RUTLAND COUNTY
SOLID WASTE DISTRICT

Rutland Regional Food Scrap Recycling Assessment
October 2014

Commissioned by:
Rutland County Solid Waste District
& Vermont Solid Waste District Managers Association

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1. Executive Summary

1.1 Purpose of Study

In 2012, Vermont passed the *Universal Recycling Law* (Act 148 or the URL), which mandates diversion of food scraps and other organics such as yard waste from landfills. The URL will require food scrap generators (FSGs)[1] to participate in or create their own composting programs. The goals of the URL align with and strongly support the main purpose of composting programs: transforming food scraps and other organics from waste products into a community and agricultural resource. Development of the programming and infrastructure to capture this resource is no small task and requires significant investment, community engagement, and a paradigm shift from waste management to resource management. This study is intended to support Rutland County Solid Waste District's planning to successfully meet the goals and requirements of the URL.

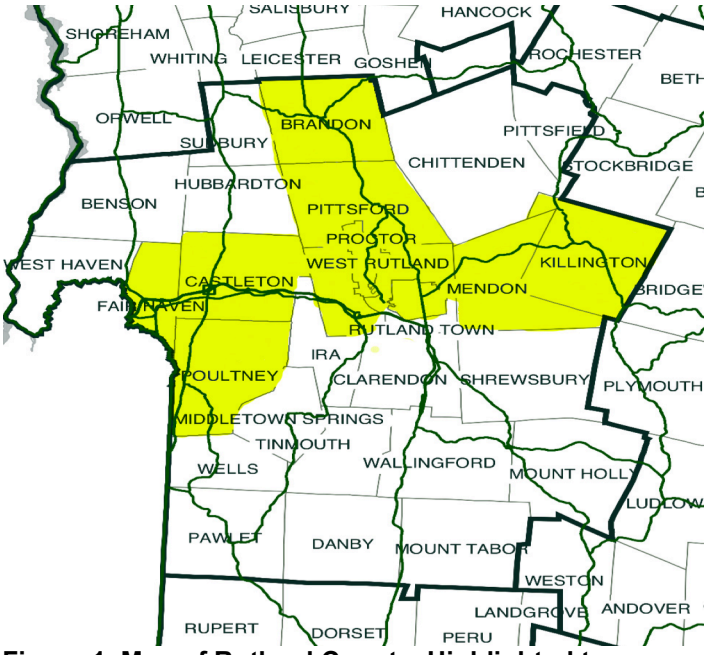

Figure 1. Map of Rutland County. Highlighted towns are considered "food scrap dense," generating >4 Tons/Week of food scraps to make collection routes economically viable, or are on route to other food-scrap-dense towns.

1.2 Report Summary

The authors utilized a community asset-based approach[2] for this study, starting by assessing existing composting activities, facilities and collection services in Rutland County. Existing data sources on food scrap generation were used, filtering the data where appropriate. The goal of this assessment was to provide insight to answer the following key questions:

- What volume of food scraps is generated in Rutland County?
- Where and by whom are food scraps generated in each sector (i.e. commercial, residential, industrial)?
- What are the current rate and methods of food scrap recycling?
- In what geographic areas are food scraps being generated at a scale sufficient to warrant a commercial food scrap collection program?
- What is the current capacity of composting sites to receive food scraps?

- What expanded site capacity is required to meet the region's needs now and into the future?

Analysis of costs or feasibility of developing additional infrastructure was not within the scope of this report. The answers to the above questions are intended to support the development of a comprehensive strategy for the region.

1.2.1 Food Scrap Generation Summary

The authors analyzed current estimates of food scrap generation in Rutland County, first dividing the region into "rural" and "food-scrap-dense" areas by Town. The assumption is that food-scrap-dense regions are more likely to be serviced by dedicated collection routes. According to our team's estimates, Rutland County currently generates **469 Tons/Week** of food scraps, with around 86% of that total generated within the "food-scrap-dense" towns (Figure 1). Food scrap generation is comprised of three sectors: Commercial/Institutional, Food Manufacturing/Processing, and Residential food scraps *(Figure 2*). Of the total generated tonnage, it is estimated that **194 Tons/Week (41%) is currently being recycled,** primarily through rendering, animal feeding, and anaerobic digestion *(Figure 7)*.

Of the 3 "sectors" of food scrap generators (FSGs), Commercial/Institutional (C/I) generators appear to generate the largest volume of food scraps (199 Tons/Week or 42%). Of note however, is that this sector is estimated to have the lowest current rate of food scrap recycling (14%). C/I generators therefore represent a major leverage point in total organics diversion, because the relatively large volume remains mostly untapped.

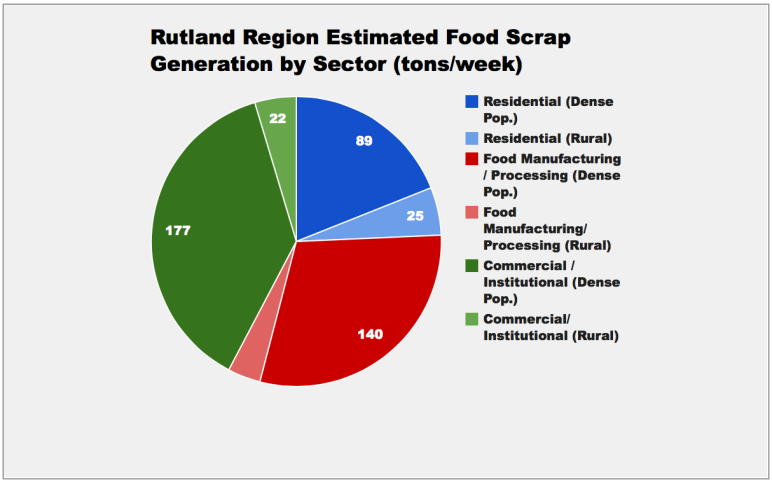

Figure 2. Tons/Week of food scraps generated by sector, showing estimated volumes generated by both Rural and "Food-Scrap-Dense" towns.

The organics recycling mandate also affects C/I generators before extending to residential FSG's, requiring the largest generators to recycle organics starting in 2014. For these reasons, it is recommended to prioritize capturing C/I generated food scraps initially.

1.2.2 Food Scrap Recycling Capacity Summary

According to the authors' assessment, the Rutland region has the *available capacity to recycle 52% of total estimated food scraps* generated in the County and is currently diverting 41% from the landfill. These estimates are based on the assessed capacity of known operators within hauling distance from the Rutland region, such as TAM Organics, Vermont Natural Ag Products, and Tinmouth Compost. It is important to note that Tinmouth Compost is the only operational site within Rutland County and is operating at less than 1 Ton/Week, which means there is a need for one or more larger scaled food scrap recycling operations in the region. In addition, the largest percentage (67% - *Figure. 13*) of the estimated available capacity is assumed to be animal feeding operations, rendering services, and anaerobic digestion servicing the Food Manufacturing/ Processing sector. While utilizing the best information available to our team, this estimate of recycling within the Food Manufacturing/Processing sector is nonetheless based on an assumption, and CTS recommends direct outreach to assess actual tonnage currently recycled by the Food Manufacturing/Processing sector in the future (more on p. 16).

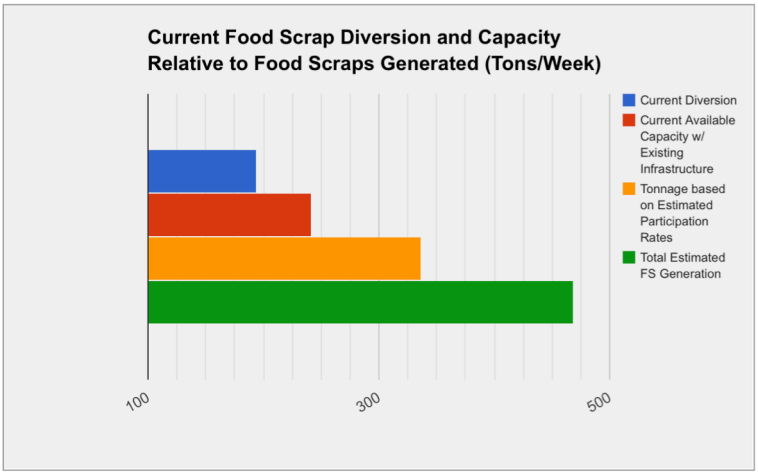

Figure 3. Rutland Region Food Scrap Recycling Capacity compared to Current Diversion, Projected Diversion, and Total FS Generation

While the Food Scrap Recycling Capacity Assessment pertains primarily to existing infrastructure or animal feeding operations, a critical component of a functional organics recycling program is ***food scrap collection service.*** At this time, the team is aware of 4 food scrap collection services in the Rutland region. These are Casella, Hubbard Brothers, TAM Organics, and Tinmouth Compost. Again, it is assumed that unidentified animal feeding operations and haulers are also currently servicing a large portion of the Food Manufacturing/Processing sector.

Rutland Region Collection Services		
Food Scrap Collection Service	**Service Area**	**Current Collection within District (Tons/Week)**
TAM Organics	Greater Rutland / Killington	8
Hubbard Brothers	Greater Rutland / Killington	3
Tinmouth Compost	Tinmouth Area	0.25
Casella	Greater Rutland / Killington	3
TOTAL TPW currently hauled		**14.25**

Figure 4. Identified food scrap collection currently servicing the Rutland Region.

1.2.3 Capacity Recommendations

Food scrap recycling capacity recommendations for the Rutland region are based on estimated diversion rates for each of the food scrap generator sectors. A 2013 report commissioned by the State projects that the Residential and Industrial/Commercial FSG sectors could reach diversion rates of 60% by 2020.[3] The CTS team also assumes a 95% diversion rate of the Food Manufacturing/ Processing residuals due to both the URL mandates and experience researching this sector.

Note: The DSM report considers Industrial food manufacturers and Commercial/ Institutional as one generator sector called Industrial/Commercial/Institutional (ICI). For this assessment, our team has chosen to separate the Industrial sector (referred to as "Food Manufacturing/Processing") from Commercial/Institutional in order to arrive at more accurate estimates and strategies for each sector.[4]

Meeting these ambitious food scrap diversion goals will require significant planning and action by Solid Waste Districts and their partners. Sufficient capacity and infrastructure for organics recycling will be required to handle the projected tonnage of food scraps as well as other organics in order for these diversion rates to be achieved. The authors outlined the likely food scrap methods and estimated the volumes of each sector that might be processed by each method below in *Figure 5*:

FSG Sector	Generated TPW	2020 Est. Diversion Rate	Recycled TPW	Diversion Rate by Method	Method of food scrap recycling
Residential	114	60%	68	47	Home Composting
				12	Drop Offs
				9	Collection
Commercial/ Institutional	198	60%	119	42	Composting
				42	Animal feed
				35	Anaerobic Digestion
Food Manufacturing/ Processing	157	95%	149	149	Animal Feed/ Anaerobic Digestion/ Rendering

Figure 5. Estimated food scraps recycled, by recycling method, by 2020. (Unit = Tons/Week)

In order for the region to increase food scrap recycling and support the area's businesses, institutions, and residents in meeting the requirements of the URL, the development a more comprehensive regional strategy is strongly recommended. Such a strategy would likely include clearly defined goals over the timeline of the URL, a more detailed assessment of partnership opportunities and needs, infrastructure costs and existing assets, and the educational requirements of both the general public and the region's operators. Throughout the report, strategies and actions for developing the required infrastructure and increasing diversion rates are suggested in more detail.

2. Food Scrap Generation and Recycling Data and Methodologies

In order to plan the infrastructure required to divert and recycle the food scraps generated in the Rutland region, estimates of the sources, rates, and locations of food scrap generation are critical. The best available sources of data were used to analyze *three sectors* of Food Scrap Generators (FSGs) in the region, as follows:

1. Residential
2. Commercial/Institutional
3. Food Manufacturing/Processing

In addition to looking at total food scrap generation by FSG sector in the region, our team assessed the *density* of food scraps by town. In Vermont, collection of organics in rural areas can be challenging for private enterprises to sustain, while in more populous areas, both public and private collection programs operate by capturing enough material within a small enough territory to economically justify providing the service. A town considered "food scrap dense" is designated as such if it has a critical mass of food scraps (>4 Tons/Week), and is nearby enough to other food-scrap-dense towns to make a collection route viable. A town which generates <4 Tons/Week may be included in this category if it is on route to other food-scrap-dense towns. The map of Rutland County (*Figure 1*) shows the towns that fall within and outside this food-scrap-dense region where dedicated food scrap collection at businesses, institutions, and possibly residences are a likely strategy. *Figure 6* lists towns in the Rutland Region considered "Food Scrap Dense," along with estimated Tons/Week of food scraps.

Rutland Region Food Scrap Generation by Town (Dense Pop.)

Town	TPW C/I	TPW Res.	Total TPW*
Brandon	11.32	7.66	18.98
Castleton	6.91	9.11	16.02
Fair Haven	5.59	5.28	10.87
Killington	62.24	1.57	63.81
Mendon	5.17	2.05	7.22
Pittsford	2.95	5.78	8.73
Poultney	4.36	6.63	10.99
Proctor	1.29	3.36	4.65
Rutland	62.21	11.5	73.71
Rutland City	9.56	31.86	41.42
West Rutland	2.73	4.49	7.22
TOTALS	**174.34**	**89.29**	**263.63**

*** Doesn't include Food Manufacturing / Processing Sector.**
(Unit = Tons/Week)

Figure 6. Estimated current food scrap generation in the Rutland Region's *food-scrap-dense* towns.

Figure 7. Rutland County Estimated Food Scrap Generation and Recycling (Unit = Tons/Week)

Food Scrap Generation						Food Scrap Recycling						
Total Food Scrap Generation	Food Scrap Density	Food Scrap Generation By Density	Food Scrap Generator Sector	Food Scrap Generation By Sector	% of Total Generation	% of Total Food Scraps Recycled by Sector	% Food Scrap Sector Recycled by Method	Food Scraps Recycled By Method	Recycling Methods	Total Food Scrap Recycling Dense By Region	Total Food Scrap Recycling	Total Food Scrap Recycling Rate
469	Dense Populated Regions	405	Residential	89	19%	4%	22%	20	Home Composting	171	194	41%
							0%	0	Residential Drop Offs			
							0%	0	Curbside Collection			
			Commercial / Institutional	177	38%	5%	5%	8	Composting			
							10%	18	Animal Feed			
							0%	0	Anaerobic Digestion			
			Food Manufacturing / Processing	140	30%	27%	0%	0	Composting			
							90%	126	Animal Feed			
									Anaerobic Digestion			
									Rendering Services			
	Dispersed Rural Regions	64	Residential	25	5%	1%	22%	6	Home Composting	23		
							0%	0	Residential Drop Offs			
							0%		Curbside Collection			
			Commercial / Institutional	22	5%	0%	0%	0	Composting			
							10%	2	Animal Feed			
							0%	0	Anaerobic Digestion			
			Food Manufacturing / Processing	17	4%	3%	0	0	Composting			
							90%	15	Animal Feed			
									Anaerobic Digestion			
									Rendering			

2.1 Residential Sector

Residential food scraps refer to food scraps generated by individuals and families in their homes. In many regions a significant percentage of these are or can be recycled at homes, either through backyard or animal-feeding systems. Recycling residential food scraps at home is not a viable option for many individuals, in which case residential drop-off and collection services are needed.

2.1.1 Residential FSG Assessment Methodology

Residential food scrap generation can be estimated using a number of methodologies. For this assessment, the authors used the number of households in the region and estimated tonnage by total households. 2010 US Census Data placed the population in Rutland County at 61,646, which equals 26,344 households at the Vermont persons per household average of 2.34.[5] Based on the EPA's yearly household food scrap generation average of 470 pounds,[6] our team estimates residential food scrap generation in Rutland County to be 114 Tons/Week. The average weekly rate per household is 9 Lbs/Week, which is at the moderate to high end of the 6-10 Lbs/Week/Household range we have seen in our investigation of this sector. Therefore this can be considered a conservative estimate of needed food scrap recycling infrastructure.

2.1.2 Home Composting Assessment Methodology

The Vermont Agency of Natural Resources in their 2001 MSW diversion report found a 25% rate of home composting of food-waste.[7] Based on professional experience and surveys of home composting literature and websites, our team assumes that most home composters do not compost their meat and dairy scraps, which reduces the total percentage composted at home. A comprehensive study on food waste in Great Britain found that meat makes up 7% and dairy 10% of food waste.[8] Based on that study (we were unable to find a comparable one for the US), around 17% of the residential waste produced is unlikely to be composted by home composters. This would reduce the total percentage of residential food waste composted at home from an estimated 25% to an estimated 22%.

The 2013 State of Vermont Waste Composition study corresponds with both statewide generation rates and estimated diversion rates used in this study. The estimated tonnage of food scraps reaching the landfill was 41,486 Tons/Year,[9] and when compared with CTS's estimated statewide residential food scrap generation of 60,304 Tons/Year (utilizing the methods described in the previous paragraph), you arrive at a residential diversion rate of 31%. Given the range in of variability in the methodology, the fact that the diversion rate is within 10% of estimates is reassuring.

2.1.3 Residential Food Scrap Drop-Offs Assessment Methodology:

The project team keeps an active list of residential food scrap drop-offs programs throughout the state of Vermont. At this time there are no residential food scrap drop-offs programs servicing Rutland County.

2.1.4 Curbside Food Scrap Collection Assessment Methodology:

The project team keeps an active list of curbside food scrap collection programs throughout the state of Vermont. At this time there are no curbside food scrap collection programs servicing Rutland County.

2.1.5 Food Scrap Recycling Strategies for the Residential Sector

The authors have noted 3 likely methods for handling the projected tonnage of food scraps generated by the Residential Sector: *Home Composting, Residential Drop-Offs, and Residential Collection programs*. Based on the projected diversion rate of 60%,[10] our team has suggested likely methods of handling this tonnage.

It is assumed that different diversion methods will be utilized based on whether a town in question is considered rural or food scrap dense *(see Figure 8). Residential Sector* food scrap recycling rates are projected to total **68 Tons/Week.** Estimated volumes and strategies for achieving this diversion rate are outlined below:

- Residential Drop-Offs and Collection Services to capture 9 Tons/Week in food-scrap-dense areas and 4 Tons/Week in rural areas. Steps to implement Residential Drop-Offs include:

  - ✓ Pilot Residential Drop-Offs at several waste district transfer stations and other convenient locations such as Grocery Stores.
  - ✓ Identify Hauler and Composter partners to service the Drop-Off Points.
  - ✓ Identify resources and educational materials.
  - ✓ Work with community groups, Master Composters, or other volunteers to provide monitoring and education at the Drop-Off Points.
  - ✓ Provide on-line maps of Drop-Off Points.

- Home Composting rates of 40-45% of all Residential food scraps are estimated to be possible by 2020, increased from 22-25%. Food-scrap-dense areas in the Region are estimated to home-compost 36 Tons/Week, while rural areas are estimated to home-compost 11 Tons/Week. Steps to increase home composting rates include:

  - ✓ Support home composters with educational programs and resources in order to effectively compost at home and avoid nuisances and vectors.
  - ✓ Provide discounted home composting systems to area residents and free pallets for setting up backyard bin systems.
  - ✓ Provide free carbon materials, commonly referred to as “browns,” to help residents effectively compost at home. Making “browns” available year round to residents at transfer stations or other convenient locations will increase residents’ confidence in the process and reduce problems associated with poor food scrap management.
  - ✓ Launch a marketing campaign promoting all composting options for residents.

- ✓ Work with community groups, Master Composters, or other volunteers to provide home composting education at convenient locations.

- Residential Collection Services picking up 10% of residential scraps or 9 Tons/Week in food-scrap-dense regions. Collection of residential material is hard to predict and may ultimately be anywhere from 0-20% of the overall sector, depending on feasibility, partners, and investments. Steps to develop residential collection options for residents include:

  - ✓ Conduct a feasibility study to look at residential collection.
  - ✓ Identify Hauler and Composter partners to service a Residential Collection Route. Releasing an RFP for haulers and providing incentives is one way to ascertain interest.
  - ✓ Pilot Residential Collection and Small-Scale Collection Equipment.
  - ✓ Support the development of triple-stream collection equipment such as trucks that can collect organics, recycling, and trash simultaneously.
  - ✓ Support the development of a bicycle-operated food scrap collection route.

FSG Sector	2020 Projected Tons/Week Diverted	Recycling Strategies	% of FSG Sector Diverted by Method	Estimated Diversion By Method
Residential (Dense Pop.)	53.4	Home Composting	40%	36
		Drop Offs	10%	9
		Collection	10%	9
Residential (Rural)	15	Home Composting	45%	11
		Drop Offs	15%	4
		Collection	0%	0

Figure 8. Projected residential food scrap tonnage and potential methods of food scrap recycling based on food scrap density.

Some examples of educational materials and resources for implementing residential composting programs can be found here: http://highfieldscomposting.org/toolkit-resources/resources-for-home-composting

2.2 Commercial/Institutional Sector

Commercial/Institutional food scraps refer to food scraps generated by businesses such as restaurants, grocery stores, delis, hospitals, schools, colleges, cafeterias, etc. The majority of generators in this sector do not perform on-site composting, and community collection services provide them with a viable solution to "close the loop" locally.

2.2.1 Commercial/Institutional FSG Assessment Methodology

In April 2014, Vermont Agency of Natural Resources produced food scrap generation estimates for Vermont Commercial/Institutional FSGs, with data on 5844 FSGs statewide.[11] For this assessment, the authors started with the 2014 ANR estimates, removing FSGs from the Food Manufacturing/Processing Sector in order to pinpoint the *Commercial/Institutional Sector*. However, our project team notes a trend of over-estimation within ANR's projected figures for C/I generators when compared to actual collection records.

For our analysis, the authors compared ANR projections for 49 C/I FSGs, to actual food scrap generation data from these generators recorded by collection services within Vermont. Although the actual collection data for those FSGs was 25% greater than ANR would have estimated, the sample size was small, and disproportionally represented large grocery stores, which ANR dramatically underestimates. When put into the context of statewide generation, the team believes that FSG actual Tons/Week is approximately 36% lower than ANR estimates for C/I generators, although much more work is needed to refine those estimates. Based on this methodology, the team has used 64% of ANR estimates for this sector. These new numbers significantly change the outlook on infrastructure requirements to fulfill Vermont's Universal Recycling bill. Data comparing more FSG actuals to ANR projections from this sector will help to further refine these estimates and assess the accuracy of ANR's projections.

Note: A more detailed summary of the data and methodology used for adjusting the ANR Data is attached as an appendix to this report.

The team has also noted discrepancies in FSG projections between the abovementioned ANR projections and the 2013 report, Systems Analysis of the Impact of Act 148 on Solid Waste Management in Vermont, which was commissioned by the State.[12] Of significant note is the difference in estimated Industrial/Commercial/Institutional generation - the report estimates 18,592 Tons/Year disposed for Vermont - contrasting with ANR's estimate of 123,312 Tons/Year total generation. When you apply even a generous diversion rate of 30% to the ANR Database's total C/I generation, 86,318 Tons/Year remain, making the report's estimates ~22% of the Database's. When you apply a 36% reduction to the ANR Database's estimates, as the team has done with its regional projections, the 2013 Report still only accounts for 34% of the team's estimated food scraps in the State. Coupled with the aforementioned discrepancies between ANR's projections and actual FSG tonnage figures, this suggests a need for further inquiry and a more precise estimate of commercially generated food scraps.

2.2.2 Food Scrap Composting Assessment Methodology

The project team keeps an active list of food scrap composters and the collection services that deliver to them throughout Vermont. Known operators were contacted to request estimates of the weekly food scraps diverted from both *Commercial/Institutional* and *Food Manufacturing/ Processing* generators. (*See Figure 9)*

2.2.3 Animal Feed Assessment Methodology

Food scraps have long been used as primary or supplemental feed for both commercial and homestead livestock operations. Feeding food scraps to chickens is an increasing trend due to high feed costs. Feeding food scraps to swine is also common, although regulations make the practice illegal on commercial operations unless the food scraps are heated to kill pathogens. The team keeps an active list of food scrap feeding operations and the collection services that deliver to them in Vermont, but acknowledges the likelihood of operations we are unaware of. At this time the team has not located any significant animal feeding operations who service *Commercial/Institutional* generators, and instead provides an assumption based on experience in other regions that 10% of the *Commercial/Institutional* sector is diverted for the purpose of animal feed. (*See Figure 7).* Known operators were contacted to request estimates of the weekly food scraps diverted from both *Commercial/Institutional* and *Food Manufacturing/Processing* generators.

2.2.4 Anaerobic Digestion Assessment Methodology

At this time, there are no Anaerobic Digesters in Vermont permitted to receive food scraps from *Commercial/Institutional* generators, although small amounts of food scraps may be going to the Vermont Technical College Digester in Randolph under permit exemptions. At the time of this report the authors do not believe that any C/I food scraps from Rutland County were being digested *(See Figure 7).*

Food Scrap Recycling			Food Scrap Collection			Diversion By FSG Sector		
Food Scrap Recycler	**Location**	**Current Recycling (Tons/Week)**	**Food Scrap Collection Service**	**Service Area**	**Current Collection (Tons/Week)**	**Diversion By Sector**	**FSG Sector**	**Total Diversion**
TAM Organics	Bennington	8	TAM Organics (Interested)	Greater Rutland	6	6	Commercial / Institutional	**193**
			Hubbard Brothers	Greater Rutland / Killington	2	2	Commercial / Institutional	
Tinmouth Compost	Tinmouth	0.25	Tinmouth Compost	Tinmouth Area	0.25	0.25	Commercial / Institutional	
Anaerobic Digestion	TBD (Assumes 10% of Commercial/Inst and 90% of Food Manufacturing	158	Other	Unknown	158	17	Commercial / Institutional	
Animal Feed								
Rendering Services						141	Food Manufacturing & Processing	
Home Composting (Assumes 25%)	District Wide	25	N/A	N/A	N/A	25	Residential	

Figure 9. Food Scrap Diversion by Sector and Operator (*Unit = Tons/Week)*

2.2.5 Potential Food Scrap Recycling Strategies for the Commercial/Institutional Sector

The authors have identified 3 primary methods for handling the projected tonnage of food scraps generated by the Commercial/Institutional Sector: *Composting, Animal Feed, and Anaerobic Digestion*. Based on the projected diversion rate of 60%,[13] our team has suggested likely methods of handling this tonnage.

It is assumed that different diversion methods will be utilized based on whether a town is considered rural or food-scrap dense *(see Figure 10)*. Commercial/Institutional food scrap recycling rates are projected to total **119 Tons/Week.** Estimated volumes and strategies for achieving this diversion rate are outlined below:

- By 2020, an estimated **42 Tons/Week** will be recycled by C/I FSGs and received by **composting operations** - 35 Tons/Week from food-scrap-dense areas and 7 Tons/Week from rural towns. Steps to increase the region's composting capacity include:
  - ✓ Identify potential compost site locations and operators.
  - ✓ Provide technical support to prospective composters in site planning, permitting, design, business planning, and market development.
  - ✓ Partner with farms or make use of unused farm infrastructure, both of which can save on infrastructure costs.
  - ✓ Support composters in sourcing of clean and affordable carbon feedstocks.
  - ✓ Support collection services in educating FSGs, in order to ensure that composters receive the cleanest possible food scrap materials.

- Similar volumes of recycled C/I food scraps are projected to be received by Animal Feeding Operations and Egg Laying Operations in particular (since feeding hogs food scraps from the public is largely prohibited). The authors have estimated a total of **42 Tons/Week** of recycled C/I food scraps going towards **animal feeding operations**- 35 Tons/Week from food-scrap-dense areas and 7 Tons/Week from rural towns. Steps to increase the region's animal feeding capacity include:
  - ✓ Outreach to existing and potential Egg Laying Operations.
  - ✓ Provide technical support to prospective Egg Laying Operations in site planning, permitting, design, business planning, and market development.
  - ✓ Partner with farms or make use of unused farm infrastructure, both of which can save on infrastructure costs.
  - ✓ Support Egg Laying Operations in sourcing of clean and affordable carbon feedstocks and animal bedding.
  - ✓ Support collection services in educating FSGs, in order to ensure that Egg Laying Operations receive the cleanest possible food scrap materials.

- The authors have estimated that by 2020, **35 Tons/Week** of recycled C/I food scraps will be received by **anaerobic digesters (AD)**, comprising 20% of recycled tonnage from food-scrap-dense towns and 0% from rural towns. While the authors have not identified any currently operational AD facilities in the Rutland area, there are likely digesters within hauling range and it is noted in the 2013 VT State systems analysis that there are a number of on-farm AD facilities that receive industrial food residuals, and "it is likely that a number of [them] will consider potential energy sales benefits of adding slurried food residuals."[14] Steps to increase the region's AD capacity include:

- ✓ Conduct a feasibility study and environmental impact analysis of AD options for the region.
- ✓ Conduct a hauling feasibility study that incorporates food scrap "slurrying" into its business analysis.
- ✓ Support the development of a food scrap "slurrying" operation, with the capacity to remove contamination prior to entering the digester.
- ✓ Provide technical support to prospective AD operations in site planning, permitting, design, business planning, and market development.
- ✓ Partner with an existing on-farm digester in or near the region.
- ✓ Support collection services in educating FSGs, in order to ensure that AD Facilities receive the cleanest possible food scrap materials.

Food Scrap Generator Sector	2020 Projected Tons/Week Diverted	Recycling Strategies	% of FSG Sector Diverted by Method	Estimated Diversion By Method
Commercial / Institutional (Dense Pop.)	106	Composting	20%	35
		Animal feed	20%	35
		Anaerobic Digestion	20%	35
Commercial/ Institutional (Rural)	13	Composting	30%	7
		Animal feed	30%	7
		Anaerobic Digestion	0%	0

Figure 10. Projected Commercial/Industrial food scrap tonnage and potential methods of food scrap recycling based on food scrap density.

2.3 Food Manufacturing/Processing Sector

Food Manufacturing/Processing refers to the portion of a community's food scraps generated by producers such as breweries, distilleries, meat processors, packaging facilities, large bakeries, candy makers, and coffee roasters. These large FSGs generally produce multiple tons/week of food scraps, although there are also small generators that fall into this sector. A unique aspect of this sector is the homogeneity of the material compared to other sectors that produce a mix of scraps. Breweries, for example, generate "spent" grain, hops, and yeasts. Candy producers might have one batch of purely chocolate-making residuals. It is recommended that composters and farmers utilize these materials with special attention to proper composting or feeding practices. Due to predictability and scale of production, many generators in this sector find recycling options for their material (such as animal feeding operations or anaerobic digesters).

2.3.1 Food Manufacturing/Processing FSG Assessment Methodology

Both the ANR and Stone Databases provide little data from this sector. Analysis involving direct research and outreach to FSGs in the region would provide a more accurate regional projection. However, direct outreach-based research on potential *Food Manufacturing/Processing FSGs* was not within the scope of this initial assessment. In lieu of this, we utilized data from Addison County, [15] where Highfields has conducted in-depth field research, and compared ANR's *Commercial/Institutional Sector* data to the *Food Manufacturing/Processing FSGs* in that region. The *Food Manufacturing/Processing Sector* is estimated to generate food scrap tonnage equivalent to 79% of the food scrap tonnage generated by the *Commercial/Institutional Sector* in Addison. Therefore, Rutland's *Food Manufacturing/Processing Sector's* generated tonnage is estimated in this analysis to be equivalent to 79% of the *Commercial/Institutional Sector's* estimated tonnage of food scraps generated. Because 90% of Addison County's *Food Manufacturing/Processing Sector's* generated tonnage was already being recycled, this method was the most logistically feasible for current purposes, although a more thorough analysis is recommended.

2.3.2 Composting Assessment Methodology

The project team keeps an active list of food scrap composters and the collection services that deliver to them throughout the state of Vermont. Known operators were contacted to request estimates of the weekly food scraps diverted from both *Commercial/Institutional* and *Food Manufacturing/Processing* generators. (*See Figure 8)*

2.3.3 Animal Feed, Anaerobic Digestion, & Rendering Services Assessment Methodology

In general, it is assumed that most generators in Vermont's *Food Manufacturing/Processing* sector currently divert most of their organics by-products.[16] This assumption is based on direct experience working in other regions of the state. Because data on actual food scrap generation is sparse, our team relies on Chamber of Commerce information for business names and personal interviews with staff at each FSG to learn as much as we can about their organics waste management systems. This type of in-depth analysis was not within the scope of this assessment. Therefore an assumption of 90% diversion through Animal Feed, Anaerobic Digestion, and Rendering services was used based on the in-depth assessment Highfields performed in Addison County in 2012. *(See Figure 7)*

2.3.4 Potential Food Scrap Recycling Strategies for the Food Manufacturing/Processing Sector

The authors have identified 3 primary methods for handling the projected tonnage of food scraps generated by the Food Manufacturing/Processing Sector: *Composting, Animal Feed, and Anaerobic Digestion*. However, as mentioned in Section 2.3.1, there is currently little available data on current recycling methods in the Food Manufacturing/Processing Sector. The authors have assumed a potential diversion rate of 95% within this generator sector by 2020, based on a current estimated rate of 90% and assuming an increase in diversion in compliance with the URL.

Food Manufacturing/Processing residuals-recycling is projected to total **149 Tons/Week** in **2020.** For strategies to increase capacity for food scrap processing in this sector, see section *2.2.5*

Potential Food Scrap Recycling Strategies for the Commercial/Institutional Sector, on pages 13-15. Although further investigation of recycling activities by generators in this sector is highly recommended, food manufacturing/processing residuals have the most options for recycling, and recycling markets for these materials seem to be well ahead of mixed and post consumer food scraps.

Food Scrap Generator Sector	2020 Projected Tons/Week Diverted	Recycling Strategies	% of FSG Sector Diverted by Method	Estimated Diversion By Method
Food Processing/Manufacturing (Dense Pop.)	133	Animal Feed/ Anaerobic Digestion/ Rendering	95%	133
Food Processing/Manufacturing (Rural)	16	Animal Feed/ Anaerobic Digestion/ Rendering	95%	16

Figure 11. Projected Food Manufacturing/Processing food scrap tonnage and potential methods of food scrap recycling based on food scrap density.

3. Food Scrap Recycling Infrastructure Assessment

3.1 Capacity Summary

Through direct outreach and site visits where possible, the authors conducted an assessment of food scrap recycling infrastructure in Rutland County. The assessment was used to determine current food scrap recycling activities, as well as the permitted, physical, and available capacity at the operations.

According to the team's assessment of total food scrap generation in the region, the estimated available capacity to recycle that material is currently at 52% of total generation, but at 72% of capacity to meet projected recycled tonnage in 2020. It is important to note that Tinmouth Compost is the only operational site within Rutland County and is operating at less than 1 Ton/Week, which means there is a need for one or more larger-scaled food scrap recycling operations in the region. In addition, the largest percentage (67% - *Figure. 13*) of current estimated capacity is assumed to be animal feeding operations, rendering services, and anaerobic digestion servicing the Food Manufacturing/Processing sector. While utilizing the best information available to our team, this estimate of recycling within the Food Manufacturing/Processing sector is nonetheless based on an assumption, and CTS recommends direct outreach to assess actual tonnage currently recycled by the Food Manufacturing/Processing sector in the future.

3.2 Capacity Assessment Methodology

The project team keeps an active list of food scrap recycling operations within the State, including composting, AD, and animal feeding operations, and acknowledges the probability of existing operations we are unaware of. In order to assess the capacity of known infrastructure, the authors use the distinctions of *Physical Capacity, Permitted Capacity,* and *Available Capacity*. Physical capacity refers to the total capacity of the site to receive *X* Tons/Week of food scraps, and is typically based on the assessment of the individual operator. In some cases, the authors have adjusted the estimate of physical capacity based on our technical assessment of actual infrastructure and operational function. Permitted capacity refers to the amount of food scraps that the site is allowed to receive as designated by their ANR Solid Waste permit(s). Available capacity refers to the total volume of food scraps each operation currently is able to receive, including the food scraps it currently receives.

TOTAL FOOD SCRAP GENERATION (TPW)	TOTAL PROJECTED DIVERSION (TPW)	CURRENT DIVERSION (TPW)	CURRENT AVAILABLE CAPACITY (TPW)	CURRENT PERMITTED CAPACITY (TPW)	% OF NEEDED CAPACITY
469	336	194	242	150	72%

Figure 12. Food Scrap Generation compared to Food Scrap Recycling Capacity (Unit = Tons/Week)

Name	Location	Current Diversion from RCSWD	Current Permit (TPW)	Physical Capacity (TPW)	Available Capacity (TPW)	Type	Technique	Compost Uses
TAM Organics	Bennington	8	100	25	10	Commercial	Windrow	Horticulture / Green Infrastructure
Tinmouth Compost	Tinmouth	0.25	N/A	1	0.75	On-Farm	Animal Feed	Chicken Feed / Horticulture
Vermont Natural Ag Products	Middlebury	0	50	50	45	On-Farm	Windrow	Horticulture / Green Infrastructure
Anaerobic Digestion	TBD (Assumes 10% of C/I and 90% of Food Mftg/Prcsg)	161	Unknown	161	161	Unknown	AD	Energy
Animal Feed			N/A			Unknown	Animal Feed	Livestock
Rendering Services			Unknown			Unknown	Rendering	Unknown
Home Composting (Assumes 25%)	District Wide	25	N/A	25	25	Home Composting	Backyard	Horticulture
Composting Subtotals		194	150	262	242			

Figure 13. Existing Food Scrap Recycling Infrastructure (Unit = Tons/Week)

4. Conclusions

As evidenced in the assessment, there is a significant volume of residual food scraps from the Rutland Region already being recycled through a diversity of pathways. The majority of this diverted material is estimated however, due to a lack of easily accessible information about both generation and recycling of food processing residuals from the Food Processing/Manufacturing

Sector. In the Commercial/Institutional sector there is a low rate of recycling and the majority of the capacity and processing is happening outside of the County. In Rutland, we estimate the region will need ~11,900 Tons/Year capacity to process 60% of the region's C/I scraps and 20% of the Residential scraps. By comparison, the 2013 report estimates only 4,302 Tons/Year capacity to process similar rates of diversion in these sectors for Rutland, and that estimate includes material from the Industrial Sector as well.[17] These discrepancies are explained in more depth in the Appendix.

The research conducted by the authors points to several clear opportunities in the region that would greatly increase the likelihood of effectively and efficiently achieving the goals of the URL:

- There is a significant amount of available Food Scrap Recycling Capacity outside of the County and Commercial Haulers interested in increasing services in the region. Supporting these haulers with marketing, outreach, and training could greatly increase the diversion.

- Increasing residential food scrap diversion through Home Composting and Residential Drop-Off programs require little infrastructure and could have a significant impact on total diversion without requiring new large-scale infrastructure.

- Researchers and the state need to refine their estimates of food scrap generation in the Commercial/Institutional sector and refine estimates of both generation and diversion in the Food Manufacturing/Processing sector. This should be simply a matter of increasing the sample size of actual generation from FSGs of different types and sectors and comparing it to the statewide data available from ANR. Direct outreach to Food Manufacturing/Processing generators in the region would be the most accurate method of obtaining regionally specific estimates.

- Based on the Food Scrap Recycling Capacity Assessment, by 2020 the Rutland region will at a minimum need to build capacity for approximately 94 Tons/Week in addition to current food scrap recycling capacity in order to effectively handle the projected recycling rate. The region may ultimately require more than 94 Tons/Week given that most of the current available capacity is outside of the County.

- Meeting the need for expanded food scrap recycling capacity will likely include a diversity of different operators and methods, as is currently the case in Vermont. The methods of food scrap collection and recycling will depend on the FSG sector being serviced, and FSG density within Rutland and the surrounding areas.

- Further work is needed to develop a strategic approach and goals for increasing infrastructure and food scrap recycling program participation in the region.

Endnotes:

[1] For the purposes of this report, the term food scrap generator (FSG) refers to any business,

[2] Asset-Based Community Development leverages existing community resources to develop lasting programs. For more information visit: http://www.abcdinstitute.org/. Web: October 8, 2014

[3] P.61. Systems Analysis of the Impact of Act 148 on Solid Waste Management in Vermont. DSM Environmental Services, Windsor VT. Web: October 8, 2014 http://www.anr.state.vt.us/dec/wastediv/solid/documents/FinalReport_Act148_DSM_10_21_2013.pdf

[4] The reason to separate the two categories is that there is more information available on Commercial/Institutional generators as well as a methodology for estimating tonnage, whereas there are gaps in the available information for the Industrial/Food Manufacturing sector. Separating the Industrial/Food Manufacturing from the Commercial/Institutional therefore allows a more accurate estimate of the Commercial/Institutional sector, which is estimated to be the largest sector in terms of TPW generated.

[5] US Census Data for Vermont. Web: October 8, 2014 http://quickfacts.census.gov/qfd/states/50000.html

[6] As recently as fall of 2012, the EPA published annual household food scrap generation data of 470 lbs/year on their website; however, we recently discovered that this citation is no longer available. For lack of a strong and simple citation to replace it, we have chosen to continue to use this data for estimating residential generation purposes. In searching for the original source of the EPA's estimate, we did find a very similar estimate of 467.2 lbs/household/year, published in 2002 by Dr. Timothy W. Jones at the University of Arizona. This estimate is not of total generation, but of total discarded (not including scraps going to composting, animals, garbage disposals) and therefore points to the EPA's estimate possibly being low. Web: October 8, 2014 http://www.ce.cmu.edu/~gdrg/readings/2006/12/19/Jones_UsingContemporaryArchaeologyAndAppliedAnthropologyToUnderstandFoodLossInAmericanFoodSystem.pdf

[7] State of Vermont Waste Composition Study, Final Report. Department of Environmental Conservation, 2002. Web: October 8, 2014 http://www.anr.state.vt.us/dec/wastediv/solid/pubs/VT%20WASTE%20COMP.pdf

[8] Household Food and Drink Waste in the United Kingdom 2012, Final Report. WRAP 2013. Web: October 8, 2014 - http://www.wrap.org.uk/sites/files/wrap/hhfdw-2012-main.pdf.pdf

[9] P. 16. State of Vermont Waste Composition Study, Final Report. Department of Environmental Conservation, 2013. Web: October 8, 2014 http://www.anr.state.vt.us/dec/wastediv/solid/documents/finalreportvermontwastecomposition13may2013.pdf

[10] P.60. Systems Analysis of the Impact of Act 148 on Solid Waste Management in Vermont. DSM Environmental Services, Windsor VT. 2013. Web: October 8, 2014 http://www.anr.state.vt.us/dec/wastediv/solid/documents/FinalReport_Act148_DSM_10_21_2013.pdf

[11] This data is available on the VT ANR website as an interactive map. Web: October 8, 2014 http://www.anr.state.vt.us/dec/wastediv/solid/URmap_launch.html

[12] Systems Analysis of the Impact of Act 148 on Solid Waste Management in Vermont. DSM Environmental Services, Windsor VT. 2013. Web: October 8, 2014 http://www.anr.state.vt.us/dec/wastediv/solid/documents/FinalReport_Act148_DSM_10_21_2013.pdf

[13] P.60. Systems Analysis of the Impact of Act 148 on Solid Waste Management in Vermont. DSM Environmental Services, Windsor VT. 2013.

[14] Page 58. Systems Analysis of the Impact of Act 148 on Solid Waste Management in Vermont. DSM Environmental Services, Windsor VT. 2013. Web: October 8, 2014 http://www.anr.state.vt.us/dec/wastediv/solid/documents/FinalReport_Act148_DSM_10_21_2013.pdf

[15] Addison County Regional Community Composting Program Assessment, January 2, 2013. Produced by Highfields Center for Composting for Addison County Solid Waste Management District.

[16] ibid.

[17] P. 70, Table 31. Systems Analysis of the Impact of Act 148 on Solid Waste Management in Vermont. DSM Environmental Services, Windsor VT. 2013. Web: October 8, 2014 http://www.anr.state.vt.us/dec/wastediv/solid/documents/FinalReport_Act148_DSM_10_21_2013.pdf

Acknowledgments

This Food Scrap Recycling Assessment was funded in part by a grant from the Vermont Agency of Agriculture, Food and Markets and the Working Lands Enterprise Board with the VSWDMA as grantee, and also funded in part by grants from the Utilities Programs, United States Department of Agriculture, and the Vermont Agency of Natural Resources Solid Waste Program with Highfields Center for Composting as the grantee. Any opinions, findings, and conclusions or recommendations expressed in these materials are solely the responsibility of the authors and do not necessarily represent the official views of the Grantors.

Working Lands Enterprise Initiative

VT DEC Waste Management Division