable bags, and many of the products did not fully break down (ASTM standard is 60% breakdown in 120 days, but Silver Springs has a 45-day process from start to finish). The anonymous facility echoed issues of dealing with compostable ware and additionally noted problems with broken glass.

Nuisance odors is another concern among a few of the facilities surveyed. OCRRA mentioned that part of the reason they screen material after curing is to minimize release of unpleasant odors. Most facilities at the very least use a 6 to 1- inch layer of finished compost on ASP's to act as a biofilter.

CSWD

CHITTENDEN SOLID WASTE DISTRICT
1021 Redmond Road • Williston, VT 05495-7729
802-872-8100 • Fax: 802-878-5787 • Web: www.cswd.net

MEMORANDUM

To: Executive Board
From: CSWD Staff
Date: November 2, 2017
Re: Program Updates

1. Solid Waste Disposed – (Jon & Nancy) – Data for October are not yet finalized.

2. MRF Overview (Josh) – The MRF financial information is not in at the time of this memorandum. We should have that information for the Full Board packet.

3. Compost (Dan) – Food scrap tonnages for October are not yet finalized. • Total compost and soils sales thru October 28th were $176,623. This is $51,886 or 29% higher than the same period last fiscal year, and $13,112 above YTD budget expectations. YTD Bagged product sales are at $24,744, down 3.5% below FY17 totals. YTD bulk sales are at $151,555, up 34.8% above FY17. • Orders for bagged products by garden centers have been coming in steadily, with 35 customers placing early orders, 8 of which are new accounts. • Fall bagged product production has picked up and we have also begun shipping out loads of pallets to some customers

4. School & Youth Outreach (Rhonda) – October came in with a roar this year. CSWD staff (thanks Ethan) moved 178 students and staff through the MRF and Green Mountain Compost on tours. • Recycle Rhonda visited five schools reaching more than 600 people through programming, technical assists and two Trash On the Lawn Days. • Rhonda assisted Charlotte Central School (CCS) in a clean-up of the school's "Quonset Hut" storage building. About 20 members of the public took advantage of an opportunity to "shop" the Quonset Hut for reuse items no longer needed by CCS. Next, 1-800-Got Junk recycled scrap metal, electronics and clean wood, delivered reusable items to ReSource, and sent the remainder to the landfill. We established a safe, orderly area for fleet fluids storage and corralled, packed and shipped fluorescent bulbs for recycling. Continued support will be given to CCS as they implement a greatly improved materials management plan. Thanks to Charlotte Commissioner Abby Foulk for making this happen.

5. Business Outreach (Michele/Ethan) – In October Outreach staff presented to UVM Eco-Reps and conducted the second annual waste sort at Autumn Harp in Essex. • Michele and Jeannine advised principals on the Burlington Town Center redevelopment team on demolition materials management requirements and coordinated with the Environmental Depot to ensure proper recycling of hundreds of fluorescent bulbs. • Ethan provided materials for an annual Fire & Safety Day event at Home Depot in Williston and fielded new inquiries from three new businesses responding to the food scrap requirements mailer. • Staff met and toured GMC with representatives from BioBag and Eco Products to give them a first-hand look at what happens to the products they market: BioBag voluntarily sampled and tested a pervasive and problematic green film—not a BioBag product—from GMC "overs" and confirmed it is a non-compostable polymer; EcoProducts has agreed to make several changes to their products and labeling to address our concerns. • The Vermont Agency of Natural Resources (ANR) has indicated that they are reconsidering and likely revising their formulas for estimating commercial food scrap generation rates. Staff is providing input and we are adjusting

our outreach in anticipation of this change, which could dramatically reduce the number of businesses estimated to be meeting the current threshold for mandatory food scraps diversion.

6. Community Outreach (Robin) -- In October staff provided two compost workshops and coordinated one led by Ron Krupp, with a total of 30 attendees; 12 Soil Savers and four Green Cones purchased ● Provided materials and support to three multi-residential housing complexes, two of which are starting food scraps diversion programs ● CSWD loaned seven compost containers to three events; two events reported an estimated 117 gallons of compostable materials diverted from landfill. ● Robin joined ANR staff in presenting to Salvation Farms Commodity Program trainees on organics diversion. ● Interviews are underway for a new Community Outreach Coordinator. Michele is coordinating community and municipal requests in the interim.

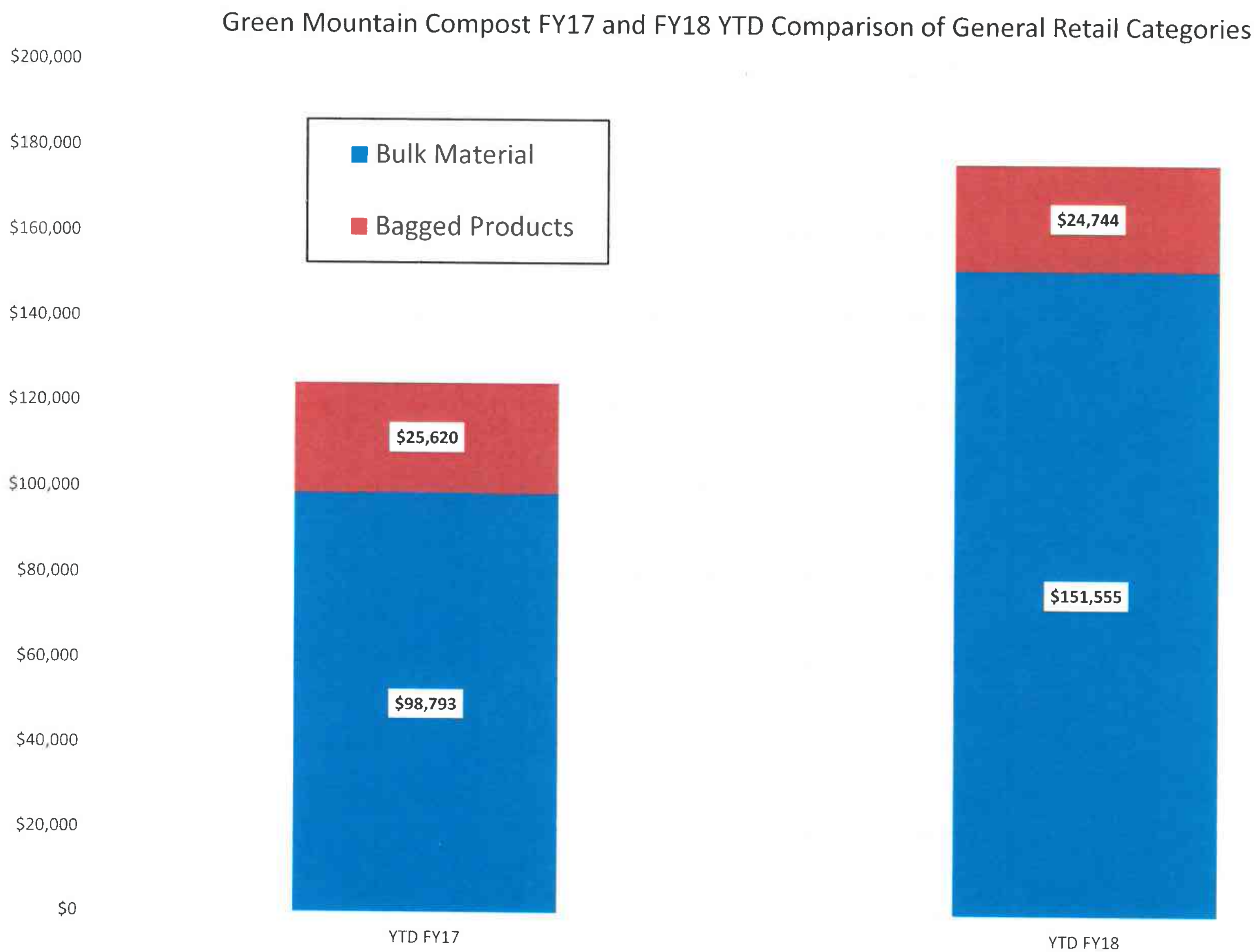
7. Marketing (Jonny Finity) – **Hinesburg closure communication**: We are heavily publicizing the Hinesburg closure, to ensure we reached as many Hinesburg customers as possible. In addition to a mailer to all Hinesburg residential addresses, we took out ads in all local newspapers in the towns surrounding Hinesburg, and we continue to monitor and post on Front Porch Forum. We also created a webpage for Hinesburg-specific information that we will update as the situation progresses: www.cswd.net/hinesburg. At the Hinesburg Drop-Off Center, we posted sandwich boards announcing the closure of the DOC (Dec 2) and the ReUse Zone (Nov 4), and printed flyers for staff to hand out. We have applied for OBDS signs for Mountain View Rd, to direct people coming from Hinesburg toward the Williston Drop-Off Center. Through June 2018, we will be running a raffle at the Williston DOC, with stamp cards to encourage customers to use that facility – our most spacious and least visited. ● **Leaves & yard debris:** We are promoting leaf & yard debris management options on social media and through newspaper ads, including extra hours at Essex, South Burlington, and Green Mountain Compost, as well as pickup and other drop-off options. ● **Local Color on WCAX:** On our suggestion, a reporter from WCAX visited the Local Color warehouse to do a story on the new space and encourage drop-offs of paint before the winter. ● **Customer Appreciation Days:** Outreach & Communication staff spent two Saturdays at Drop-Off Centers (South Burlington 10/14, Essex 10/21), greeting customers, answering questions, and trying to avoid getting stung by wasps. Essex had 657 customers that day, while South Burlington had 582 customers. ● **Website stats** [% change from previous month]: 28,492 pageviews [+3%], 7,620 users [+1.5%]. ● **Top pages:** 1. Drop-Off Centers 2. Homepage 3. A-Z list 4. South Burlington DOC 5. Environmental Depot 6. Burlington DOC 7. Essex DOC 8. DOC Fees 9. Williston DOC 10. McNeil Wood & Yard Waste Depot. **Top searches:** 1. Hours, 2. Tires, 3. Mattresses, 4. Paint, 5. Batteries.

8. Recycling Market Development Grants (Nancy) – Three applications were received for Recycling Market Development Grants. Targeted materials include MRF glass, tennis balls, and Styrofoam packaging. The grant committee, made up of CSWD board members and staff and a representative from the Lake Champlain Regional Chamber of Commerce, will consider the applications for awards.

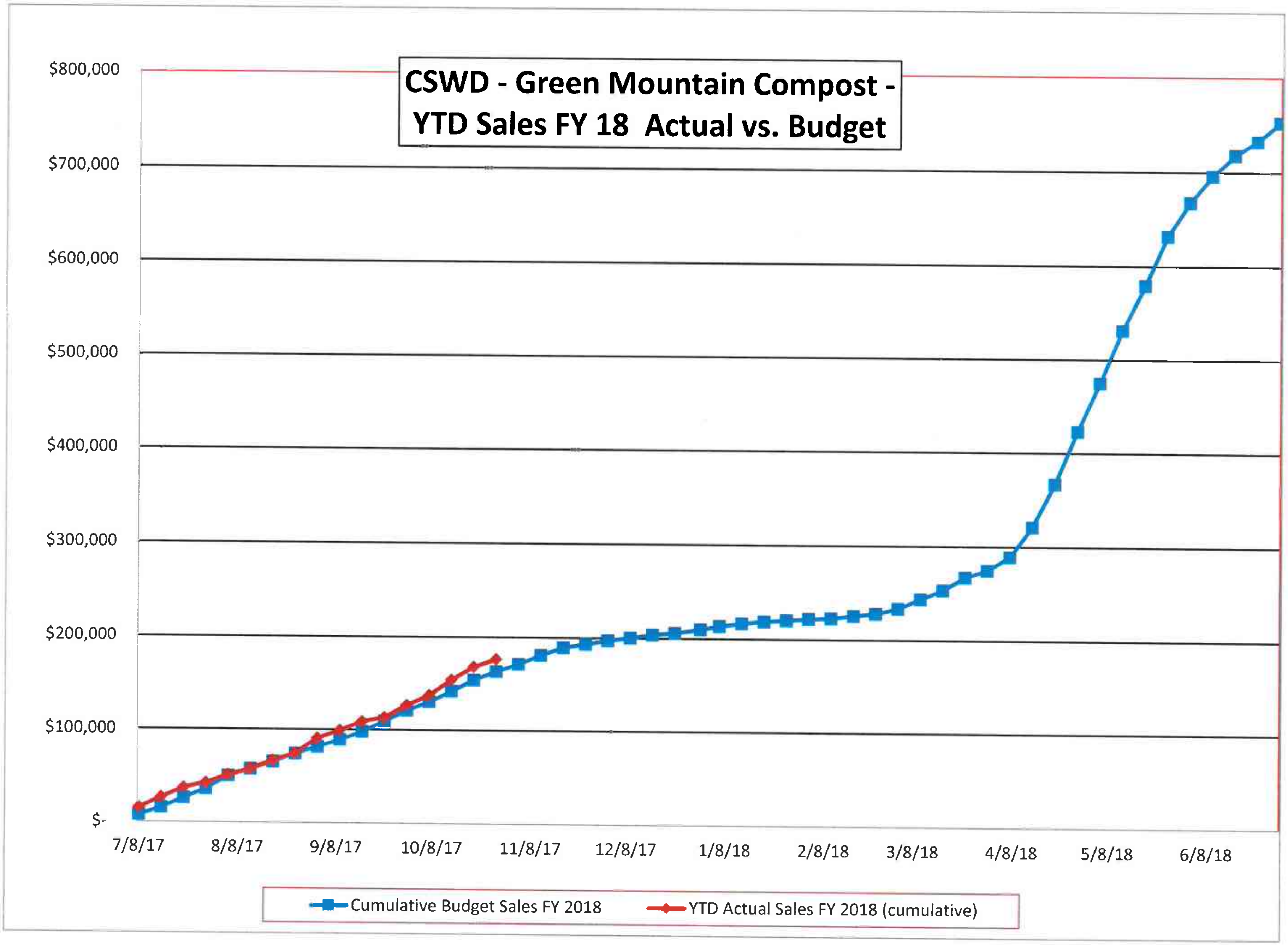
9. Rover in Hinesburg (Jen) The Rover experienced record breaking participation at Hinesburg. The Rover normally is located at the Hinesburg DOC but because of the uncertainty with the construction schedule this summer the location was moved. Approximately 190 customers dropped off their HHW compared to approximately 60-80 customers participating at the Hinesburg DOC in previous years. Staff attributes the high participation mostly to the high visibility of the event on route 116.

10. CSWD Hosting Fellow – CSWD is hosting a fellow, Alexander Batista, from the Young Leaders of the Americas Initiatives Fellow program through November 2. Alexander is the founder of a start-up company in Panama called Eco Urnas. Eco Urnas seeks to address deforestation and provide an affordable alternative to traditional burial services. Alexander holds an MBA and a Bachelor's degree in Industrial Engineering. Jen will be working with him on performing a process analyses for our paint program. Hopefully it will help us understand where we can find efficiencies, evaluate the costs better and what our true labor needs are.

11. Velco Project (Brian) – The Velco roadway and storage facility project on Redmond Road is nearing completion. The work on CSWD property will be finished before winter. There will be some additional work on the storage pad next spring, but that will not impact our property. Power has yet to be extended to the new project. We are expecting an easement agreement for Green Mountain Power for access to their power service line along the side of the road. This easement agreement should be coming soon and we will bring it to the Board for approval as soon as we get it.


Green Mountain Compost FY17 and FY18 YTD Comparison of General Retail Categories
$200,000
$180,000
$160,000
$140,000
$120,000
$100,000
$80,000
$60,000
$40,000
$20,000
$0
Bulk Material
Bagged Products
$25,620
$98,793
$24,744
$151,555
YTD FY17
YTD FY18

11/1/2017


CSWD - Green Mountain Compost -
YTD Sales FY 18 Actual vs. Budget
$800,000
$700,000
$600,000
$500,000
$400,000
$300,000
$200,000
$100,000
$-
7/8/17
8/8/17
9/8/17
10/8/17
11/8/17
12/8/17
1/8/18
2/8/18
3/8/18
4/8/18
5/8/18
6/8/18
Cumulative Budget Sales FY 2018
YTD Actual Sales FY 2018 (cumulative)