October 21, 2024
File No. 25224046.00

Mr. John Exner, Environmental Specialist
Environmental Resources Department
Dakota County Physical Development Division
14955 Galaxie Avenue
Apple Valley, MN 55124

Subject: Analysis of Residential Organics Collection in Dakota County, Minnesota

Dear Mr. Exner:

Thank you for this opportunity to assist Dakota County as you look to update your Solid Waste Management Plan and meet your goals for waste diversion and organics recovery. This finalized summary report integrates comments to the draft summary report received from you on: April 26, 2024; June 11, 2024; July 25, 2024; August 14, 2024; and October 14, 2024. A log of these comments and our documented responses to them has been provided separately via email for your future reference.

Should additional investigation be desired, modeling can be customized to individual municipalities, or even neighborhoods. We are happy to answer questions that may come up in relation to this report going forward and we would welcome the opportunity to serve Dakota County again in the future.

Sincerely,

Jana Suriano
Project Professional
SCS Engineers

Nicholas Rich-Vetsch, PE, TRUE Advisor
Project Manager
SCS Engineers

JMS/NRV/REO_AJR

cc: Renee Burman

Encl. Analysis of Residential Organics Collection in Dakota County, Minnesota

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Analysis of Residential Organics Collection in Dakota County, Minnesota

Prepared for:

Dakota County Environmental Resources
14955 Galaxie Avenue
Apple Valley, Minnesota 55124
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SCS ENGINEERS

25224046.00 | October 21, 2024

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ABBREVIATIONS AND ACRONYMS

BBO	Blue Bag Organics
BMP	best management practice
BPI	Biodegradable Products Institute
CO_2	carbon dioxide
CO_2e	carbon dioxide emission equivalents
County	Dakota County, Minnesota
DCB	Durable Compostable Bag
DSI	Dick's Sanitation, Inc.
EJ	environmental justice
EOW	every-other-week
EPA	United States Environmental Protection Agency
Foth	Foth Infrastructure & Environment, LLC
FSB	Food Scraps Bag
FTE	full time equivalents
GHG	greenhouse gas
HERC	Hennepin Energy Recovery Center
HH	household
LF	landfill
LFG	landfill gas
MNCC	Minnesota Composting Council
MPCA	Minnesota Pollution Control Agency
MRF	material recovery facility
MSW	municipal solid waste
$MTCO_2e$	metric tons of carbon dioxide emission equivalents
n/a	not applicable
ORF	Organics Recycling Facility
R&E Center	Ramsey/Washington Recycling & Energy Center in Newport, Minnesota
RDF	refuse-derived fuel
RFP	request for proposal
REC	Minnesota Recycling Education Committee
SC	separate collection
SCORE	Select Committee on Recycling and the Environment
SCS	Stearns, Conrad, and Schmidt, Consulting Engineers, Inc.

SET	Specialized Environmental Technologies, Inc.
SMSC	Shakopee Mdewakanton Sioux Community
SSO	Source Separated Organics
SSOM	source separated organic materials
SW	solid waste
SWMP	Solid Waste Management Plan
TAZ	Transportation Analysis Zone
TCMA	Twin Cities 7-County Metropolitan Area composed of Anoka, Carver, Dakota, Hennepin, Ramsey, Scott, and Washington Counties
TPY	tons per year
USCC	United States Composting Council
WARM	Waste Reduction Model by EPA
W	weekly
WM	Waste Management, Inc.
YW	yard waste

DEFINITIONS

BPI Certification

Biodegradable Products Institute (BPI) Certification program is a third-party verification of ASTM standards for compostable products in North America. Products that are BPI Certified have been through the formal BPI Certification process.

Co-collection

Curbside collection of waste materials where a waste material of interest (i.e., organics) is source-separated and contained (i.e., in its own specified type of durable bag) prior to being placed in a waste cart with other waste (i.e., trash), such that the contained source-separated waste may be sorted out and recovered from the waste stream.

Collection Event

The act of the hauler servicing the collection route for the specified cart type. For curbside service, collection events typically occur on a weekly or every-other-week basis and multiple collection events per household may occur in a given period to collect multiple cart types (i.e., if a household has trash, yard waste, and organics carts each collected weekly, that household would be offered three collection events per week). The collection event is a hauler metric and is independent of whether or not the household sets out an individual cart at the curb.

Commingled Collection

Curbside collection of waste materials where a waste material of interest (i.e., organics) is source-separated prior to being placed in a waste cart with other waste (i.e., yard waste) where the entirety of the waste stream from those carts will go to the same destination (i.e., composting facility).

Compost

Per USCC: "Compost is the product manufactured through the controlled aerobic, biological decomposition of biodegradable materials. The product has undergone mesophilic and thermophilic temperatures, which significantly reduces the viability of pathogens and weed seeds (in accordance with EPA 40 CFR 503 standards) and stabilizes the carbon such that it is beneficial to plant growth. Compost is typically used as a soil amendment but may also contribute plant nutrients. (AAPFCO definition, official 2018). Finished compost is typically screened to reduce its particle size, to improve soil incorporation."

Waste materials collected for composting are not referred to as compost. Finished compost is a product which has been processed to meet a defined safety standard for consumer use.

Compostable

An item or material which can decompose under the conditions present in a commercial composting site in accordance with the ASTM compostability standard specifications which require that the item or material achieve: 90 percent disintegration within 90 days; 60 percent conversion to CO_2 within 180 days; and leave no toxicity in the soil. BPI certification is the most widely accepted industry approval for compostable products.

The term "compostable" is distinguished from "biodegradable," as described per BPI: ""Biodegradable" is not an appropriate marketing term or claim for describing end of life behavior because it lacks specificity on

	timeframe and environment. More importantly, the term is often used to describe non-compostable products intentionally made to look similar to certified compostable products. These products are commonly referred to as "lookalikes" and are a leading cause of contamination at compost facilities. For these reasons, four US states have made it illegal to use the term "biodegradable" in sales and marketing language for single-use products."
County	Dakota County, Minnesota.
County-wide	Refers to the 15 municipalities modeled for this report that will be mandated to have curbside collection or will be included in practice. Refer to **Section 1.2** for more information.
Drop-Off Sites	Locations where a bin or dumpster is available for residents to self-haul and deposit their organics. The terms "drop-off sites" and "drop sites" may be used interchangeably in this report.
Durable Compostable Bag (DCB)	A specific type of disposable bag made of compostable plastic used to contain source-separated organics and keep them separate from trash when co-collected in a trash cart. Bags are designed to survive collection, transport, and sorting operations until the bags are sorted from trash.
Environmental Justice	The right of communities of color, Indigenous communities, and low-income communities, to the enjoyment of a healthy environment and to fair treatment with respect to the development, adoption, implementation, and enforcement of environmental laws, regulations, and policies.
Equity	The consistent and systematic treatment of all individuals in a fair, just, and impartial manner regardless of individual characteristics.
"Everyone Pays"	The concept that residents pay for organics collection services as part of their overall trash collection bill or indirectly through taxation, whether they participate or not. This determination was made in 2023 by Minnesota Pollution Control Agency (MPCA) after clarification of that: (1) SSOM is considered a recyclable material (see Minn. Stat. § 115A.03.25a); (2) Composting is considered recycling (see Minn. Stat. § 115A.551.1); and (3) Residents cannot be billed more to participate in recycling than solely trash pickup service (see Minn. Stat. § 115A.93.3c). Therefore, costs are presented as equally distributed across households for the purposes of this study.
Foth 2017 Report	Analysis of Residential Organics Recycling in Dakota County, Foth Infrastructure & Environment, LLC, September 21, 2017.
Greenhouse Gas	The CO_2 and other emissions that contribute to climate change due to the greenhouse gas effect.

Food Scraps/Food Waste	This refers to compostable wastes derived from food products such as plate waste (i.e., food that has been served but not eaten), edible but uneaten food, expired food, byproducts of food preparation (i.e., peels and rinds), etc., but does not include yard waste and other compostable materials such as paper products and packaging. These terms are used interchangeably in this report with "source-separated organic materials (SSOM)," "organics," and "organic materials."
Mandatory Organics Recycling	A legal requirement, usually adopted through an ordinance, that residents must separate their organic materials for recovery and prohibits disposal of such organics with regular trash. Backyard composting, drop-off sites and any form of curbside collection of organics could all be eligible methods to satisfy such a mandatory organics recycling requirement.
Municipal Solid Waste (MSW)	As defined per Minnesota Statutes Minn. Stat. 115A.03, Subd. 21, Mixed Municipal Solid Waste (MSW) means (a) garbage, refuse, and other solid waste from residential, commercial, industrial, and community activities that the generator of the waste aggregates for collection; (b) Mixed municipal solid waste does not include auto hulks, street sweepings, ash, construction debris, mining waste, sludges, tree and agricultural wastes, tires, lead acid batteries, motor and vehicle fluids and filters, and other materials collected, processed, and disposed of as separate waste streams. MSW refers to the trash as collected at the curb and is used interchangeably with the term "trash" in this study.
MSW Fraction	Refers to the portion of trash that is 1) not characterized compostable in a waste characterization study; or 2) remaining after organics are removed through processing means or resulting from sortation and separation by a waste generator. This "MSW Fraction" may also be referred to as "Remaining MSW."
Multifamily Household/Housing	Residential buildings with 4+ housing units per building, whose waste service is considered commercial.
Municipality	Per the MN Uniform Municipal Contracting Law, a "municipality" is "a county, town, city, school district or other municipal corporation or political subdivision of the state authorized by law to enter into contracts.
Open Hauling	Waste collection system in which residents choose a hauling company from a list of licensed providers.
Organics/Organic Material	Used interchangeably in this report with "food scraps," "food waste," and "source-separated organic materials (SSOM)."
Organized Hauling	Waste collection system in which a municipality manages, contracts and coordinates residential curbside collection, as governed by Minn. Stat. 115A.94.

Participant	A household serviced by an organics collection program that: 1) receives a cart and participates by sorting organics separately from MSW in the identified manner, placing those organics in the cart, and setting the cart out for collection as per the program instructions; or 2) sorts organics separately from MSW in the identified manner and brings those organics to a drop-off site identified by the County.
Recyclables	Refers to the traditional list of commingled recyclable materials such as paper, glass, metal, and plastics. Detailed specifications for each recyclable material type are defined by Dakota County, local municipal recycling programs and haulers. The term "recyclables" does not include yard waste or organics as used in this study.
Recovery Rate	The percentage of the total portion of a given material found in MSW stream (where total portion is identified through a waste characterization study) that is recovered from the MSW stream. For example, recovery rate of food waste is the percent of the food waste within the trash stream that is diverted by participants separating it out for collection or self-haul to a drop-off site.
Single Family Household/Housing	Residential buildings with 1 to 3 housing units per building, whose waste service is considered residential. This housing type is also referred to as "residential parcels" in this study. Parcel types were used to quantify households (HH) per parcel, which similarly indicates the number of waste carts at that parcel. Parcel types used to define this housing type include: Single Family (S) = 1 HH, Townhouse (TH) = 1 HH, Duplex (D) = 2 HH, Triplex (TR) = 3 HH, Twin Home (TW) = 2 HH, and Mobile Home (M) = 1 HH.
Self-haul	When a resident or a small business other than a waste hauling company utilizes their own means to transport material to a receiving location. This may include transport via personal, business, or rental vehicles as well as carrying materials on foot or by bicycle.
Set-out	The act of a household placing an individual waste cart at the curb for collection.
Set-out Rate	The percentage of waste carts set out during any one given collection event over the total route households serviced during that collection event.
Solid Waste Management Plan (SWMP)	An overarching plan which guides policy development and planning activities for waste streams and associated infrastructure in a defined region. "Solid Waste Management Plan" replaces previously-used terminology of "Solid Waste Master Plan." The term "County SWMP" is used in this report to refer to Dakota County's SWMP specifically.
Source-separated Organic Materials (SSOM)	Used interchangeably in this report with "organics," "food scraps" and "food waste," and does not include yard waste. As defined by Minnesota Statutes, Minn. Stat. 115A.03, Subd. 32.a.1 and Minn. Stat. 115A.551, Subd. 1(a)2 and means materials that:

(1) Are separated at the source by waste generators for the purpose of preparing them for use as compost;

(2) Are collected separately from mixed municipal solid waste and are governed by the licensing provisions of section 115A.93;

(3) Are comprised of food wastes, fish and animal waste, plant materials, diapers, sanitary products, and paper that is not recyclable because the commissioner has determined that no other person is willing to accept the paper for recycling;

(4) Are delivered to a facility to undergo controlled microbial degradation to yield a humus-like product meeting the agency's class I or class II, or equivalent, compost standards and where process residues do not exceed 15 percent by weight of the total material delivered to the facility; and

(5) May be delivered to a transfer station, mixed municipal solid waste processing facility, or recycling facility only for the purposes of composting or transfer to a composting facility, unless the commissioner determines that no other person is willing to accept the materials.

Stop	May refer to either: 1) A specific location where waste carts are stationed (e.g., at the resident's curb line) where a collection truck stops to tip the cart(s) into the truck; or, 2) The act of a collection truck servicing a waste cart as described in (1).
Stream	A flow of materials from its source of generation to its location of further sorting, recycling, processing, or disposal.
Subscriber	A household that proactively "opts-in" to voluntarily receive an organics cart and participate as per the program instructions. The number of organics program subscribers equals the number of organics carts delivered.
Ton	Use of the unit "tons" in the context of this report will refer primarily to "short tons" or "US tons" equal to 2,000 pounds. The term "tonnage" shall likewise refer to an accumulation of short or US tons of material. Where it applies, the use of "metric tons" shall be specifically noted; one metric ton equals 1,000 kilograms or 2,204.62 pounds.
Transfer Station	A facility where waste or recovered material is unloaded from collection vehicles and briefly held while it is reloaded into larger long-distance transport vehicles for shipment to landfills or other treatment, processing, or disposal facilities.
Trash	See definition for "mixed municipal solid waste" above.
Twin Cities Metropolitan Area (TCMA)	Seven County Metropolitan Area including the Counties of Anoka, Carver, Dakota, Hennepin, Ramsey, Scott and Washington. (Also referred to as the "Metro.")

Waste Designation	A system where local government dictates where waste is transported and/or processed, whether it is hauled by private entities, public entities, or a combination. Per Minn. Stat. 115A.80 to 115A.893, to establish waste designation for a waste stream or portion of a waste stream, a county or solid waste management district must: develop a designation plan; receive approval from MPCA of the plan; hold a public hearing to take testimony on the plan; negotiate contracts; prepare a designation ordinance; and receive approval from MPCA of the ordinance prior to its incorporation.
Yard Waste (YW)	Compostable materials such as grass, leaves, plants, trimmings, etc. that does not include food waste.

EXECUTIVE SUMMARY

Dakota County (County) is evaluating options for residential food scraps ("organics") collection policies and programs in response to the recently adopted Minnesota Pollution Control Agency (MPCA) Solid Waste Policy Plan. This plan requires that Twin Cities Metro Area (TCMA) counties ensure residents in cities with a population of 5,000 or more have access to curbside organics collection by 2030. The following 11 cities within Dakota County will be subject to the MPCA requirement for residential curbside organics collection based on population:

- Lakeville
- Eagan
- Burnsville
- Apple Valley
- Inver Grove Heights
- Rosemount
- Farmington
- Hastings
- West Saint Paul
- South Saint Paul
- Mendota Heights

Four other municipalities were included for the purposes of this study:

- City of Empire
- Sunfish Lake
- Lilydale
- Mendota

The goal of this study is to evaluate the economics, environmental impacts, and potential diversion rates of the following curbside food scrap collection methods:

- Separate organics collection in a dedicated cart;
- Co-collection of organics contained in durable compostable bags (DCBs) with trash; and
- Commingling organics with yard waste in a dedicated cart.

These collection methods are analyzed with the variations of "open" versus "organized" hauling markets and weekly versus every-other-week (EOW) trash collection. An "open market" is where residents choose from a list of private waste haulers licensed through the county and/or municipality and pay the hauler; an "organized market" is where a municipality manages residential collection by contracting with a waste hauler and residents pay the municipality through taxes or a utility bill. This report also investigates the feasibility and timeline for implementation of the collection scenarios, and the role of the County's existing organics drop-off sites after curbside collection rollout.

This report builds upon a study performed for the County in 2017. Since that study, MPCA clarified that **"everyone pays"** for curbside organics collection regardless of participation.

"Everyone Pays"

Residents cannot be billed more to participate in recycling (including organics) than solely trash pickup service (see Minn. Stat. § 115A.93.3c).

Currently, there are no waste haulers offering curbside organics collection to single-family households within Dakota County. There are several haulers who provide commercial organics collection services to multifamily residences such as apartments, condominiums, senior living, and townhouses. Residents who wish to compost their organics can self-haul their collected materials to one of 11 residential drop-off sites located throughout the County or use backyard compost bins for select organics.

The 11 modeled scenarios are defined in Table ES-1 below. The baseline scenario is defined as the current "status quo" waste management system and assumes that all organics are being disposed with the trash and sent to a landfill. Organics collection scenarios were evaluated for cost, food waste diversion, environmental impacts (including greenhouse gas (GHG) emissions, roadway miles, and collection trucks), and collection labor. These results include management of three waste streams: trash, yard waste, and food waste.

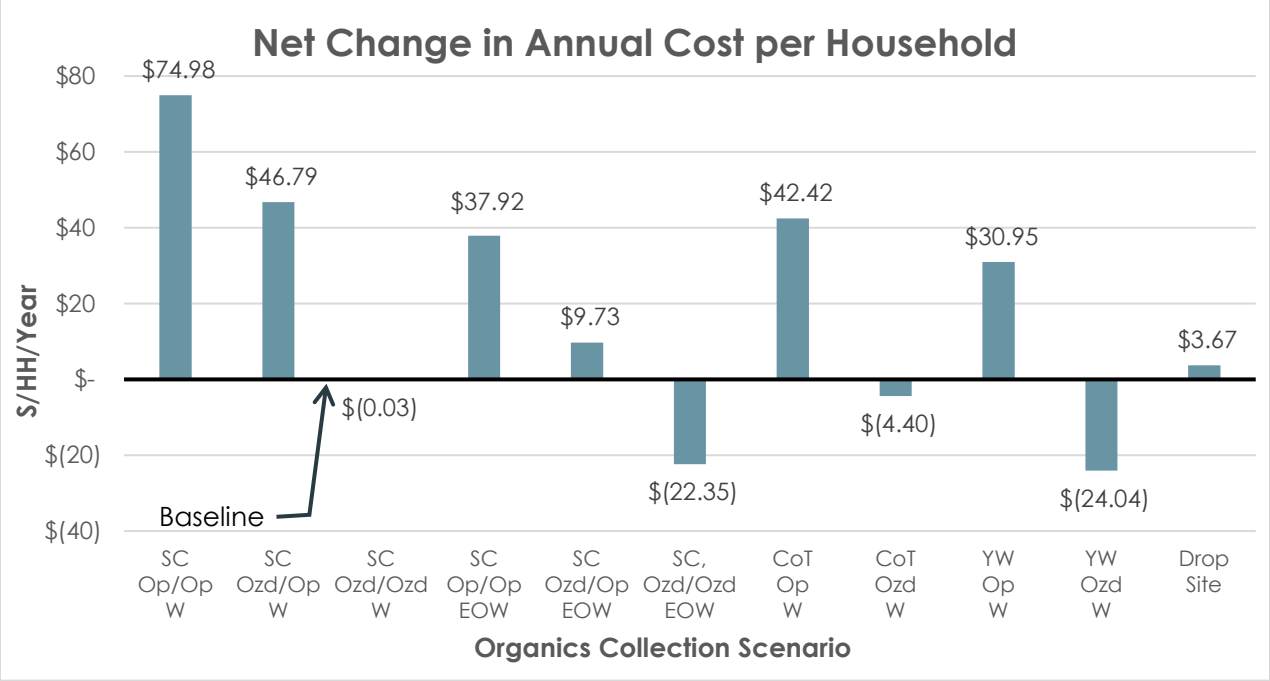
Table ES-1. Definition of Modeled Collection Scenarios

Scenario Acronym	Organics Collection Method	Organics Hauling Structure	Trash Hauling Structure	Trash Collection Frequency
Base (Baseline)	Commingled with Trash (to LF)	N/A	Open*	Weekly
SC, Op/Op, W	Separate Collection	Open	Open	Weekly
SC, Ozd/Op, W	Separate Collection	Organized	Open	Weekly
SC, Ozd/Ozd, W	Separate Collection	Organized	Organized	Weekly
SC, Op/Op, EOW	Separate Collection	Open	Open	EOW
SC, Ozd/Op, EOW	Separate Collection	Organized	Open	EOW
SC, Ozd/Ozd, EOW	Separate Collection	Organized	Organized	EOW
CoT, Op, W	Co-collection with Trash	Open**	Open**	Weekly
CoT, Ozd, W	Co-collection with Trash	Organized**	Organized**	Weekly
YW, Op, W	Commingled with Yard Waste	Open	Open	Weekly
YW, Ozd, W	Commingled with Yard Waste	Organized	Organized	Weekly
Drop Site	Drop-Off Sites	N/A	Open	Weekly

**Referred to as "open" for simplicity; two cities in the County are organized.*
***Organics and trash collection occur in the same cart, and therefore the same hauling market.*

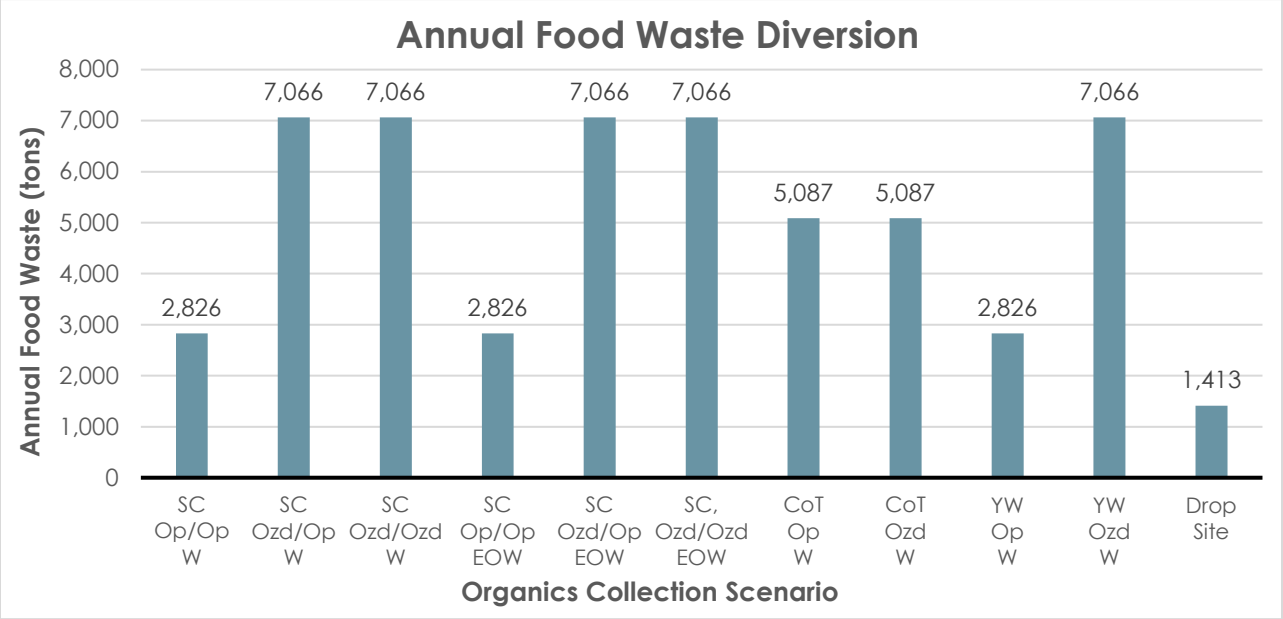
The annual net change in cost required to collect organics compared to the "baseline" waste management system, distributed per single-family household (HH) of the 15 modeled municipalities, ranges from a decrease of about $24/HH/year to an increase of about $75/HH/year (see ES-Figure 1 below). Costs are modeled for comparison purposes and may not reflect direct charges to residents.

Figure ES-1. Net Change in Cost per Household of Scenarios



Household food waste generation is estimated to range from 190 to 211 pounds/HH/year. The annual amount of food waste diverted via curbside collection ranges from 2,826 TPY to 7,066 TPY as shown below. However, commingled scenarios result in a total amount of 22,300 TPY SSOM due to the implications of including food waste with yard waste. The estimated total near-term capacity of local composters is 25,500 TPY SSOM, but other organics generators in the region will likely be competing for this capacity.

Figure ES-2. Annual Food Waste Diverted by Scenarios



The performance of each scenario in key categories is summarized in Table ES-2 below. The "overall ranking" provides an unweighted average of the performance across these five categories.

Table ES-2. Ranking of Scenario Performance

Organics Collection Scenario	Annual Cost	Food Waste Diversion*	GHG Emissions Reduction	Annual Road Miles	Collection Trucks	Average Score	Overall Ranking**
SC, Op/Op, W	11	3	9	8	11	8.4	10
SC, Ozd/Op, W	10	1	4	4	10	5.8	6
SC, Ozd/Ozd, W	4	1	2	2	4	2.6	2
SC, Op/Op, EOW	8	3	8	5	9	6.6	7
SC, Ozd/Op, EOW	6	1	3	3	7	4	5
SC, Ozd/Ozd, EOW	2	1	1	1	3	1.6	1
CoT, Op, W	9	2	7	9	6	6.6	7
CoT, Ozd, W	3	2	6	6	1	3.6	4
YW, Op, W	7	3	11	10	8	7.8	9
YW, Ozd, W	1	1	5	7	2	3.2	3
Drop Site	5	4	10	11	5	7	8

**This category is ranked 1 through 4 because some scenarios result in the same total food waste diversion.*
***Resultant ranking is 1 through 10 due to a tie in average score.*

The overall best-performing scenarios were found to be:

1. Separate Collection in a Dedicated Cart, Organized Organics, Organized Trash, EOW schedule
2. Separate Collection in a Dedicated Cart, Organized Organics, Organized Trash, weekly schedule

Collection of organics in a separate, dedicated cart is the most favorable method for organics processing and timely implementation. This method is readily available to begin operations in Dakota County, and organizing organics and trash collection can offset the costs and environmental impacts of adding a new collection route. Reduction of trash pickup frequency to EOW in the top scenario provides additional reductions in cost, GHG emissions, and road miles compared to the second-best scenario. Organization of organics maximizes participation regardless of collection method.

Co-collection with trash is not currently an option for the County. Local haulers with small-scale co-collection programs have indicated their operations do not have capacity to expand. The R&E Center has invested in DCB sortation equipment and launched their "Food Scraps Bag" co-collection program; however, the R&E Center is not available for Dakota County waste. Establishing co-collection programs in the County would require significant private investment in a waste sorting facility and construction of such a facility may be infeasible by the 2030 organics collection deadline.

Commingled collection with yard waste has been piloted in multiple TCMA communities with unfavorable results. When food waste and yard waste are commingled, it is difficult for haulers and composters to separately track quantities for reporting to MPCA and to control the feedstock ratio of compost mixes. Additionally, adding food waste to yard waste during collection requires the full load of material to be processed as food waste composting which has added permit requirements and cost. This method could be considered in Dakota County but is not considered practical for large-scale collection programs and would exceed existing local processing capacity.

To facilitate the timely establishment of economically and environmentally successful organics collection programs, the County can consider the following strategies:

- Continue to provide the current amount of support for the development of private organics collection, transfer, and processing operations while providing public education and outreach about organics collection.
- Advocate for an "opt-in" approach to curbside organics service to reduce contamination and cart misuse.
- Develop a new hauler licensing provision that curbside organics collection service be available to residential customers.
- Maintain current drop sites and consider locations for additional drop sites to provide access to: rural and multifamily residents who will not be mandated to have to curbside service, small businesses, and/or residents with overflow events.
- Monitor drop site usage following curbside collection rollout to evaluated level of use and effectiveness of locations.
- Facilitate conversations with local composters to discuss processing capacity agreements and best practices for compostable packaging and contamination.

- Provide cities with technical assistance on related needs for program rollout such as contract language, procurement and legal requirements, and public engagement materials.

- Establish a grant program for cities to provide financial support for administrative, enforcement, and/or outreach staff time associated with organized collection programs.

Many of the above recommendations are also identified as optional strategies for TCMA counties in the MPCA Solid Waste Policy Plan. The County is advised to begin public engagement around the new service requirements as soon as possible and may benefit from assisting interested communities with early program rollout.

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1.0 INTRODUCTION

1.1 PURPOSE

Dakota County is evaluating options for residential organics collection policies and programs in response to new MPCA requirements for TCMA counties outlined in the Metropolitan Solid Waste Management Policy Plan ("Metropolitan Policy Plan")[1] published in January 2024. This study analyzes the options available to Dakota County for collection of residential organics. For quantification purposes in this report, organics refers only to food scraps and excludes compostable products, yard waste, pet waste, and any other non-food residential organic materials.

As dictated in the Metropolitan Policy Plan, TCMA Counties must include certain strategies for waste diversion in their own respective county-level SWMP. Waste diversion strategies related to organics collection include:

- Required strategies:
  - Make residential curbside organics collection available in cities with a population greater than 5,000 by 2030 (Strategy 40).

- Optional strategies:
  - Pair the option of bi-weekly trash with weekly recycling and organics collection (Strategy 32).
  - Contract for residential recycling and organics by 2030 (Strategy 33).
  - Establish additional organics recycling drop-off sites (Strategy 43).

Other strategies listed in the Metropolitan Policy Plan that are related to the management of organics and are notable to consider in relation to implementing organics collection services include:

- Expand backyard composting outreach and resources for residents (Required Strategy 41).
- Require food-derived compost in county construction and landscaping projects (Required Strategy 55).
- Standardize the role of compostable products in organics recycling programs by 2025 (State-led Strategy 44).

This report summarizes an analysis of residential organics collection options performed by SCS on behalf of Dakota County in response to these new requirements. The evaluation includes an overview and analysis of the following:

- Economics, environmental impacts, and potential diversion rates achieved by the following residential curbside organics collection methods and variations within Dakota County:
  - Collection methods:
    - Separate organics collection in a dedicated cart.
    - Co-collection of organics contained in DCBs with trash.
    - Commingling of organics with yard waste in a dedicated cart.

[1] MPCA. Metropolitan Solid Waste Management Policy Plan 2022-2024. January 2024.

  - Variations:
    - Open hauling versus organized hauling markets.
    - "Weekly" versus "EOW" trash collection (where applicable).

- Feasibility and timeline for implementation of these potential collection methods.

- Role of drop-off sites under curbside collection rollout including:
  - Quantitative comparison of drop-off sites to curbside collection scenarios.
  - Provision of recycling opportunities considering equity and EJ concerns.

- Recommendations and best practices for the County based on industry experience, literature review of community case studies, and conversations with regional stakeholders.

A similar study was previously performed in 2017 (Foth 2017 Report)[2]. Dakota County requested that SCS Engineers (SCS) replicate the methodology used for the Foth 2017 Report where possible for consistency, updated with new data and resources. The County will use this information to assist in making policy decisions for development and management of residential food waste diversion programs.

This report provides:

- A definition of different curbside organics collection methods used for modeling which the County expressed interest in (**Section 2.0**).
- A summary of current trash, yard waste, and organics collection in Dakota County (**Section 3.0**).
- A discussion of the operational challenges of the different curbside organics collection methods in the context of the existing Dakota County system (**Section 4.0**).
- A review of findings from case studies, community examples of organics collection programs, and stakeholder feedback (**Section 5.0**).
- A summary of the modeling methodology and assumptions used to evaluate the various organics collection scenarios identified by the County (**Section 6.0**).
- A summary and discussion of quantitative modeling results (**Section 7.0**).
- A review and summary of programmatic approaches available to Dakota County to facilitate organics collection program implementation (**Section 8.0**).
- Recommendations based on the overall findings of the report (**Section 9.0**).
- Conclusions based on the overall findings of the report (**Section 10.0**).

1.2 BACKGROUND

The MPCA regulates solid waste and recycling activities, including the collection and processing of compostable materials such as organics and yard waste. As described in **Section 1.1**, the latest MPCA Metropolitan Policy Plan includes new requirements for TCMA counties. TCMA counties must revise their respective SWMPs to include certain strategies for waste diversion, including the required and optional strategies noted in **Section 1.1** related to residential organics. Dakota County

[2] Foth Infrastructure & Environment, LLC. Analysis of Residential Organics Recycling in Dakota County. September 21, 2017.

is in the process of revising their SWMP at the time of this report publication, and this report is intended to help inform their approach.

This study evaluates the collection of residential organics for beneficial use at commercial composting facilities. Anaerobic digestion is an emerging alternative beneficial use for this material, but because local facilities do not currently exist, this has not been considered as a viable diversion outlet by 2030. The Metropolitan Policy Plan includes more details on the advantages to Minnesota communities provided by organics management processes. It is important to note that there are other means of diverting organics from the waste stream for recovery, such as food waste prevention, edible food recovery, home composting, "upcycling" into animal feed, or other uses. Dakota County is actively pursuing these other means of organics diversion as discussed in detail in the County SWMP[3]. This report is limited to reviewing the collection of food waste from residential sources only.

Curbside organics collection scenarios are compared to the use of resident food scrap drop-off locations. There are 11 drop-off sites currently operating in the County and consideration of their continued use after the implementation of curbside service is provided in **Section 8.7**.

The municipalities within Dakota County analyzed for curbside organics collection modeling are summarized in **Table 1.** Cities with populations greater than 5,000 are automatically included as they will be required to offer curbside organics collection. Additional municipalities below this population threshold were included in the evaluation because:

- They are small geographic areas bordered by larger cities and have similarly high collection route densities, often being serviced by the same routes; and/or
- Their population is projected to grow by 2030 such that they will exceed the population requirement.

These communities are referred to as "Included in Practice" in **Table 1**. These communities were similarly included during the implementation of weekly recycling collection.

In total, the **15 municipalities** – 11 included by requirement, and 4 included in practice – are referred to as **"County-wide"** in this report for the purposes of modeling and discussion. **Figure 2** shows these included municipalities.

[3] Dakota County Solid Waste Management Plan 2018-2038, September 2018.

Table 1. Municipalities Modeled for Curbside Organics Collection

Included by Population Requirement	
Municipality	**2022 Population[4]**
Lakeville	73,828
Eagan	68,889
Burnsville	64,522
Apple Valley	55,673
Inver Grove Heights	35,652
Rosemount	26,943
Farmington	23,719
Hastings (partial)	22,153
West Saint Paul	21,169
South Saint Paul	20,489
Mendota Heights	11,658

Included in Practice		
Municipality	**2022 Population***	**2030 Forecast***
City of Empire	3,152	5,465
Sunfish Lake	520	1,202
Lilydale	790	828
Mendota	195	227

**2030 forecast populations for "included in practice" municipalities were developed by calculating estimated rate of population change from population projections of the Transportation Analysis Zone (TAZ) that the township is part of in the Dakota County 2025-2040 Comprehensive Plan[5] and applying these rates to the 2022 final population data.*

2.0 DESCRIPTION OF CURBSIDE ORGANICS COLLECTION METHODS STUDIED

Three potential methods of recovering organics through curbside collection service are modeled, as specified by Dakota County for evaluation:

- Separate organics collection in a dedicated cart.
- Co-collection of SSOM contained in DCBs with trash.
- Commingling of organics with yard waste in a dedicated cart.

These collection methods are defined below; modeling assumptions for these methods and their variations follow in **Section 6.0**. Conceptual flow diagrams for these collection methods are presented in **Section 2.5**.

These collection methods were selected due to their regional precedent in Minnesota and/or the greater United States; see **Section 5.0** for examples of Minnesota and national programs collecting organics using these methods. Co-collection of SSOM with trash in the U.S. is only currently occurring

[4] 2022 Met Council Final Population & Household Estimates.
[5] Dakota County Comprehensive Plan 2025-2040, March 2021.

at scale in Minnesota. Additional consideration of organics collection methods relative to local conditions is provided in Section 4.

2.1 CURRENT SYSTEM – BASELINE

The "baseline" system in Dakota County is a simplified version of the current waste management system, and the following is assumed:

- No organics separation by residents and no curbside organics recovery is occurring.
- Yard waste is typically collected curbside weekly for 8 months of the year in its own cart, and is not collected the remaining 4 months of the year. Yard waste is sent directly to a yard waste composting facility. Half of residences have a yard waste cart.
- Trash that includes organics is collected weekly from single-family residents in curbside carts and brought directly to a landfill for disposal. All residences have a trash cart.
- For modeling purposes, we do not consider transfer of the trash or the small portion of trash that is going to a facility for processing.

2.2 SEPARATE ORGANICS COLLECTION IN A DEDICATED CART

The "separate collection" method involves residents keeping organics separate from trash in their household and placing them in an additional dedicated cart to be picked up curbside on the same schedule as trash carts per scenario. The following is assumed:

- The organics may be loose or contained in a compostable bag, depending on resident preference or the restrictions of the hauler and/or the organics processor.
- The entire contents of the separate cart will be sent to a SSOM composting facility without further sorting.
- For modeling purposes, we do not consider transfer of the organics.
- This cart will be referred to as a "separate cart," "green cart," or "organics cart" in this report. Carts are opt-in and participation varies by hauler market structure.
- Yard waste cannot be placed in this cart. Yard waste continues to be managed as it is in the baseline.

This collection method has the potential to be paired with EOW trash service due to the reduction in trash volume, pests, and odors achieved by diverting organics from the trash.

2.3 CO-COLLECTION WITH TRASH

The "co-collection with trash" method involves residents separating organics from trash in their household, placing the organics in a specific type of DCB that is securely tied, and placing the DCB in the trash cart with MSW. The following is assumed:

- These DCBs will be separated at a processing facility after collection, with recovered DCBs then being transferred to a composting facility and the MSW fraction transferred to a landfill for disposal.
- The DCB used is specific to the program and will be provided through the hauler and/or municipality.
- Yard waste cannot be placed in the DCBs. Yard waste continues to be managed as it is in the baseline.

This method retains weekly trash pickup, as the volume and putrescible nature of organics is still present in the trash cart necessitating that the schedule will not change.

2.4 COMMINGLED WITH YARD WASTE

The "commingled with yard waste" method involves residents keeping organics separate from trash in their household and placing them in a yard waste cart. The following is assumed:

- The organics may be loose and/or placed in a compostable bag, depending on resident preference and/or the restrictions of the hauler and/or the organics processor.
- The entire contents of this cart will be sent to an SSOM composting facility without further sorting.
- This method differs from the "separate collection" method because the cart may also be utilized for yard waste.
- Commingled yard waste and food waste is collected curbside weekly year-round. All residences have a yard waste cart (resulting in an additional cart for those households that weren't using curbside yard waste collection service in the baseline).

This collection method has the potential to be paired with EOW trash service due to the reduction in trash volume, pests, and odors achieved by diverting organics from the trash.

2.5 QUALITATIVE COMPARISON OF THE THREE ALTERNATIVE ORGANICS COLLECTION METHODS

Table 2 provides a comparison of key aspects of the modeled collection methods. The "EOW Trash Possible?" column accounts for methods that may reduce the volume, pest, and odor concerns of the trash such that the frequency of trash pickup service could be reduced.

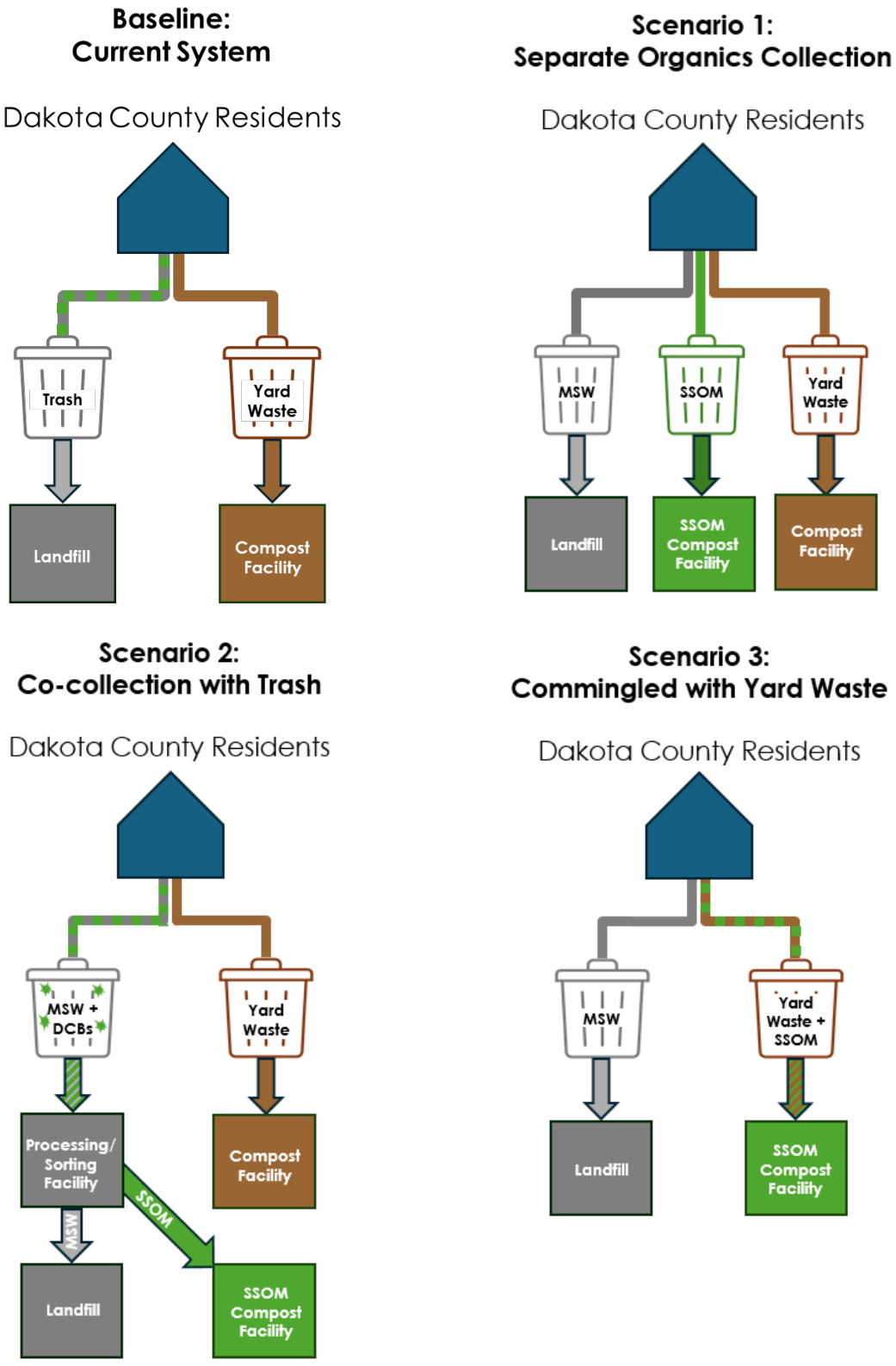
Table 2. Qualitative Comparison of Three Organics Collection Methods

Collection Method	Additional Truck?	Additional Cart?	DCB Required?	Additional MSW Processing?	EOW Trash Possible?
Separate Cart	Yes	Yes	No	No	Yes
Co-collected with Trash	No	No	Yes	Yes	No
Commingled with Yard Waste	No*	No*	No	No	Yes

**While only certain areas of the County have an actual cart just for yard waste, this study accounts for the curbside collection of yard waste that currently occurs across the modeled municipalities. The "commingled with yard waste" scenario is therefore not considered to require an "additional" truck or route versus what already exists in the system.*

A conceptual waste flow diagram for each scenario is presented on Figure 1 below to illustrate how waste streams are being modeled. For the purposes of this study, no waste transfer between collection and primary tipping is evaluated. As shown in the figure, yard waste and food scraps are delivered to different composting facilities. In Minnesota, yard waste and food scraps composting operations have significantly different permitting requirements; see Section 4.2.1 for further information on these differences.

Figure 1. Conceptual Flow Diagrams of Modeled Collection Scenarios



3.0 EXISTING WASTE MANAGEMENT SYSTEM

3.1 COUNTY INFRASTRUCTURE OVERVIEW

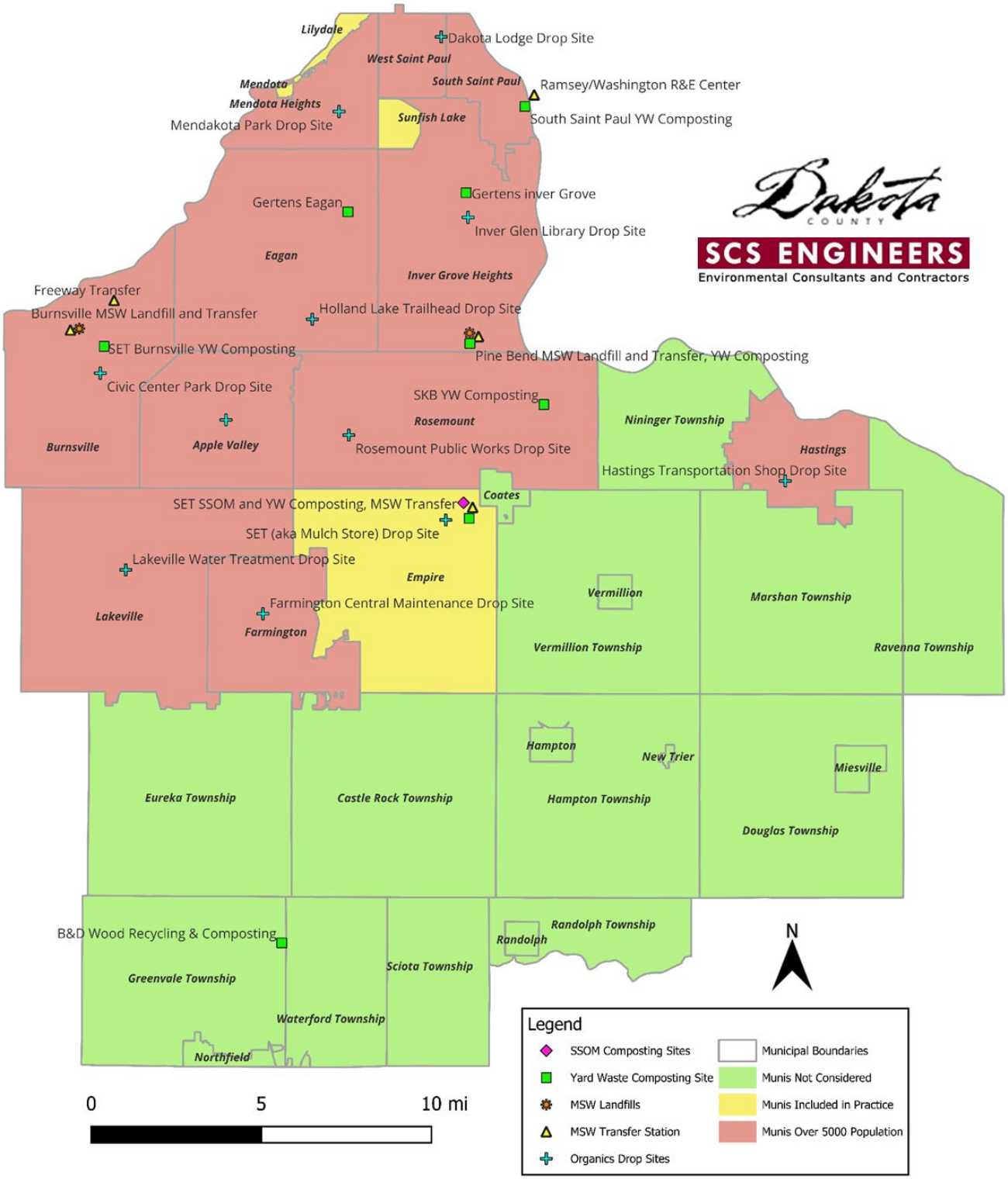
Dakota County is home to diverse waste management infrastructure, which is described in full in Appendix A of the County's SWMP. This section of the report summarizes those facilities relevant to this evaluation and accounts for changes since the last County SWMP update performed in 2018.

Relevant entities for the analysis of County waste streams include collection, processing, and landfill disposal infrastructure. These relevant facilities and their locations are shown on **Figure 2**. Facilities that are outside of the County border but are utilized for waste management or processing analysis are discussed in **Sections 3** and **4** but are not displayed on **Figure 2**, with the exception of the R&E Center located just outside the County boundary.

Besides the organics drop-off sites, the County does not own or operate waste infrastructure shown on **Figure 2**. The County owns the land on which the existing SET composting facility operates, but WM leases this land and owns the facility.

No curbside collection of organics is currently available for residents of Dakota County, aside from a small-scale bucket subscription service as further described in **Section 3.2.2**. Co-collection of bagged organics with trash is not available in the County as described in **Section 4.1.2** through **4.1.4**.

Figure 2. County Waste Management Infrastructure



3.2 WASTE HAULING

3.2.1 Market Structures

This report considers two hauling market structures: open and organized.

An open market is a waste collection system in which residents choose a hauling company from a list of providers that have been approved via licensing through a county and/or municipality. Licenses include what type of waste may be collected, how it may be stored, and other expectations for service. The resident contracts with and pays the hauler directly for the service.

An organized market is a waste collection system in which a municipality manages and coordinates residential curbside collection. Typically, residents pay the municipality, rather than the waste hauler, through taxes or a utility bill; alternatively, contracts may dictate that the hauler is responsible to collect payment. While organization may occur in a variety of ways, such as franchise zones, this report considers organized collection to be a scenario where a municipality contracts with a single waste hauler to service their area. Whether contracting with a single waste hauler or multiple, organized collection designates service areas such that haulers are not overlapping. As such, organization of haulers facilitates more standardized collection, and can reduce environmental impacts through improved efficiency.

There is precedent in the greater TCMA region that municipalities may organize one portion of the waste stream (often recyclables) while remaining an open market for another (often trash). This allows for a flexible approach to managing waste streams that will be handled and processed in different ways. As noted in Section 3.2.2 below, there are municipalities in the County that have chosen to organize for trash, recycling, and yard waste service simultaneously.

While organization of an existing market for trash collection must follow Minnesota Statutes 115A.94 Subdivision 1, organics collection may be organized where a current market has not developed through contracting directly with a hauler. The statutory process for collection organization is intended to provide fairness when a government entity seeks to organize services in what was already an established, open market.

See Sections 5.2 and 8.2 for details on a program that was recently established by the City of Plymouth to contract for organics collection without use of the organization statute. Plymouth contracted directly with a hauler without a bidding process by adding organics collection to an existing recycling service contract during a renewal period. It is recommended that the County continue monitoring any legal developments with this program and consult with County legal counsel on contract development procedures to provide best possible assistance to municipalities in following applicable purchasing policies.

The MPCA provides a useful reference[6] for collection service RFP development titled "RFP Scope of Services Framework Residential Solid Waste Collection Services," Each city potentially has slightly different thresholds for required solicitation of proposals defined in their Purchasing Policy or equivalent document. The Uniform Municipal Contracting Law (Minnesota Statutes 471.345) outlines certain quotation/bid requirements based on the amount of the purchase, including that:

[6] https://www.pca.state.mn.us/sites/default/files/w-sw1-15c.pdf

- Sealed bids solicited by public notice are required for contracts over $175,000; and
- Contracts between $25,000 and $175,000 may be made either upon sealed bids or by direct negotiation by obtaining two or more quotations without advertising for bids.

As an example of an existing organized hauling market, the 2022 "Solid Waste / Recycling Services Agreement Between the City of Farmington and Dick's Sanitation" was provided to SCS for review. Notable language in Farmington's agreement includes:

- 1.1.6. City-Designated Solid Waste Disposal Facility: The facility designated by the City where DSI is required to deposit trash and/or recyclables collected under this Contract.

- 3.2. DSI shall furnish all labor and equipment as shall be necessary and adequate to ensure satisfactory collection, transportation, and proper separation and processing of the MSW, recyclables, bulky wastes, and yard waste from residential dwellings …

- 3.2.3. Frequency of Collection. MSW collection shall be weekly for each premise. Recyclables collection shall be weekly for each premise. … Yard waste collection shall be weekly during the season beginning on or about mid-April and continuing through mid-November …

- 3.2.7. Containers. DSI shall provide each residence with a trash cart, a clearly distinguished recycling cart, and, when requested by a subscribing customer, a yard waste cart. The cost of providing a cart is built into the rate of agreements …

- 3.2.8. Doorstep/Valet Collection. Doorstep/valet collection, rather than curbside or alley collection, must be allowed for senior citizens and persons with decreased mobility for no additional charge with verification of need.

- 6.4. Required Disposal. Pursuant to MN 115A.46 and 115A.471 all waste collected by DSI in the City shall be delivered to the transfer station and transported to the Red Wing Resource and Recovery Facility or as otherwise approved by the City.

- 7.6. Processing of Recyclables. DSI shall haul all collected recyclables to a recyclables processing facility or end market. … All costs of transporting and depositing the recyclables with the recyclables processing facility or the end market shall be at the sole expense of DSI.

- 10. SSO Collections

- 10.1. DSI and the City agree to monitor the Dakota County organics drop site in Farmington. **Should the City determine the need for a curbside collection program, DSI will work with the City to develop an SSO pilot program**.

- 11.1. Education. DSI will assist in the distribution of educational materials in compliance with Dakota County educational requirements related to solid waste. … The method of distribution and content of materials shall be approved by the City in writing prior to distribution. …

- 13.1. Billing. DSI shall collect all charges from each premise for its collection services.

- 16.3. Christmas Tree Collection. DSI agrees to provide Christmas tree collection … Customers with subscription yard waste service shall receive Christmas tree collection included in the cost of subscription yard waste.

Municipalities may want to consider adopting elements from this contract to facilitate curbside organics program development most suited to their needs.

3.2.2 Current Hauling Systems

Current residential hauling systems in the County consist of:

- Trash and recyclables:
  - Separate cart each for trash and recyclables.
  - Organized hauling in Farmington (single hauler, DSI).
  - Organized hauling in Hastings (multiple haulers).
  - Open hauling in all other municipalities.
  - Weekly collection of trash and recyclables.

- Yard waste[7]
  - Third cart provided in certain areas.
  - Curbside collection of loose materials or material in paper yard waste bags in certain areas.
  - Organized, optional (subscription or as-needed) hauling in Farmington (single hauler, DSI).
  - Organized, optional (subscription or as-needed) hauling in Hastings (multiple haulers).
    - Assumed, contract was not available to review.
  - Open, optional hauling in the 13 other studied municipalities.
    - Assumed, information not readily reported.
  - Assumed to be weekly collection of yard waste from mid-April to mid-November.

- Organics
  - Small-scale subscription services offered in southern Dakota County by Northfield Curbside Composting Co-op[8], collecting via a separate bucket for food waste.

Trash and recyclables haulers are licensed at the County level, as well as licensed by individual cities.

At the time of this report in Dakota County, the Cities of Farmington and Hastings currently have organized collections; the remaining municipalities have open market systems. The number of single-family households per 2022 census population values serviced by each market structure are:

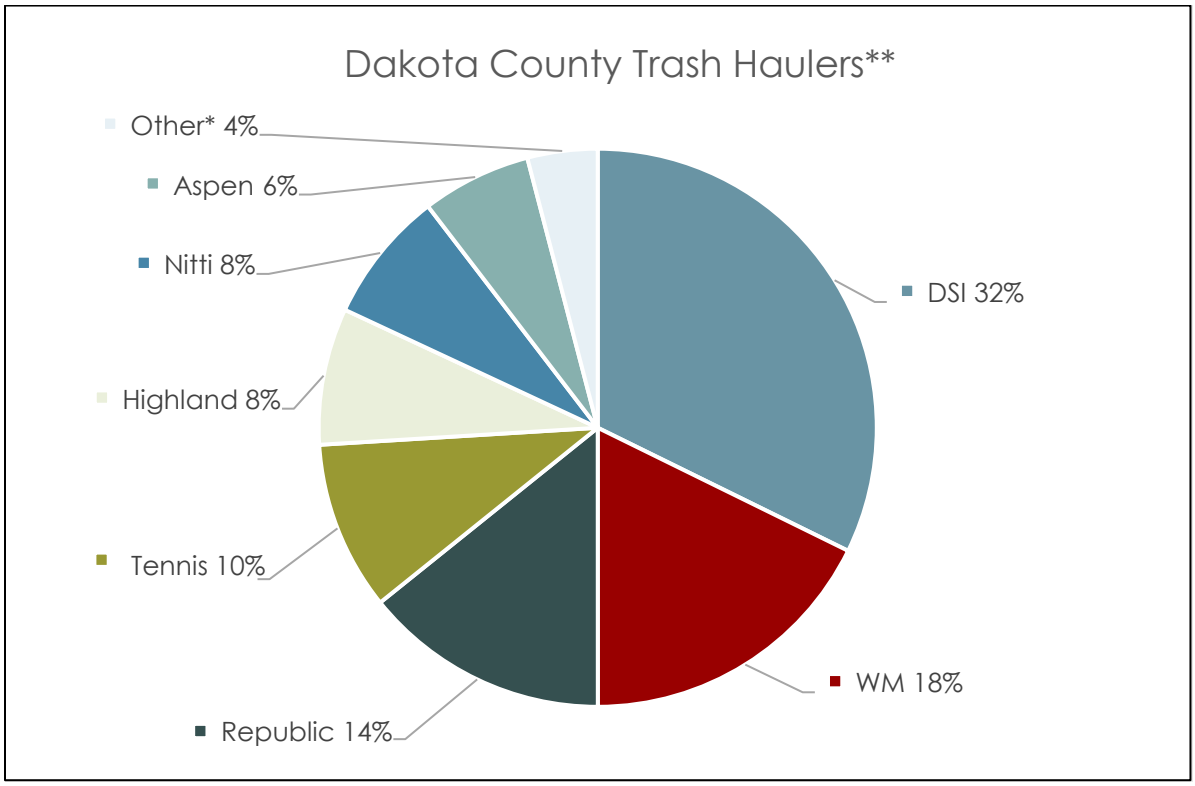
- Total households in the 15 modeled municipalities = 133,878 households (100 percent)
  - Organized = 15,603 households (Farmington and Hastings)
  - Open = 118,275 households (remaining 13 modeled municipalities)

[7] Information on the distribution of collection methods for yard waste in Dakota County is not readily available.
[8] https://www.curbsidecompostmn.coop/

Being that trash hauling is organized only in Hastings and Farmington, this equates to approximately 12 percent of County households having organized trash collection and 88 percent of County households choosing a locally-licensed hauler for trash collection.

The haulers providing service differ across municipalities within the County. A large portion of trash in the County is hauled by DSI, followed by WM and Republic Services (see **Figure 3**). The majority of yard waste is hauled by DSI followed by Tennis (see **Figure 4**). **Appendix A** provides a breakdown of trash hauler markets by municipality, and **Appendix B** provides a breakdown of yard waste haulers by municipality.

Figure 3. Major Residential Trash Haulers in Dakota County[9]

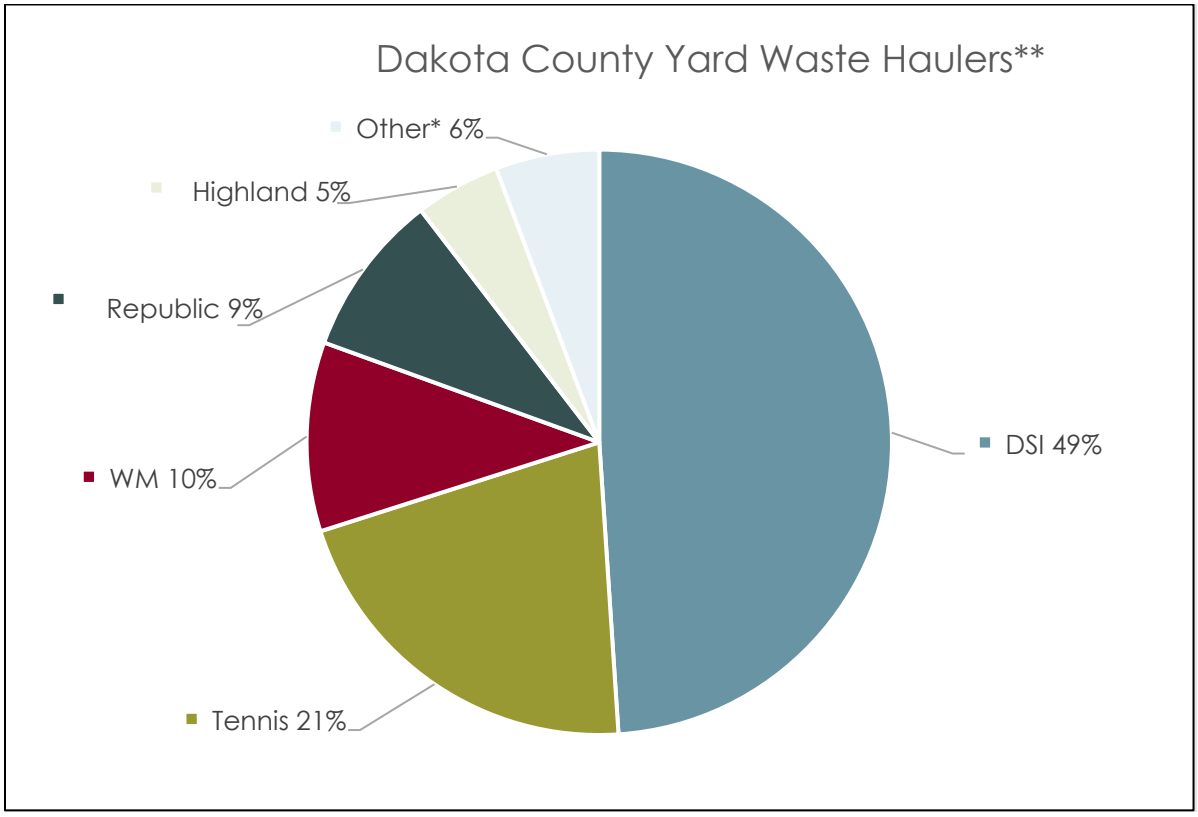


Four haulers managed 1 percent or less of trash and are not reflected on **Figure 3: Buckingham's, IGS, Triangle, and Advanced (now owned by GFL).*

***Only includes the 15 municipalities modeled for this report.*

[9] Data is based on annual tonnage from 2022 SCORE reporting.

Figure 4. Major Residential Yard Waste Haulers in Dakota County[10]



Four haulers managed 1 percent or less of yard waste and are not reflected on **Figure 4: Aspen, Nitti, Buckingham's, and IGS.*

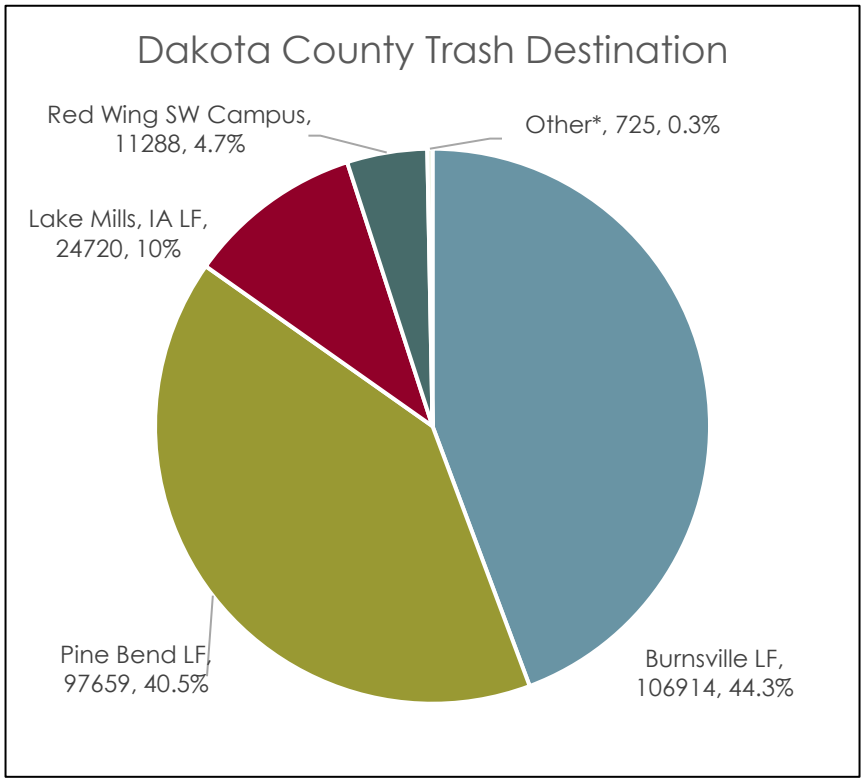
***Only includes the 15 municipalities modeled for this report.*

3.3 TRASH MANAGEMENT FACILITIES

Most of the trash collected in the County is being landfilled, primarily at the Burnsville LF owned by WM followed closely by the Pine Bend LF owned by Republic. In total, seven landfills receive County waste. Three total waste processing (Red Wing SW Campus, R&E Center) or mass-burn incineration facilities (HERC) are receiving County trash. Of these facilities, the most trash is sent to the Red Wing SW Campus, a resource recovery facility that sorts trash to remove recyclable metal and process remaining MSW into RDF, with residue from the process being landfilled. **Figure 5** presents a current breakdown of the destination of trash generated in the County.

[10] Data is based on annual tonnage from 2022 SCORE reporting.

Figure 5. Destination of Dakota County Trash[11]



*Other Trash Destinations	Tons Per Year (TPY)
R&E Center	259.5
HERC	194.0
Seven Mile Creek LF (Eau Claire, WI)	186.7
Elk River LF	75.1
Spruce Ridge LF	9.3
Nobles County LF	0.6
TOTAL	725.2

3.4 ORGANICS MANAGEMENT

3.4.1 Available Infrastructure

Processing infrastructure for both yard waste and SSOM collected in the County is currently limited to composting, and the County is required to offer curbside organics collection by 2030 as discussed in **Section 1.1.** Private development of anaerobic digestion capacity in the region that may accept residential compostable material as a feedstock is being considered. For example, Dem-Con is currently in the design process of a facility that may have available capacity for up to 10,000 TPY of SSOM from the region. (Much of the total planned capacity is intended for organics from the R&E Center.) Per Dem-Con, they are in the design phase of their anaerobic digestion facility and hope to begin operations in 2027. Similar facilities have seen longer development timeframes due to supply chain delays for equipment procurement and challenges during commissioning and ramp up to full capacity which may further extend Dem-Con's timeline. For this reason, this report only considers composting as an end use of collected organics.

3.4.2 Yard Waste Composting Facilities

The location of facilities within the County that compost only yard waste and that are used in the modeling collection scenarios (see **Section 6.2**) are shown on **Figure 2.** Yard waste generated within

[11] Annual tonnage data is from 2022 SCORE reporting and includes both commercial and residential waste. Data was not available specific to the residential waste stream. Note this data represents waste for the entire County, not just the 15 modeled municipalities, as data broken down by municipality was not available.

the County is largely managed by composting sites within the County. These facilities are not considered to face capacity concerns for reasons described in **Section 4.2.1**, so it was not necessary to consider yard waste sites outside the County for the purposes of this report.

3.4.3 SSOM Composting Facilities

While the following operations are possible outlets for County organics, they are not considered as SSOM composting capacity for the purposes of this report for the reasons described below:

- Small-scale, non-permitted SSOM composting operations which fall below the MPCA de minimis of 120 cubic yards of material on-site at any given time[12], because they are not able to predictably meet demand on a commercial scale; and

- SSOM facilities that are permitted but not currently operational for food scraps processing, such as Pine Bend and SKB, because it is not anticipated that they will be operating at a commercial scale by 2030.

Operational SSOM composting within Dakota County is currently limited to one facility, SET, as shown on **Figure 2**. SSOM from Dakota County, including waste from the County organics drop-off sites, is also composted at the SMSC ORF, located on tribal land within Scott County. Both facilities operate yard waste composting sites in addition to SSOM composting. More information on the difference between yard waste and SSOM composting is provided in **Section 4.2**.
Capacity for these SSOM sites is estimated as follows:

- SET Composting Facility in the City of Empire currently processes about 20,000 TPY of SSOM.
  - Permitted capacity for SSOM is 32,500 TPY SSOM.
  - Available capacity is estimated to be 12,500 TPY SSOM.
  - The site's current layout does not allow much of the available permitted SSOM capacity to be utilized; However, SET/WM staff have indicated they are willing and able to adjust operations and expand the lined pad to meet demand for SSOM processing capacity.

- The SMSC ORF currently accepts approximately 12,000 TPY of SSOM and 70,000 TPY of total material from across the region.
  - The SMSC ORF is not subject to state permitting because it is located in an independent nation but is currently at maximum operational capacity for SSOM.
  - The SSOM composting operations of SMSC ORF are scheduled to move further west into Scott County to the future Dakota Prairie Composting Facility which will have expanded capacity to receive organics from Dakota County and other generators. The Dakota Prairie Composting Facility is scheduled to open in the fall of 2024.

[12] https://www.pca.state.mn.us/business-with-us/community-composting#:~:text=Operating%20requirements,Must%20avoid%20creating%20nuisance%20conditions.

- The new SMSC Dakota Prairie Composting Facility is being constructed in a location subject to state permitting and is permitted at full design capacity of 215,000 TPY total material of which 35,000 TPY is SSOM.
    - Phase 1 of construction, scheduled to be completed in fall of 2024, will have 115,000 TPY total capacity of which 25,000 TPY is SSOM.
- Based on the existing intake of 12,000 TPY of SSOM, the full facility design will have 23,000 TPY of available SSOM capacity beyond their current intake rates.
    - Phase 1 of the new Dakota Prairie site will have 13,000 TPY of available SSOM capacity beyond their current intake rates.

These estimates of 12,500 TPY SSOM at SET and 13,000 TPY SSOM at SMSC indicate an estimated total of 25,500 TPY SSOM composting capacity available in the region. Note however that other organics generators will likely be competing for this capacity. **Section 8.1** discusses the composting capacity required to process the estimated material generated by the modeled curbside collection scenarios.

3.4.4 Organics Drop-Off Sites

Dakota County opened its first residential organics drop-off site in 2016 and currently has 11 drop-off sites located throughout the County (see **Figure 2** and **Figures 27** through **30**). These sites are publicly owned and operated, aside from the drop-off located at the SET composting site. Interested residents are required to register to participate for tracking purposes. **Table 3** summarizes participation at each drop-off site as of January 30, 2024.

Table 3. Organics Drop-off Site Participation

Location	Registered Households[13]	Households Per City[14]	Portion of City Participating
Apple Valley	1,248	21,412	6%
Burnsville	947	25,834	4%
Eagan	1,803	27,954	6%
Farmington	527	8,011	7%
Hampton	3	277	1%
Hastings (part)[15]	752	9,195	8%
Inver Grove Heights	942	14,448	7%
Lakeville	1,316	24,975	5%
Lilydale	38	538	7%
Mendota Heights	821	4,810	17%

[13] Registered households obtained from 2023 drop-off site participation data provided by Dakota County. In addition to those listed in **Table 3**, registrants from outside Dakota County include: 6 from Cannon Falls (Goodhue Co.), 15 from St. Paul (Ramsey Co.), and 11 residents from an unspecified location. Households that are within the city but outside of County boundaries may be included in registered totals.
[14] City and County total household data obtained from 2022 Met Council Final Population & Household Estimates. Totals here represent the portion of the city households located within Dakota County.
[15] Hastings is located mostly in Dakota County and partially in Washington County.

Location	Registered Households[13]	Households Per City[14]	Portion of City Participating
Northfield (part)[16]	4	510	1%
Rosemount	923	9,474	10%
South St. Paul	431	8,429	5%
Sunfish Lake	6	180	3%
West St. Paul	768	9,287	8%
Vermillion Township	11	478	2%
Total Registered Households:	**10,540**	**Average City Participation:**	7%
Total County Households:	**171,512**	**Overall Participation:**	6%

These drop-off sites are displayed on **Figure 2** as "Organics Drop Sites." Drop site infrastructure shown on these figures only includes County-operated drop-off sites for residential food waste. Other types of drop-off locations for compostable material are present in the County, but are not labeled on the figure as "drop sites" for the following reasons:

- Yard waste drop-off locations at private yard waste composting facilities, because they do not currently process or receive SSOM, and are not affiliated with the County.
- Yard waste collection or transfer at trash transfer stations, because they do not currently process or receive SSOM, and are not affiliated with the County.
- Private or nonprofit entities operating small-scale organics management activities, such as shared gardens or the Hastings Spiral Food Co-op, because they are not a scalable solution to provide curbside to required areas, often operate as a subscription model which does not align with MPCA guidance of "everyone pays" for organics (see **Section 6.1**), and are not affiliated with the County.

4.0 COLLECTION METHOD CONSIDERATIONS

In addition to the results of the economic and environmental analyses for the collection scenarios described below in **Section 7.0**, it is important to consider operational realities of these collection methods and the value chain of the recovered materials in order to evaluate their feasibility in Dakota County. This section addresses these considerations.

4.1 CO-COLLECTION WITH TRASH

The County considered curbside collection of organics through co-collection with trash. Programs across the country were reviewed to find examples of co-collection to better understand their feasibility for use in Dakota County and identify best management practices (BMPs). However, this collection method is not mainstream. The limited examples available are described in the sections below.

[16] Northfield is located mostly in Rice County and partially in Dakota County.

4.1.1 National Examples

Co-collection programs exist in Europe, but no similar full-scale programs are known to be operating in the U.S. outside of Minnesota. Previously, a handful of cities in California had co-collected organics, but this was done either with yard waste or with single-stream recycling. Both programs were offered by WM and have been discontinued. Details on those operations are provided below.

- Co-collection with yard waste – Manhattan Beach, California
  - Organics co-collected in bags provided by resident, either plastic or compostable.[17]
  - Bags removed from yard waste to be processed at a wastewater treatment plant.
  - Bags get shredded into a slurry, which is then added to an anaerobic digester with other waste for recovery of biogas for energy.[18]

- Co-collection with recyclables – Laguna Beach, California
  - Organics co-collected in a hauler-provided yellow bag[19] to be placed in recycling carts.
  - Manual recovery of bags at an MRF where recyclables were being processed.
  - Not known whether yellow bags were compostable or being emptied and removed by an organics processor, or how long the program was operated.

Both programs have been discontinued. This may be due in part to SB 1383, which requires that certain approved methods are used to recover organics, such as separate collection in a dedicated cart or mechanical extrusion of organic material remaining in the trash after recyclables have been recovered.

4.1.2 Local Programs

Co-collection of DCBs with trash is occurring with three waste management facilities in Minnesota. See Appendix F and G for more information on specific municipalities participating in each of these programs.

- Walter's (smallest scale operation)
  - Bags are manually removed from the trash stream at a transfer station.
  - Programs are operating in Hennepin and Anoka County.

- Republic/Randy's "Blue Bag Organics (BBO)" program (medium scale operation)
  - Bags are sorted by one robot in Republic's Delano facility.
  - Collection programs are operating in Hennepin County.

- R&E Center "Food Scraps Bag (FSB)" program (largest scale operation)
  - Bags are sorted from trash by automatic robots with optical sensors.
  - Four robots currently operate with the intent of adding additional sortation lines as the program expands to new participants.

[17] Program flier accessed at: https://manhattanbeach.wm.com/documents/MB%20Food%20Waste%20Program%20and%20Tips_Final.pdf
[18] Article from 2016, accessed at: https://www.dailybreeze.com/2016/11/16/manhattan-beach-wants-more-residents-to-recycle-their-food-scraps/
[19] Program flier from 2018, accessed at: https://localsites.wm.com/a4480000006oNwTAAU/Laguna+Beach+Commercial+Services+Guide++11+1+2018.pdf

- Collection is occurring in two municipalities in Ramsey County and seven municipalities in Washington County[20].

These three programs are not available options for processing Dakota County organics. Walter's does not currently provide residential trash collection in Dakota County. The Republic/Randy's BBO program is also not offered in the County, and Republic has indicated they consider this to be a pilot program, currently with no intent to expand it. Both programs operate at a small scale at individual transfer stations and are not a timely solution to provide service for the whole County.

Also note that some of the areas serviced by Republic/Randy's co-collection program have been discontinued since 2017 (see **Section 5.2** discussion of TCMA region program changes). In addition to Republic/Randy's and Walter's co-collection programs, WM operated a pilot in Burnsville to separate co-collected bags from trash at the SET transfer station by hand. This program was also discontinued due to low participation and inefficiency of manual sorting.

Dakota County does not currently have access to tipping at the R&E Center and R&E will not have capacity for County waste by 2030 for reasons described below.

4.1.3 Processing Capacity Limitations

The following facilities currently process and/or receive County trash. These facilities either already have processing capacity for organics co-collection (R&E Center) or could potentially develop new co-collection processing capacity for some type of program (explained below). These facilities are unlikely to develop viable capacity for co-collected Dakota County organics by the 2030 curbside collection rollout deadline for the following reasons:

- R&E Center (less than 1 percent of County waste):
  - Material that currently routes through the facility is subject to "waste designation," or the predetermination that waste within Ramsey and Washington Counties will be brought to the R&E Center for processing.
  - Operations are still being scaled up to provide service to all municipalities within Ramsey and Washington Counties and the R&E Center is unlikely to have capacity for waste from other counties by 2030.
  - The small amount of Dakota County waste that is currently tipped at R&E is brought as reciprocity for waste from Ramsey or Washington County that was incidentally tipped at a Dakota County LF for disposal.
- Red Wing SW Campus (approximately 5 percent of County waste):
  - The facility does not have the advanced sortation equipment used by the R&E Center to separate DCBs and is not currently recovering organics in other ways.

[20] These municipalities are listed to have access to the Food Scraps Pickup co-collection program in Ramsey and Washington Counties as of May 2024 (https://foodscrapspickup.com/pages/phasing-plan).

  - The facility is outside the TCMA region where Metropolitan Policy Plan requires mandatory pre-processing of waste at resource recovery facilities by 2030 (Strategy 36).

  - The facility is publicly owned but their consideration of future expansion of processing capacity was not investigated for this study.

- Local landfills (approximately 85 percent of County waste):

  - Landfills in Dakota County will be subject to a Metropolitan Policy Plan requirement of mandatory pre-processing of waste at TCMA landfills by 2030 (Strategy 36) but strategy language does not currently specify which recyclable materials facilities will be mandated to recover.

Dakota County does not currently have waste designation authority. Should any of these facilities develop processing capacity for co-collection and become viable options for County organics, Dakota County could not dictate whether haulers bring trash to said facility without adopting this authority. Municipalities may be able to include a stipulation for tipping location as part of individual municipality contracts for service but would need to pursue market organization through the statutory process to develop a contract for trash collection (see **Section 3.2.1**).

4.1.4 Financial Considerations

It is unlikely that new processing facilities for co-collection will be developed in the County. There are a number of disincentives for the private sector to construct a large-scale mixed waste processing facility capable of separating DCBs from trash, including:

- Some haulers have interest in using company-owned infrastructure.
  - County waste largely goes to private landfills located within the County (see **Figure 5**).
  - Companies that own these landfills are also major waste haulers within the County (see **Figure 3**).

- Market prices for recyclable materials are variable.
  - Policies for recycled content mandates, extended producer responsibility, recycling refunds, carbon taxes, preservation of landfill space, or other similar policies that would raise commodity values are still in development.

- Grant funding may not be widely available for such processes or may require public entity partnership for eligibility.

Being that the R&E Center is a public entity supported by tax dollars, they have more flexibility to offer services that are the best fit for their residents. It is worth noting that the Counties serviced by the R&E Center do not have active landfills, and that some waste infrastructure in those Counties is also publicly owned and/or operated.

4.2 COLLECTION WITH YARD WASTE

The 15 municipalities considered in this study are already serviced with curbside yard waste collection, either through carts or pickups of bagged or loose material. Curbside collection of SSOM with yard waste was modeled to explore potential savings in mileage or additional truck traffic that

might be achieved by utilizing existing curbside yard waste collection routes. Curbside collection of organics in the same container as yard waste can be achieved through two means:

- Commingling organics with yard waste
  - Organics are placed loosely in the cart or in a compostable bag, depending on resident preference; or

- Co-collection of bagged organics with yard waste
  - Organics MUST be in a DCB, and the DCBs are separated from yard waste at a processing facility

For modeling purposes, the County explored both processes and ultimately decided to model commingling with yard waste, for reasons described in the following sections.

4.2.1 Processing Capacity Limitations

The inclusion of SSOM with yard waste, whether co-collected in a compostable bag or commingled, has several drawbacks when it comes to processing the material, including:

- Permitting of the operation,
- Reporting of SSOM and yard waste tonnage, and
- Control of feedstock.

Composting facilities that process SSOM are subject to more stringent permitting requirements than facilities that process exclusively yard waste. Yard waste has been widely composted since the yard waste landfill ban under Minnesota Statutes 115A.931, enacted in the TCMA in 1990 and extended Statewide in 1992. Only a handful of composting facilities having chosen to process SSOM, which is typically viewed as having a higher risk for contaminants. Facilities accepting SSOM have limited operational area to handle this material.

MPCA staff have indicated that if SSOM is mixed with yard waste during collection, the entire material stream will then be considered SSOM, resulting in a composting capacity limitation. Theoretically, to avoid this, DCBs could be sorted from yard waste in the co-collection scenario. However, organics facilities and waste collectors would be required to prove to MPCA that co-collection of DCBs with yard waste was a reliable means to avoid contamination of yard waste with SSOM. Due to the nature of yard waste, it is unlikely that every DCB would survive the collection and sortation processes without tearing/opening, making this argument difficult to prove.

Similarly, if inclusion of SSOM with yard waste results in the entire stream being considered SSOM for permitting purposes, then the entire stream would also be considered SSOM for measuring and reporting waste tonnage. This would result in errors understanding the actual amount of food waste diverted and impair the ability of the County to track progress toward meeting State recycling goals.

Additionally, the composting process requires control of feedstock ratios to produce a quality finished product. A commingled stream of SSOM and yard waste creates a feedstock that is challenging for a composting facility to predict or properly control. Co-collecting SSOM would allow a facility to better control feedstock ratios but would also require facilities to manually sort DCBs or invest in sortation equipment.

4.2.2 Financial Considerations

In addition to the above operational capacity concerns, including SSOM with yard waste will complicate the financial outlook of programs compared to processing these materials separately due to tip fees, end market compost sale, and billing to residents.

Since all yard waste materials would be considered SSOM for permitting, haulers may be charged higher tip fees in accordance with the tip fee structure currently in place at the two major local composting facilities:

- SET site
  - SSOM tip fee: $33 per ton
  - Yard waste tip fee: $11 per ton

- SMSC ORF
  - SSOM tip fee: $50 per ton
  - Yard waste tip fee: $25 per ton

Other yard waste-only facilities in the area charge around $10 to 20 per ton tip fee for yard waste.

Being that a large portion of the material would otherwise be tipped as yard waste without this permitting change, this could increase collection costs. This increased tip fee is due in part to the increased cost of operating under the permitted conditions required for SSOM management, as well as potential equipment upgrades to remove contamination or provide feedstock flexibility, such as a de-packager to process food waste from commercial sources.

In addition, yard waste compost is typically sold for more than SSOM compost. At the two major local composting facilities, typical bulk customer pricing is as follows:

- SET site
  - SSOM compost: $20 per ton
  - Yard waste compost: $40 per ton

- SMSC ORF
  - SSOM compost: $25 per ton
  - Yard waste compost: $30 per ton

Bulk contractor pricing is typically on a per-customer basis and can be significantly lower than the residential pricing referenced here. Additionally, the sale price of bagged compost produced exclusively from yard waste can be significantly higher.

Having a large portion of yard waste classified as SSOM because it is commingled with food waste could result in a revenue loss for composters. These lower market values for SSOM-based compost may be due to contamination concerns from glass, plastic, or other materials that can be found more frequently in SSOM than yard waste, or to historically perceived poor quality of SSOM-based compost.

Commingled collection with yard waste is common on the West Coast, and some national examples are provided in **Section 4.1.1** and **Appendix H**. Commingled collection of SSOM with yard waste in Minnesota is only known to be occurring in three locations: the City of Hutchinson (McLeod County), Carver County, and Swift County (see **Appendix F**). These three composting facilities are publicly

owned and operated. This public ownership provides greater discretion to operate based on needs of the community (i.e., operating as an SSOM permitted site to allow commingled collection for residents) and potential access to public funds to support operation in this capacity. The Carver County site is operated at a pilot scale by county staff and does not have capacity to expand without additional investment or partnership with a private operator.

In terms of resident billing, commingled collection with yard waste may cause additional complications and overall cost. Yard waste collection throughout the County is currently provided as an opt-in service for an additional charge, even for areas with organized collection[21]. Since MPCA determined "everyone pays" for organics collection (see Section 6.1), commingled collection of food waste would likely cause yard waste service to be similarly considered recycling. This may result in additional resident pushback against new service charges.

4.3 SEPARATE CART

Two of the collection methods modeled would require an additional cart at households: separate collection of organics and commingled with yard waste. Adding an additional cart may be undesirable by residents and should be considered prior to implementation. It may be an inconvenience to add an additional cart in space-constrained residences, but a separate organics cart (typically 35 gallons) is more compact than a yard waste cart (typically 95 gallons).

Collection in a separate cart avoids the processing issues associated with co-collection with trash and commingled collection with yard waste identified in Sections 4.1 and 4.2. Section 8.2 provides additional information on the anticipated steps required to implement a separate cart system.

5.0 REGIONAL FINDINGS

5.1 OUTREACH

SCS contacted a variety of stakeholders to better understand the landscape of waste collection, organics diversion programs, and regulation at the state and local level and to gain insight and lessons learned for potential curbside organics collection in Dakota County. Stakeholders contacted include:

- Private haulers that operate in the County;
- MPCA staff that regulate collections, billing and reporting, and facility permitting;
- Municipal staff in the TCMA who oversee waste, recycling, and/or organics management programs;
- Organics processing facilities operating or developing capacity in the County; and
- Collections or processing technology providers.

Information from these conversations and the case studies reviewed (refer to Sections 5.2 and 5.3, and Appendices F, G, and H) helped to identify the feasibility, potential barriers, and BMPs associated with organics collection implementation and expansion in the County identified in Sections 4.0, 8.0, and 9.0. Findings from this research were also incorporated into modeling parameters and assumptions.

[21] See DSI Combined Solid Waste contract for City of Farmington, where optional seasonal yard waste service results in a cost increase of about 10% to 50% to residential rates (depending on level of trash service).

5.2 MINNESOTA ORGANICS PROGRAMS

There has been a substantial increase in curbside collection of organics in Minnesota in recent years. Across the state, there are 38 communities with residential curbside organics collection programs at the county or municipal level as identified for this report. Of these communities with curbside programs, 28 are new since 2017. The Foth 2017 Report included a summary of 14 known communities with curbside programs in the greater TCMA region (see Table 2 in the 2017 Foth Report). Since that report, four of those communities have discontinued their programs. The remaining 10 are still in operation, although some have changed in collection method and/or hauler market structure.

An updated version of the Foth table is provided in **Appendix G**. Some notable updates to the 14 communities with curbside programs in the TCMA region described by Foth in 2017 include:

- Four communities have switched their collection methods (refer to Medicine Lake, St. Louis Park, Edina, Minnetonka,)
  - Communities have switched from co-collection with trash and/or commingling SSOM with yard waste to separate collection.

- Four communities discontinued curbside organics collection entirely (refer to Elk River, Coon Rapids, Orono, Shorewood)
  - These communities had been co-collecting with trash (Elk River, Coon Rapids) or commingling with yard waste (Shorewood) or both (Orono).

- Six communities continued with the same collection method (refer to Loretto, Maple Plain, Medina, Minneapolis, St. Bonifacius, and Wayzata)
  - These communities are co-collecting with trash or except for one using separate collection (Minneapolis).

- One community has switched from open to organized hauling (Edina).

Communities that have discontinued or switched away from co-collection were being serviced through the Republic/Randy's BBO program.

New organics curbside programs across the state identified as being adopted since 2017 are summarized in the Minnesota Community Organics Programs Matrix included in **Appendix F**, including these notable program examples:

- Hennepin County (multiple municipalities)
  - Ordinance 13 amended in 2018 to include organics collection.
  - County ordinance requires cities with 10,000+ residents to license residential waste haulers.
  - Hauler license in these cities must include curbside organics collection.
  - Residents cannot be charged more to participate; trash, recyclables, and organics collection are billed to all residents per MPCA interpretation of state statute (see **Section 6.1**).
  - Messaging that all residents pay for the service based on state precedent must be clear prior to rollout, from municipalities and from haulers. Some residents were surprised to see charges on their bill.

  - Carts are distributed on an opt-in basis to discourage contamination and bin misuse Initial curbside rollout gave a cart to every household and bins were used for trash by some residents and damaged by some residents who did not want the service.
  - Continued use of drop sites after curbside rollout.

- Plymouth (Hennepin County)
  - Contract developed directly with Republic for separate cart organics collection as a modification to an existing recyclables collection contract during renewal.
  - Organics collection rolled out in 90 days from contract development.
  - Program costs are charged to residents on monthly utility bills.
  - Charges will increase as participation in the program increases, to cover the costs associated with increased routing. See **Appendix F** for an example table of Plymouth's contracted fee increments.
  - See **Sections 3.2.1** and **8.2** for more details.

- City of Columbia Heights (Anoka County)
  - Switched from commingled collection with yard waste to separate collection in 7-gallon pails.

- City of Hutchinson (McLeod County), Carver County, and Swift County
  - These three communities were the only programs identified to be currently collecting SSOM by commingling with yard waste.

The collection methods and hauling market structures found in communities with curbside programs in 2017 and at present in 2024 are illustrated on **Figures 6** and **7** and summarized in **Table 4**. Overall, there has been a shift in the dominant collection methods, from co-collection with trash and commingling with yard waste, to separate collection (see **Figure 6**). This shift is due to the challenges associated with co-collection with trash and commingled collection with yard waste identified in **Sections 4.1** and **4.2**, respectively. Municipalities with "unknown[22]" collection methods are likely collecting with a separate cart due to these same challenges.

New programs and existing TCMA region programs with separate collection are operating under both open and organized hauling markets. Co-collection with trash in the TCMA region has only continued in organized hauling markets, but new co-collection programs in both organized (refer to Osseo) and open markets (refer to Lino Lakes, Ramsey County, Washington County) are found in other parts of Minnesota. Hauling markets for commingled collection with yard waste are partially unknown. See **Appendices F** and **G** for more information on community programs.

More curbside programs were found in 2017 in organized markets than open markets (see **Figure 7**). While new programs have come online since 2017 in both organized and open markets, there have been more new programs in open markets, shifting the balance to be closer to an even split between open and organized markets.

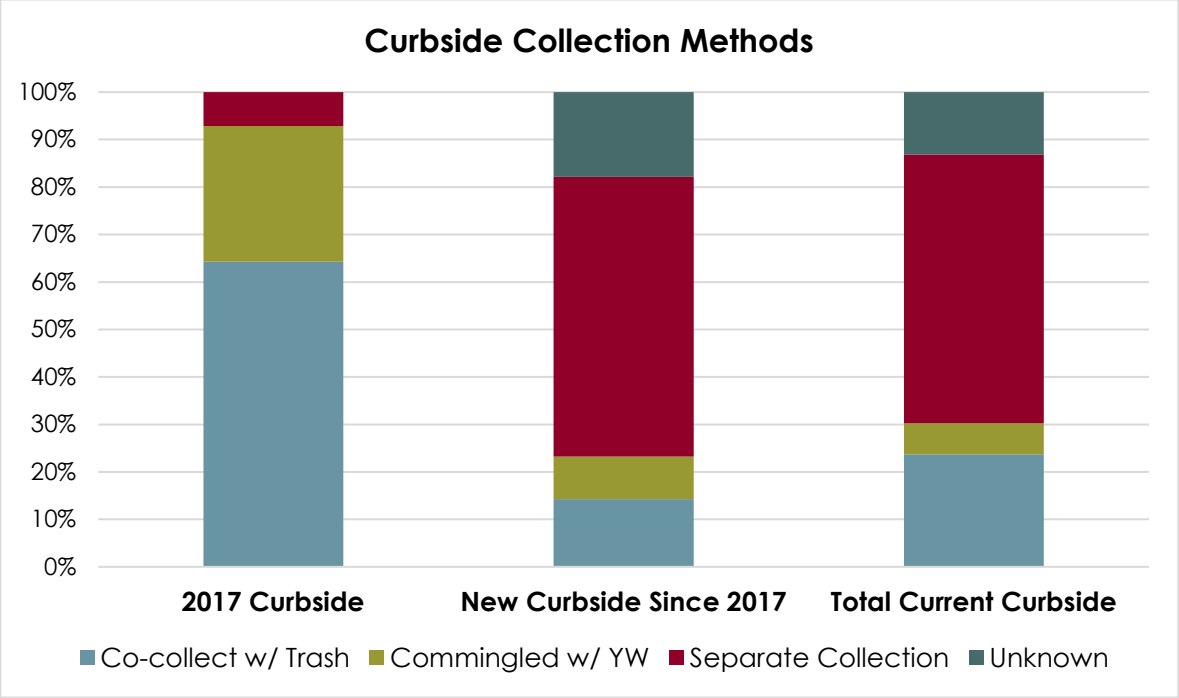
Note that Ramsey and Washington Counties are counted as open systems for this report because residents can choose their hauler, aside from St. Paul which has franchise zones. However, these counties have waste designation as described in **Section 4.1.3** and are therefore more controlled than a typical open hauling system. Additionally, Ramsey County and Washington County are counted

[22] The collection methods for some municipalities were not documented in sources available at the time of this study.

as one program each for the purposes of this report, as they intend to provide the co-collection service to residents County-wide.

As of May 2024, the Ramsey/Washington co-collection program is available to all residents in Maplewood and North St. Paul (Ramsey County) and Cottage Grove, Grey Cloud Island Township, Landfall, Newport, Oakdale, St. Paul Park, and Woodbury (Washington County). The current service area is still in development[23]. When the program is more mature, it will be possible to account for the number of communities serviced in each county and will increase the total number of curbside programs utilizing the co-collection method.

Figure 6. Minnesota Curbside Organics Collection Methods – 2017 and 2024



[23] The Food Scraps Pickup co-collection program in Ramsey and Washington Counties is not at full scale at the time of this report, and the website indicates "The proposed program rollout schedule is subject to change." (https://foodscrapspickup.com/pages/phasing-plan).

Figure 7. Minnesota Curbside Organics Collection Hauling Markets – 2017 and 2024

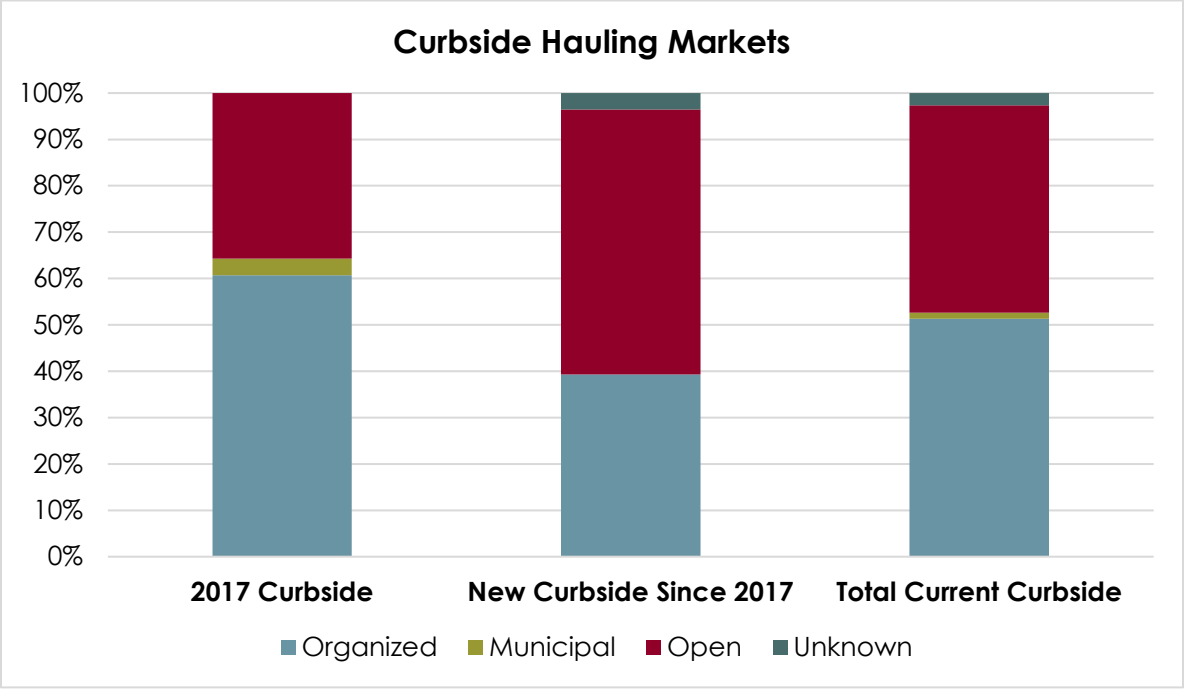


Table 4. Summary of Minnesota Curbside Organics Collection Program Characteristics*

Curbside Organics Collection Method	2017 Curbside Programs		2024 Curbside Programs		Total Curbside Programs	
	#	%	#	%	#	%
Separate Collection	1	7%	16.5	61%	21.5	58%
Co-collect w/ Trash	9	64%	4	14%	9	24%
Commingled w/ Yard Waste	4	29%	2.5	7%	2.5	5%
Unknown	0	0%	5	18%	5	13%
Total	14	100%	28	100%	38	100%
Curbside Organics Hauling Market	**2017 Curbside Programs**		**2024 Curbside Programs**		**Total Curbside Programs**	
	#	%	#	%	#	%
Organized	8.5	61%	11	39%	19.5	51%
Municipal	0.5	4%	0	0%	0.5	1%
Open	5	36%	16	57%	17	45%
Unknown	0	0%	1	4%	1	3%
Total	14	100%	28	100%	38	100%

Half a program is indicated in program numbers to reflect the City of Minneapolis, which has both municipal and organized collection, and Carver County, which has both separate collection and commingled with yard waste. See **Appendices F and **G** for more details on communities with these programs.*

5.2.1 Local Program Prices

The price of curbside collection programs (as billed to residents) within the TCMA varies by county, collection method, and hauler market type. In open markets, service is provided by private hauler companies and cost information is not readily available. In organized markets, the price of organics collection may not be apparent even when rates for utilities are publicly available.[24] Due to the MPCA decision that "everyone pays" (see **Section 6.1**), the charge for organics is to be included with trash service and is not always listed as an individual line item. In general, billing practices are not standardized across the region and vary by hauler, whether service is contracted or not[25].

Conversations with local haulers and municipal waste management staff indicate that separate cart collection is cheaper for residents when hauling is organized; an online review of available local program information confirms this. Hauler pricing is subject to change, and some current local billing rates are likely to go down as more collection programs come online and mature, and with the enforcement of "everyone pays" for the service.

5.3 CASE STUDIES OUTSIDE MINNESOTA

The Foth 2017 Report included the following national case studies:

- Portland, Oregon
- Seattle, Washington
- King County, Washington

These programs are still in operation and have continued collecting organics with the same collection method (commingling with yard waste) and hauling markets (organized in cities) as found at the time of the Foth 2017 Report.

Notably, Portland continues to collect trash EOW. Seattle is noted to have EOW trash service at the time of the Foth 2017 Report but is found to currently collect trash weekly under pay-as-you-throw cart sizing and billing.

The Portland and Seattle programs are not found to be operating public drop-off sites for SSOM. King County appears to offer drop-off of SSOM at 2 of 10 publicly owned transfer station/recycling drop-off facilities. Three additional locations were specifically reviewed:

- Cambridge City, Massachusetts
- Howard County, Maryland
- Milan, Italy

Notable details of these six programs outside of Minnesota noted here for review are included in **Appendix H** and BMPs identified in these case studies are incorporated into **Section 9**.

[24] For example, see utility rates for St. Louis Park. The cost of organics collection is included in a quarterly solid waste collection rate, which is dependent on the size and service frequency of the garbage cart. https://www.stlouisparkmn.gov/services/garbage-recycling/collection-rates-fees

[25] For example, Loretto is an organized market that contracts with Republic and utilizes the BBO co-collection program for organics collection. BBO is included in the Residential Recycling fee of $6.93/month.

The publication *Biocycle* conducted a nationwide survey[26] of residential food waste collection access from February to June 2023. This study found that, of the programs responding to the survey, service offerings include:

- Curbside Only: 230 programs, 8.2 million households with access
- Drop-Off Only: 139 programs, 5.1 million households with access
- Curbside + Drop-Off: 31 programs, 1.8 million households with access

Of the curbside programs surveyed, 198 programs responded to the question of how their food waste is set out for collection with the following responses:

- Commingled collection with yard waste in a dedicated cart: 148 programs
- Separate organics collection in a dedicated cart: 33 programs
- Co-collection with trash in designated bags supplied by the jurisdiction or service provider: 17 (pilot-scale) programs

While commingled collection with yard waste is common in other areas of the country, permitting concerns unique to the state of Minnesota for collection and composting of food scraps make this more challenging than in other states (see **Section 4.2**).

6.0 MODELING METHODOLOGY

6.1 GENERAL

This study consists of both quantitative analyses and qualitative research of the various collection scenarios. This section addresses the modeling performed to address the quantitative analysis. Details on the specific model parameters are described in **Sections 6.2** through **6.5** below. See **Sections 3** through **5** for more information on qualitative findings. This qualitative research provided context to develop or refine model parameters to be more representative of local conditions.

The internal "SCS Model" prepared to achieve modeling for this report is built upon several other existing models which were inadequate for the purposes of this report on their own. Model sources evaluated include:

- The EPA Waste Reduction Model (WARM)[27]
- The EPA Local GHG Inventory Tool[28]
- The Solid Waste Emissions Estimation Tool (SWEET)[29]
- "Analysis of Waste Collection Service Arrangements," prepared for MPCA by Foth, June 2009[30] including:
  - "Tool to Calculate Potential Greenhouse Gas Savings for a Specific Area Such as a City" referred to in later works as "MPCA Collections Tool," and the "Transfer Haul Cost Model."

[26] https://www.biocycle.net/residential-food-waste-collection-access-in-u-s/
[27] https://www.epa.gov/warm
[28] https://www.epa.gov/statelocalenergy/local-greenhouse-gas-inventory-tool
[29] https://globalmethane.org/resources/details.aspx?resourceid=5176
[30] https://www.pca.state.mn.us/sites/default/files/w-sw1-06.pdf

- "Analysis of Residential Organics Recycling in Dakota County," prepared by Foth for Dakota County, September 2017[31], including:
  - "MPCA Collections Tool," "Transfer Haul Cost Model," and WARM.

The SCS Model developed for this project integrates relevant base factors from the WARM background documentation with customized inputs to account for the specific aspects of waste collections scenarios which are not part of standard EPA or previously documented models, along with localized cost and labor considerations. See **Appendix D** for additional information on the model including references and values used. See **Section 7.0** for the results for the scenarios modeled. The model has the ability to evaluate additional scenarios.

This entire evaluation assumes "everyone pays" for organics collection services, whether they participate or not. This determination was made in 2023 by MPCA after clarification of that:

- SSOM is considered a recyclable material (see Minn. Stat. § 115A.03.25a);
- Composting is considered recycling (see Minn. Stat. § 115A.551.1); and
- Residents cannot be billed more to participate in recycling than solely trash pickup service (see Minn. Stat. § 115A.93.3c).

Therefore, costs are presented as equally distributed across all households.

6.2 MODELING SCENARIOS

The baseline and organics collection methods modeled are summarized in **Table 5** below. Each scenario is modeled as if only one organics collection method is in place at a time. Analysis of each scenario was performed with local data for each of the 15 municipalities identified to be candidates for curbside organics collection (see **Section 1.2**), and County-wide results were generated from the cumulative results of these individual municipalities. Only results for the County-wide are included in this report.

Collection of separated organics is assumed to occur weekly in each modeled scenario regardless of trash collection frequency. Yard waste is assumed to be collected weekly for 8 months of the year, except for commingled scenarios where yard waste is collected weekly all year due to the inclusion of organics.

It is assumed that a new processing facility for co-collection would need to be constructed to have adequate capacity for the waste generated in the municipalities being modeled as described in **Section 4.2.1**. To generate representative calculations, a hypothetical future processing facility was modeled near the SET compost site and transfer station for co-collection with trash scenarios. The SET site itself is used to model SSOM tipping. Yard waste is modeled to be tipped at the closest yard waste compost site to each municipality (except when commingled with SSOM). Trash is modeled to be tipped at the nearest landfill location (except when additional processing is needed in co-collection scenarios), either Pine Bend LF or Burnsville LF.

[31] Provided by Dakota County.

Table 5. Definition of Collection Scenarios

Scenario Acronym	Organics Curbside Collection Method	Organics Collection Hauling Structure	Trash Collection Hauling Structure	Trash Collection Frequency
Base (Baseline)	Commingled with Trash (to LF)	N/A	Open*	Weekly
SC, Op/Op, W	Separate Collection	Open	Open	Weekly
SC, Ozd/Op, W	Separate Collection	Organized	Open	Weekly
SC, Ozd/Ozd, W	Separate Collection	Organized	Organized	Weekly
SC, Op/Op, EOW	Separate Collection	Open	Open	EOW
SC, Ozd/Op, EOW	Separate Collection	Organized	Open	EOW
SC, Ozd/Ozd, EOW	Separate Collection	Organized	Organized	EOW
CoT, Op, W	Co-collection with Trash	Open**	Open**	Weekly
CoT, Ozd, W	Co-collection with Trash	Organized**	Organized**	Weekly
YW, Op, W	Commingled with Yard Waste	Open	Open	Weekly
YW, Ozd, W	Commingled with Yard Waste	Organized	Organized	Weekly
Drop Site	Drop-Off Sites	N/A	Open	Weekly

Referred to as "open" for simplicity; two of the modeled cities are organized (Farmington and Hastings). Treatment of open and organized hauling is detailed in **Appendix D.*

***Organics collection and trash collection are occurring in the same cart and, therefore, the same collection event for co-collection scenarios, so organics and trash hauling market structures must be the same.*

6.3 BASELINE SCENARIO ASSUMPTIONS

For the purposes of this analysis, we assume no curbside collection of source-separated organics is occurring in the baseline scenario (organics are commingled with trash and not recovered).

- While some instances of curbside collection of source-separated organics exist, these programs are limited to local subscription service or other small-scale activities and are not included in this analysis as measurable organics diversion.
- Specific tonnage data was not available for current County drop-off site participation and is assumed to be a small percentage of waste generation so is not accounted for in the baseline.
- While a small portion of waste is being processed at an MSW-to-RDF facility (see Figure 5), we assume for calculations that trash is currently going to landfill disposal.
- Yard waste tipping is modeled at yard-waste-only composting sites closest to each municipality.

Data on trash and yard waste tonnage provided by the County is treated to be equally generated across single-family households that have a cart for that material, and that all material is carted for collection. All households have a trash cart in all scenarios. It is assumed that 50 percent of households have a yard waste cart in the baseline, separate collection, and co-collection with trash scenarios, and 100 percent of households have a yard waste cart in the commingled with yard waste scenarios (see Section 6.4).

6.4 DIVERSION ASSUMPTIONS

Residential trash is assumed to have a composition similar to the findings of the 2019/2020 MPCA food waste generation and composition study[32] which quantifies 17.6 percent food waste by weight. Other compostable material was documented in the trash stream (for a total of 24.4 percent compostable fraction), but we consider only food waste for the purposes of this study to be conservative because:

- While these other materials are technically able to be composted, processing facilities differ in their willingness or ability to handle these materials depending on their technological limitations or end use of their products.

- EPA WARM model factors for GHG emissions resulting from handling organic materials through composting or landfill disposal are based on food and yard waste and do not yet include compostable paper or bioplastics.

Every collection scenario assumes 100 percent cart set-out per collection event and an organics drop-off every week for participating households in the drop site scenario. Except for commingling with yard waste (described below), collection scenarios assume 100 percent recovery of the food waste in each participating household. Due to the structure of the model, participation is reflected in slightly different locations depending on the scenario:

- For separate cart scenarios, participation is reflected in the cart signup rate.
  - Participation is estimated to be 20 percent under open hauling[33] and 50 percent under organized hauling.[34]

- For co-collection scenarios, participation is reflected in the DCB signup rate.
  - Participation is estimated to be 40 percent in both open and organized hauling.

- For commingled collection with yard waste scenarios, participation is reflected in the food waste capture rate.
  - Participation is estimated to be 20 percent under open hauling and 50 percent under organized hauling.

- For drop sites, participation is reflected in the drop site signup rate.
  - Participation is estimated to be 10 percent.

Participation in co-collection scenarios was assumed to be the same regardless of hauling market. Only one sorting facility is assumed to be present in the market to process the waste from all haulers, and waste designation or some other market control mechanism would need to be in place to control the flow of waste (see Section 4.1.3). For this reason, outreach to households is assumed to come from a central source, such as the County or municipality, and be uniform. So, while open

[32] "2019/2020 Food Waste Generation and Composition Study Analysis" prepared by RRS for MPCA, published August 2021. SCS analyzed this data in February 2024; MPCA has since updated the Food Waste Generation and Composition Study Analysis to include data from 2019-2022.
[33] Assumption based on current rates in West Metro cities per discussion with Republic Services.
[34] Assumption based on current rates reported by City of Minneapolis https://www.wastedive.com/news/organics-collection-recycling-compost-minneapolis-hennepin-county/623038/

market is still modeled as less efficient in terms of collection, co-collection scenarios use the same participation rate of 40 percent in both open and organized markets.

Table 6 summarizes these assumptions. Here "gray cart" refers to trash; "green cart" refers to either the separate food waste cart or the commingled food waste and yard waste cart, as all the collected material would be processed as food waste for permitting reasons described in Section 4.2.

Table 6. Modeling Assumption Summary

Scenario Acronym	Food Waste In	Yard Waste In	Food Waste Participation	Gray Cart Material To	Yard Waste Material To	Green Cart Material To
Base	Gray cart	Yard Waste Cart	n/a	LF	Local YW Composter	n/a
SC, Op/Op, W	Green cart	Yard Waste Cart	20%	LF	Local YW Composter	SET
SC, Ozd/Op, W	Green cart	Yard Waste Cart	50%	LF	Local YW Composter	SET
SC, Ozd/Ozd, W	Green cart	Yard Waste Cart	50%	LF	Local YW Composter	SET
SC, Op/Op, EOW	Green cart	Yard Waste Cart	20%	LF	Local YW Composter	SET
SC, Ozd/Op, EOW	Green cart	Yard Waste Cart	50%	LF	Local YW Composter	SET
SC, Ozd/Ozd, EOW	Green cart	Yard Waste Cart	50%	LF	Local YW Composter	SET
CoT, Op, W	DCB, Gray cart	Yard Waste Cart	40%	Sorting Facility	Local YW Composter	n/a
CoT, Ozd, W	DCB, Gray cart	Yard Waste Cart	40%	Sorting Facility	Local YW Composter	n/a
YW, Op, W	Green cart	Green cart	20%	LF	n/a	SET
YW, Ozd, W	Green cart	Green cart	50%	LF	n/a	SET
Drop Site	Drop Site	Yard Waste Cart	10%	LF	Local YW Composter	n/a

For co-collection scenarios, it was assumed that a certain percentage of DCBs would not survive the transport and recovery process and the organics would be lost back to the MSW stream. Based on experience implementing R&E's co-collection program, the designed recovery rate of DCBs is 93 percent. For simplicity and to be conservative, a recovery rate of 90 percent was used for modeling. See Section 9 for recommendations of BMPs to achieve high material recovery, and Appendix D for more details on the assigned parameter values. Results under assumptions of 100 percent participation, referred to as "full diversion," can be found in Appendix E.

6.5 COST ASSUMPTIONS

Tip fees for different waste streams are specific to the waste type, with assumed fees as follows:

- Trash or MSW fraction at a LF: $148.50 per ton
- Yard waste at a yard waste composting facility: $13.60 per ton
- SSOM at a SSOM composting facility: $33 per ton

- Trash with DCBs at a processing facility: $121 per ton
  - An additional cost of $63 per ton is added to account for processing costs, amortized facility construction costs, and secondary transfer and tipping of the SSOM and MSW fractions once trash has been sorted.

These tip fees are based on regional information for similar facilities. See **Appendix D** for more details on the development of these metrics. Note that commingling yard waste with SSOM causes all material in those carts to be designated SSOM as described in **Section 4.2.1**.

As further detailed in **Appendix D**, annualized costs are calculated for DCBs and the varied sizes of carts relevant for each scenario. Also documented therein, the unit costs for labor, vehicles, maintenance, and fuel are held constant across scenarios for comparison purposes.

7.0 MODELING RESULTS AND DISCUSSION

7.1 MODELING RESULTS SUMMARY

This section provides a summary of the performance of the organics collection scenarios and a ranking of the scenarios by their performance. **Sections 7.2** through **7.5** present the results of the collection scenarios in each performance category. Drop-off site collection results are included for comparison to the 10 curbside collection scenarios. The collection of all three waste streams (trash, yard waste, and organics) is accounted for in each scenario, not just the organics collection, to allow for a full comparison of overall impacts to the total system. Recycling collection is not included.

Some graphs display the total performance of all 11 organics collection scenarios and the baseline collection system, while others display "net change" in performance of only the 11 scenarios. These "net" values are obtained by subtracting the baseline result value from the result of each organics collection scenario for a given performance parameter. When these "net" values are graphed, the horizontal axis (zero) is the baseline; some scenarios result in a reduction of a parameter (i.e., cost, emissions, trucks, etc.) as compared to baseline and therefore have negative net values. Thus, the "net" performance graphs display the difference from the baseline collection system to more easily compare the performance between scenarios.

Figure 8 provides an overview of the performance of the 11 organics collection scenarios across key categories. Note that this figure has two scales, presenting annual net cost on the left vertical axis and tons of food waste diversion on the right vertical axis. Discussions of the individual categories included on this figure follow in **Sections 7.2**, **7.3**, and **7.4.1**.

Figure 8. Comparison of Collection Scenario Performance[35]

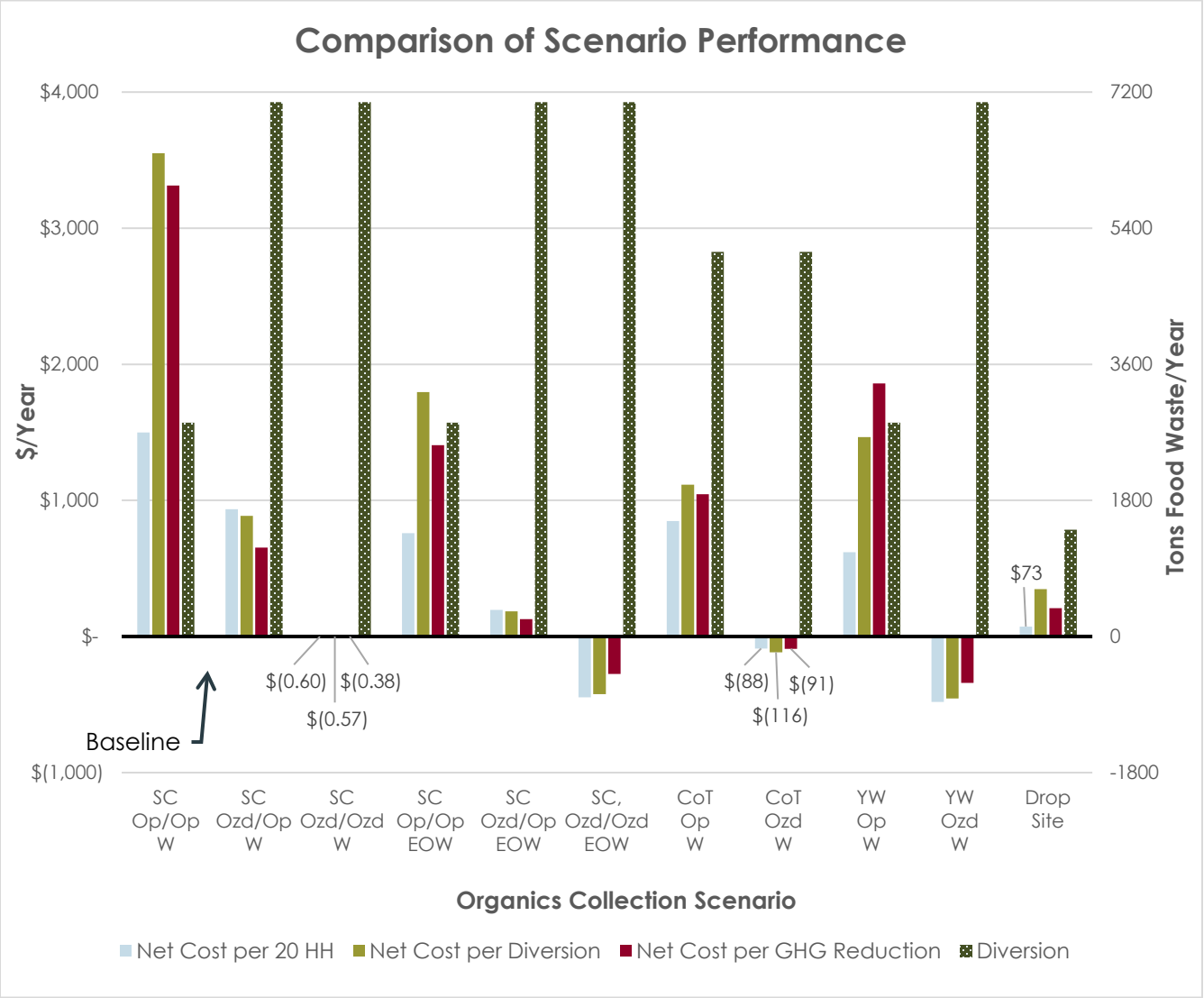


Table 7 summarizes the ranked performance of scenarios in key modeled categories. Each category was ranked based on its improvement over the baseline collection system. For example, the score of "1" indicates the scenario was the top performer by achieving the most food waste diverted or the greatest reduction in cost, GHG emissions, road miles, or collection trucks per event. The overall rank represents an unweighted average of performance categories.

[35] Overall net cost is presented per 20 households so the scale of the vertical axis would allow comparison across the other cost parameters.

Table 7. Summary of Scenario Performance by Category

Organics Collection Scenario	Annual Cost	Food Waste Diversion*	GHG Emissions Reduction	Annual Road Miles	Collection Trucks	Average Score	Overall Ranking**
SC, Op/Op, W	11	3	9	8	11	8.4	10
SC, Ozd/Op, W	10	1	4	4	10	5.8	6
SC, Ozd/Ozd, W	4	1	2	2	4	2.6	2
SC, Op/Op, EOW	8	3	8	5	9	6.6	7
SC, Ozd/Op, EOW	6	1	3	3	7	4	5
SC, Ozd/Ozd, EOW	2	1	1	1	3	1.6	1
CoT, Op, W	9	2	7	9	6	6.6	7
CoT, Ozd, W	3	2	6	6	1	3.6	4
YW, Op, W	7	3	11	10	8	7.8	9
YW, Ozd, W	1	1	5	7	2	3.2	3
Drop Site	5	4	10	11	5	7	8

**This category is ranked 1 through 4 instead of 1 through 11 because some scenarios resulted in the same total food waste diversion. See Section 7.3 for more details.*

***Resultant ranking is 1 through 10 due to a tie in average score.*

Based on the above results, the overall rank of each scenario is as follows in **Table 8**, from best performance to least:

Table 8. Overall Scenario Performance Ranking

Overall Rank	Scenario Acronym	Organics Curbside Collection Method	Organics Collection Hauling Structure	Trash Collection Hauling Structure	Trash Collection Frequency
1	SC, Ozd/Ozd, EOW	Separate Collection	Organized	Organized	EOW
2	SC, Ozd/Ozd, W	Separate Collection	Organized	Organized	Weekly
3	YW, Ozd, W	Commingled with Yard Waste	Organized	Organized	Weekly
4	CoT, Ozd, W	Co-collection with Trash	Organized**	Organized**	Weekly
5	SC, Ozd/Op, EOW	Separate Collection	Organized	Open	EOW
6	SC, Ozd/Op, W	Separate Collection	Organized	Open	Weekly
7	SC, Op/Op, EOW	Separate Collection	Open	Open	EOW
7	CoT, Op, W	Co-collection with Trash	Open**	Open**	Weekly
8	Drop Site	Drop-Off Sites	N/A	Open	Weekly
9	YW, Op, W	Commingled with Yard Waste	Open	Open	Weekly
10	SC, Op/Op, W	Separate Collection	Open	Open	Weekly
n/a	Base (Baseline)	Commingled with Trash (to LF)	N/A	Open*	Weekly

Referred to as "open" for simplicity; two of the modeled cities are organized (Farmington and Hastings). Treatment of open and organized hauling is detailed in **Appendix D.*

***Organics collection and trash collection are occurring in the same cart and, therefore, the same collection event for co-collection scenarios, so organics and trash hauling market structures must be the same.*

This ranking indicates that separate cart collection performs the best of the modeled collection methods. This ranking also indicates that performance is highest when hauling markets are organized, especially the market through which organics are collected. Reducing trash to EOW service provides additional economic and environmental benefits.

Collection staffing results were not included in the performance ranking categories, as this parameter may be considered to have both positive and negative impacts and is ultimately accounted for within the program cost. For example, a greater number of collection employees may increase local job opportunities and economic activity providing a benefit, but also increases costs for haulers to provide service. See **Section 7.5** for details on collection labor results.

7.2 COST

High-level total annual cost of the baseline County-wide waste management system is estimated at $45.3 MM per year while the total annual cost of different County-wide organics collection scenarios ranges from $42.1 MM per year to $55.4 MM per year (see **Figure 9**). The cost of gas in personal resident vehicles used to self-haul organics to the drop sites is included in the drop site scenario. **Figures 11** and **12** provide an attribution of the costs to highlight which factors contribute most heavily to each overall cost. In all cases, modeling results are not meant to provide for exact budgeting and are intended primarily for comparison of collection scenarios.

Figure 9. Total Cost of Collection Scenarios

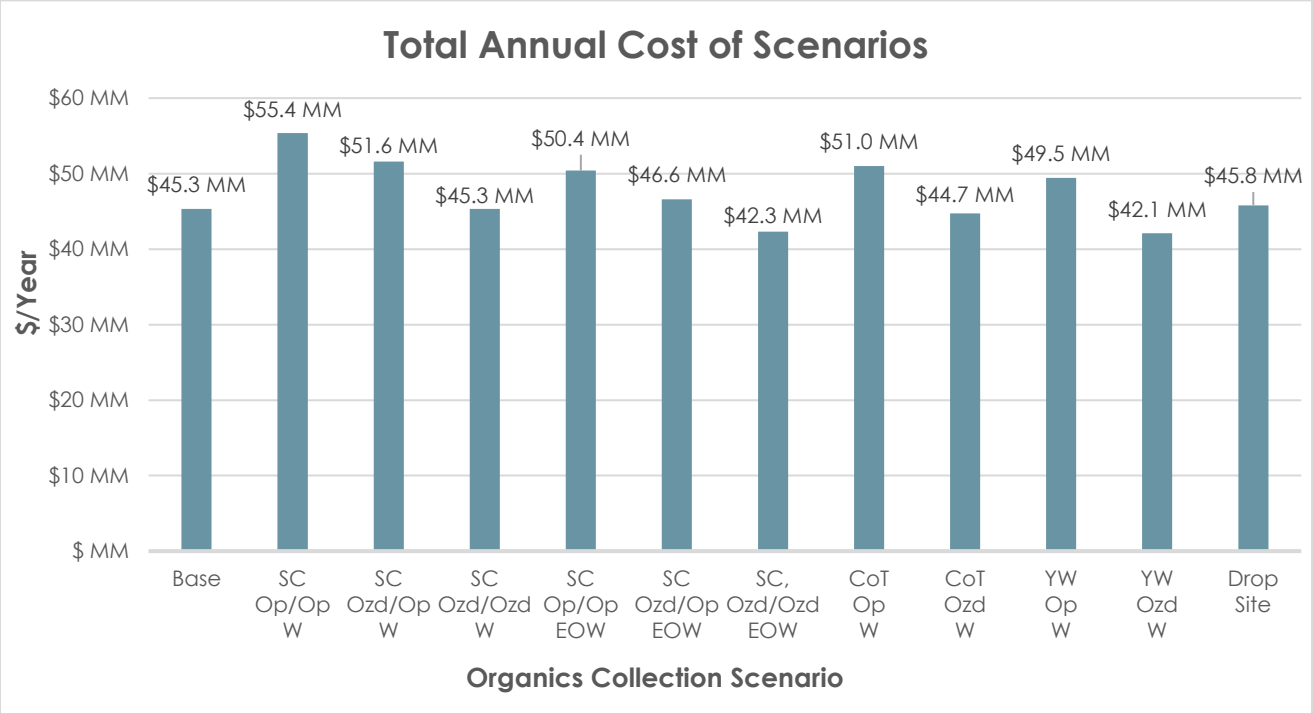
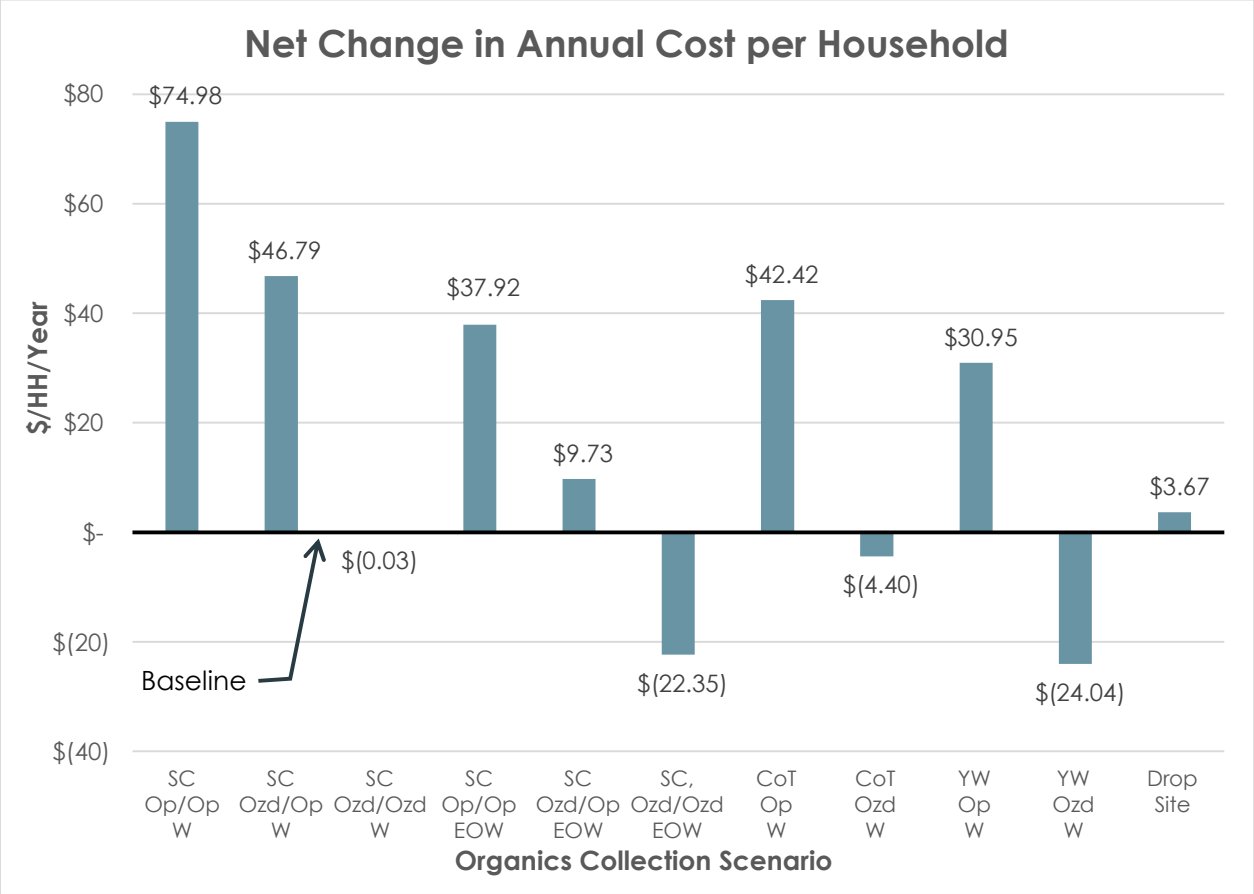


Figure 10 shows the net cost of the waste management system compared to the baseline in each of the scenarios on a per-household basis. The overall cost of the system is essentially unchanged when adding a separate cart if both organics and trash collection are organized, indicating that the cost of a new collection route is offset by organization of the hauling markets. The organized separate cart scenario with organized EOW trash and the organized commingling with yard waste

scenario show the greatest reduction in cost compared to the baseline system. The greatest increase in cost compared to the baseline system is found from open separate collection of organics with open trash collected on a weekly basis.

Reducing trash to EOW with a separate cart system reduces the impact on overall system costs, as does organics market organization. However, these savings are greatest when both approaches are used. For example, cost per household still increases from the baseline with EOW trash service when neither organics nor trash are organized. Cost per household when adding a curbside organics collection method decreases from the baseline when trash collection is organized.

Figure 10. Net Cost of Scenarios per Household

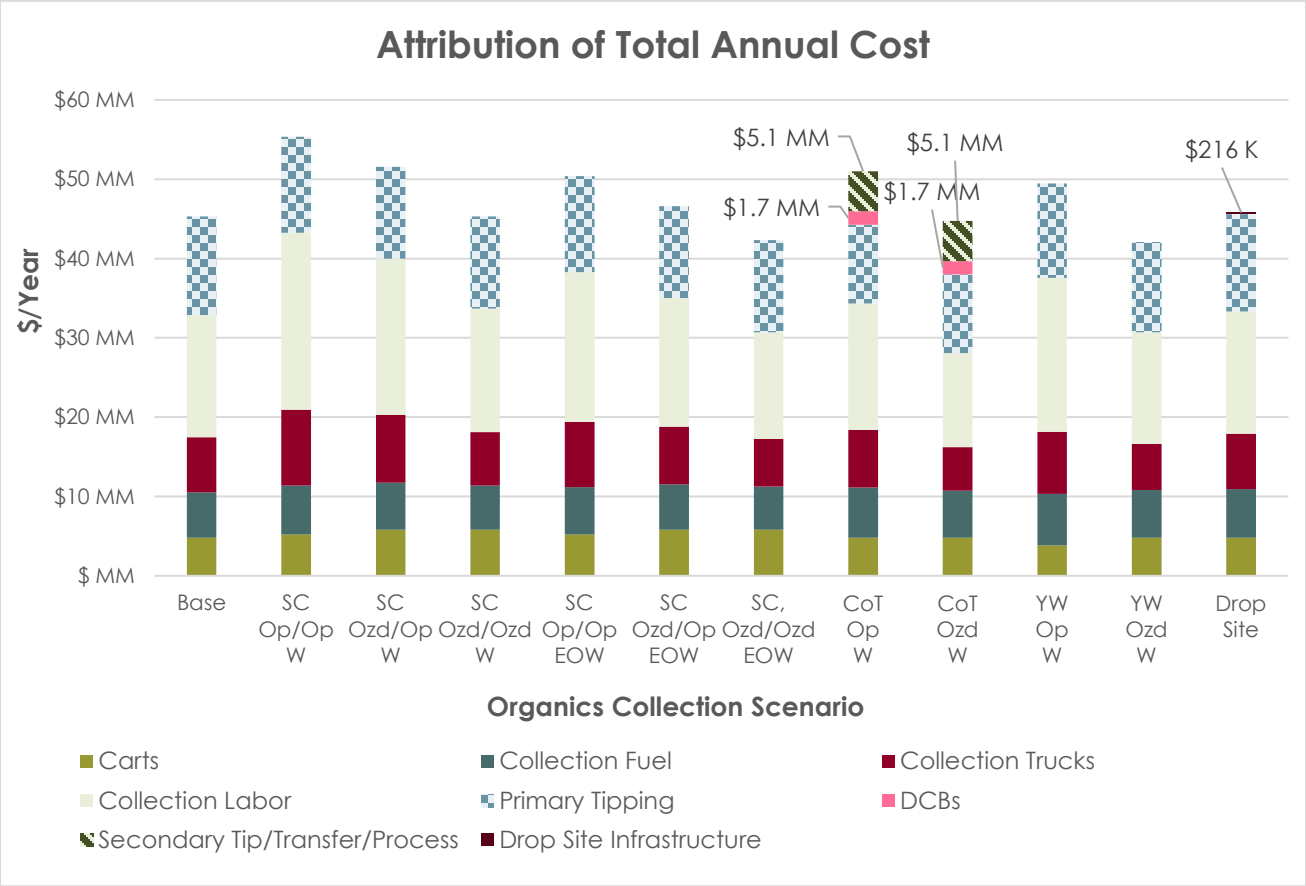


The individual parameters that contribute to total cost of the collection scenarios include:

- Carts,
- Collection trucks,
- Fuel for the collection trucks,
- Labor for collection service,
- Primary tipping of material,
- DCBs (co-collection only),
- Waste processing and secondary transfer/tipping (co-collection only), and
- Drop site infrastructure.

Observed overall costs are most heavily dependent on labor, followed by primary tipping (see **Figure 11**). Amortized costs to construct a processing facility are incorporated into the waste processing cost for co-collection scenarios, but costs associated with obtaining rights to and ongoing licensing of co-collection intellectual property are not explicitly included in modeled co-collection costs.

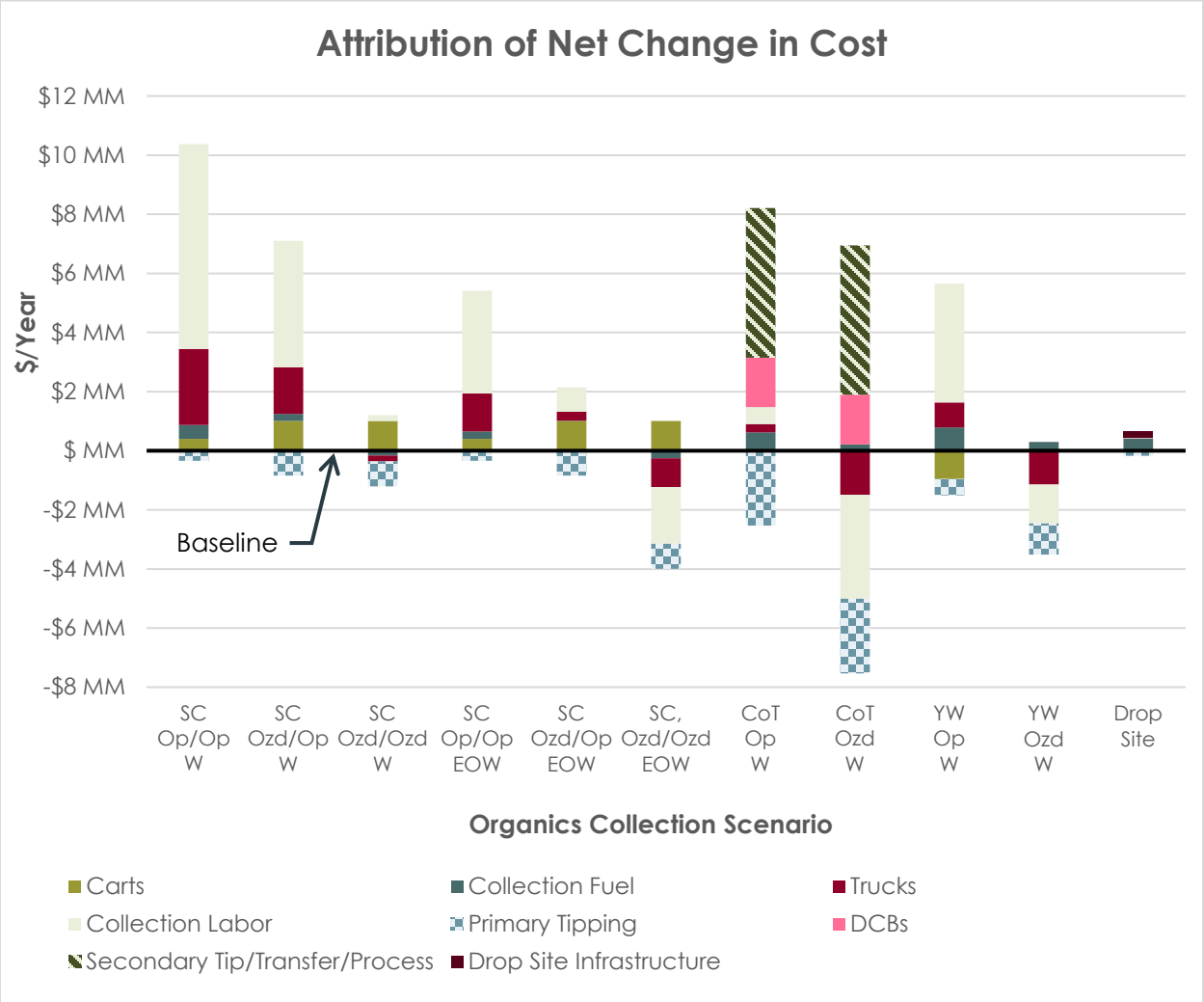
Figure 11. Attribution of Total Scenario Cost



Changes to collection labor and truck costs are primary drivers for changes in net cost, along with costs associated with co-collection such as DCBs and secondary processing (see **Figure 12**). Note that there appear to be savings in primary tipping in co-collection scenarios, but these savings are offset by the cost of tipping at a sorting facility instead of a landfill which is built into the "secondary tip/transfer/process" category. Otherwise, savings on primary tipping costs are due to the tipping of diverted food waste at a composting facility for a lower fee rather than a landfill.

Costs for collection labor and trucks increase the most when organics are collected in a separate cart and trash collection is not organized; these costs decrease the most when the method of collecting organics is organized.

Figure 12. Attribution of Net Scenario Cost



7.3 DIVERSION POTENTIAL

Diversion estimates were generated using participation assumptions described in **Section 6.4** and **Appendices C** and **D**. **Appendix E** includes model results assuming 100 percent participation for reference. As illustrated on **Figure 13,** tons of food waste diverted results in the same value for multiple scenarios because it is based on participation and the percentage of organics in the waste stream. Trash is equally distributed across households for modeling purposes and as such the amount of organics recovered per participating household is the same except for co-collection scenarios that experience loss due to DCB breakage (see **Figure 15**). The estimated amount of captured organics ranges from 190 to 211 pounds per household per year (see **Figure 14**).

Organized separate cart collection (regardless of trash market) and organized commingled collection with yard waste result in the greatest annual food waste diversion at 7,066 tons per year (see **Figure 13**). These scenarios see greater participation due to hauler organization and do not experience loss related to bag breakage during co-collection sortation. Drop sites divert the least

annual food waste at 1,413 tons per year due to lower participation, followed by open separate cart collection and open commingled collection with yard waste at 2,826 tons per year.

Figure 13. Diversion Estimates of Collection Scenarios

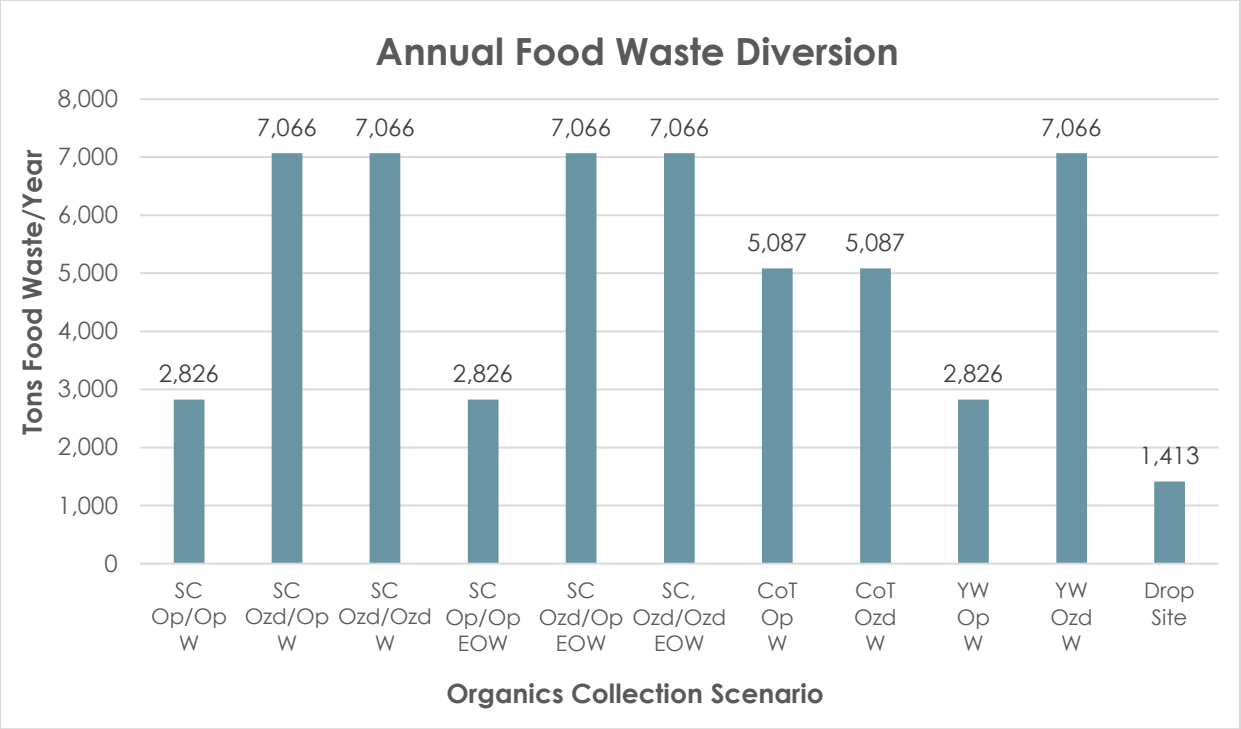
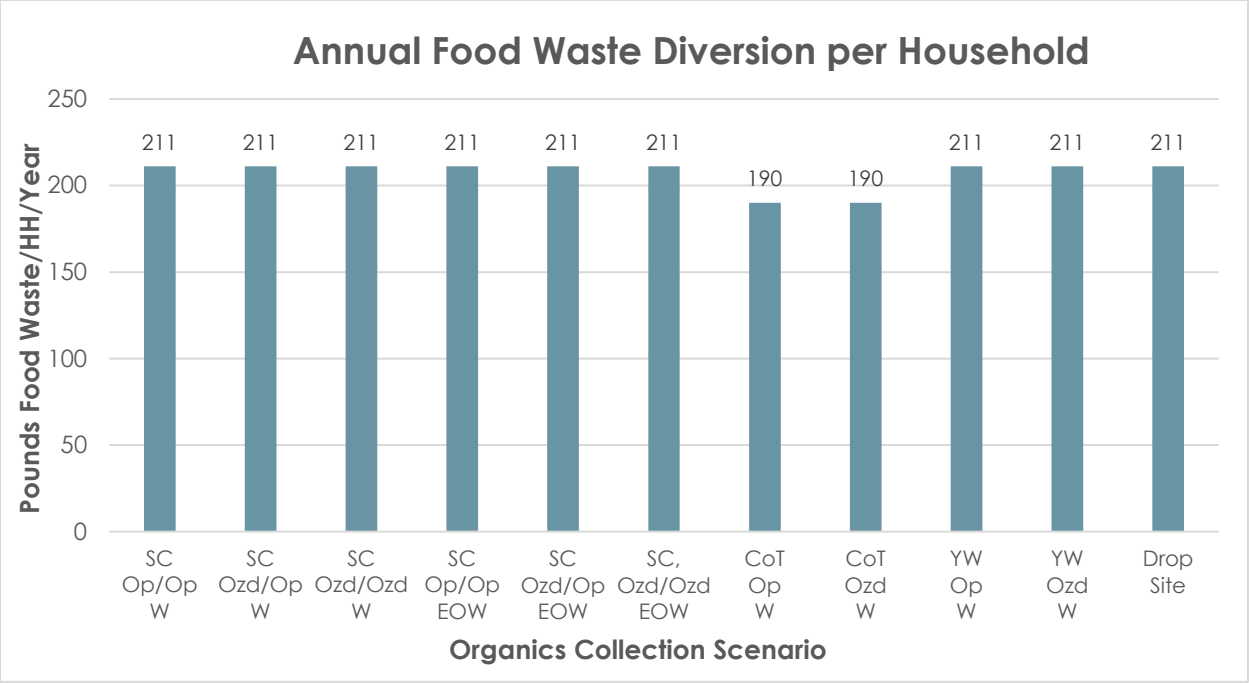
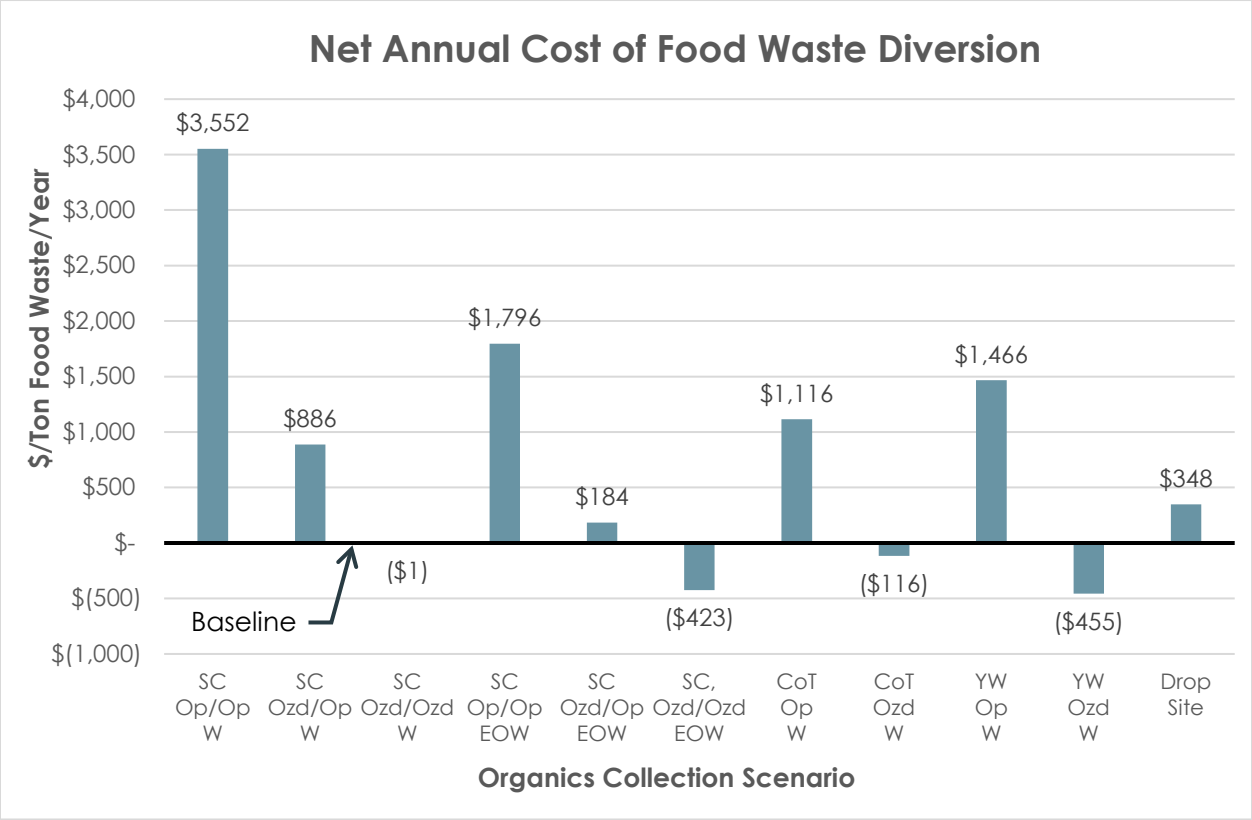


Figure 14. Diversion of Collection Scenarios per Household



Organized commingled collection with yard waste is found to have the lowest relative cost per ton of food waste diverted, followed by organized separate cart collection with organized EOW trash (see Figure 15). Open separate cart collection with open trash costs the most per ton of food waste diversion compared to the baseline. Organization of the trash hauling market and reduction of trash service to EOW both result in lower overall system costs, and thus provide the lowest cost per ton of diverted food waste.

Figure 15. Net Cost of Food Waste Diversion



7.4 ENVIRONMENTAL IMPACTS

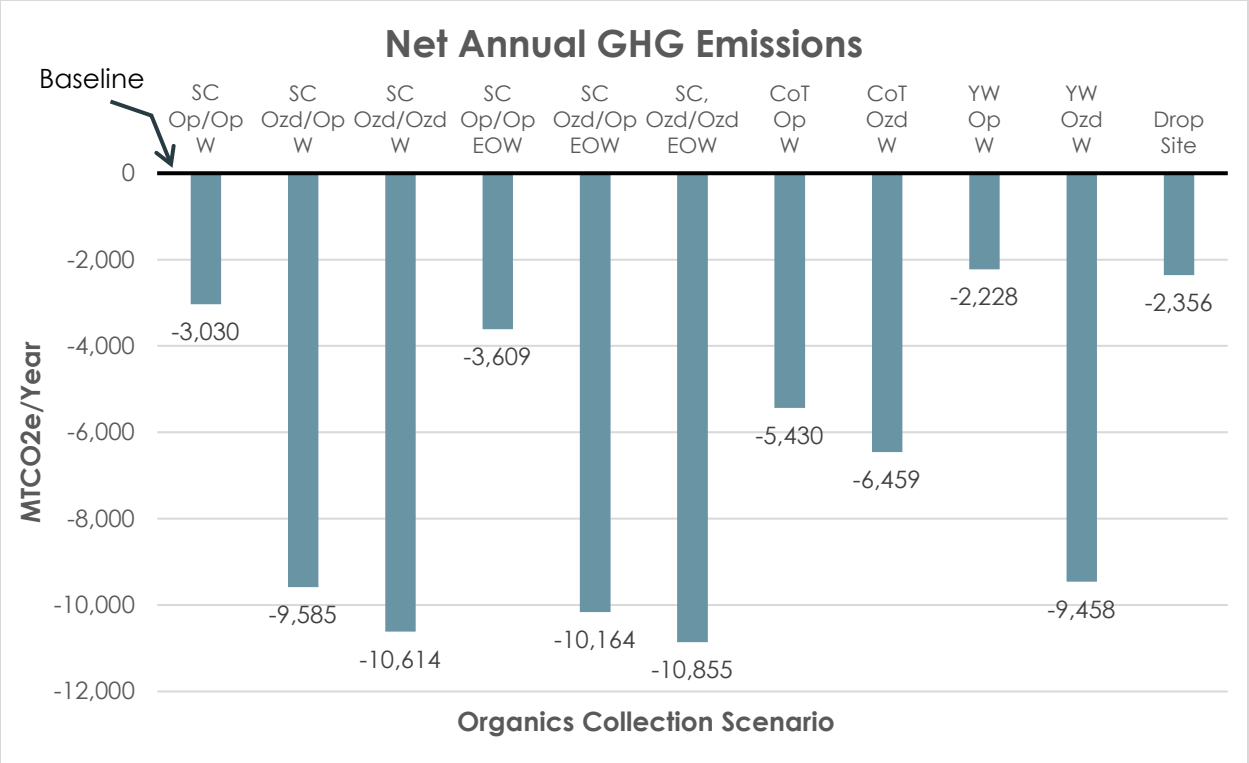
This study considers the impact of the collection scenarios in terms of GHG emissions (due to collection, transport, and end use of waste), roadway miles traveled, and the number of collection vehicles required for each collection event.

7.4.1 GHG Emissions

Figure 16 summarizes the estimated GHG impacts for each of the scenarios modeled. Diversion of organics from trash is found to provide a net reduction in GHG emissions compared to the baseline in all of the modeled collection scenarios. Organized separate cart collection of organics with organized EOW trash is found to have the greatest reduction in GHG emissions of the curbside scenarios, followed by organized separate cart collection with organized weekly trash. Open commingled collection with yard waste provides the least reduction in GHG emissions of the curbside scenarios, followed by open separate cart collection with open weekly trash. While reducing trash

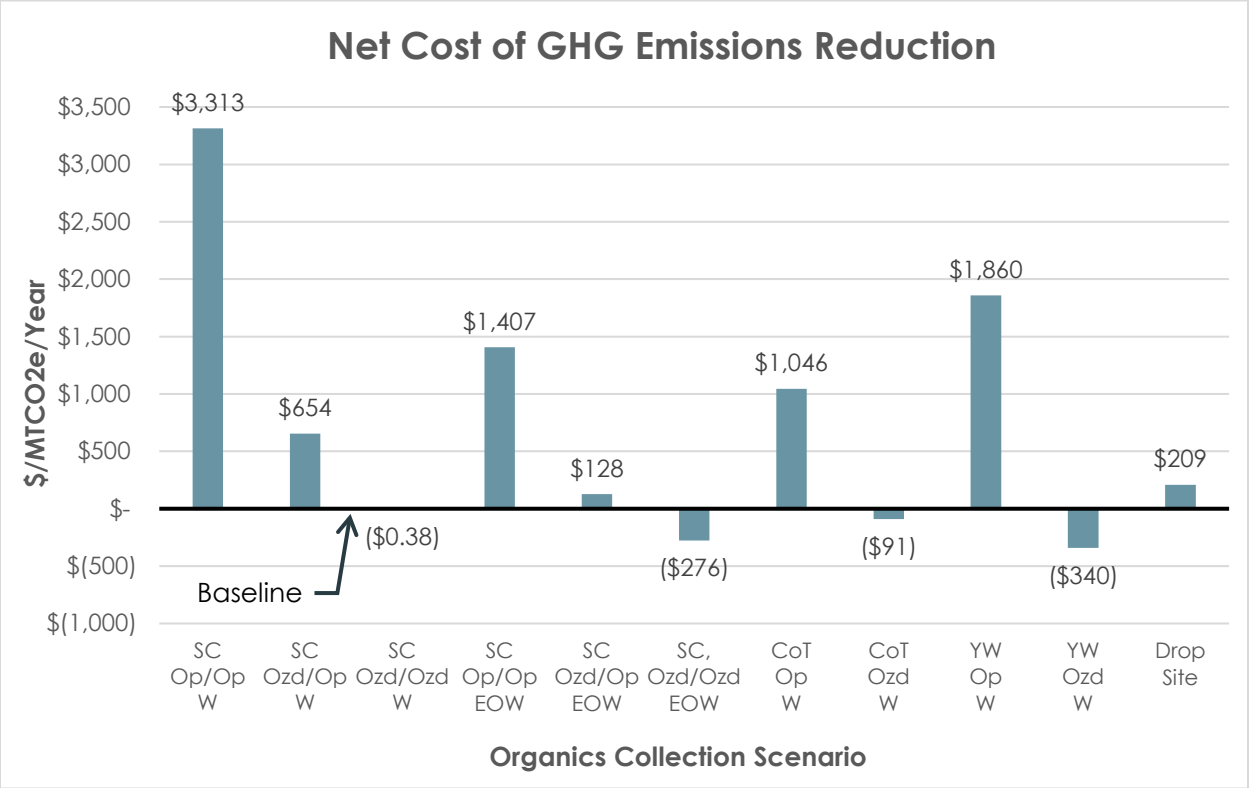
frequency to EOW does provide additional GHG reductions, the greatest emissions reductions are found with hauler organization, especially when organizing the market that collects organics.

Figure 16. GHG Impact of Collection Scenarios



Organized commingled collection with yard waste is found to have the lowest net cost per GHG emissions reduction, followed by organized separate cart collection of organics with organized EOW trash (see **Figure 17**). Open separate cart collection with open trash hauling has the greatest increase in cost compared to the baseline per emissions reduction, followed by open commingled collection with yard waste.

Figure 17. Net Cost per GHG Reduction



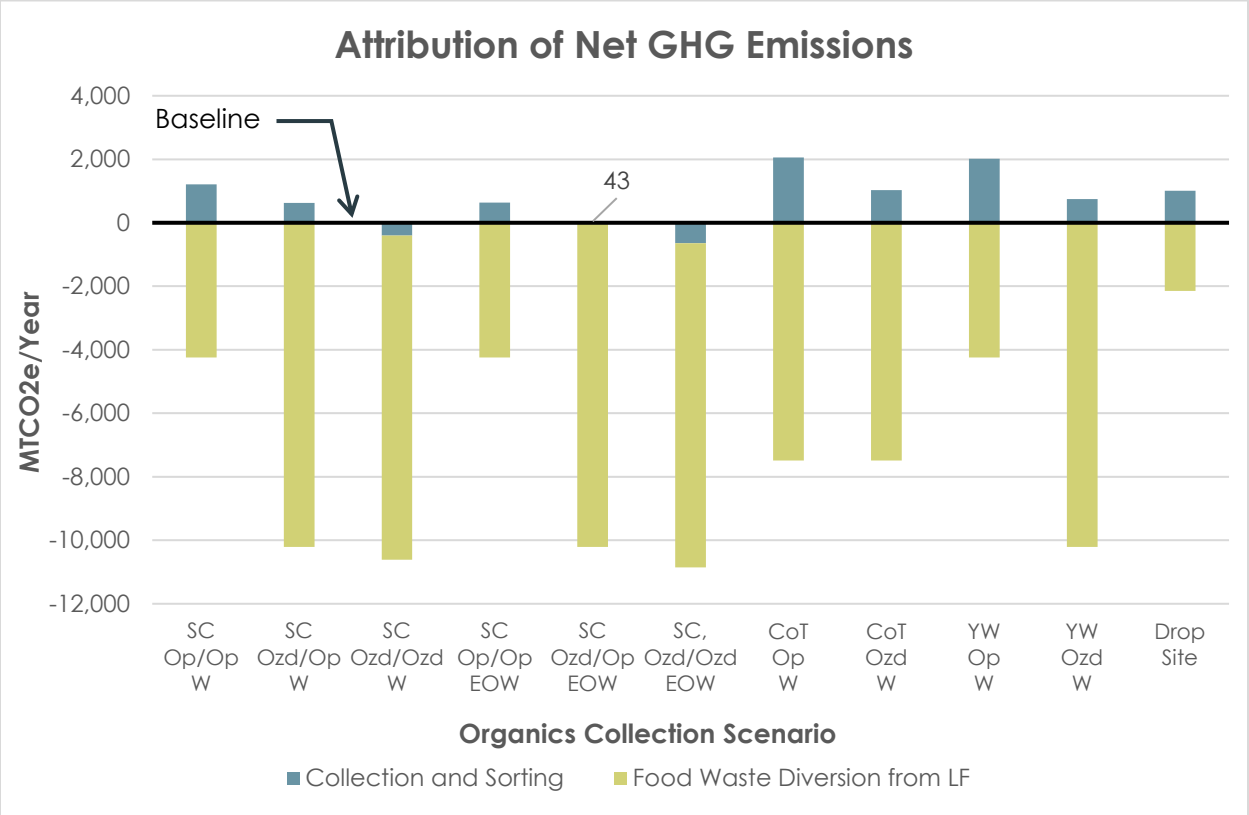
The majority of emissions reductions are due to diversion of food waste to composting instead of the baseline landfill disposal in all scenarios (see **Figure 18**). The assumed increase in participation rate under organized collection results in a greater effect on emissions than reduction of trash service to EOW because more food waste is diverted when there are more participants.

Note that emissions due to collection increase from the baseline in:

- Separate cart scenarios with open trash markets due to less-efficient haul routes;
- Co-collection with trash scenarios due to hauling trash to the processing facility instead of tipping directly at a landfill and additional secondary transfer after sorting;
- Commingled collection with yard waste scenarios due to carted yard waste being brought to a SSOM composting facility rather than to local yard waste composting sites as described in **Section 4.2.1**; and
- Drop site scenarios due to additional mileage in passenger vehicles.

Even in these scenarios with increased collection emissions, the overall emissions decrease compared to the baseline is due to the magnitude of emissions reduction achieved by composting food waste instead of landfilling it.

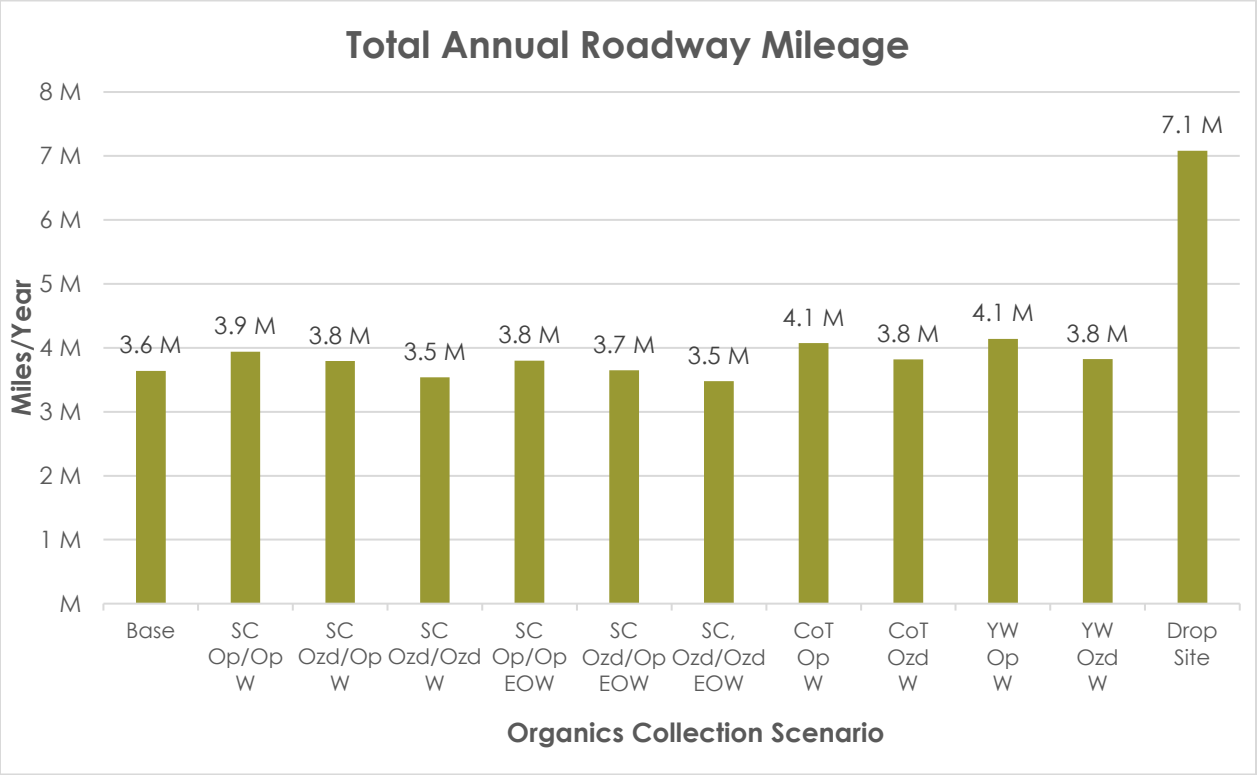
Figure 18. Attribution of Net GHG Emissions Reduction



7.4.2 Roadway Miles

Figure 19 shows the total annual road miles travelled for each of the scenarios, including on-route miles by collection trucks while servicing each household combined with the miles required to leave the collection route, empty the truck, and return to the route to continue collection. In the drop site scenario, the total also includes miles traveled in passenger vehicles for residents to self-haul organics to drop sites. This figure emphasizes that each curbside collection scenario has similar overall annual miles as compared to the much higher number of total miles traveled when individual participating households deliver their organics to a drop off site.

Figure 19. Total Road Miles of Collection Scenarios



The net change in roadway miles compared to baseline is shown on **Figure 20**. Note that the net change for the drop site scenario has a value of 3.4 million miles and extends far above the chart, compared to the net change resulting from curbside scenarios that range from about -161,000 to 501,000 miles. The greatly increased mileage in the drop site scenario creates added opportunity for traffic accidents. However, since one mile of compactor truck travel is equivalent to about 1,279 passenger car miles in terms of their effect on roadway infrastructure (see **Section 8.6**) drop sites have a relatively similar impact to roadway maintenance despite the added traffic.

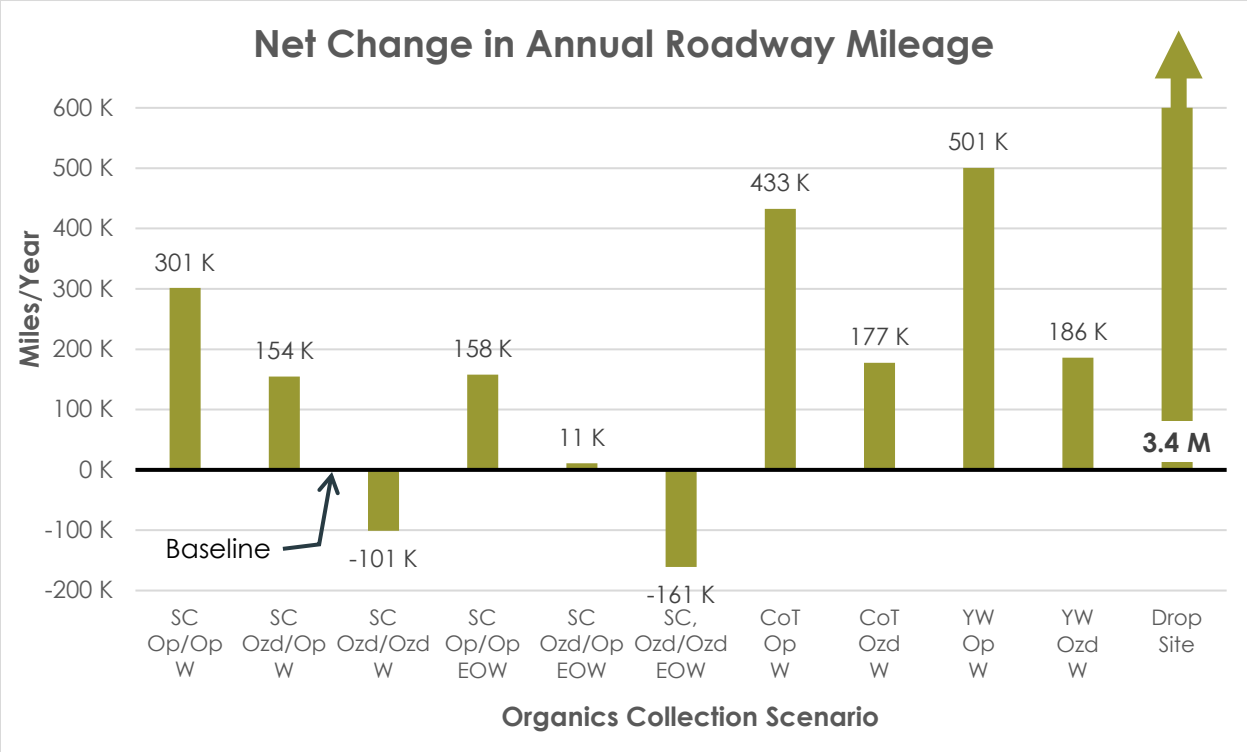
It may seem that adding a separate curbside cart for organics would result in greater traffic, road wear, and an increased risk for accidents because "more carts means more truck trips." However, the model suggests that adding a separate cart can result in similar or reduced overall system road miles when paired with hauler organization and/or reduction of trash service frequency (with organized organics).

Total mileage increases in all scenarios except separate cart collection when both organics and trash are organized. These results indicate that the mileage avoided by reducing trash frequency to EOW while using a separate dedicated cart is made up for by additional mileage from route inefficiencies in open hauling markets.

Co-collection with trash and commingled collection with yard waste, while not adding a new cart to the system, result in greater roadway miles than separate cart scenarios regardless of market organization. For co-collection, this is due to increased mileage when bringing material to a sorting facility rather than a landfill and additional secondary transfer of materials after sorting. For commingled collection with yard waste, additional mileage is incurred when carted yard waste must

be brought to a SSOM composting facility rather than to local yard waste composting sites as described in **Section 4.2.1**.

Figure 20. Net Road Miles of Scenarios



7.4.3 Number of Collection Trucks

The following figures show the number of heavy trucks required to complete service of the waste system in each collection scenario. Individual passenger vehicles used by residents for drop site transport are not included. In this context a "collection event" may occur over a single week for weekly collection or over a 2-week period for EOW collection. The number of collection trucks needed reflects the total time required to complete a single collection event and correlates to the number of individual employees required to occupy the trucks during that time.

As shown on **Figure 21**, the most collection trucks are required for the open separate cart scenario with open weekly trash, and the least trucks are required for organized co-collection with trash.

Figure 21. Total Trucks per Collection Event

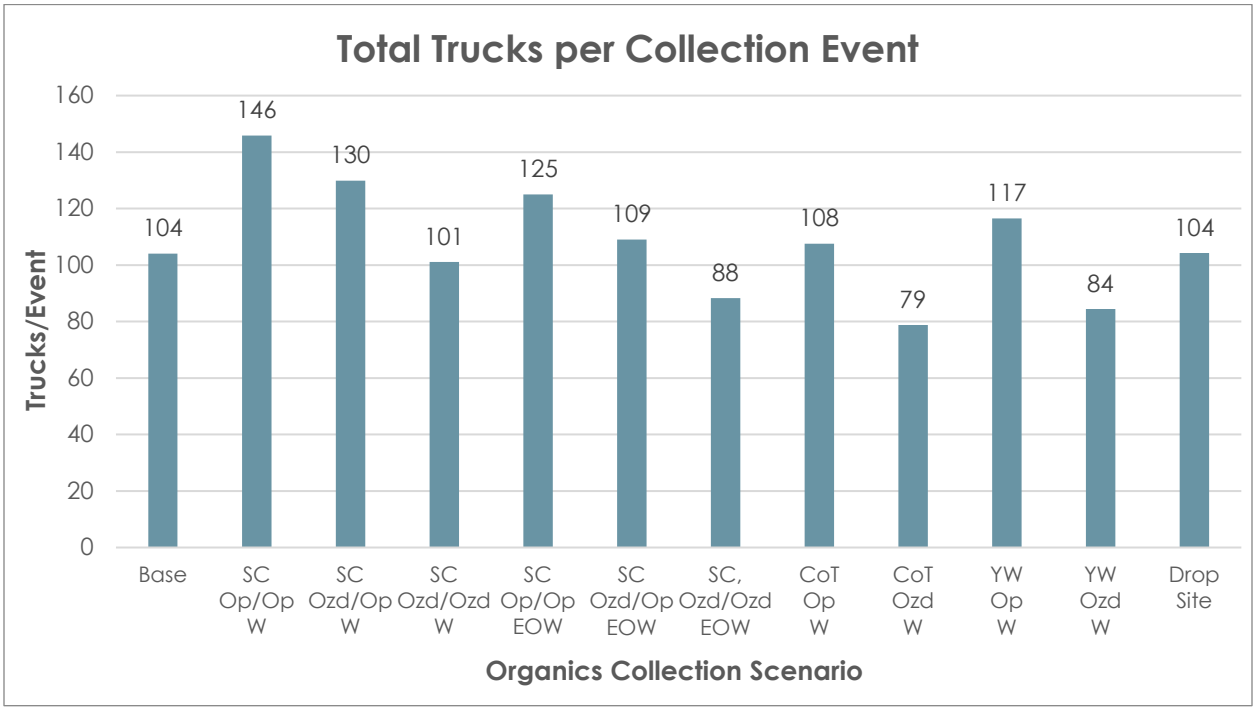


Figure 22 shows the net number of collection trucks per event as compared to baseline. Total trucks per collection event most notably decrease from the baseline when:

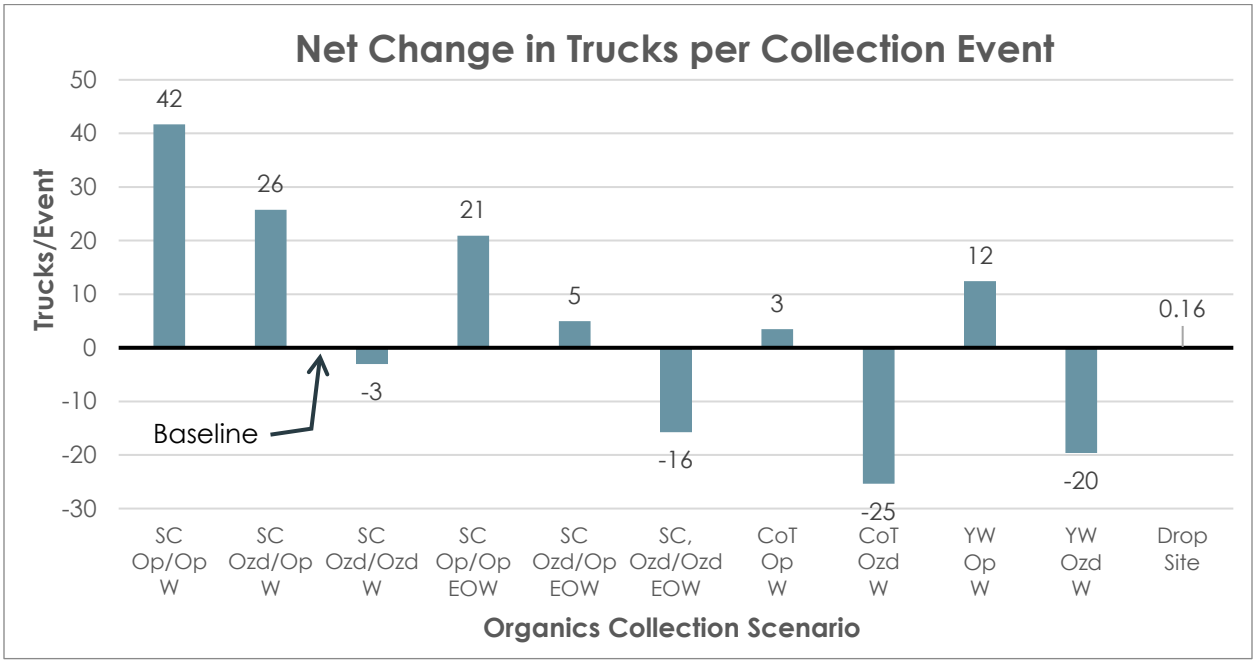
- Organics are collected via co-collection with trash or commingling with yard waste and collection is organized.
- Organics are collected in a separate cart with organized organics and trash collection, and trash service is reduced to EOW.

Total trucks per collection event most notably increase when:

- Organics are collected in a separate cart and weekly trash remains an open market; or
- Organics are collected in a separate cart with EOW trash, and both organics and trash are collected in open markets.

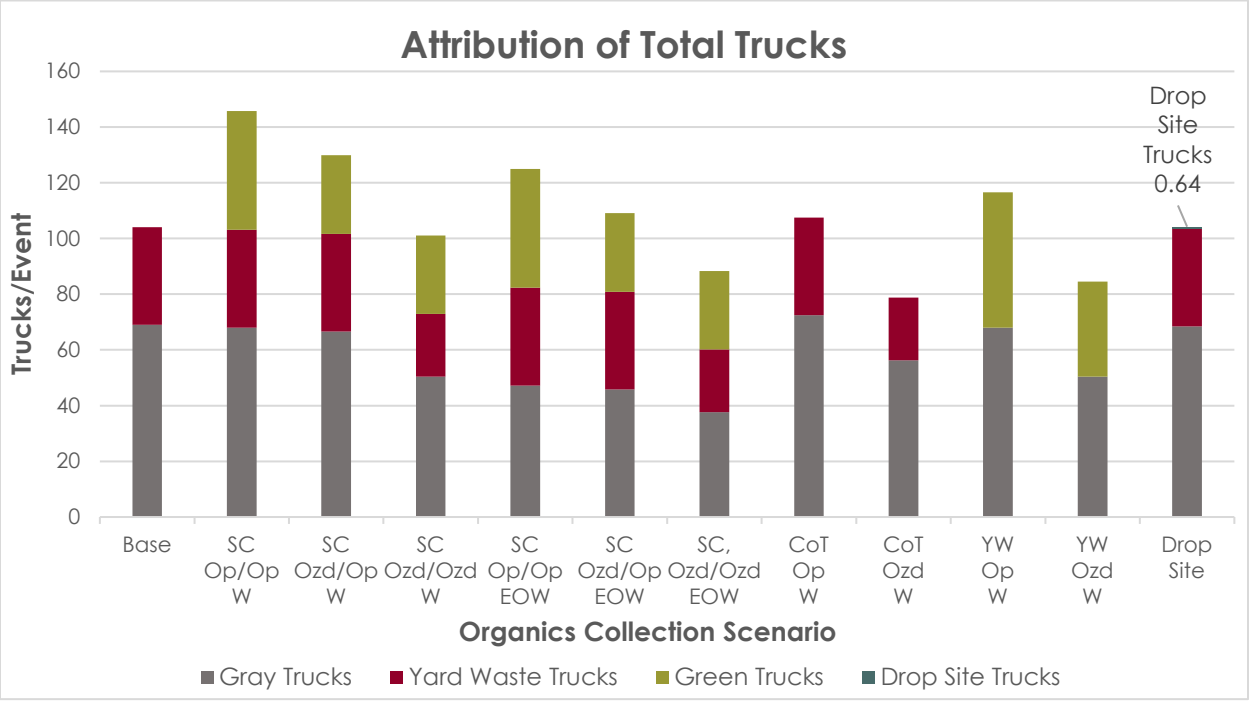
These results highlight that market organization and trash frequency reduction both reduce the number of trucks required to complete service.

Figure 22. Net Trucks per Collection Event



Figures 23 and **24** show the attribution of the number of trucks in each scenario to the type of cart being collected or secondary transport of sorted materials. For this study, "gray trucks/carts" are trash; "green trucks/carts" contain SSOM (may be food waste or food waste commingled with yard waste); and "yard waste trucks/carts" only contain yard waste.

Figure 23. Attribution of Total Trucks per Event



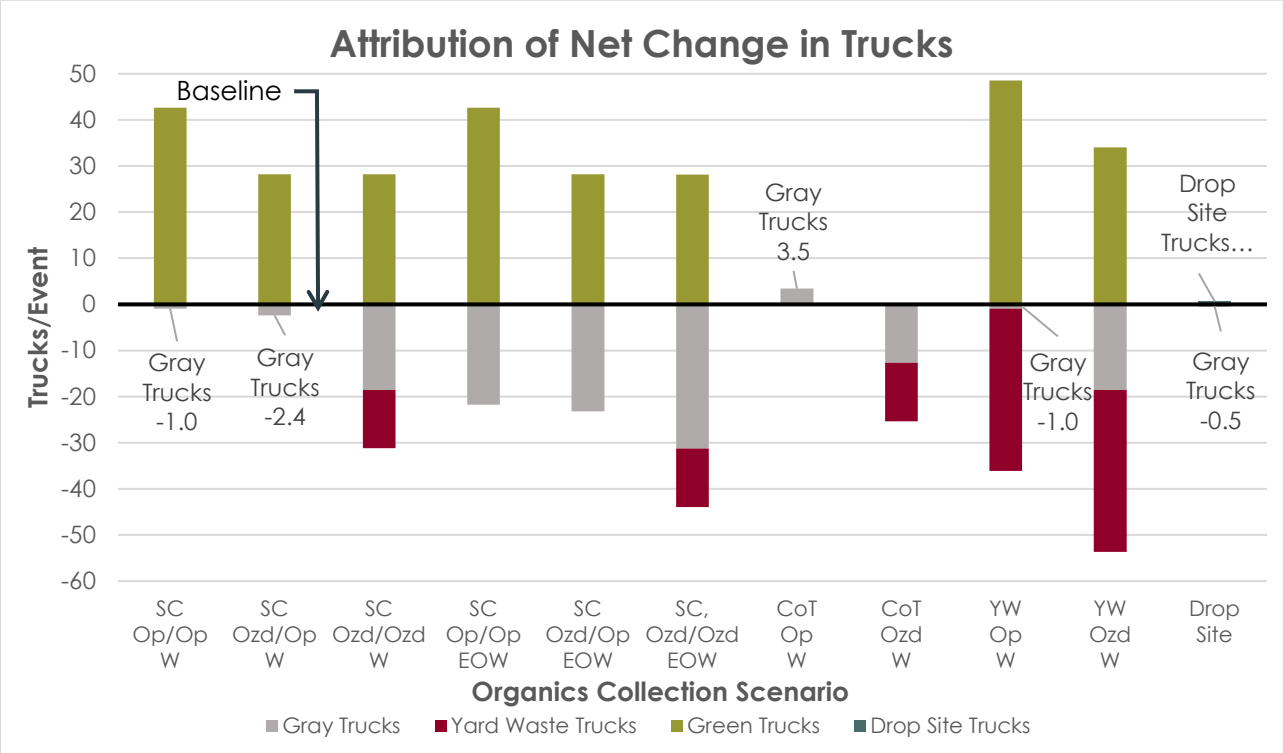
The net number of trucks varies in each scenario as materials are handled differently and the amount of material in each collection cart varies. The values here quantify the total number of individual trucks needed to provide the collection services in each scenario, and does not directly reflect the number of truck trips past an individual residence. This figure is used to estimate incremental cost and depreciation of the trucks as a financial asset. The changes from the baseline number of trucks are due to some combination of:

- The addition of organics trucks required based on participation;
- The addition of trash trucks to haul to a sorting facility instead of the nearest landfill;
- The reduction in trash and yard waste trucks (or addition of fewer organics trucks) in organized markets where collection is more efficient;
- The reduction in trash trucks required under EOW trash scenarios when individual trucks are able to serve twice as many routes (i.e., one route one week, another route the next);
- The reduction of yard waste trucks when yard waste becomes "green truck" material when food waste is commingled; and/or
- The reduction in trash trucks due to diversion of waste (see **Figure 24**).

The diverted organics only represent about 2 to 8 percent of the total trash tonnage, so the variation in trash trucks is due in greater part to market organization rather than the volume of organics diverted.

The number of trucks required in the drop site scenario is similar to the baseline because the small reduction in trash trucks still required to serve curbside trash collection, paired with the addition of relatively few green trucks required to haul food waste from the centralized drop sites, results in a very slight net increase to the number of trucks.

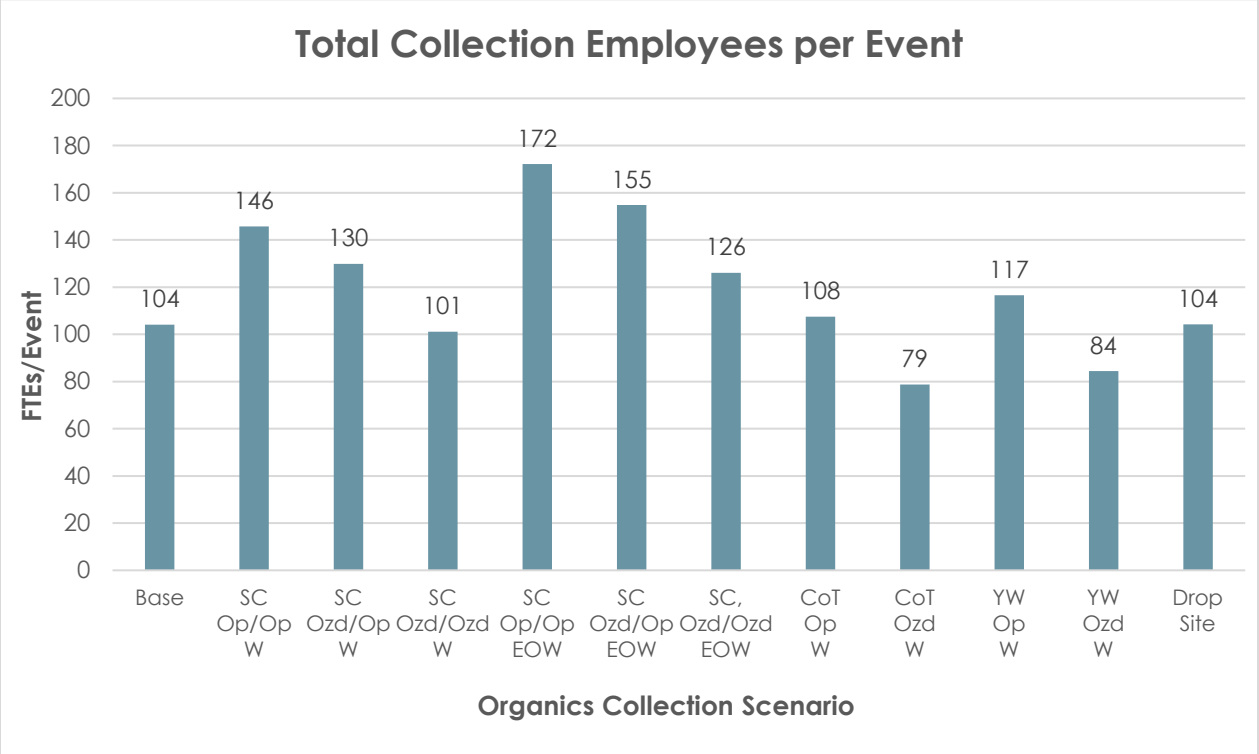
Figure 24. Attribution of Net Trucks per Event



7.5 COLLECTION LABOR

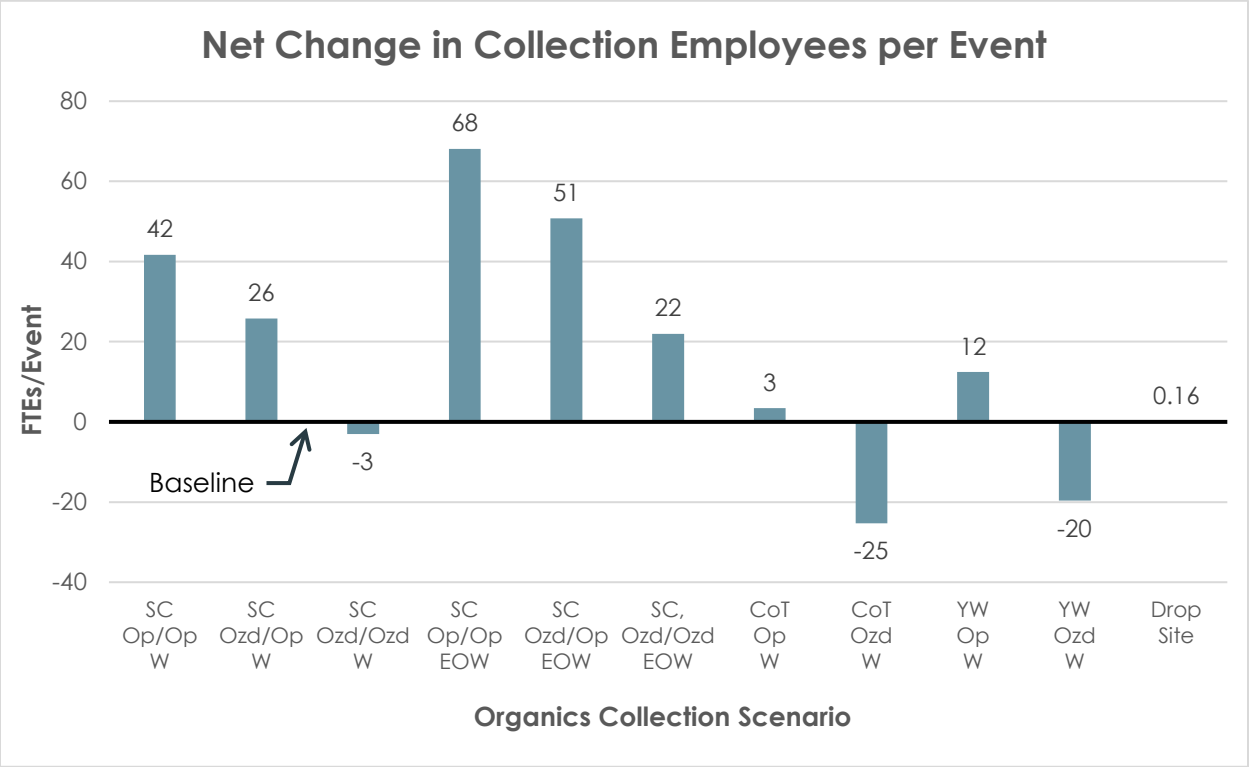
Figure 25 summarizes the estimated number of collection employees required for each of the scenarios modeled. These numbers result from collections only and do not account for job market stimulation on the processing side (such as additional compost operators, sortation facility staff, etc.) related to the end use of organics, or changes to landfill or transfer station staffing.

Figure 25. Total Collection Employees per Collection Event



In all scenarios the on-route time stays relatively the same as the same number of houses are being serviced and the truck must stop the same number of times. However, the off-route time approximately doubles in EOW scenarios because the trucks fill up twice as fast when each house has two weeks of trash to collect as opposed to one week of trash generation; this causes EOW scenarios to require more labor per collection event (see **Figure 26**).

Figure 26. Net Collection Employees per Collection Event



8.0 IMPLEMENTATION CONSIDERATIONS

8.1 COMPOSTING CAPACITY

Prior to implementing a curbside organics collection program, it is important to understand existing processing capacity in the region to accommodate the organics.

- Annual residential yard waste typically handled by curbside collection is estimated to be around 15,200 TPY.
- Based on the results of the modeled scenarios, rollout of curbside organics collection is estimated to generate around 2,800 to 22,300 TPY of SSOM, depending on the collection scenario selected.
  - Separate collection: 2,800 to 7,100 TPY SSOM (food waste only).
  - Co-collection with trash: 5,100 TPY SSOM (food waste only).
  - Commingled with yard waste: 18,000 to 22,300 TPY SSOM (2,800 to 7,100 TPY food waste + 15,200 TPY yard waste due to permitting concerns described in Section 4.2.1).
- Considering the currently operational SSOM composting facilities identified in Section 3.4.3, SSOM composting capacity potentially available to the County is estimated to be 25,500 TPY.
  - If only SET is considered, potentially available SSOM composting capacity is estimated to be 12,500 TPY.

With these considerations, it seems that current composting facilities could potentially process the SSOM generated under separate cart and co-collection scenarios; commingled scenarios are likely to exceed capacity. However, any scenario may present a capacity issue if:

- Resident participation exceeds modeled expectations;
- There is competition from other waste generators for SSOM capacity; and/or
- Only SET is considered for SSOM capacity.

Considering other waste generators in the TCMA region will likely be competing for SSOM composting capacity in the coming years, it is recommended that the County take steps to secure processing capacity regardless of collection method chosen (see Section 9).

8.2 POTENTIAL TIMELINE

The time required to roll out curbside organics collection will vary by collection method, dependent on factors such as:

- Legal processes for collection organization (where applicable);
- Contract development and approval (where applicable);
- Education and outreach to residents;

- Hauler considerations including:
  - appropriate carts and trucks,
  - procurement of new or additional carts, and
  - enforcing consistency in an open market;
- Organics processor (composter) considerations including:
  - processing capacity, and
  - permit modification.

Contract development for organization of organics collection is expected to take a shorter length of time than organization of trash collection (see **Section 3.2.1**).

As a recent example, Plymouth organized organics collection by adding organics service via an extension to their recycling services contract with Republic in December 2023, with collections beginning March 2024. Plymouth developed the contract directly without solicitation, but time is built into the estimates below to account for the possibility of a bidding period.

Since yard waste is collected curbside by existing residential trash haulers (see **Figures 3** and **4**, and **Appendices A** and **B**), organizing organics collection when commingled with yard waste would still require the statutory process. Since some haulers are not currently collecting yard waste with a cart, additional infrastructure would be needed for those haulers to implement commingled collection.

Table 9 compares the estimated relative timeline for implementation across the 10 modeled curbside organics collection scenarios. Relative length of time to implement is estimated as:

- Short (S), 6 to 12 months
- Medium (M), 12 to 24 months
- Long (L), 24 to 36 months
- Extra-long (XL), 36+ months

These estimated timelines for implementation include education and outreach to residents, but do not include time prior to the initiation of program rollout such as time required for the County to have the updated SWMP approved and adopted, or for ordinance language updates to be approved.

Table 9. Comparison of Scenario Implementation Timelines

Scenario Acronym	Curbside Organics Collection Scenario	Estimated Time to Implement	Key Considerations
SC, Op/Op, W	Separate Collection (Open Organics; Weekly Open Trash)	M	– Implementation may be required across 5+ haulers in a given municipality with open organics collection
SC, Ozd/Op, W	Separate Collection (Organized Organics; Weekly Open Trash)	S	– Organizing organics does not need to follow statutory process; time includes contract and rollout with one hauler
SC, Ozd/Ozd, W	Separate Collection (Organized Organics; Weekly Organized Trash)	L	– Organizing organics does not need to follow statutory process; time includes contract and rollout with one hauler – Organizing trash must follow statutory process

Scenario Acronym	Curbside Organics Collection Scenario	Estimated Time to Implement	Key Considerations
SC, Op/Op, EOW	Separate Collection (Open Organics; EOW Open Trash)	M	– Implementation may be required across 5+ haulers in a given municipality with open organics collection – Additional education needed regarding EOW trash
SC, Ozd/Op, EOW	Separate Collection (Organized Organics; EOW Open Trash)	S	– Organizing organics does not need to follow statutory process; time includes contract and rollout with one hauler – Additional education needed regarding EOW trash
SC, Ozd/Ozd, EOW	Separate Collection (Organized Organics; EOW Organized Trash)	L	– Organizing organics does not need to follow statutory process; time includes contract and rollout with one hauler – Organizing trash must follow statutory process – Additional education needed regarding EOW trash
CoT, Op, W	Co-collection w/ Trash (Open Organics; Weekly Open Trash)	XL	– Time to design/construct facility and commission equipment
CoT, Ozd, W	Co-collection w/ Trash (Organized Organics; Weekly Organized Trash)	XL	– Organizing trash must follow statutory process – Time to design/construct facility and commission equipment
YW, Op, W	Commingled w/ Yard Waste (Open Organics; Weekly Open Trash)	L	– Organizing yard waste must follow statutory process – Some haulers must change how yard waste is collected (add carts and trucks) – New composting infrastructure needed to accommodate larger volume (SSOM + yard waste) permitted as entirely SSOM
YW, Ozd, W	Commingled w/ Yard Waste (Organized Organics; Weekly Organized Trash)	XL	– Organizing trash and yard waste must follow statutory process – Some haulers must change how yard waste is collected (add carts and trucks) – New composting infrastructure needed to accommodate larger volume (SSOM + yard waste) permitted as entirely SSOM

8.3 POLICY OPTIONS

The County may choose to establish curbside organics collection in several ways, and the approach may dictate enforcement on municipalities, haulers, and residents:

- **County requires weekly curbside organics collection in County hauler licensing.** This is similar to the weekly recycling collection rollout. This can be applied to the entire County with variance language to account for areas that have low route densities, as experienced with weekly recycling. This would retain the ability to apply to municipalities to be included in practice, as for weekly recycling.

- **County mandates that municipalities license haulers and require curbside organics collection in this license.** This can include variance language for low-density municipalities. Such a mandate does not dictate that the municipality implements organized collection but puts the burden of enforcement in an open hauling market on the municipality.

- **County mandates that municipalities organize for organics collection.** It would be challenging for the County to organize organics collection as a whole, but the County could approach the organization of hauling markets by means of a mandate that municipalities organize for organics collection, rather than mandating curbside organics collection in the hauler license.

The County has precedent for utilizing the first means which was utilized for implementation of weekly curbside recycling; Hennepin County may be referenced for utilization of the two other approaches.

8.4 PUBLIC STAFFING IMPACTS

County and municipal employees will be required to dedicate time to develop and implement curbside organics collection programs, including for:

- Policy development,
- Contract development/licensing updates,
- Administration of billing or coordinating haulers on billing matters,
- Public outreach and education,
- Hauler coordination and communication,
- Reporting, and
- Enforcement, as necessary.

While reference can be made to the rollout of the weekly recycling collection in the County to understand the level of commitment that may be needed, additional time is likely required considering recycling infrastructure and collection was more mature at the time than organics is now.

Municipalities that select to implement organized collection may incur greater upfront time investment, but there may be less effort after rollout for enforcement and education, and greater resident participation.

8.5 EQUITY CONSIDERATIONS

The MPCA provides mapping data[36] of areas identified as having disproportionate negative environmental impacts on any group of people referred to as "EJ" areas. Delineating these EJ areas allows targeting of environmental improvements, equal levels of environmental protection, and opportunities to participate in decisions that may affect those peoples' environment or health. This data identifies census tracts where additional consideration or effort is warranted using four criteria:

- At least 35 percent of residents reported income less than 200 percent of the federal poverty level,
- At least 40 percent of residents are people of color,
- At least 40 percent of residents have limited English proficiency, and/or
- The tract contains Federally recognized Indian Tribes.

This information is obtained from the U.S. Census Bureau's 5-year 2017 to 2021 American Community Survey data. Tribal areas are derived from the U.S. Census Bureau's 2023 Cartographic Boundary File and the Minnesota Department of Transportation's Tribal Government in Minnesota. The areas in Dakota County meeting these criteria are displayed on **Figures 29** and **30**. The following **Table 10** provides a summary of the populations of affected persons in Dakota County residing in EJ areas described above.

Table 10. Environmental Justice Populations in Dakota County

Criteria	Number of Census Tracts or Tribal Lands	Affected Population within Impacted Tracts/Lands	% Affected out of Full County Population
>35% income <200% of federal poverty level	42	72,255	16%
>40% people of color	30	65,101	15%
>40% limited English proficiency	0	n/a	n/a
Tribal Lands	1	0	n/a
TOTAL	73	137,356	31%

It is possible that some of the affected populations overlap in the identifying criteria; the data provided by MPCA does not differentiate populations that fall into multiple categories, only populations within each category. Additional detail identifying data for individual tracts is provided in **Appendix D**. This data is evaluated for the full County and not specified to the 15 subject municipalities. The one tribal land holding identified in Dakota County is the Prairie Island Off-Reservation Trust Land located in Ravenna Township which is undeveloped.

8.5.1 Economic Considerations

Because "everyone pays" for organics service as described in **Section 6.1**, the cost of service is distributed equally across residents. Therefore, the collection scenarios most likely to increase the fees per household present the highest burden to the most economically sensitive residents. As

[36] https://gisdata.mn.gov/dataset/env-ej-mpca-census

shown on Figure 10, the scenarios can be broken down in terms of their impact on individual household cost compared to baseline as follows:

- Scenarios that significantly increase waste service cost per household:
  - Separate Collection, Open/Open, Weekly = +$74.98 per year
  - Separate Collection, Organized/Open, Weekly = +$46.79 per year
  - Co-collection with Trash, Open, Weekly = +$42.42 per year
  - Commingled with Yard Waste, Open, Weekly = +$30.95 per year

- Scenarios that do not significantly change waste service cost per household:
  - Separate Collection, Open/Open, EOW = +$6.42 per year
  - Drop-Off Sites, Open, Weekly = +$3.67 per year
  - Separate Collection, Organized/Organized, Weekly = -$0.03 per year
  - Co-collection with Trash, Organized, Weekly = -$4.40 per year

- Scenarios that significantly decrease waste service cost per household:
  - Separate Collection, Organized/Open, EOW = -$21.77 per year
  - Commingled with Yard Waste, Organized, Weekly = -$24.04 per year
  - Separate Collection, Organized/Organized, EOW = -$40.85 per year

The County can further seek to mitigate impacts to low-income residents by covering the cost of carts, or otherwise subsidizing the additional service cost of organics collection for individuals evidencing hardship. To assure equity in co-collection scenarios, the cost for DCBs could be covered through the program and residents equally offered access to as many bags as they need at no extra cost.

8.5.2 Co-Collection with Trash

Minnesota has pioneered the use of co-collection of organics with trash at scale in the United States. This collection approach is equitable and accessible to all residents and does not require an additional cart or service. Co-collection reaches all residents who have access to trash service, including shared service in multifamily housing, and can therefore maximize equitable rollout of services by allowing all residents within a service area to register in the same time period.

8.5.3 Commingled Collection with Yard Waste

Collecting organics with yard waste may have unequal impacts across municipalities as different cities and towns have a different approach to handling yard waste collection in place, depending on their needs. Residential yard waste collection is very much limited to only single-family housing, and even then is not universal as an existing service.

8.5.4 Separate Cart

Separate cart collection provides the same new resource across participating municipalities and can be offered equitably to single-family residences. A separate dedicated cart may be somewhat less equitable in terms of accessibility for residents with disabilities who have difficulty in wheeling an additional cart to the curb. Accessibility of cart mobility is addressed in the Farmington organized hauler agreement as listed in Section 3.2.1 by requiring that the contracted hauler provide Doorstep/Valet Collection for no additional charge with verification of need. In high density areas, spatial constraints at residences may present challenges in storing an extra cart and there may be

additional issues with odors and pests than in lower density areas where carts are further apart and more garage storage space may be available.

Carted collection is not strictly limited to single-family residences. St. Louis Park and other communities currently utilize the same carts for single-family and multifamily residences; it is either the responsibility of the property ownership or the hauler to move the carts from the collection area to the tipping truck. The moving of carts or dumpsters located in tight areas can be assisted using electric moving dollies[37] (pictured to the right) also called "tugs" that have become prevalent in recent years.

8.5.5 Drop Sites

Drop sites can also be designed using carts rather than large dumpsters for ease of locating the containers in limited access sites. A number of providers offer cart enclosures which can be printed with custom messaging and may include access controls such as a keypad with custom codes for each user, or even Bluetooth app access. Access control adds both the ability to limit access to only those users dropping organics to avoid contamination and can also be used to track collections. Access apps typically include features for users to report when the bins are filled or other issues are present. The following cart enclosure pricing was provided by MetroSTOR[38]:

Table 11. FX-Series Organics Cart Enclosure Pricing from MetroSTOR

Cart Size	Price Per Unit
35-gallon	$1820
65-gallon	$1920
95-gallon	$2020
Keypad Lock (all sizes)	$210
metroKEY App Access (all sizes)	$410 plus $20 per month for app servicing

Drop sites allow for multifamily residents to access organics collection as further described in **Section 8.7**.

8.5.6 Equitable Planning

As evidenced by data in **Section 8.5**, environmental justice communities in Dakota County most heavily consist of economically impacted individuals. By minimizing any increases to waste servicing cost and providing mechanisms to assist those who are most heavily burdened by these costs, the County can minimize negative economic impacts to residents. Under modeled scenarios that result in cost savings, the money saved can be applied to education, outreach, program cost waivers, or other means to specifically target assistance to those most in need. Although Dakota County is not

[37] https://www.xerowaste.ca/electric-tugs/waste-bin-tug-or-dumpster-mover/
[38] https://metrostor.us/products/access-controlled-cart-recycling-housings/

home to areas that meet the MPCA criteria for targeted EJ actions based on limited English-speaking populations, this is still an essential planning component to prevent inequity in waste planning. Outreach and education should consider any major language demographics in different districts to best target languages in which to have materials translated and how best to distribute information.

8.6 ROAD IMPACT CONSIDERATIONS

Roadway impacts result from both the number of waste hauling vehicles and the mileage they travel. Areas impacted by these factors include[39]:

- Safety
  - Visual obstructions due to large trucks.
  - Accidents due to slow-moving or stopped trucks.
  - Longer stopping distances of heavy trucks.

- Traffic
  - Longer acceleration periods of heavy trucks.
  - Impediment of traffic on narrow roads.
  - Blocking of alley access.
  - Extra trucks on roadways add to total traffic.

- Roadway physical damage/maintenance
  - One mile of compactor truck travel is estimated equal the impact of 1,279 passenger car miles[40].
  - One mile of transfer truck and trailer travel is estimated to equal the impact of 1,408 passenger car miles[41].

Roadway impacts are quantified in **Sections 7.4.2** and **7.4.3**. The most optimal scenarios for reduction of roadway miles are organized separate collection with organized or open EOW trash (see **Figure 20**). The most optimal scenarios to reduce the number of collection vehicles are organized separate collection with organized EOW trash and organized co-collection with trash (see **Figure 22**).

8.7 FUTURE OF ORGANICS DROP-OFF SITES

As described in **Section 3.4.4**, the County has continued to expand drop-off sites for residential organics over the past 8 years as participation has increased and cities have expressed interest in additional sites. Under rollout of curbside organics collection, some participants currently utilizing the drop sites will have the option of curbside service instead. However, these curbside organics collection requirements do not apply to multifamily housing or lower-density areas of the County. These drop sites offer a unique opportunity to provide access to organics collection for multifamily housing residents as well as residents of more rural areas, especially those who are already driving to more populated areas for work or other purposes.

[39] Further analysis of roadway impacts may be supported by this detailed model developed by MnDOT: "Assessing the Effects of Heavy Vehicles on Local Roadways," MnDOT, August 2014, https://www.lrrb.org/pdf/201432.pdf

[40] "Assessing the Effects of Heavy Vehicles on Local Roadways," MnDOT, August 2014, https://www.lrrb.org/pdf/201432.pdf

[41] Ibid.

The County anticipates that multifamily housing will continue to increase throughout many areas of the County. Notably, areas high in multifamily housing often coincide with areas identified for EJ concerns. See **Figures 27** and **28** of existing drop sites in relation to property use types, and **Figures 29** and **30** for existing drop sites in relation to EJ areas. Parcel data displayed in the figures was provided by Dakota County GIS staff, other data was obtained from the Minnesota Geospatial Commons[42].

In addition to providing access for residents not serviced by curbside organics collection, drop sites are found to be lower than other curbside collection scenarios with an open trash market in:

- Cost per household (see **Figure 10**),
- Cost per ton of food waste diverted (see **Figure 15**), and
- Cost per ton of GHG emissions reduction (see **Figure 17**).

There are several regions in the County that are high in multifamily housing that do not currently fall into the typical service area identified for the drop sites, shown as a buffer on **Figures 27** through **30**. Possible areas to construct another drop site to increase access in these critical areas include:

- Northern Inver Grove Heights,
- North-central Eagan,
- Southwestern Eagan, and
- South-central Burnsville.

Drop sites located in areas that primarily serve single-family housing could potentially be discontinued with the implementation of curbside organics collection. However, some residents may still prefer to use the drop-off sites, and the County is aware of residents traveling longer distances to participate than identified by the buffer zones due to lack of local programs. Even in areas that have curbside service, residents may still wish to utilize drop sites for large volumes from gatherings/events, or if they miss set-out for a collection event and wish to expedite removal of waste from their residence.

The County can consider continuation of drop sites in these areas based on feedback from residents, costs, and accessibility to multifamily residences that will continue to require an outlet for organics for those interested in diverting. The County may also explore offering use of these drop sites to small businesses that wish to divert but are not large quantity generators or do not generate consistently, such as a small office or church.

[42] https://gisdata.mn.gov/

Figure 27. Dakota County Drop-off Sites and Property Types

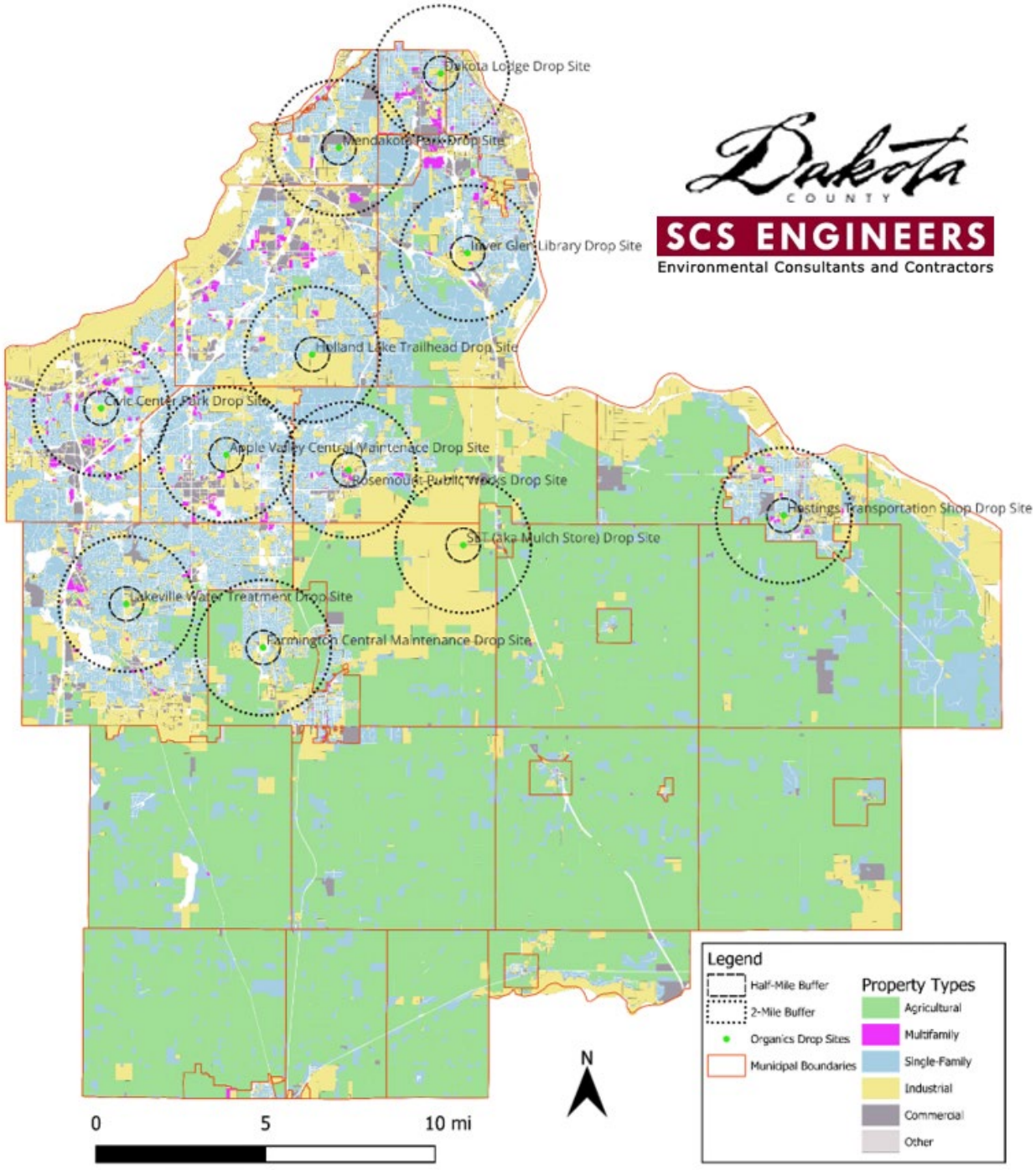


Figure 28. Insets of Drop-off Sites and Property Types

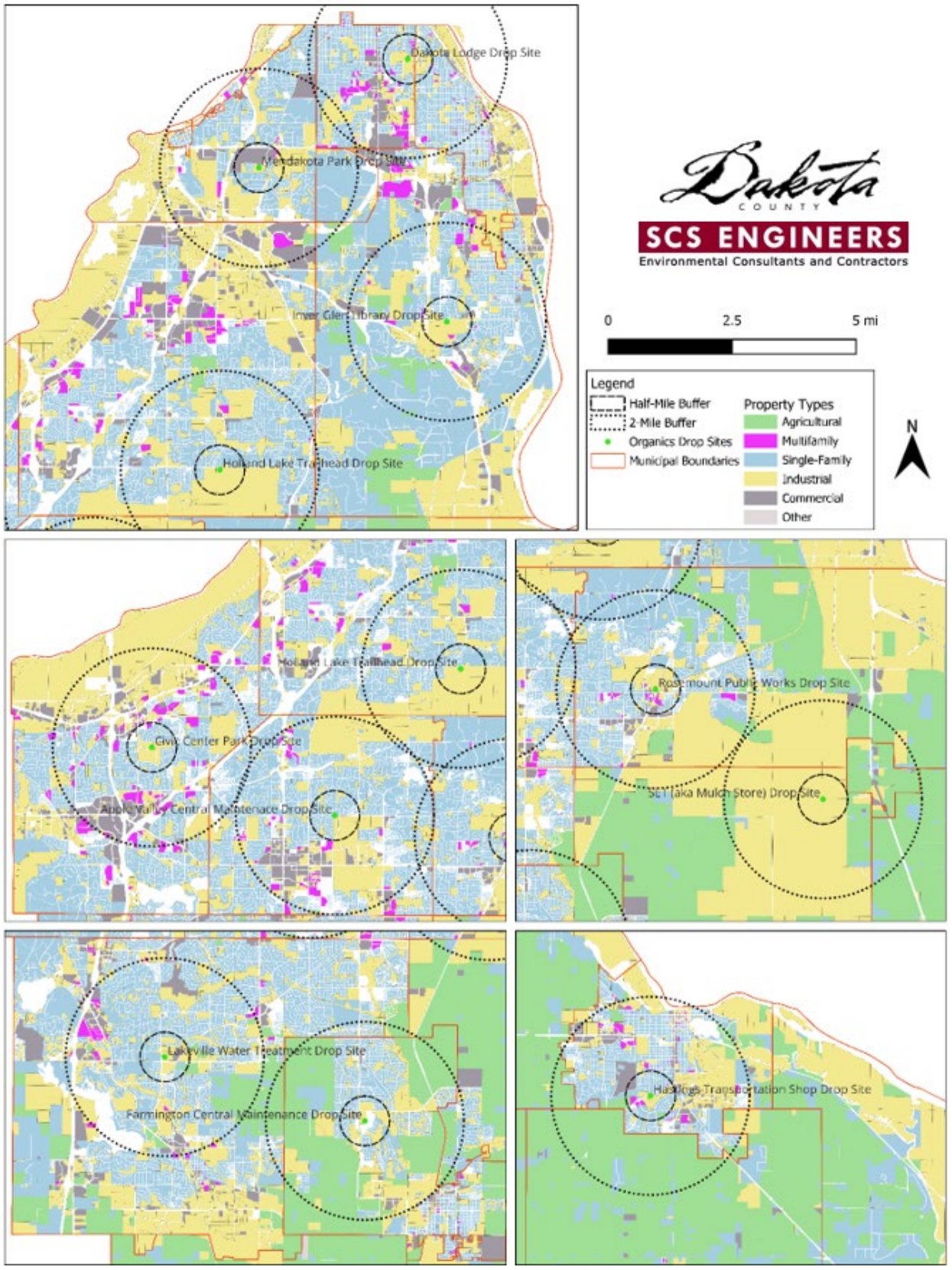


Figure 29. Dakota County Drop-off Sites and EJ Areas

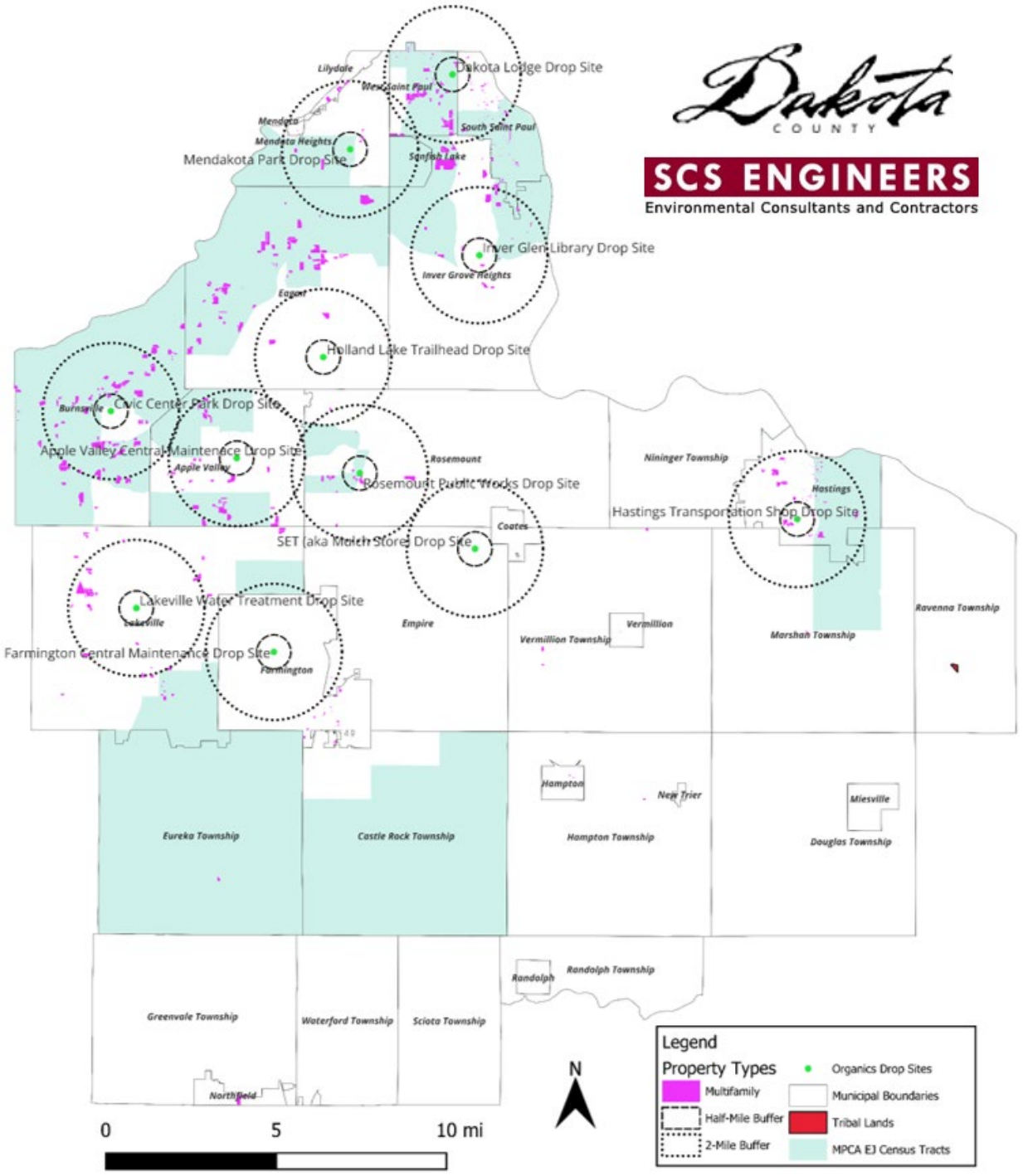
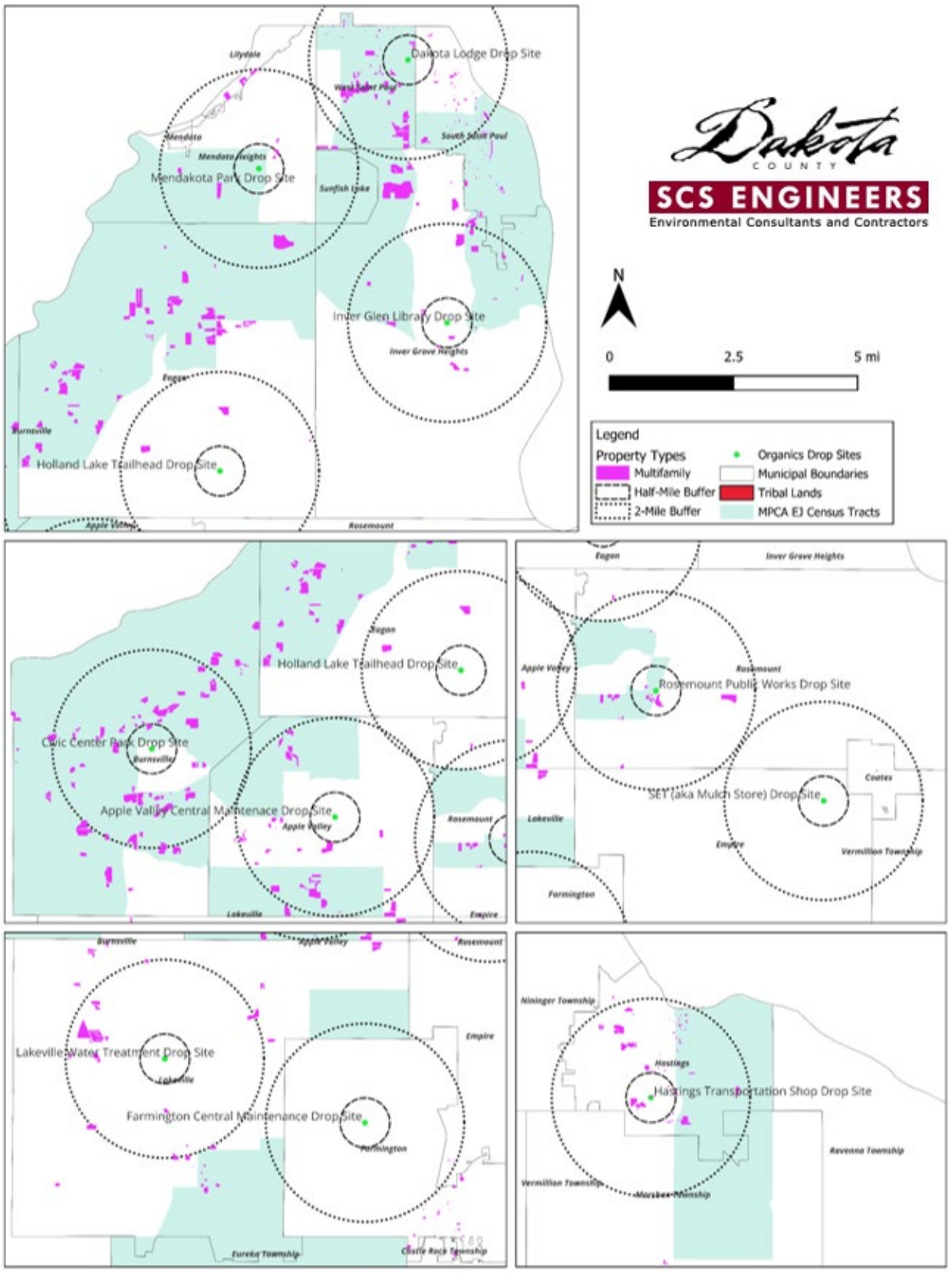


Figure 30. Insets of Drop-off Sites and EJ Areas



8.8 USE OF COMPOSTABLE BAGS

As discussed in relation to co-collection methods, compostable bags (specifically DCBs) are a minimum requirement to isolate organics from the other stream with which they are being co-collected. This section further elaborates on the advantages and disadvantages of using compostable bags across collection methods.

Consistent messaging is essential to public understanding of acceptable materials in composting. MNCC regularly updates the Organics Recycling Outreach Guide[43] which is a statewide resource contributed to by: composters accepting materials from the TCMA; municipal program managers; and other industry experts. This statewide guidance document, written in conjunction with composters including SET staff, specifies that compostable bags with BPI certification are an acceptable material.

Compostable bags can be a highly effective tool for residents to overcome the "ick" factor of diverting organics. Compostable bags have become widely available and more affordable, now being sold at "big box" grocery and department store chains. Rather than fight the desire of residents to have the decision to use compostable bags, bags could be integrated as a tool for residents to maximize diversion of food scraps with messaging focused on which compostable products are verified as acceptable by composters.

Alternative options for mitigating the "ick" factor for in-kitchen food scraps collection include bins with built-in charcoal filters, taking out the bin often, rinsing after each use, storing food scraps in the freezer, or using brown paper bags as liners for food-scrap containers.

Residents and businesses may also have concerns for the cleanliness and odor of their curbside cart. Some programs require the use of compostable bags to maintain the cleanliness of carts. Alternatively, residents can regularly wash their cart or utilize mobile cart washing services that are available in some areas. Compostable cart liners (essentially large compostable bags) are also available which are most commonly used by businesses. Some product manufactures promote the use of compostable bin and cart liners for collection of trash, but this practice is not recommended in areas served by co-collection programs as trash bags may appear similar to DCBs and result in false positive picks by robotic systems.

Disadvantages of compostable bags and products include cost and the potential for look-alikes which are not certified compostable and may ultimately result in contamination at compost sites. Additionally, evaluations of compostability are performed for the conditions found at commercial composting sites only. Home composting typically does not achieve the same temperatures or levels of monitoring as commercial sites and compostable products generally do not break down to the same level in home composting. For this reason, if the County chooses to promote use of compostable bags for curbside collection or drop site use, messaging should be clear that compostable bags are not recommended for home composting.

[43] http://www.mncompostingcouncil.org/uploads/1/5/6/0/15602762/organics_recycling_outreach_guide_-_7.19.22.pdf

9.0 RECOMMENDATIONS

Dakota County has made great strides in waste diversion, including organics recovery, since implementing the Dakota County SWMP (2018-2038). Considering the modeling findings and other qualitative research performed for this report, the below recommendations are provided for the implementation of curbside organics collection in Dakota County, which includes considerations for municipalities:

Collection method:

- Weekly curbside organics collection using a separate dedicated cart and reduce trash collection to EOW (see Scenario SC Ozd/Ozd EOW from **Table 8**).
  - Distribute carts on an opt-in basis (see Hennepin County program in **Section 5.2**).
  - Separate collection has become the dominant curbside organics collection method in Minnesota (**Figure 6**).

- Encourage organized collection of organics where possible.

- Recommended due to: lower annual costs (**Figure 10**); lower net cost of food waste diversion (**Figure 15**); lower net cost of GHG reduction (**Figure 17**); lowest net roadway mileage (**Figure 20**); lower net number of collection trucks (**Figure 22**); and feasibility/timeline for implementation (**Section 4.3** and **Table 9**).

Drop-off sites:

- Consider adding additional drop sites to provide access to rural and multifamily residents.
  - Areas such as northern Inver Grove Heights, north-central Eagan, southwestern Eagan, south-central Burnsville may have high impact (see **Section 8.7**).

- Monitor drop site usage following curbside collection rollout.
  - Consider addition of keypad or app access at drop sites with high levels of contamination.
  - Consider allowing Cities to take over operation and maintenance of drop sites following County best practices for more localized communication and contamination control.

Policy:

- Mandate curbside collection of organics in County hauler licensing.
  - Provide variances for low-density areas not included in the 15 modeled municipalities.
    - Consider language that allows small-scale, subscription-based services to provide service in rural areas.
  - Require submission of hauler implementation plans prior to curbside rollout that include a description of outreach materials and strategy.
  - Establish County authority for enforcement and well-defined reporting expectations.
  - Consider language that specifies required cart appearance (i.e., green for separate carts) and labeling.
  - Provide cities with example language for hauler bills and standardized invoicing requirements to avoid discrepancies between haulers and resident confusion about program costs during organics rollout.

  - Promote equity by including language in hauler agreements similar to that used by Farmington as listed in Section 3.2.1 where it is required that the contracted hauler provide Doorstep/Valet Collection for no additional charge with verification of need.

- Ensure compliance of new curbside programs with the Uniform Municipal Contracting Law (Minnesota Statutes 471.345) and internal purchasing policies.
  - Consult with County legal counsel on contract development procedures.
  - Monitor any legal developments with Hennepin County curbside collection programs.

- Fund enforcement positions:
  - Monitor messaging by municipalities and haulers.
  - Monitor compliance, which can include:
    - Observation of routes and cart set-out.
    - Evaluating the composition of trash loads.
    - Inspection and flagging of trash carts at the curb.
  - Implement enforcement strategies, which can range from:
    - No penalties, just education and technical assistance; to
    - Warnings and compliance notices to offending residents or haulers; to
    - Minor misdemeanor civil offenses with associated penalties.
  - Promote active and accurate reporting.

- Reaffirm the County policy contained in the SWMP to use finished compost derived from yard waste in County transportation, parks, and capital landscaping projects.
  - Consider removing "derived from yard waste" from compost use language to allow utilization of compost derived from SSOM.

- Consider alternative revenue sources such as an incremental tax to offset reduced host fees from landfill disposal when organics are diverted from the waste stream.

- Establish a contractual agreement with an organics processor to guarantee capacity for Dakota County organics.
  - Implement purchase-back agreements where the equivalent quantity of compost produced from a municipality's diverted food scraps will be purchased back by that municipality for use in public works projects.
  - Consider an agreement built into the property lease with the SET site.

- Continue to consider initiatives to enhance organics diversion such as:
  - Adoption of mandatory organics recycling ordinances similar to other mandatory recycling ordinances for recyclables.
    - Language can be chosen to specify whether participation in a curbside collection program is the only acceptable recycling method or define others, including the end use of the organic material.
    - Language could allow residents to do backyard compost or deliver organics to a drop-off site.
  - Adoption of a ban on disposal of organics in trash.
    - Language can be chosen to specify acceptable collection methods or end uses of the collected material.

Outreach:

- Use the curbside organics collection initiative to strengthen public education efforts that encourage other forms of recycling and waste reduction behaviors.

- Streamline messaging on collections rollout, acceptable materials, and billing of collection services.
  - Use Dakota County ordinance language as a standard for other counties for transparency in billing.
  - Strictly enforce and emphasize ordinance language as part of outreach and education during rollout of the organics collection programs to ensure that residents understand new charges and that haulers openly and fairly promote new organics program offerings without undermining the intent.
  - Consider dictating a County-wide color of carts used for organics as cart color can greatly impact residents' understanding beyond just labeling requirements. (County ordinance requires haulers to follow standard labeling guidance including color, terminology, and images.)
  - Communicate with local composters on accepted materials and contamination concerns.
  - Require cities and haulers to provide frequent standardized messaging (including terms, images, and colors) on what is/is not accepted in organics bins.
  - Have haulers provide feedback to customers when they are not sorting organics properly.
  - Provide clear messaging that everyone will be billed for organics collection regardless of participation, pursuant to MPCA clarification in 2023 (see **Section 6.1**).

- Maintain online directories of organics collection infrastructure and resources.
  - Display operational public SSOM drop-off sites (see Dakota Valley Recycling map of "Where to Recycling in Dakota County"[44] which shows only 4 of the 11 drop sites).
  - Include private SSOM processors where possible.

- Consider active strategies to keep participants engaged and material stream clean, such as:
  - Surveys for residents during rollout and annually for feedback.
  - Mailers with engaging metrics that document progress with the program, diversion achieved, etc. to provide positive feedback and reinforcement to residents.
  - Provide a directory to residents of where locally made compost is sold, noting where their organics are processed to encourage ownership.
  - Collaborate with local compost sites to arrange tours and advertise to residents.
  - Provide starter kits to residents new to organics collection which may include kitchen compost pails, a supply of compostable bags, and/or refrigerator magnets showing accepted materials.

- Provide backyard composting education and bins for purchase, especially to areas of the County not readily served by curbside collection or near to drop-off sites.

[44] https://dakotavalleyrecyclingmn.gov/map#!rc-cpage=568383

Other recommended actions:

- Consider ways to develop end markets for products made from recycled organics, such as:
  - Incentivize or require compost usage across County or municipal projects.
  - Provide grant opportunities for composters for infrastructure, operations, and/or marketing.

- Continue or consider ways to expand collection of seasonal streams of organics.
  - Continue funding and promoting existing successful pumpkin collection activities.
  - Consider additional promotion of diversion for Christmas trees, wreaths, corn stalks, haybales, and other compostable material used for seasonal decorations.
  - Consider increased funding for the Community Waste Abatement grant program which funds municipal staff time and collection events.
  - Seek to recruit additional municipalities to participate in the programs.
  - Specifically track volumes of seasonal organics to be accounted for in diversion reporting.

- Perform recurring waste characterization studies as required by MPCA to track progress towards waste diversion goals.

- Consider offering favorable long-term leasing of County property to composting or anaerobic digestion facilities to encourage development of organics management capacity.

10.0 CONCLUSIONS

Collection of organics in a separate, dedicated cart is the most favorable scenario for organics processing and timely implementation. Organized collection greatly increases the efficiency of any hauling system but can be a challenge in existing markets. Throughout Dakota County, there is no existing hauler market for organics collection, so now at the beginning of program development is the most favorable time to implement organized collection for organics. Switching to EOW trash collection can have several potential challenges but can lead to significant cost savings.

Based on the results of the modeled scenarios, rollout of curbside organics collection is estimated to generate around 2,800 to 22,300 TPY of SSOM. The estimated capacities of 12,500 TPY SSOM at SET and 13,000 TPY SSOM at SMSC indicate an estimated total of 25,500 TPY SSOM composting capacity available in the region; note, however, that other organics generators will likely be competing for this capacity. The County and/or individual municipalities should seek agreements for access to composting capacity while it remains available.

To facilitate the timely establishment of economically and environmentally successful organics collection programs, the County can consider the following strategies:

- Continue to provide the current amount of support for the development of private organics collection, transfer, and processing operations while providing public education and outreach about organics collection.

- Review current staffing and determine additional needs to fulfill education, outreach, and enforcement activities for a new service.

- Promote use of a separate dedicated cart for weekly curbside organics collection and reduction of trash collection to EOW to offset costs of the new organics collection route.

- Encourage cities to consider organized collection of organics where possible to maximize participation and reduce costs, GHG emissions, and roadway mileage.

- Advocate for an "opt-in" approach to curbside organics service to reduce contamination and cart misuse.

- Maintain current drop sites and consider locations for additional drop sites to provide access to: rural and multifamily residents who will not be mandated to have to curbside service, small businesses, and/or residents with overflow events.

- Monitor drop site usage following curbside collection rollout to evaluate level of use and effectiveness of locations.

- Develop a new hauler licensing provision that curbside organics collection service be available to residential customers.

- Facilitate conversations with local composters to discuss processing capacity agreements and best practices for compostable packaging and contamination.

- Provide cities with technical assistance on related needs for program rollout such as contract language, procurement and legal requirements, and public engagement materials.

- Review County and Minnesota Composting Council (MNCC) guidance on organics program terminology and educate County and city staff for consistent messaging to avoid confusion during rollout and potential contract negotiations with haulers.

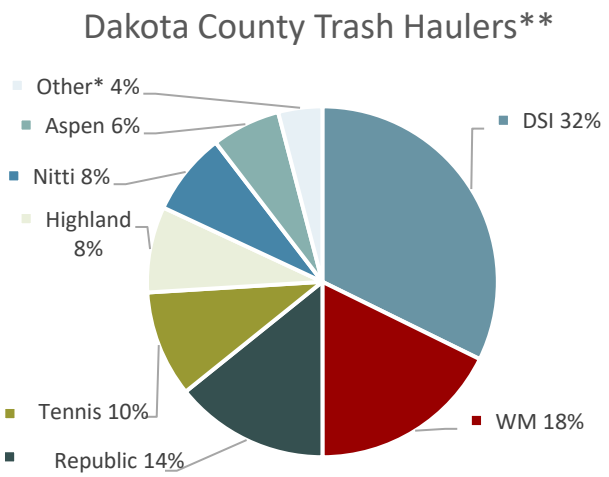
- Establish a grant program for cities to provide financial support for administrative, enforcement, and/or outreach staff time associated with organized collection programs.

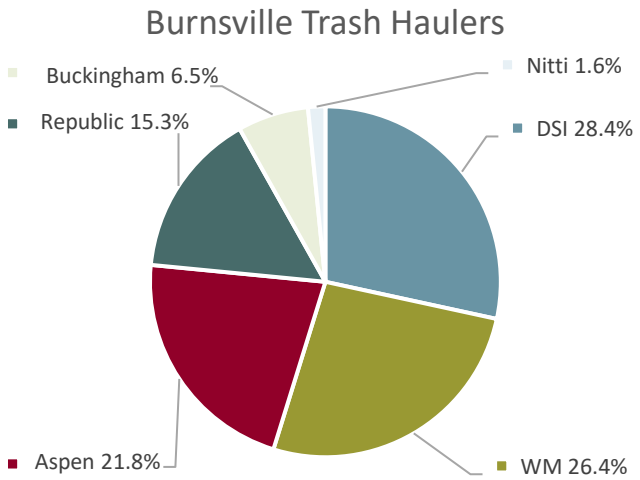
Many of the above recommendations are also identified as optional strategies for TCMA counties in the MPCA Solid Waste Policy Plan. The County is advised to begin public engagement around the new service requirements as soon as possible and may benefit from assisting interested communities with early program rollout.

Appendix A

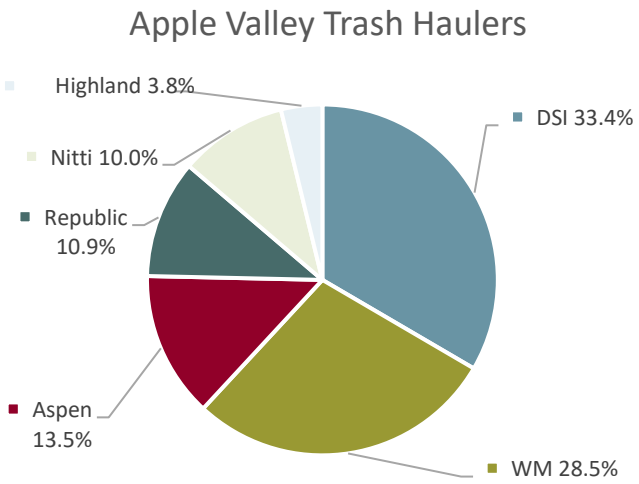
Trash Hauler Market Shares by Municipality

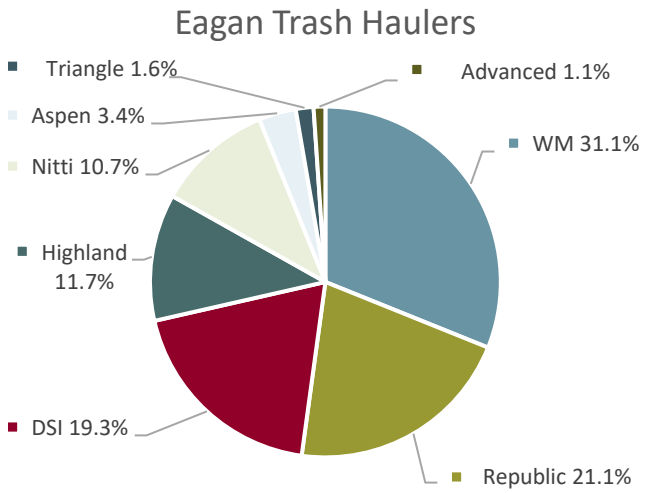
Appendix A
Trash Hauler Market Shares by Municipality
Organics Collection Analysis Report





*Other: Buckingham's, IGS, Triangle, Advanced (now GFL)
**Only includes 15 municipalities modeled for this report.





Data obtained from 2022 SCORE reported tonnage.

Appendix A
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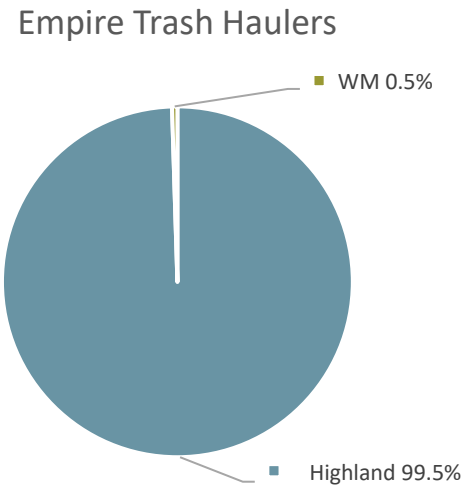
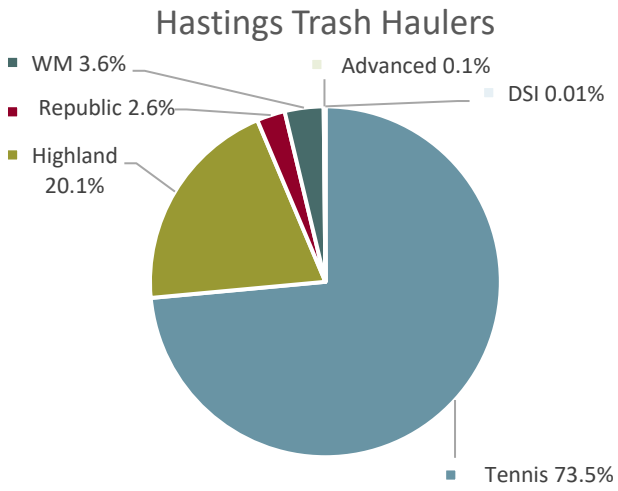
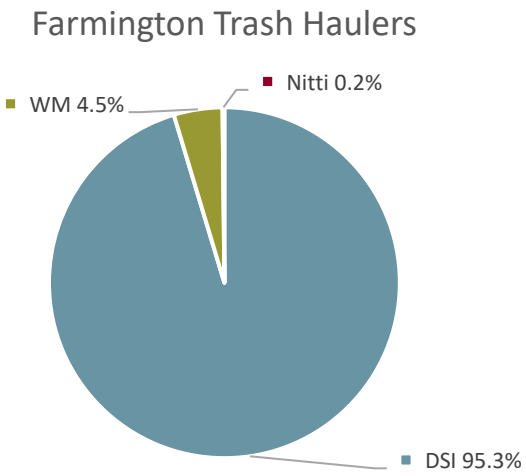
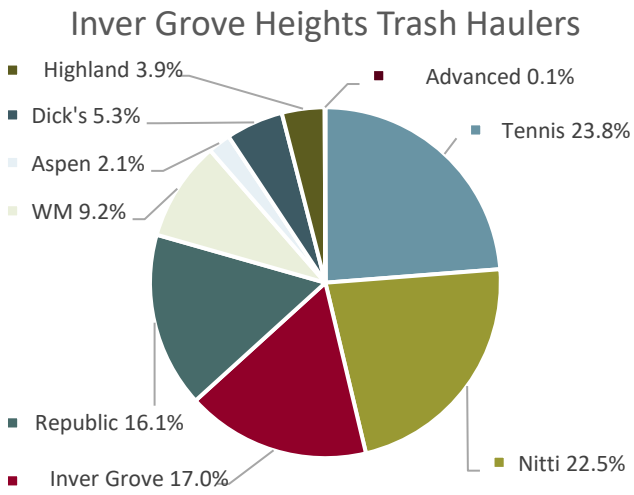
Organics Collection Analysis Report









Data obtained from 2022 SCORE reported tonnage.

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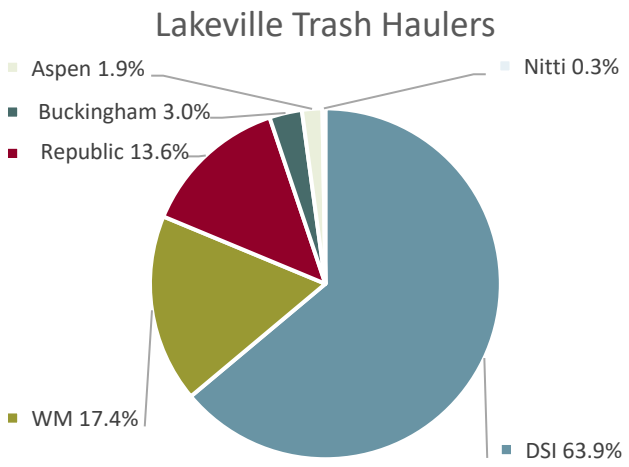

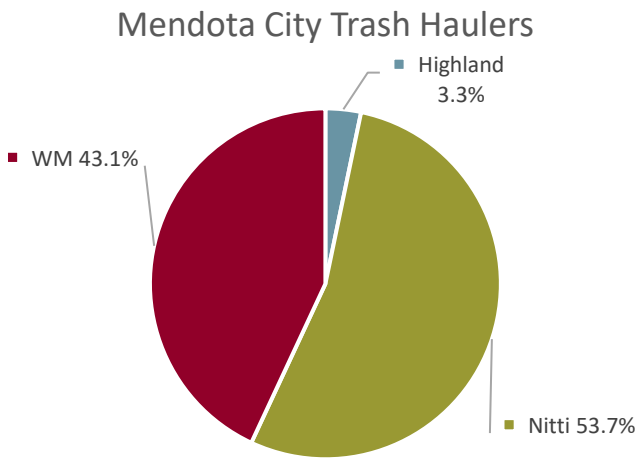

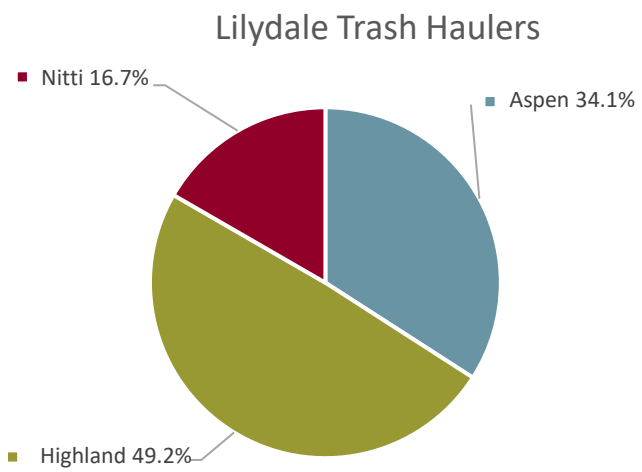

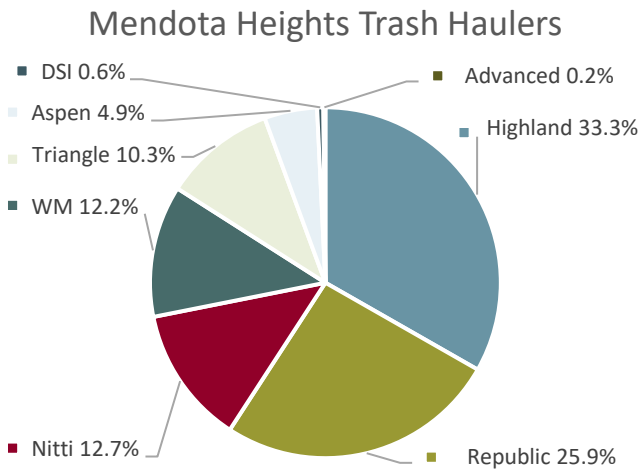

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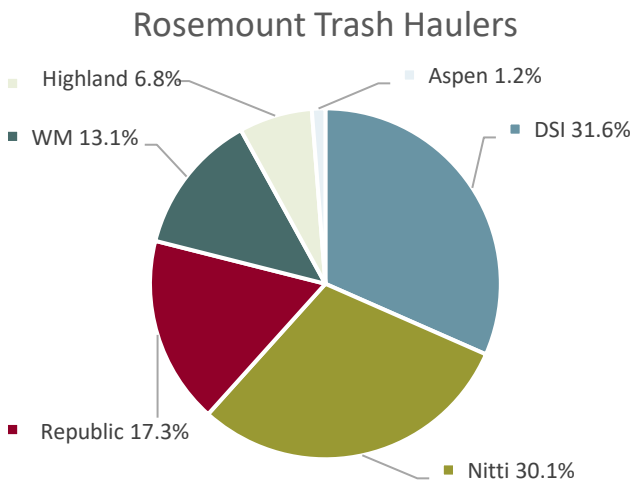
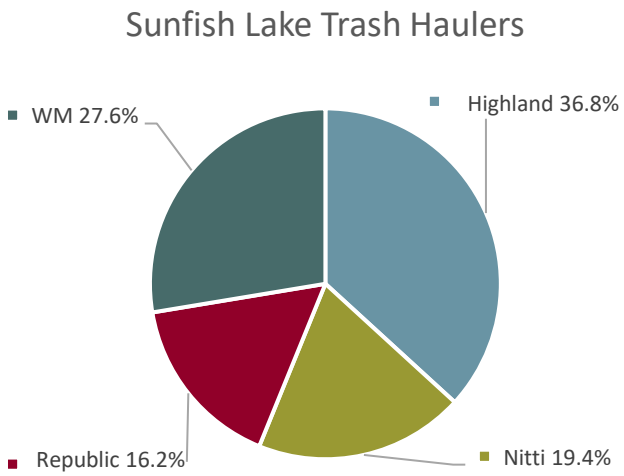
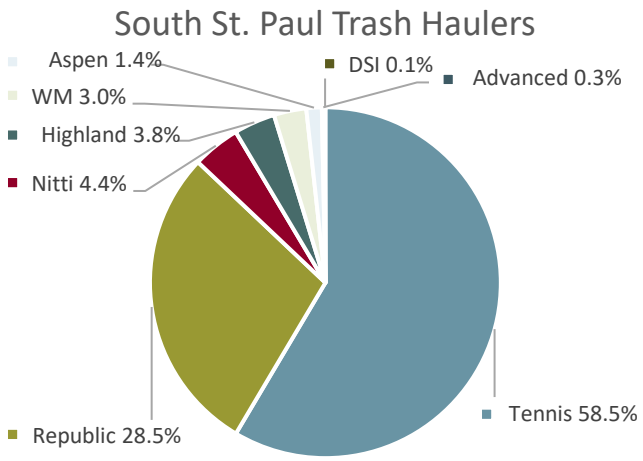
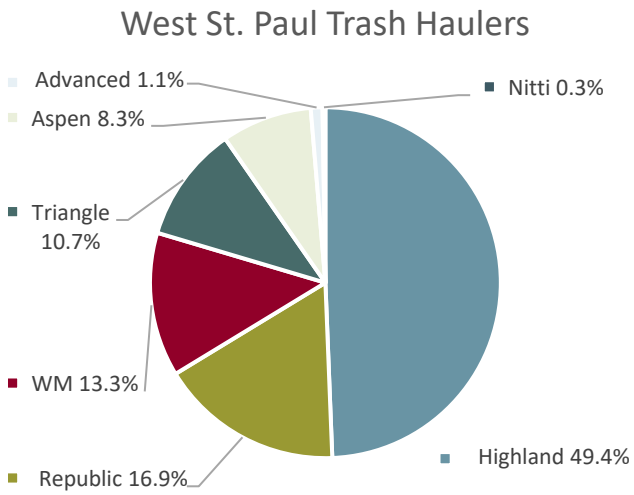
Organics Collection Analysis Report







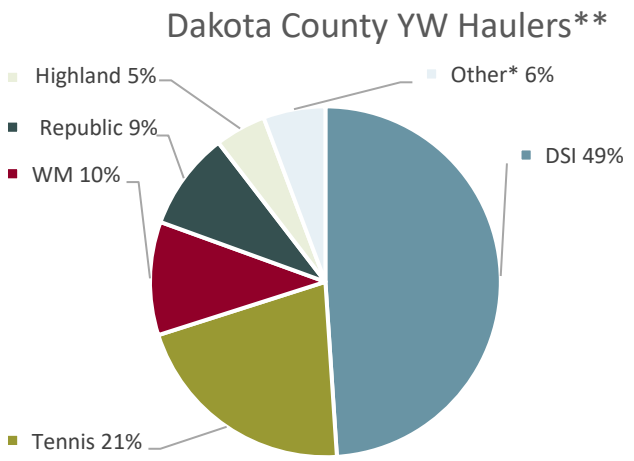


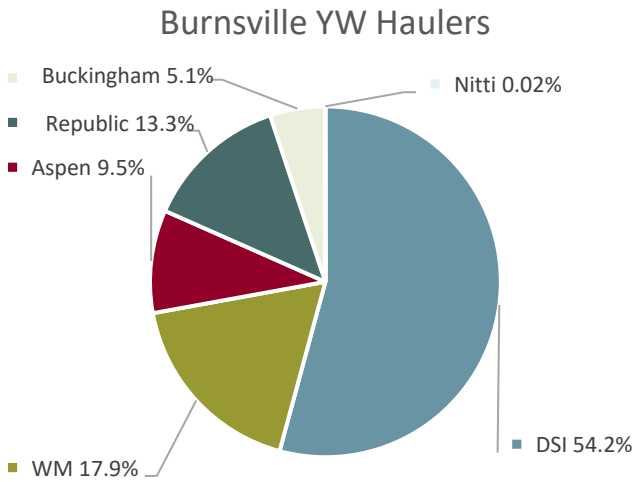
Data obtained from 2022 SCORE reported tonnage.

Appendix B

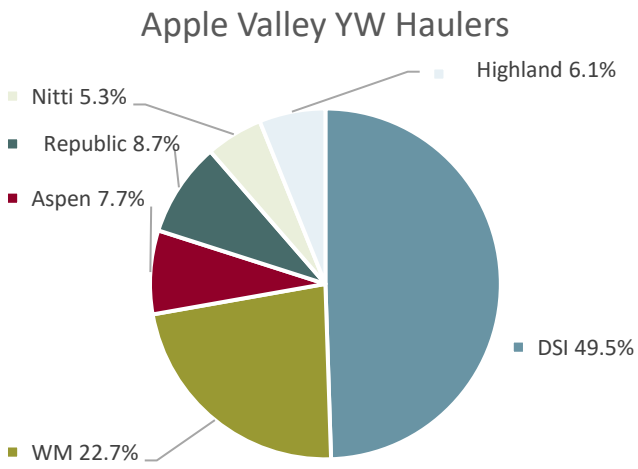
Yard Waste Hauler Market Shares by Municipality

Appendix B
Yard Waste Hauler Market Shares by Municipality
Organics Collection Analysis Report





*Other: Aspen, Nitti, Buckingham, IGS
**Only includes 15 municipalities modeled for this report.

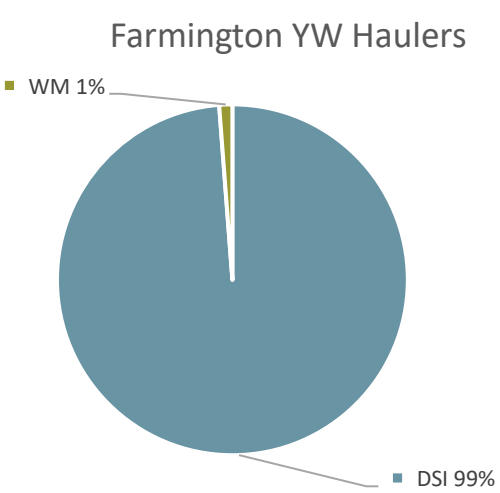


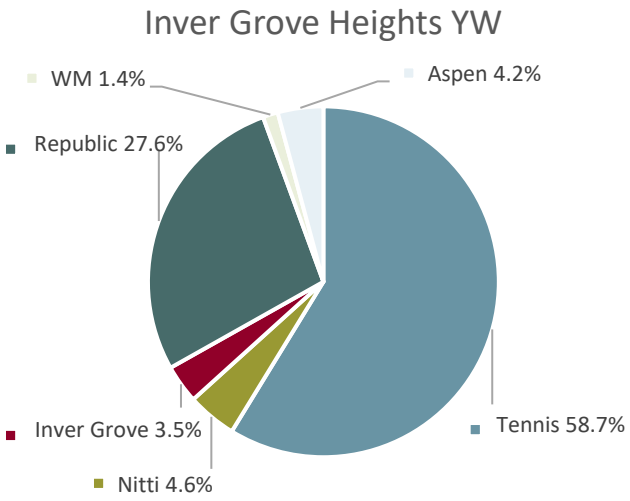
Eagan YW Haulers*

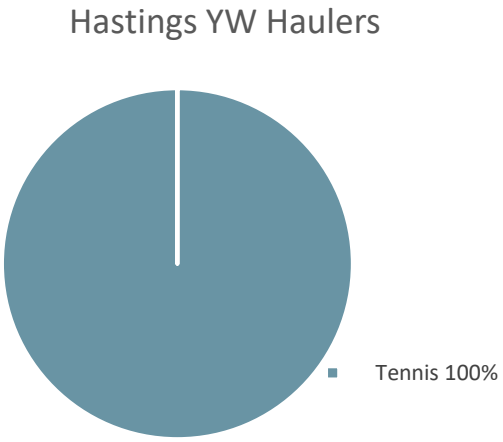
*YW was collected but no data for Eagan was available due to a reporting error.

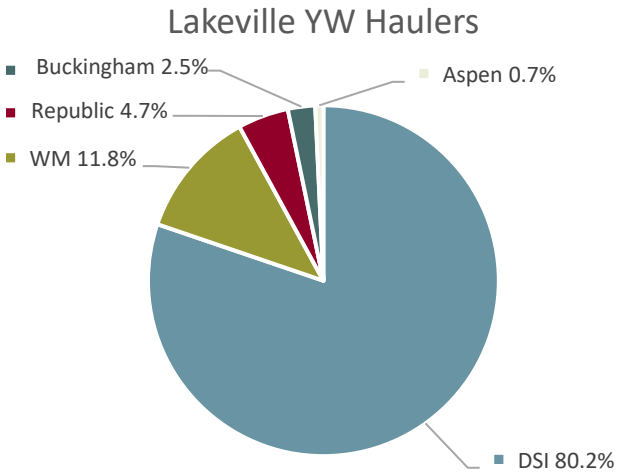
Data obtained from 2022 SCORE reported tonnage.

Appendix B
Yard Waste Hauler Market Shares by Municipality
Organics Collection Analysis Report









Data obtained from 2022 SCORE reported tonnage.

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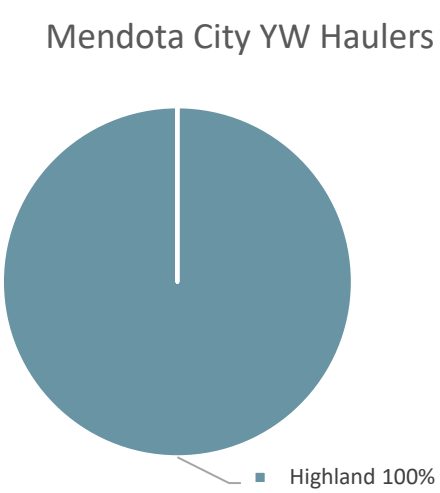

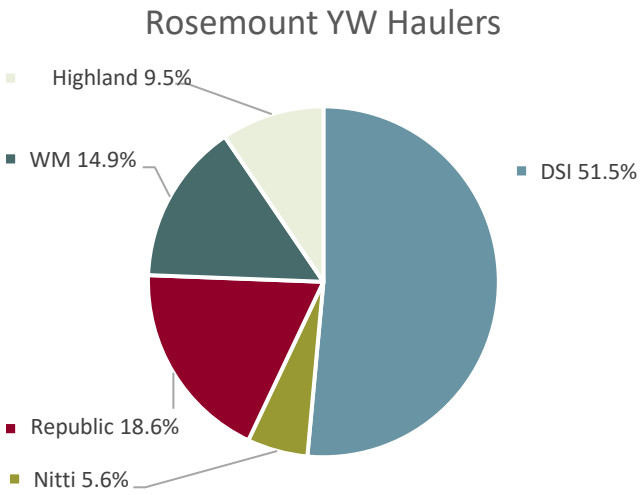

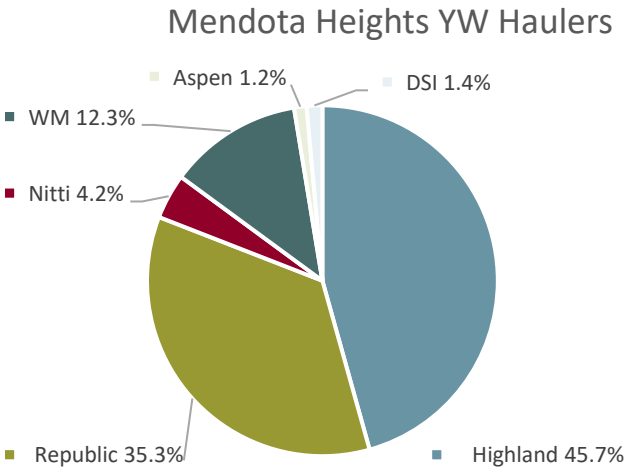

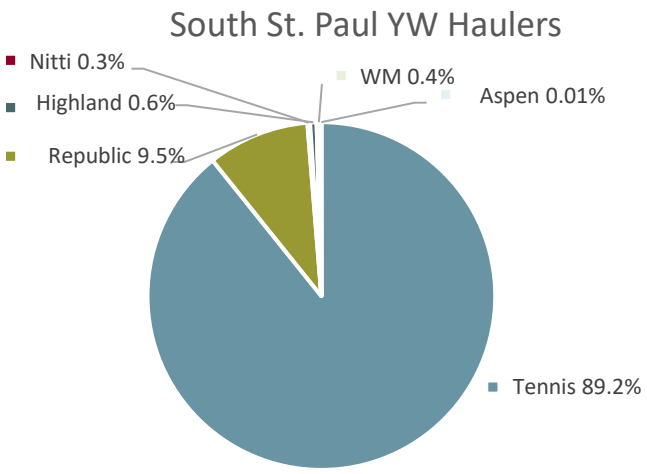

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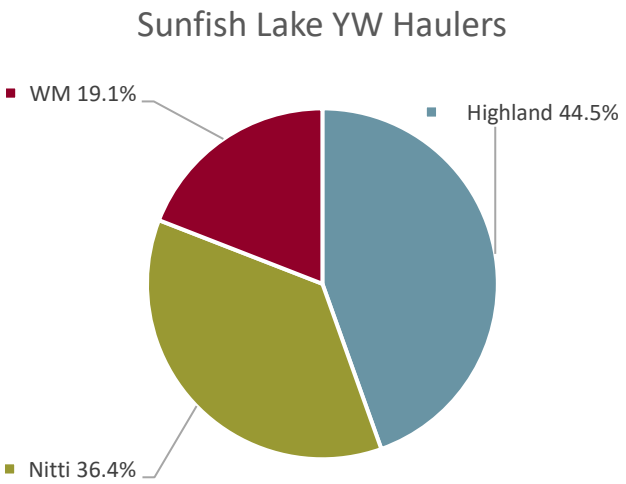
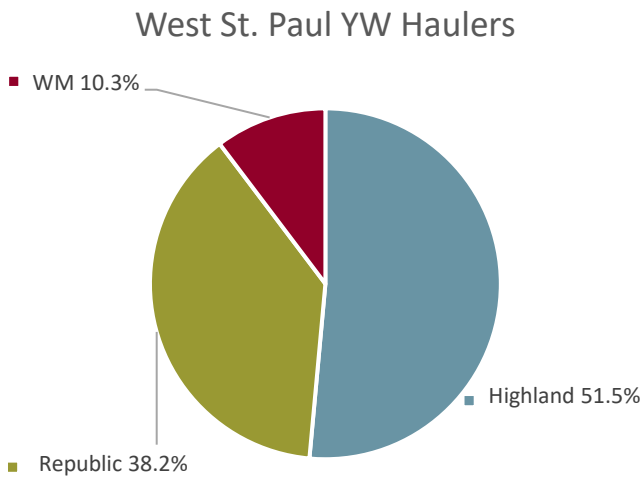




Data obtained from 2022 SCORE reported tonnage.

Appendix C

Modeling Scenarios and Results Summary

Appendix C
Modeling Scenarios and Results Summary
Organics Collection Analysis Report

With Assumed Participation Rate Factors Applied

Scenario Acronym (Report)	Food Waste In	YW In	Gray Cart	Yard Waste Cart	Green Cart	YW Signup	Green Signup	DCB Signup	Drop Off Freq.	Drop Off Signup	Food Waste Capture per Part. HH	Gray Cart To	Yard Waste Cart To	Green Cart To
Base	gray	YW	95-gal	95-gal	n/a	50%	n/a	n/a	n/a	n/a	n/a	LF	YW Comp.	n/a
SC, Op/Op, W	green	YW	95-gal	95-gal	35-gal	50%	20%	n/a	n/a	n/a	100%	LF	YW Comp.	SET
SC, Ozd/Op, W	green	YW	95-gal	95-gal	35-gal	50%	50%	n/a	n/a	n/a	100%	LF	YW Comp.	SET
SC, Ozd/Ozd, W	green	YW	95-gal	95-gal	35-gal	50%	50%	n/a	n/a	n/a	100%	LF	YW Comp.	SET
SC, Op/Op, EOW	green	YW	95-gal	95-gal	35-gal	50%	20%	n/a	n/a	n/a	100%	LF	YW Comp.	SET
SC, Ozd/Op, EOW	green	YW	95-gal	95-gal	35-gal	50%	50%	n/a	n/a	n/a	100%	LF	YW Comp.	SET
SC, Ozd/Ozd, EOW	green	YW	95-gal	95-gal	35-gal	50%	50%	n/a	n/a	n/a	100%	LF	YW Comp.	SET
CoT, Op, W	DCB, gray	YW	95-gal	95-gal	n/a	50%	n/a	40%	n/a	n/a	100%	Sort	YW Comp.	n/a
CoT, Ozd, W	DCB, gray	YW	95-gal	95-gal	n/a	50%	n/a	40%	n/a	n/a	100%	Sort	YW Comp.	n/a
YW, Op, W	green	green	95-gal	n/a	95-gal	0%	100%	n/a	n/a	n/a	20%	LF	n/a	SET
YW, Ozd, W	green	green	95-gal	n/a	95-gal	0%	100%	n/a	n/a	n/a	50%	LF	n/a	SET
Drop Site	Drop Site	YW	95-gal	95-gal	n/a	50%	n/a	n/a	weekly	10%	100%	LF	YW Comp.	n/a

Notes:

1) *Abbreviations: YW = Yard Waste; Freq. = Frequency; Part. = Participating; Sort = Sorting Facility; Comp. = Composting Facility.*
2) *See **Table 7** and **Section 6.2** of the report for scenario acronyms and details.*
3) *The modeling results for these scenarios are included in **Section 7.***
4) *All cart types are picked up weekly in all scenarios except for trash carts in separate cart collection scenarios with EOW trash.*
5) *Recovery of DCBs in co-collection scenarios is assumed to be 90%.*

Appendix C
Modeling Scenarios and Results Summary
Organics Collection Analysis Report

Assuming 100% Participation

Scenario Acronym (Full Diversion)	Food Waste In	YW In	Gray Cart	Yard Waste Cart	Green Cart	YW Signup	Green Signup	DCB Signup	Drop Off Freq.	Drop Off Signup	Food Waste Capture per Part. HH	Gray Cart To	Yard Waste Cart To	Green Cart To
Base	gray	YW	95-gal	95-gal	n/a	50%	n/a	n/a	n/a	n/a	n/a	LF	YW Comp.	n/a
SC, Op/Op, W	green	YW	95-gal	95-gal	35-gal	50%	100%	n/a	n/a	n/a	100%	LF	YW Comp.	SET
SC, Ozd/Op, W	green	YW	95-gal	95-gal	35-gal	50%	100%	n/a	n/a	n/a	100%	LF	YW Comp.	SET
SC, Ozd/Ozd, W	green	YW	95-gal	95-gal	35-gal	50%	100%	n/a	n/a	n/a	100%	LF	YW Comp.	SET
SC, Op/Op, EOW	green	YW	95-gal	95-gal	35-gal	50%	100%	n/a	n/a	n/a	100%	LF	YW Comp.	SET
SC, Ozd/Op, EOW	green	YW	95-gal	95-gal	35-gal	50%	100%	n/a	n/a	n/a	100%	LF	YW Comp.	SET
SC, Ozd/Ozd, EOW	green	YW	95-gal	95-gal	35-gal	50%	100%	n/a	n/a	n/a	100%	LF	YW Comp.	SET
CoT, Op, W	DCB, gray	YW	95-gal	95-gal	n/a	50%	n/a	100%	n/a	n/a	100%	Sort	YW Comp.	n/a
CoT, Ozd, W	DCB, gray	YW	95-gal	95-gal	n/a	50%	n/a	100%	n/a	n/a	100%	Sort	YW Comp.	n/a
YW, Op, W	green	green	95-gal	n/a	95-gal	0%	100%	n/a	n/a	n/a	100%	LF	n/a	SET
YW, Ozd, W	green	green	95-gal	n/a	95-gal	0%	100%	n/a	n/a	n/a	100%	LF	n/a	SET
Drop Site	Drop Site	YW	95-gal	95-gal	n/a	50%	n/a	n/a	weekly	10%	100%	LF	YW Comp.	n/a

Notes:

1) *Abbreviations: YW = Yard Waste; Freq. = Frequency; Part. = Participating; Sort = Sorting Facility; Comp. = Composting Facility.*
2) *See **Table 7** and **Section 6.2** of the report for scenario acronyms and details.*
3) *The modeling results for these scenarios are included in **Appendix E.***
4) *All cart types are picked up weekly in all scenarios except for trash carts in separate cart collection scenarios with EOW trash.*
5) *Recovery of DCBs in co-collection scenarios is assumed to be 90%.*

Report Diversion Summary	Unit	Base	SC, Op/Op, W
Cost per HH (annual)	$/HH/yr	$ 338.48	$ 413.46
Net Cost per HH (annual)	$/HH/yr	$ -	$ 74.98
Cost per HH (monthly)	$/HH/mo	$ 28.21	$ 34.45
Net Cost per HH (monthly)	$/HH/mo	$ -	$ 6.25
Total Program Cost	$/yr	$ 45,314,582	$ 55,352,901
Net Cost per Diversion	$/ton	no diversion	$ 3,551.66
Diversion	tons/yr	0	2826
Net Cost per GHG Reduction	$/MTCO2e	no diversion	$ 3,312.73
Net Road Miles	miles/yr	0	301,341
Total Road Miles	miles/yr	3,640,291	3,941,632
Net Collection FTEs	FTE/event	0	42
Total FTEs	FTE/event	104	146
Gray Trucks	trucks/event	69	68
YW Trucks	trucks/event	35	35
Green Trucks	trucks/event	0	43
DS Trucks	trucks/event	0	0
Total Trucks Per Collection Event	trucks/event	104	146
Net Gray Trucks	trucks/event	0	-1
Net YW Trucks	trucks/event	0	0
Net Green Trucks	trucks/event	0	43
Net DS Trucks	trucks/event	0	0
Net Trucks Per Collection Event	trucks/event	0	42
Net Collection and Sorting GHG	MTCO2e/yr	0	1214
Net Food Waste Diversion from LF GHG	MTCO2e/yr	0	-4244
Net GHG Emissions	MTCO2e/yr	0	-3030
Total GHG Emissions	MTCO2e/yr	37572	34542
Gray Cart Cost	$/yr	$ 3,202,362	$ 3,202,362
YW Cart Cost	$/yr	$ 1,601,181	$ 1,601,181
Green Cart Cost	$/yr	$ -	$ 400,563
Cart Cost	$/yr	$ 4,803,543	$ 5,204,106
Collection Trucks Cost	$/yr	$ 6,973,658	$ 9,536,324
Collection Fuel Cost	$/yr	$ 5,712,235	$ 6,185,091
Collection Labor Cost	$/yr	$ 15,373,054	$ 22,313,038
Primary Tipping Cost	S/yr	$ 12,452,093	$ 12,114,342
DCBs Cost	$/yr	$ -	$ -
Secondary Tip/Transfer/Process Cost	$/yr	$ -	$ -
DS Infrastructure Cost	$/yr	$ -	$ -
GRAND TOTAL Collection Cost	$/yr	$ 45,314,582	$ 55,352,901
Net Cart Cost	$/yr	$ -	$ 400,563
Net Trucks Cost	$/yr	$ -	$ 2,562,667
Net Collection Fuel Cost	$/yr	$ -	$ 472,856
Net Collection Labor Cost	$/yr	$ -	$ 6,939,984
Net Primary Tipping Cost	$/yr	$ -	$ (337,751)
Net DCBs Cost	$/yr	$ -	$ -
Net Secondary Tip/Transfer/Process Cost	$/yr	$ -	$ -
Net DS Infrastructure Cost	$/yr	$ -	$ -
Net GRAND TOTAL Collection Cost	$/yr	$ -	$ 10,038,319

Report Diversion Summary	Unit	SC, Ozd/Op, W	SC, Ozd/Ozd, W
Cost per HH (annual)	$/HH/yr	$ 385.26	$ 338.45
Net Cost per HH (annual)	$/HH/yr	$ 46.79	$ (0.03)
Cost per HH (monthly)	$/HH/mo	$ 32.11	$ 28.20
Net Cost per HH (monthly)	$/HH/mo	$ 3.90	$ (0.00)
Total Program Cost	$/yr	$ 51,578,285	$ 45,310,560
Net Cost per Diversion	$/ton	$ 886.47	$ (0.57)
Diversion	tons/yr	7066	7066
Net Cost per GHG Reduction	$/MTCO2e	$ 653.50	$ (0.38)
Net Road Miles	miles/yr	154,496	-101,017
Total Road Miles	miles/yr	3,794,786	3,539,274
Net Collection FTEs	FTE/event	26	-3
Total FTEs	FTE/event	130	101
Gray Trucks	trucks/event	67	50
YW Trucks	trucks/event	35	22
Green Trucks	trucks/event	28	28
DS Trucks	trucks/event	0	0
Total Trucks Per Collection Event	trucks/event	130	101
Net Gray Trucks	trucks/event	-2	-19
Net YW Trucks	trucks/event	0	-13
Net Green Trucks	trucks/event	28	28
Net DS Trucks	trucks/event	0	0
Net Trucks Per Collection Event	trucks/event	26	-3
Net Collection and Sorting GHG	MTCO2e/yr	622	-407
Net Food Waste Diversion from LF GHG	MTCO2e/yr	-10207	-10207
Net GHG Emissions	MTCO2e/yr	-9585	-10614
Total GHG Emissions	MTCO2e/yr	27987	26958
Gray Cart Cost	$/yr	$ 3,202,362	$ 3,202,362
YW Cart Cost	$/yr	$ 1,601,181	$ 1,601,181
Green Cart Cost	$/yr	$ 1,001,407	$ 1,001,407
Cart Cost	$/yr	$ 5,804,950	$ 5,804,950
Collection Trucks Cost	$/yr	$ 8,550,496	$ 6,771,919
Collection Fuel Cost	$/yr	$ 5,954,665	$ 5,553,722
Collection Labor Cost	$/yr	$ 19,660,459	$ 15,572,255
Primary Tipping Cost	S/yr	$ 11,607,715	$ 11,607,715
DCBs Cost	$/yr	$ -	$ -
Secondary Tip/Transfer/Process Cost	$/yr	$ -	$ -
DS Infrastructure Cost	$/yr	$ -	$ -
GRAND TOTAL Collection Cost	$/yr	$ 51,578,285	$ 45,310,560
Net Cart Cost	$/yr	$ 1,001,407	$ 1,001,407
Net Trucks Cost	$/yr	$ 1,576,838	$ (201,739)
Net Collection Fuel Cost	$/yr	$ 242,430	$ (158,513)
Net Collection Labor Cost	$/yr	$ 4,287,405	$ 199,201
Net Primary Tipping Cost	$/yr	$ (844,378)	$ (844,378)
Net DCBs Cost	$/yr	$ -	$ -
Net Secondary Tip/Transfer/Process Cost	$/yr	$ -	$ -
Net DS Infrastructure Cost	$/yr	$ -	$ -
Net GRAND TOTAL Collection Cost	$/yr	$ 6,263,703	$ (4,022)

Report Diversion Summary	Unit	SC, Op/Op, EOW	SC, Ozd/Op, EOW
Cost per HH (annual)	$/HH/yr	$ 376.40	$ 348.20
Net Cost per HH (annual)	$/HH/yr	$ 37.92	$ 9.73
Cost per HH (monthly)	$/HH/mo	$ 31.37	$ 29.02
Net Cost per HH (monthly)	$/HH/mo	$ 3.16	$ 0.81
Total Program Cost	$/yr	$ 50,391,178	$ 46,616,562
Net Cost per Diversion	$/ton	$ 1,796.15	$ 184.26
Diversion	tons/yr	2826	7066
Net Cost per GHG Reduction	$/MTCO2e	$ 1,406.61	$ 128.10
Net Road Miles	miles/yr	157,616	10,770
Total Road Miles	miles/yr	3,797,906	3,651,060
Net Collection FTEs	FTE/event	68	51
Total FTEs	FTE/event	172	155
Gray Trucks	trucks/event	47	46
YW Trucks	trucks/event	35	35
Green Trucks	trucks/event	43	28
DS Trucks	trucks/event	0	0
Total Trucks Per Collection Event	trucks/event	125	109
Net Gray Trucks	trucks/event	-22	-23
Net YW Trucks	trucks/event	0	0
Net Green Trucks	trucks/event	43	28
Net DS Trucks	trucks/event	0	0
Net Trucks Per Collection Event	trucks/event	21	5
Net Collection and Sorting GHG	MTCO2e/yr	635	43
Net Food Waste Diversion from LF GHG	MTCO2e/yr	-4244	-10207
Net GHG Emissions	MTCO2e/yr	-3609	-10164
Total GHG Emissions	MTCO2e/yr	33963	27408
Gray Cart Cost	$/yr	$ 3,202,362	$ 3,202,362
YW Cart Cost	$/yr	$ 1,601,181	$ 1,601,181
Green Cart Cost	$/yr	$ 400,563	$ 1,001,407
Cart Cost	$/yr	$ 5,204,106	$ 5,804,950
Collection Trucks Cost	$/yr	$ 8,260,022	$ 7,274,194
Collection Fuel Cost	$/yr	$ 5,959,561	$ 5,729,134
Collection Labor Cost	$/yr	$ 18,853,147	$ 16,200,568
Primary Tipping Cost	S/yr	$ 12,114,342	$ 11,607,715
DCBs Cost	$/yr	$ -	$ -
Secondary Tip/Transfer/Process Cost	$/yr	$ -	$ -
DS Infrastructure Cost	$/yr	$ -	$ -
GRAND TOTAL Collection Cost	$/yr	$ 50,391,178	$ 46,616,562
Net Cart Cost	$/yr	$ 400,563	$ 1,001,407
Net Trucks Cost	$/yr	$ 1,286,365	$ 300,537
Net Collection Fuel Cost	$/yr	$ 247,326	$ 16,899
Net Collection Labor Cost	$/yr	$ 3,480,094	$ 827,514
Net Primary Tipping Cost	$/yr	$ (337,751)	$ (844,378)
Net DCBs Cost	$/yr	$ -	$ -
Net Secondary Tip/Transfer/Process Cost	$/yr	$ -	$ -
Net DS Infrastructure Cost	$/yr	$ -	$ -
Net GRAND TOTAL Collection Cost	$/yr	$ 5,076,596	$ 1,301,980

Report Diversion Summary	Unit	SC, Ozd/Ozd, EOW	CoT, Op, W
Cost per HH (annual)	$/HH/yr	$ 316.13	$ 380.90
Net Cost per HH (annual)	$/HH/yr	$ (22.35)	$ 42.42
Cost per HH (monthly)	$/HH/mo	$ 26.34	$ 31.74
Net Cost per HH (monthly)	$/HH/mo	$ (1.86)	$ 3.53
Total Program Cost	$/yr	$ 42,322,300	$ 50,993,662
Net Cost per Diversion	$/ton	$ (423.48)	$ 1,116.29
Diversion	tons/yr	7066	5087
Net Cost per GHG Reduction	$/MTCO2e	$ (275.66)	$ 1,045.80
Net Road Miles	miles/yr	-160,903	432,826
Total Road Miles	miles/yr	3,479,388	4,073,117
Net Collection FTEs	FTE/event	22	3
Total FTEs	FTE/event	126	108
Gray Trucks	trucks/event	38	72
YW Trucks	trucks/event	22	35
Green Trucks	trucks/event	28	0
DS Trucks	trucks/event	0	0
Total Trucks Per Collection Event	trucks/event	88	108
Net Gray Trucks	trucks/event	-31	3
Net YW Trucks	trucks/event	-13	0
Net Green Trucks	trucks/event	28	0
Net DS Trucks	trucks/event	0	0
Net Trucks Per Collection Event	trucks/event	-16	3
Net Collection and Sorting GHG	MTCO2e/yr	-648	2054
Net Food Waste Diversion from LF GHG	MTCO2e/yr	-10207	-7484
Net GHG Emissions	MTCO2e/yr	-10855	-5430
Total GHG Emissions	MTCO2e/yr	26717	32142
Gray Cart Cost	$/yr	$ 3,202,362	$ 3,202,362
YW Cart Cost	$/yr	$ 1,601,181	$ 1,601,181
Green Cart Cost	$/yr	$ 1,001,407	$ -
Cart Cost	$/yr	$ 5,804,950	$ 4,803,543
Collection Trucks Cost	$/yr	$ 5,996,078	$ 7,259,529
Collection Fuel Cost	$/yr	$ 5,459,751	$ 6,331,415
Collection Labor Cost	$/yr	$ 13,453,806	$ 15,947,004
Primary Tipping Cost	S/yr	$ 11,607,715	$ 9,922,812
DCBs Cost	$/yr	$ -	$ 1,670,797
Secondary Tip/Transfer/Process Cost	$/yr	$ -	$ 5,058,562
DS Infrastructure Cost	$/yr	$ -	$ -
GRAND TOTAL Collection Cost	$/yr	$ 42,322,300	$ 50,993,662
Net Cart Cost	$/yr	$ 1,001,407	$ -
Net Trucks Cost	$/yr	$ (977,580)	$ 285,871
Net Collection Fuel Cost	$/yr	$ (252,484)	$ 619,180
Net Collection Labor Cost	$/yr	$ (1,919,248)	$ 573,950
Net Primary Tipping Cost	$/yr	$ (844,378)	$ (2,529,281)
Net DCBs Cost	$/yr	$ -	$ 1,670,797
Net Secondary Tip/Transfer/Process Cost	$/yr	$ -	$ 5,058,562
Net DS Infrastructure Cost	$/yr	$ -	$ -
Net GRAND TOTAL Collection Cost	$/yr	$ (2,992,282)	$ 5,679,080

Report Diversion Summary	Unit	CoT, Ozd, W	YW, Op, W
Cost per HH (annual)	$/HH/yr	$ 334.08	$ 369.42
Net Cost per HH (annual)	$/HH/yr	$ (4.40)	$ 30.95
Cost per HH (monthly)	$/HH/mo	$ 27.84	$ 30.79
Net Cost per HH (monthly)	$/HH/mo	$ (0.37)	$ 2.58
Total Program Cost	$/yr	$ 44,725,938	$ 49,457,839
Net Cost per Diversion	$/ton	$ (115.70)	$ 1,465.93
Diversion	tons/yr	5087	2826
Net Cost per GHG Reduction	$/MTCO2e	$ (91.13)	$ 1,859.72
Net Road Miles	miles/yr	177,314	500,547
Total Road Miles	miles/yr	3,817,604	4,140,838
Net Collection FTEs	FTE/event	-25	12
Total FTEs	FTE/event	79	117
Gray Trucks	trucks/event	56	68
YW Trucks	trucks/event	22	0
Green Trucks	trucks/event	0	49
DS Trucks	trucks/event	0	0
Total Trucks Per Collection Event	trucks/event	79	117
Net Gray Trucks	trucks/event	-13	-1
Net YW Trucks	trucks/event	-13	-35
Net Green Trucks	trucks/event	0	49
Net DS Trucks	trucks/event	0	0
Net Trucks Per Collection Event	trucks/event	-25	12
Net Collection and Sorting GHG	MTCO2e/yr	1025	2016
Net Food Waste Diversion from LF GHG	MTCO2e/yr	-7484	-4244
Net GHG Emissions	MTCO2e/yr	-6459	-2228
Total GHG Emissions	MTCO2e/yr	31112	35344
Gray Cart Cost	$/yr	$ 3,202,362	$ 3,202,362
YW Cart Cost	$/yr	$ 1,601,181	$ -
Green Cart Cost	$/yr	$ -	$ 640,472
Cart Cost	$/yr	$ 4,803,543	$ 3,842,834
Collection Trucks Cost	$/yr	$ 5,480,952	$ 7,819,858
Collection Fuel Cost	$/yr	$ 5,930,472	$ 6,497,678
Collection Labor Cost	$/yr	$ 11,858,800	$ 19,390,289
Primary Tipping Cost	S/yr	$ 9,922,812	$ 11,907,180
DCBs Cost	$/yr	$ 1,670,797	$ -
Secondary Tip/Transfer/Process Cost	$/yr	$ 5,058,562	$ -
DS Infrastructure Cost	$/yr	$ -	$ -
GRAND TOTAL Collection Cost	$/yr	$ 44,725,938	$ 49,457,839
Net Cart Cost	$/yr	$ -	$ (960,709)
Net Trucks Cost	$/yr	$ (1,492,706)	$ 846,200
Net Collection Fuel Cost	$/yr	$ 218,237	$ 785,443
Net Collection Labor Cost	$/yr	$ (3,514,254)	$ 4,017,235
Net Primary Tipping Cost	$/yr	$ (2,529,281)	$ (544,913)
Net DCBs Cost	$/yr	$ 1,670,797	$ -
Net Secondary Tip/Transfer/Process Cost	$/yr	$ 5,058,562	$ -
Net DS Infrastructure Cost	$/yr	$ -	$ -
Net GRAND TOTAL Collection Cost	$/yr	$ (588,645)	$ 4,143,257

Report Diversion Summary	Unit	YW, Ozd, W	Drop Site
Cost per HH (annual)	$/HH/yr	$ 314.44	$ 342.15
Net Cost per HH (annual)	$/HH/yr	$ (24.04)	$ 3.67
Cost per HH (monthly)	$/HH/mo	$ 26.20	$ 28.51
Net Cost per HH (monthly)	$/HH/mo	$ (2.00)	$ 0.31
Total Program Cost	$/yr	$ 42,096,162	$ 45,806,308
Net Cost per Diversion	$/ton	$ (455.48)	$ 347.96
Diversion	tons/yr	7066	1413
Net Cost per GHG Reduction	$/MTCO2e	$ (340.29)	$ 208.71
Net Road Miles	miles/yr	186,021	3,442,695
Total Road Miles	miles/yr	3,826,312	7,082,985
Net Collection FTEs	FTE/event	-20	0
Total FTEs	FTE/event	84	104
Gray Trucks	trucks/event	50	68
YW Trucks	trucks/event	0	35
Green Trucks	trucks/event	34	0
DS Trucks	trucks/event	0	0.64
Total Trucks Per Collection Event	trucks/event	84	104
Net Gray Trucks	trucks/event	-19	0
Net YW Trucks	trucks/event	-35	0
Net Green Trucks	trucks/event	34	0
Net DS Trucks	trucks/event	0	1
Net Trucks Per Collection Event	trucks/event	-20	0
Net Collection and Sorting GHG	MTCO2e/yr	749	1011
Net Food Waste Diversion from LF GHG	MTCO2e/yr	-10207	-2149
Net GHG Emissions	MTCO2e/yr	-9458	-2356
Total GHG Emissions	MTCO2e/yr	28114	35216
Gray Cart Cost	$/yr	$ 3,202,362	$ 3,202,362
YW Cart Cost	$/yr	$ -	$ 1,601,181
Green Cart Cost	$/yr	$ 1,601,181	$ -
Cart Cost	$/yr	$ 4,803,543	$ 4,803,543
Collection Trucks Cost	$/yr	$ 5,833,108	$ 6,975,618
Collection Fuel Cost	$/yr	$ 6,004,133	$ 6,128,494
Collection Labor Cost	$/yr	$ 14,054,826	$ 15,399,642
Primary Tipping Cost	S/yr	$ 11,400,553	$ 12,283,217
DCBs Cost	$/yr	$ -	$ -
Secondary Tip/Transfer/Process Cost	$/yr	$ -	$ -
DS Infrastructure Cost	$/yr	$ -	$ 215,793
GRAND TOTAL Collection Cost	$/yr	$ 42,096,162	$ 45,806,308
Net Cart Cost	$/yr	$ -	$ -
Net Trucks Cost	$/yr	$ (1,140,550)	$ 1,961
Net Collection Fuel Cost	$/yr	$ 291,898	$ 416,259
Net Collection Labor Cost	$/yr	$ (1,318,228)	$ 26,589
Net Primary Tipping Cost	$/yr	$ (1,051,540)	$ (168,876)
Net DCBs Cost	$/yr	$ -	$ -
Net Secondary Tip/Transfer/Process Cost	$/yr	$ -	$ -
Net DS Infrastructure Cost	$/yr	$ -	$ 215,793
Net GRAND TOTAL Collection Cost	$/yr	$ (3,218,420)	$ 491,726

Appendix E Full Diversion Summary	Unit	Base	SC, Op/Op, W
Cost per HH (annual)	$/HH/yr	$ 338.48	$ 416.89
Net Cost per HH (annual)	$/HH/yr	$ -	$ 78.41
Cost per HH (monthly)	$/HH/mo	$ 28.21	$ 34.74
Net Cost per HH (monthly)	$/HH/mo	$ -	$ 6.53
Total Program Cost	$/yr	$ 45,314,582	$ 55,812,391
Net Cost per Diversion	$/ton	no diversion	$ 742.85
Diversion	tons/yr	0	14132
Net Cost per GHG Reduction	$/MTCO2e	$ -	$ 595.31
Net Road Miles	miles/yr	0	356,900
Total Road Miles	miles/yr	3,640,291	3,997,191
Net Collection FTEs	FTE/event	0	42
Total FTEs	FTE/event	104	146
Gray Trucks	trucks/event	69	64
YW Trucks	trucks/event	35	35
Green Trucks	trucks/event	0	47
DS Trucks	trucks/event	0	0
Total Trucks Per Collection Event	trucks/event	104	146
Net Gray Trucks	trucks/event	0	-5
Net YW Trucks	trucks/event	0	0
Net Green Trucks	trucks/event	0	47
Net DS Trucks	trucks/event	0	0
Net Trucks Per Collection Event	trucks/event	0	42
Net Collection and Sorting GHG	MTCO2e/yr	0	1437
Net Food Waste Diversion from LF GHG	MTCO2e/yr	0	-19072
Net GHG Emissions	MTCO2e/yr	0	-17634
Total GHG Emissions	MTCO2e/yr	37572	19938
Gray Cart Cost	$/yr	$ 3,202,362	$ 3,202,362
YW Cart Cost	$/yr	$ 1,601,181	$ 1,601,181
Green Cart Cost	$/yr	$ -	$ 2,002,815
Cart Cost	$/yr	$ 4,803,543	$ 6,806,358
Collection Trucks Cost	$/yr	$ 6,973,658	$ 9,576,575
Collection Fuel Cost	$/yr	$ 5,712,235	$ 6,272,271
Collection Labor Cost	$/yr	$ 15,373,054	$ 22,393,850
Primary Tipping Cost	S/yr	$ 12,452,093	$ 10,763,336
DCBs Cost	$/yr	$ -	$ -
Secondary Tip/Transfer/Process Cost	$/yr	$ -	$ -
DS Infrastructure Cost	$/yr	$ -	$ -
GRAND TOTAL Collection Cost	$/yr	$ 45,314,582	$ 55,812,391
Net Cart Cost	$/yr	$ -	$ 2,002,815
Net Trucks Cost	$/yr	$ -	$ 2,602,917
Net Collection Fuel Cost	$/yr	$ -	$ 560,036
Net Collection Labor Cost	$/yr	$ -	$ 7,020,797
Net Primary Tipping Cost	$/yr	$ -	$ (1,688,757)
Net DCBs Cost	$/yr	$ -	$ -
Net Secondary Tip/Transfer/Process Cost	$/yr	$ -	$ -
Net DS Infrastructure Cost	$/yr	$ -	$ -
Net GRAND TOTAL Collection Cost	$/yr	$ -	$ 10,497,809

Appendix E Full Diversion Summary	Unit	SC, Ozd/Op, W	SC, Ozd/Ozd, W
Cost per HH (annual)	$/HH/yr	$ 379.83	$ 399.62
Net Cost per HH (annual)	$/HH/yr	$ 41.35	$ 61.14
Cost per HH (monthly)	$/HH/mo	$ 31.65	$ 33.30
Net Cost per HH (monthly)	$/HH/mo	$ 3.45	$ 5.09
Total Program Cost	$/yr	$ 50,850,668	$ 53,499,858
Net Cost per Diversion	$/ton	$ 391.75	$ 643.56
Diversion	tons/yr	14132	12719
Net Cost per GHG Reduction	$/MTCO2e	$ 303.96	$ 533.17
Net Road Miles	miles/yr	213,174	432,826
Total Road Miles	miles/yr	3,853,465	4,073,117
Net Collection FTEs	FTE/event	65	3
Total FTEs	FTE/event	169	108
Gray Trucks	trucks/event	43	72
YW Trucks	trucks/event	35	35
Green Trucks	trucks/event	47	0
DS Trucks	trucks/event	0	0
Total Trucks Per Collection Event	trucks/event	125	108
Net Gray Trucks	trucks/event	-26	3
Net YW Trucks	trucks/event	0	0
Net Green Trucks	trucks/event	47	0
Net DS Trucks	trucks/event	0	0
Net Trucks Per Collection Event	trucks/event	21	3
Net Collection and Sorting GHG	MTCO2e/yr	859	2054
Net Food Waste Diversion from LF GHG	MTCO2e/yr	-19072	-17406
Net GHG Emissions	MTCO2e/yr	-18213	-15352
Total GHG Emissions	MTCO2e/yr	19359	22220
Gray Cart Cost	$/yr	$ 3,202,362	$ 3,202,362
YW Cart Cost	$/yr	$ 1,601,181	$ 1,601,181
Green Cart Cost	$/yr	$ 2,002,815	$ -
Cart Cost	$/yr	$ 6,806,358	$ 4,803,543
Collection Trucks Cost	$/yr	$ 8,300,273	$ 7,259,529
Collection Fuel Cost	$/yr	$ 6,046,741	$ 6,331,415
Collection Labor Cost	$/yr	$ 18,933,960	$ 15,947,004
Primary Tipping Cost	S/yr	$ 10,763,336	$ 9,922,812
DCBs Cost	$/yr	$ -	$ 4,176,994
Secondary Tip/Transfer/Process Cost	$/yr	$ -	$ 5,058,562
DS Infrastructure Cost	$/yr	$ -	$ -
GRAND TOTAL Collection Cost	$/yr	$ 50,850,668	$ 53,499,858
Net Cart Cost	$/yr	$ 2,002,815	$ -
Net Trucks Cost	$/yr	$ 1,326,615	$ 285,871
Net Collection Fuel Cost	$/yr	$ 334,506	$ 619,180
Net Collection Labor Cost	$/yr	$ 3,560,906	$ 573,950
Net Primary Tipping Cost	$/yr	$ (1,688,757)	$ (2,529,281)
Net DCBs Cost	$/yr	$ -	$ 4,176,994
Net Secondary Tip/Transfer/Process Cost	$/yr	$ -	$ 5,058,562
Net DS Infrastructure Cost	$/yr	$ -	$ -
Net GRAND TOTAL Collection Cost	$/yr	$ 5,536,086	$ 8,185,276

Appendix E Full Diversion Summary	Unit	SC, Op/Op, EOW	SC, Ozd/Op, EOW
Cost per HH (annual)	$/HH/yr	$ 380.02	$ 387.41
Net Cost per HH (annual)	$/HH/yr	$ 41.55	$ 48.93
Cost per HH (monthly)	$/HH/mo	$ 31.67	$ 32.28
Net Cost per HH (monthly)	$/HH/mo	$ 3.46	$ 4.08
Total Program Cost	$/yr	$ 50,876,966	$ 51,865,466
Net Cost per Diversion	$/ton	$ 393.61	$ 463.55
Diversion	tons/yr	14132	14132
Net Cost per GHG Reduction	$/MTCO2e	$ 330.47	$ 357.79
Net Road Miles	miles/yr	556,105	189,220
Total Road Miles	miles/yr	4,196,396	3,829,510
Net Collection FTEs	FTE/event	13	26
Total FTEs	FTE/event	117	130
Gray Trucks	trucks/event	64	64
YW Trucks	trucks/event	0	35
Green Trucks	trucks/event	53	31
DS Trucks	trucks/event	0	0
Total Trucks Per Collection Event	trucks/event	117	130
Net Gray Trucks	trucks/event	-5	-5
Net YW Trucks	trucks/event	-35	0
Net Green Trucks	trucks/event	53	31
Net DS Trucks	trucks/event	0	0
Net Trucks Per Collection Event	trucks/event	13	26
Net Collection and Sorting GHG	MTCO2e/yr	2240	762
Net Food Waste Diversion from LF GHG	MTCO2e/yr	-19072	-19072
Net GHG Emissions	MTCO2e/yr	-16832	-18309
Total GHG Emissions	MTCO2e/yr	20740	19262
Gray Cart Cost	$/yr	$ 3,202,362	$ 3,202,362
YW Cart Cost	$/yr	$ -	$ 1,601,181
Green Cart Cost	$/yr	$ 3,202,362	$ 2,002,815
Cart Cost	$/yr	$ 6,404,724	$ 6,806,358
Collection Trucks Cost	$/yr	$ 7,860,109	$ 8,575,653
Collection Fuel Cost	$/yr	$ 6,584,859	$ 6,009,153
Collection Labor Cost	$/yr	$ 19,471,101	$ 19,710,966
Primary Tipping Cost	S/yr	$ 10,556,174	$ 10,763,336
DCBs Cost	$/yr	$ -	$ -
Secondary Tip/Transfer/Process Cost	$/yr	$ -	$ -
DS Infrastructure Cost	$/yr	$ -	$ -
GRAND TOTAL Collection Cost	$/yr	$ 50,876,966	$ 51,865,466
Net Cart Cost	$/yr	$ 1,601,181	$ 2,002,815
Net Trucks Cost	$/yr	$ 886,451	$ 1,601,995
Net Collection Fuel Cost	$/yr	$ 872,624	$ 296,918
Net Collection Labor Cost	$/yr	$ 4,098,047	$ 4,337,913
Net Primary Tipping Cost	$/yr	$ (1,895,919)	$ (1,688,757)
Net DCBs Cost	$/yr	$ -	$ -
Net Secondary Tip/Transfer/Process Cost	$/yr	$ -	$ -
Net DS Infrastructure Cost	$/yr	$ -	$ -
Net GRAND TOTAL Collection Cost	$/yr	$ 5,562,384	$ 6,550,884

Appendix E Full Diversion Summary	Unit	SC, Ozd/Ozd, EOW	CoT, Op, W
Cost per HH (annual)	$/HH/yr	$ 340.59	$ 350.35
Net Cost per HH (annual)	$/HH/yr	$ 2.12	$ 11.87
Cost per HH (monthly)	$/HH/mo	$ 28.38	$ 29.20
Net Cost per HH (monthly)	$/HH/mo	$ 0.18	$ 0.99
Total Program Cost	$/yr	$ 45,597,742	$ 46,903,743
Net Cost per Diversion	$/ton	$ 20.04	$ 112.45
Diversion	tons/yr	14132	14132
Net Cost per GHG Reduction	$/MTCO2e	$ 14.64	$ 84.13
Net Road Miles	miles/yr	-66,293	45,494
Total Road Miles	miles/yr	3,573,998	3,685,784
Net Collection FTEs	FTE/event	-3	49
Total FTEs	FTE/event	101	153
Gray Trucks	trucks/event	48	43
YW Trucks	trucks/event	22	35
Green Trucks	trucks/event	31	31
DS Trucks	trucks/event	0	0
Total Trucks Per Collection Event	trucks/event	101	109
Net Gray Trucks	trucks/event	-21	-26
Net YW Trucks	trucks/event	-13	0
Net Green Trucks	trucks/event	31	31
Net DS Trucks	trucks/event	0	0
Net Trucks Per Collection Event	trucks/event	-3	5
Net Collection and Sorting GHG	MTCO2e/yr	-267	183
Net Food Waste Diversion from LF GHG	MTCO2e/yr	-19072	-19072
Net GHG Emissions	MTCO2e/yr	-19339	-18888
Total GHG Emissions	MTCO2e/yr	18233	18684
Gray Cart Cost	$/yr	$ 3,202,362	$ 3,202,362
YW Cart Cost	$/yr	$ 1,601,181	$ 1,601,181
Green Cart Cost	$/yr	$ 2,002,815	$ 2,002,815
Cart Cost	$/yr	$ 6,806,358	$ 6,806,358
Collection Trucks Cost	$/yr	$ 6,797,075	$ 7,299,351
Collection Fuel Cost	$/yr	$ 5,608,210	$ 5,783,622
Collection Labor Cost	$/yr	$ 15,622,763	$ 16,251,076
Primary Tipping Cost	S/yr	$ 10,763,336	$ 10,763,336
DCBs Cost	$/yr	$ -	$ -
Secondary Tip/Transfer/Process Cost	$/yr	$ -	$ -
DS Infrastructure Cost	$/yr	$ -	$ -
GRAND TOTAL Collection Cost	$/yr	$ 45,597,742	$ 46,903,743
Net Cart Cost	$/yr	$ 2,002,815	$ 2,002,815
Net Trucks Cost	$/yr	$ (176,582)	$ 325,693
Net Collection Fuel Cost	$/yr	$ (104,025)	$ 71,387
Net Collection Labor Cost	$/yr	$ 249,709	$ 878,022
Net Primary Tipping Cost	$/yr	$ (1,688,757)	$ (1,688,757)
Net DCBs Cost	$/yr	$ -	$ -
Net Secondary Tip/Transfer/Process Cost	$/yr	$ -	$ -
Net DS Infrastructure Cost	$/yr	$ -	$ -
Net GRAND TOTAL Collection Cost	$/yr	$ 283,159	$ 1,589,161

Appendix E Full Diversion Summary	Unit	CoT, Ozd, W	YW, Op, W
Cost per HH (annual)	$/HH/yr	$ 318.27	$ 352.80
Net Cost per HH (annual)	$/HH/yr	$ (20.21)	$ 14.32
Cost per HH (monthly)	$/HH/mo	$ 26.52	$ 29.40
Net Cost per HH (monthly)	$/HH/mo	$ (1.68)	$ 1.19
Total Program Cost	$/yr	$ 42,609,481	$ 47,232,134
Net Cost per Diversion	$/ton	$ (191.42)	$ 150.77
Diversion	tons/yr	14132	12719
Net Cost per GHG Reduction	$/MTCO2e	$ (138.16)	$ 117.06
Net Road Miles	miles/yr	-126,179	177,314
Total Road Miles	miles/yr	3,514,112	3,817,604
Net Collection FTEs	FTE/event	20	-25
Total FTEs	FTE/event	124	79
Gray Trucks	trucks/event	35	56
YW Trucks	trucks/event	22	22
Green Trucks	trucks/event	31	0
DS Trucks	trucks/event	0	0
Total Trucks Per Collection Event	trucks/event	89	79
Net Gray Trucks	trucks/event	-34	-13
Net YW Trucks	trucks/event	-13	-13
Net Green Trucks	trucks/event	31	0
Net DS Trucks	trucks/event	0	0
Net Trucks Per Collection Event	trucks/event	-15	-25
Net Collection and Sorting GHG	MTCO2e/yr	-508	1025
Net Food Waste Diversion from LF GHG	MTCO2e/yr	-19072	-17406
Net GHG Emissions	MTCO2e/yr	-19580	-16381
Total GHG Emissions	MTCO2e/yr	17992	21191
Gray Cart Cost	$/yr	$ 3,202,362	$ 3,202,362
YW Cart Cost	$/yr	$ 1,601,181	$ 1,601,181
Green Cart Cost	$/yr	$ 2,002,815	$ -
Cart Cost	$/yr	$ 6,806,358	$ 4,803,543
Collection Trucks Cost	$/yr	$ 6,021,235	$ 5,480,952
Collection Fuel Cost	$/yr	$ 5,514,239	$ 5,930,472
Collection Labor Cost	$/yr	$ 13,504,314	$ 11,858,800
Primary Tipping Cost	S/yr	$ 10,763,336	$ 9,922,812
DCBs Cost	$/yr	$ -	$ 4,176,994
Secondary Tip/Transfer/Process Cost	$/yr	$ -	$ 5,058,562
DS Infrastructure Cost	$/yr	$ -	$ -
GRAND TOTAL Collection Cost	$/yr	$ 42,609,481	$ 47,232,134
Net Cart Cost	$/yr	$ 2,002,815	$ -
Net Trucks Cost	$/yr	$ (952,423)	$ (1,492,706)
Net Collection Fuel Cost	$/yr	$ (197,996)	$ 218,237
Net Collection Labor Cost	$/yr	$ (1,868,740)	$ (3,514,254)
Net Primary Tipping Cost	$/yr	$ (1,688,757)	$ (2,529,281)
Net DCBs Cost	$/yr	$ -	$ 4,176,994
Net Secondary Tip/Transfer/Process Cost	$/yr	$ -	$ 5,058,562
Net DS Infrastructure Cost	$/yr	$ -	$ -
Net GRAND TOTAL Collection Cost	$/yr	$ (2,705,101)	$ 1,917,552

Appendix E Full Diversion Summary	Unit	YW, Ozd, W	Drop Site
Cost per HH (annual)	$/HH/yr	$ 321.06	$ 372.40
Net Cost per HH (annual)	$/HH/yr	$ (17.41)	$ 33.92
Cost per HH (monthly)	$/HH/mo	$ 26.76	$ 31.03
Net Cost per HH (monthly)	$/HH/mo	$ (1.45)	$ 2.83
Total Program Cost	$/yr	$ 42,983,117	$ 49,856,116
Net Cost per Diversion	$/ton	$ (164.98)	$ 321.37
Diversion	tons/yr	14132	14132
Net Cost per GHG Reduction	$/MTCO2e	$ (128.23)	$ 214.80
Net Road Miles	miles/yr	220,745	34,426,946
Total Road Miles	miles/yr	3,861,036	38,067,237
Net Collection FTEs	FTE/event	-19	2
Total FTEs	FTE/event	85	106
Gray Trucks	trucks/event	48	64
YW Trucks	trucks/event	0	35
Green Trucks	trucks/event	37	0
DS Trucks	trucks/event	0	0.155814117
Total Trucks Per Collection Event	trucks/event	85	99
Net Gray Trucks	trucks/event	-21	-5
Net YW Trucks	trucks/event	-35	0
Net Green Trucks	trucks/event	37	0
Net DS Trucks	trucks/event	0	0
Net Trucks Per Collection Event	trucks/event	-19	-5
Net Collection and Sorting GHG	MTCO2e/yr	889	10115
Net Food Waste Diversion from LF GHG	MTCO2e/yr	-19072	-19072
Net GHG Emissions	MTCO2e/yr	-18182	-21143
Total GHG Emissions	MTCO2e/yr	19389	16429
Gray Cart Cost	$/yr	$ 3,202,362	$ 3,202,362
YW Cart Cost	$/yr	$ -	$ 1,601,181
Green Cart Cost	$/yr	$ 3,202,362	$ -
Cart Cost	$/yr	$ 6,404,724	$ 4,803,543
Collection Trucks Cost	$/yr	$ 5,858,265	$ 6,617,538
Collection Fuel Cost	$/yr	$ 6,058,621	$ 9,874,825
Collection Labor Cost	$/yr	$ 14,105,333	$ 15,638,940
Primary Tipping Cost	S/yr	$ 10,556,174	$ 10,763,336
DCBs Cost	$/yr	$ -	$ -
Secondary Tip/Transfer/Process Cost	$/yr	$ -	$ -
DS Infrastructure Cost	$/yr	$ -	$ 2,157,934
GRAND TOTAL Collection Cost	$/yr	$ 42,983,117	$ 49,856,116
Net Cart Cost	$/yr	$ 1,601,181	$ -
Net Trucks Cost	$/yr	$ (1,115,393)	$ (356,120)
Net Collection Fuel Cost	$/yr	$ 346,386	$ 4,162,590
Net Collection Labor Cost	$/yr	$ (1,267,720)	$ 265,886
Net Primary Tipping Cost	$/yr	$ (1,895,919)	$ (1,688,757)
Net DCBs Cost	$/yr	$ -	$ -
Net Secondary Tip/Transfer/Process Cost	$/yr	$ -	$ -
Net DS Infrastructure Cost	$/yr	$ -	$ 2,157,934
Net GRAND TOTAL Collection Cost	$/yr	$ (2,331,465)	$ 4,541,534

Appendix D

Modeling Parameters and Definitions

Appendix D
Modeling Parameters and Definitions

Organics Collection Analysis Report
SCS Engineers Project #25224046.00

Purpose:

The model developed by SCS Engineers (SCS Model) provides high-level comparisons of the economic costs, environmental impacts, diversion effectiveness, and roadway impacts for various scenarios of single-family residential curbside organics collection under both open and organized hauler markets. The SCS Model integrates relevant base factors from the EPA WARM background documentation with customized inputs to account for the specific aspects of waste collections scenarios which are not part of standard EPA WARM or previously documented models (Foth 2009 and Foth 2017), along with localized cost and labor considerations.

Modeling Background and Development

Per Webster's Dictionary[1], a model is defined as:

> **model:** *noun:* a system of postulates, data, and inferences presented as a mathematical description of an entity or state of affairs
>
> *also:* a computer simulation (see SIMULATION sense 3a) based on such a system

As evidenced by this definition, a model is much more than just a spreadsheet or user interface used to define inputs and receive results. The background data and inferences utilized to develop the mathematical description of what is being modeled is the true spirit of any given model and the individual file or program used to access that description is just a vessel which can be modified while maintaining the intent of the system. The creation of a customized model is simply the act of sourcing and referencing these background assumptions to organize the system of calculations in a way which best represents the modeling task at hand.

The internal "SCS Model" prepared to achieve modeling for this report is built upon several other existing models each with useful aspects which contributed to the ultimate SCS Model and a lack of functionality for certain criteria which resulted in their inability to provide the data for this report on their own. Model sources evaluated include:

- "Analysis of Waste Collection Service Arrangements," prepared for Minnesota Pollution Control Agency (MPCA) by Foth, June 2009[2]
  - Foth references the "Tool to Calculate Potential Greenhouse Gas Savings for a Specific Area Such as a City" referred to in later works as "MPCA Collections Tool"
  - Foth generated a spreadsheet model "Transfer Haul Cost Model"

[1] https://www.merriam-webster.com/dictionary/model
[2] https://www.pca.state.mn.us/sites/default/files/w-sw1-06.pdf

- "Analysis of Residential Organics Recycling in Dakota County," prepared by Foth for Dakota County, September 2017[3]
  - Foth used a combination of the MPCA Collection Analysis Tool and WARM to model GHG emissions of the two different organics collection methods ("separate collection" and "co-collection with trash").
  - "MPCA Collections Tool" (described further in Foth 2009)

- Waste Reduction Model (WARM) by U.S. EPA[4]
  - WARM is created to evaluate and compare high-level materials management scenarios for GHG emissions reductions, energy savings, and economic impacts.
  - WARM is useful for comparing the end uses of collected materials but is not useful for comparing collection methods for those materials. Further, WARM does not allow for adjustment to economic factors for local labor, taxation, or tipping rates and assumes generalized national cost averages. The following table provides a listing of the WARM inputs and indicates their relevance to comparison of collection scenarios:

Table 1. Summary of WARM Inputs and Relation to Collections Modeling

Step	Input	Unit/Selection	Relevant to Collections
1.	Baseline Waste Generation by Category	Tons	Yes
2.	Alternative Waste Generation by Category	Tons	Yes
3.	Electricity Grid Emissions Factor	State-Specific or National Average	No
4.	Source Reduction Factor	Current Mix or 100% Virgin Materials	No
5.	LFG Control System Factor	National Average or Yes/No LFG Recovery	No
6a.	LFG Recovery Use Factor	Energy Production or Flared	No
6b.	LFG Recovery Efficiency Factor by Landfill Age	Typical, Worst-Case, Aggressive, or California Regulatory	No
7.	Moisture Condition for MSW Decay Rate (k)	National Average, Dry, Moderate, Wet, or Bioreactor	No
8a.	AD Type Factor	Wet or Dry	No
8b.	Digestate Curing Factor	Cured or Not Cured	No
9a.	Transport Distance Emissions Factor	Default Distances (20 miles each) or Provide Information	Yes
9b.	Provide Information for Transport Distance Emissions Factor	Add Distances in Miles for Transport to Landfill, Combustion, Recycling, Composting, and AD	Yes
10.	Personalized Data Sheet Fields	Name, Organization, Project Period	No

- The EPA Local GHG Inventory Tool[5] is a spreadsheet tool which calculates GHG emissions for many sectors, including residential, commercial, transportation, and waste and water management. The Local GHG Inventory Tool is highly useful and provides a much higher level of detail than WARM. However, this tool does not include cost or labor modeling which were ultimately integrated to the SCS Model.

[3] provided by Dakota County
[4] https://www.epa.gov/warm
[5] https://www.epa.gov/statelocalenergy/local-greenhouse-gas-inventory-tool

- The Solid Waste Emissions Estimation Tool (SWEET)[6] is a spreadsheet tool which quantifies emissions of methane, black carbon, and other pollutants from sources in the municipal solid waste sector. Similar to the Local GHG Inventory Tool, SWEET provides for a much greater level of detail and user customization than WARM but does not integrate cost or labor considerations.

The SCS Model developed for this project integrates relevant base factors from the WARM background documentation with customized inputs to account for the specific aspects of waste collections scenarios which are not part of standard EPA or previously documented models, along with localized cost and labor considerations.

SCS Model Input and Output

- Available Inputs
  - Number of Households
  - Annual MSW Generation (tons)
  - Food Waste or Compostables (SSOM) Fraction of MSW (percent - tons/ton)
  - Annual Yard Waste Generation (tons)
  - Residential Roadways (on-route miles)
  - Destination for Composting
  - Destination for Landfill
  - DCBs Adoption Rate (percent of households)
  - Price per DCB (dollars)
  - SSOM Capture Rate
  - Collection Frequency (weeks/event)
  - Gray Cart = weekly or EOW
  - Yard Waste Cart = weekly or none
  - Green Cart = none or weekly
  - Hauler Market Efficiency Factor (percent - miles/mile)
  - Collection Frequency
  - Cost per Cart
  - Tipping Fee
  - Trucks
    - Capacity (tons)
    - Fuel Economy (mpg)
    - Cost per Truck (dollars)
  - Collection Time
  - Labor Cost

- Available Outputs
  - Cost for DCBs
  - Total Numbers of Carts and Total Households Serviced per Cart Type
  - Total Cart Costs
  - Total Tipping Costs
  - Trucks Required for Collection
  - Truck and Fuel Costs
  - Collection Distance
  - Collection Time
  - Labor Costs
  - Total Servicing, Diversion, and Costs for DCBs
  - Sorting Cost
  - Diesel Fuel Used for Collections and Secondary Transport
  - Diesel Fuel Used by Front-end Loaders During Recovery of DCBs (gallons)
  - Electricity Used for Recovery of DCBs (kwh)
  - Annual Diversion of SSOM to Composting (tons)

[6] https://globalmethane.org/resources/details.aspx?resourceid=5176

- Annual Remaining MSW to Landfill (tons)
- Annual Yard Waste to Composting (tons)
- Equivalent Roadway Impacts of Hauling Vehicles compared to Passenger Vehicles
- GHG Impacts
  - Diesel Fuel during Collection (MTCO2E/yr)
  - Diesel Fuel Used by Front-end Loaders During Recovery of DCBs (MTCO2E/yr)
  - Electricity Used for Recovery of DCBs (MTCO2E/yr)
  - Yard Waste Composting (MTCO2E/yr)
  - Food Waste Composting (MTCO2E/yr)
  - Adjusted Emissions Factor for MSW to Landfill Minus the Percentage of Food Waste Diverted (MTCO2E/ton)
  - MSW Landfilling (MTCO2E/yr)
  - Total System GHG Emissions Per Ton Diversion (MTCO2E/ton)

Key Approach Assumptions: Refer to **Attachment D1** for a detailed list of approach assumptions.

Key Input Assumptions: Refer to **Attachment D2** for additional detail on assumptions.

Table 2. Summary of SCS Model Input Assumptions Used

Input Parameter	Source of Data	Assumed Value
Primary Hauling and Tipping		
Households per municipality	Estimated from census data	Varies (documented in Attachment D2)
Participation and setout percentages per cart type	Assumed per Scenario	Varies per Scenario
Collection frequency and seasonality per cart type	Assumed per Scenario	Varies per Scenario
Annual MSW generation per municipality	Estimated from hauling data per municipality provided by County	Varies (documented in Attachment D2)
Food waste fraction	Estimated from "2019/2020 Food Waste Generation and Composition Study Analysis," prepared by RRS for MPCA, August 2021[7]	17.6%
Yard waste generation per municipality	Estimated from hauling data per municipality provided by County	Varies (documented in Attachment D2)
On-route/residential roadway mileage per municipality	Extracted for each municipality using GIS	Varies (documented in Attachment D2)
Off-route mileage	Estimated for each municipality using GIS	Measured from centroid of municipality to select disposal location
Hauling market efficiency factor	Assumption from hauling data per municipality provided by County	Varies (documented in Attachment D2)
Cart tipping time	Assumed	0.25 minutes/cart
Truck unloading time	Assumption from Foth 2009 Report	20 minutes/load

[7] SCS analyzed this data in February 2024; MPCA has since updated the Food Waste Generation and Composition Study Analysis to include data from 2019-2022.

Input Parameter	Source of Data	Assumed Value
Tip fees	Assumed per Scenario	Varies (documented in Attachment D2)
Haul truck speed	Assumption from Foth 2009 Report	5 mph on-route 55 mph off-route
Packer truck capacity	Assumption - EPA average (https://www.epa.gov/sites/default/files/2016-03/documents/r02002.pdfa)	7 tons/truck
Fuel economy	Assumption (Alternative Fuels Data Center: Maps and Data - Average Fuel Economy by Major Vehicle Category (energy.gov))	2.53 mpg
Diesel fuel average price	Assumption (AAA Gas Prices), MN 2023 average	$3.97
Operating hours per truck	Assumed	8 hours/truck/day
Licensing, insurance, etc.	Foth 2009 Report, with inflation	$10,000
Annual per truck amortization	Assumption based on SCS LAC 2022 and Foth 2009 Report	$50,000
Maintenance cost per mile	Assumption from Foth 2009 Report	$0.20/mile
Labor cost	Assumption (https://www.bls.gov/oes/current/naics4_562100.htm) x4 to account for overhead costs	$80/hr
Number of operators per truck	Assumed based on automated side loader tipping	1
Capacity of green cart	Assumed	35 gallons for food waste only collection, 95 gallons for commingled food and yard waste
Annualized cost per green cart	Estimated	$14.96 (calculations documented in Attachment D2)
Capacity of YW cart	Assumption	95 gallons
Annualized cost per YW cart	Estimated	$23.92 (calculations documented in Attachment D2)
Base capacity of gray cart	Assumption	95 gallons
Gray cart base size cost	Estimated	$23.92 (calculations documented in Attachment D2)
Price per DCB	Assumed based on R&E Center program estimates	$0.60
Secondary Sorting or Transfer, Hauling and Tipping		
Mass recovery rate of DCBs	Conservatively assumed based on Ramsey/Washington program estimate of 94%	90%
Transfer load capacity	Assumption – EPA average (https://www.epa.gov/sites/default/files/2016-03/documents/r02002.pdfa)	21 tons/load
Sorting of DCBs from remainder MSW and secondary transfer/tipping cost	SCS 2019 Report, with inflation	$63.00/ton-processed

Input Parameter	Source of Data	Assumed Value
Roadway Impacts		
Residential trash truck passenger car equivalents	Referenced from Foth 2009 Report	1,279
Transfer truck and trailer passenger car equivalents	Referenced from Foth 2009 Report	1,408
GHG Analysis		
Diesel fuel emission factor	Assumption (U.S. Energy Information Administration - EIA - Independent Statistics and Analysis)	10.19 kgCO2e/gallon
Conversion factor	Factor	0.001 (MT/kg)
Base MSW to landfill GHG emissions	EPA WARM V16	0.31 MTCO2e/ton
Food waste to landfill emissions	EPA WARM V16	0.50 MTCO2e/ton
Yard trimmings to composting emissions	EPA WARM V16	-0.11 MTCO2e/ton
Food waste to composting emissions	EPA WARM V16	-0.15 MTCO2e/ton
Base diesel transport emissions	EPA WARM V16	0.00016 MTCO2e/mile
Base travel distance	EPA WARM V16	20 miles
Diesel fuel usage for sorting of DCBs from remainder MSW	Estimated from Foth 2019 Report	0.078 gal/ton-processed
Electricity usage for sorting of DCBs from remainder MSW	Estimated from Foth 2019 Report	4.4 kwh/ton-processed
Electricity usage emissions factor	Assumption (https://www.epa.gov/energy/greenhouse-gases-equivalencies-calculator-calculations-and-references)	0.000699 MTCO2e/kwh

Source Data Notes:

Foth 2009 Report: "Analysis of Waste Collection Service Arrangements," prepared for MPCA by Foth, June 2009, https://www.pca.state.mn.us/sites/default/files/w-sw1-06.pdf

Foth 2017 Report: "Analysis of Residential Organics Recycling in Dakota County," prepared by Foth for Dakota County, September 2017.

EPA WARM: Waste Reduction Model (WARM) by U.S. EPA https://www.epa.gov/warm

Appendix D, Attachment D1
Key Model Approach Assumptions

Organics Collection Analysis Report
SCS Engineers Project #25224046.00

Collection Process

- Generation
  - Waste is generated at individual households, which then must be collected.
  - Residential MSW and yard waste generation rates were estimated based on hauling data per municipality provided by County staff.
    - Residential parcel types were used to determine the ratio of MSW generation attributed to single-family versus multi-family households.
    - Yard waste collection reported by residential haulers was fully attributed to single-family households.
  - An MPCA waste composition study[8] was used to estimate the percentage of food waste present in the waste stream, which was then multiplied by the MSW generation rate to quantify the food waste available for diversion.
    - Varying assumptions were made for the percentage of food waste captured in different collection scenarios.
- Collection
  - The primary focus of this report is single-family residential curbside collection via individually serviced carts.
    - Diversion of organics to drop-off sites via self-hauling by residents was also considered for comparison but was not excluded from the overall curbside collection estimates.
  - Curbside collection of source-separated organics was considered via:
    - The existing trash cart (gray cart) using a DCB to keep food waste separated from trash for later separation;
    - A new separate food waste cart (green cart); or
    - By commingling food waste and yard waste in a new separate cart (green cart).

[8] "2019/2020 Food Waste Generation and Composition Study Analysis," prepared by RRS for MPCA, August 2021. SCS analyzed this data in February 2024; MPCA has since updated the Food Waste Generation and Composition Study Analysis to include data from 2019-2022.

        - Existing yard waste collection carts could also be used to service the commingled collection.

    - Due to the putrescible nature of food waste, it was assumed that any carts used to collect food waste would be collected weekly.

        - Once food waste is removed from the rest of the trash, the remaining trash has had the "ick" factor nearly eliminated and can be considered for every-other-week collection as modeled in the noted scenarios.

    - Waste collection containers can be of a variety of sizes and either wheeled carts or buckets.

        - For the purposes of this study, it was assumed that curbside collection would be completed using automated side loader trucks which are generally limited to being able to grab carts sized 35-gallon and greater.

            - Smaller containers require manual tipping into the truck adding significant time, labor, and worker safety hazards to the collections.

- Trucking Routes

    - Once waste has been tipped into the collection truck, the truck will continue along its route until full.

        - The more waste that is in the carts being collected, the faster the truck will fill up, and the more frequently it will have to leave the collection route to be emptied at a primary tipping destination then return to the collection route.

    - For modeling purposes, these activities were separated into on-route distance and off-route distance.

        - The on-route distance was considered to be the total residential roadway miles of each municipality.

        - The off-route distance was considered to be the distance from the centroid of the municipality to the primary tipping destination selected for each cart in each scenario (multiplied by 2 to account for the round-trip travel).

        - Distances were quantified using geographical information systems (GIS) software.

        - The number of off-route trips required during each collection event was quantified by dividing the total amount of waste to be collected for the cart time in question by the assumed capacity of the collection truck.

        - In practice, the off-route distance travelled can be minimized by using transfer stations to consolidate waste from multiple collection trucks into larger transfer trailers.

- For the purposes of calculations in this report it was assumed that transfer trailers are only used following mixed waste sorting and that in all other scenarios the collection trucks deliver waste directly to their final destination.

Primary and Secondary Tipping Destinations

- The primary tipping destination is considered to be the location where collection trucks empty their payload when full.

- For the purposes of this report, the modeled primary tipping destinations include:

  – Landfills for trash,
  – Yard waste compost sites for yard waste,
  – SSOM compost sites for food waste, and
  – Mixed waste processing facilities for co-collection scenarios.

- Transfer stations can also be considered as primary tipping destinations but are not modeled in this report.

- Following mixed waste sorting or primary tipping at a transfer station, materials are then transferred to a secondary tipping location which for this modeling include:

  – Landfills for trash,
  – SSOM compost sites for separated DCBs, and
  – SSOM compost sites for commingled food and yard waste.

- Dakota County does not own or operate the waste management facilities included in our analysis (with the exception of owning the land on which SET operates and leasing the land to WM).

- Existing infrastructure locations are used for modeling, aside from the assumption of a new, hypothetical mixed waste processing facility location for co-collection scenarios located in currently undeveloped areas within the vicinity of SET (distances to SET utilized for calculation purposes).

Mixed Waste Processing

- Assumptions for tipping fee, infrastructure, and processing costs, as well as associated GHG emissions, for mixed waste processing were based directly on documented data for the R&E Center and are further defined in **Appendix D**. Hauling distances for a hypothetical mixed waste processing facility were not based on the existing R&E Center for a number of reasons, including:

  – Waste designation for Ramsey and Washington Counties creates complications for accepting additional waste from other counties.

  – The current capacity at the R&E Center is already designated for waste from Ramsey and Washington Counties with additional sorting capacity needed to achieve their current organics recovery goals.

  - The remaining MSW following organics bag recovery at the R&E center is further processed for commodity recyclables recovery to market, separation of a loose organic-rich fines fraction to landfill, and recovery of the remaining material as RDF which is transported a great distance for incineration. For the purposes of the theoretical mixed waste processing in this report, it was assumed that following the recovery of the SSOM contained in DCBs that the remaining MSW would be transferred to a local landfill.

- Based on the above, it is assumed that a new processing facility would need to be constructed to have adequate processing capacity for the waste generated in the municipalities being modeled. A hypothetical future processing facility was modeled near the SET compost site and transfer station, due to the below reasoning:

  - SET is approximately centered in the county, making it a favorable location for access and transfer considerations;

  - Further, SET's location is also near major industrial areas surrounding the Pine Bend MSW landfill, SKB industrial solid waste and hazardous waste landfills, and Flint Hills Resources refinery which this makes the theoretical transport distances to and from SET generally relevant to numerous locations which could be considered for mixed waste processing;

  - SET is already permitted as both a transfer station and compost site, so could be a favorable location for further permitted use and private development;

  - SET is surrounded by large areas of undeveloped industrial zoning, portions of which are owned by the County and could be considered for use;

  - SET is relatively close to existing landfill infrastructure to create feasible transfer distances for trash residuals after processing.

Organics Processing Destinations

- Only composting sites are considered as the receiving locations for food waste in this report.

- Anaerobic digestion or co-digestion are potential receiving locations in the near future, but this capacity does not exist within the general vicinity of Dakota County at the time of this report.

- Food waste is required to be processed at state permitted SSOM compost facilities.

  - As further discussed in Section 2.4.2, the SET facility is the only permitted SSOM compost facility within Dakota County.

  - The current and future facilities operated by SMSC are additional options for food waste collected in Dakota County but were not included in modeling due to the greater travel distance outside of Dakota County.

- Per conversations with composters and MPCA staff, yard waste that is commingled with food waste must be considered as equivalent to food waste for management purposes.

- Yard waste which has not been commingled with food waste can be managed at yard waste compost facilities which are permit-by-rule and have much lower operating costs (and by association lower tipping fees) than SSOM compost facilities.
  - Due to the lower barrier to entry and fewer siting constraints, a greater number of more localized yard waste compost facilities are present in Dakota County.
  - Certain sites as noted only operate for yard waste drop off and transfer and are not directly compost sites.
  - Some yard waste sites are only available for public self-haul loads (do not accept commercial hauler loads) and were excluded from modeling, these include:
    - Hastings Yard Waste Drop-off and Transfer Site (non-compost site)
    - South St. Paul Compost Site
- The yard waste sites accepting commercial loads which are considered in modeling include:
  - The Mulch Store – Burnsville
  - The Mulch Store – Rosemount
  - Gertens R.E.S Facility – Eagan
  - Gertens – Inver Grove Heights (non-compost site, transfer to Eagan)
  - Pine Bend Compost Site
  - SKB Compost Site
  - B&D Wood Recycling & Composting

Economic Parameters

- The modeling performed takes into consideration both the amortized cost of infrastructure, such as carts and trucks, and the operational expenses such as processing, tip fees, labor, and compostable specified bags (in the case of co-collection).
- The economic factors provided in EPA WARM were considered for this analysis but were found to be inadequate as they are based strictly on national averages and do not allow for customization to local considerations or addition or removal of costs considered.

Capital (Infrastructure Expenditures)

- Direct fixed costs for curbside collection include carts and collection vehicles.
- Indirect fixed costs for landfill, composting, and sorting infrastructure are generally considered to be integrated into tipping fees and processing costs.
- Roadway maintenance impacts resulting from collection could also be considered an indirect cost but are not directly quantified in this study.
- Section 6.4.2 provides relative roadway impacts as compared to equivalent miles travelled by passenger vehicles.

- As presented in **Attachment D2**, the annual amortized capital cost for constructing a mixed waste processing facility are:
  - $2.1 million per year for DCB recovery system (no additional recovery of recyclables), or
  - $4.4 million per year for DCB and recyclables recovery system
    - The processing inflation-adjusted cost of $63 per ton of MSW processed includes capital, operations, maintenance, program, transfer, disposal, and composting costs, as well as offsetting revenue from commodity recyclables sales.
    - Design for a facility processing 225,000 tons per year MSW results in 31,000 tons per year of organics diversion and 9,200 tons per year of recyclables diversion.
    - Resulting cost of $458 per ton per ton of diverted organics.
    - Based on estimates prepared for Ramsey/Washington R&E in 2019[9] and adjusted for inflation to 2024.
  - This co-collection in DCBs with trash is also a copyrighted process. Ongoing licensing costs are unknown. Initial and ongoing licensing costs are assumed to be included in the R&E cost estimation but are not accounted for directly in this model.

Market Structure for Collection

- Market structures for collection are modeled using an "efficiency modifier" applied to the existing information for hauler market share in each municipality.
- The municipalities within Dakota County have an open market for trash collection aside from Farmington and Hastings.
  - Within this open market, some municipalities are primarily serviced by one hauler and are essentially behaving like an organized system in practice; others have a diverse hauling market with overlapping service.
  - The understanding of these markets in each municipality considered for modeling allows the assignment of a municipality-specific modifier for open-market or organized collection conditions.
- It is assumed that a municipality is contracting with only one hauler for organized hauling scenarios.
  - In practice, a municipality could organize with other methods which utilize multiple individual hauling companies such as with franchise zones or a split contract.

[9] "Peer Review of "Preliminary Design for Processing Enhancements at the Recycling & Energy Center," Prepared by Foth Infrastructure & Environment, LLC, January 2019" prepared by SCS Engineers for Ramsey/Washington Recycling & Energy Board, March 2019

This organized market would still remain the same efficiency in terms of routing, as organized markets avoid multiple haulers overlapping service by collecting from individual households in the same areas.

Appendix D, Attachment D2
Additional Detailed Information on Input Assumptions

Organics Collection Analysis Report
SCS Engineers Project #25224046.00

- **Municipalities Considered**

  – Single-family households for this report are defined as those households residing in residentially zoned parcels with 1 to 3 dwelling units, multifamily households are then those residing in residentially zoned parcels with 4+ dwelling units sharing a common wall. The parcel data and property type were then used to generate estimated single-family households for each municipality. It was assumed that each property type consists of the number of households indicated in the heading. Parcel counts here were provided by the County for the 11 largest municipalities, the additional 4 municipalities were assumed to contain 100 percent single-family households for modeling purposes, and their number of households does not make up a significant percentage of the total data so are not highly impactful to results.

Table 3. Single-Family Household Calculation for 11 Municipalities >5000 Population

Municipality	**Estimated Single-Family HH**	Total Individually Serviced Parcels	Single Family (S) (1 HH)	Townhouse (TH) (1 HH)	Duplex (D) (2 HH)	Triplex (TR) (3 HH)	Twin Home (TW) (2 HH)	Mobile Home (M) (1 HH)
Apple Valley	**17,467**	17,264	10,874	5,639	5	0	198	548
Burnsville	**17,056**	16,663	11,107	4,409	4	1	387	755
Eagan	**20,262**	19,726	14,282	4,908	19	0	517	0
Farmington	**7,849**	7,781	6,178	1,539	31	5	27	1
Hastings	**7,754**	7,338	4,988	1,578	109	31	245	387
Inver Grove Heights	**11,472**	11,332	7,420	2,920	34	3	100	855
Lakeville	**24,673**	24,432	18,513	4,591	13	2	224	1,089
Mendota Heights	**4,030**	4,023	3,368	649	5	1	0	0
Rosemount	**9,321**	9,287	6,552	2,520	32	0	2	181
South St. Paul	**6,849**	6,395	5,813	113	348	24	58	39
West St. Paul	**5,320**	5,106	4,538	360	142	6	60	0
TOTAL	**132,053**	129,347	93,633	29,226	742	73	1,818	3,855

Table 4. Legend of Colors for Following Tables

Color	**Meaning**
Orange	Cities >5000 Population
Yellow	Cities Considered in Practice
Gray	Assumption or Exclusion

Table 5. Single-Family Household Calculation for All 15 Municipalities Modeled

Municipality	Total Population 2022	Total Households 2022	Single-Family Assumed % of Total Households	Single-Family Assumed Household Count	Multi-Family Assumed Household Count
Dakota County	**429,352**	**165,654**	**81%**	**133,878**	**31,776**
Apple Valley	55,673	21,412	82%	17,467	3,945
Burnsville	64,522	25,834	66%	17,056	8,778
Eagan	68,889	27,954	72%	20,262	7,692
Farmington	23,719	8,011	98%	7,849	162
Hastings (partial)	22,153	9,195	84%	7,754	1,441
Inver Grove Heights	35,652	14,448	79%	11,472	2,976
Lakeville	73,828	24,975	99%	24,673	302
Mendota Heights	11,658	4,810	84%	4,030	780
Rosemount	26,943	9,474	98%	9,321	153
South Saint Paul	20,489	8,429	81%	6,849	1,580
West Saint Paul	21,169	9,287	57%	5,320	3,967
Empire	3,152	1,022	100%	1,022	0
Sunfish Lake	520	180	100%	180	0
Lilydale	790	538	100%	538	0
Mendota	195	85	100%	85	0
			<5000 pop. munis assumed 100% single family for calcs		

- Waste Generation
  - Food Waste or Compostables (SSOM) as a Fraction of MSW
    - "2013 Statewide Waste Characterization Final Report," prepared by Burns & McDonnell for MPCA, December 2013, https://www.pca.state.mn.us/sites/default/files/w-sw1-60.pdf
    - "2019/2020 Food Waste Generation and Composition Study Analysis," prepared by RRS for MPCA, August 2021, 2019/2020 Food Waste Generation and Composition Analysis (state.mn.us). SCS analyzed this data in February 2024; MPCA has since updated the Food Waste Generation and Composition Study Analysis to include data from 2019-2022.

The 2019/2020 study combined Food and Compostable Paper and Packaging into a single 25.1 percent fraction of their Figure 2 Overall Sort Composition which they then broke down further in Figure 1. We wished to quantify food scraps and exclude compostable paper and packaging, so we pulled out from that 25.1 percent the Edible Food and Inedible Food which made up 45.8 percent and 24.5 percent, respectively, (combined 70.3 percent) out of that 25.1 percent fraction. This then resulted in the "All Food" fraction of 17.6 percent. The noted figures from the 2019/2020 study and associated calculations are shown below.

Figure 1. Figures from 2019/2020 Study

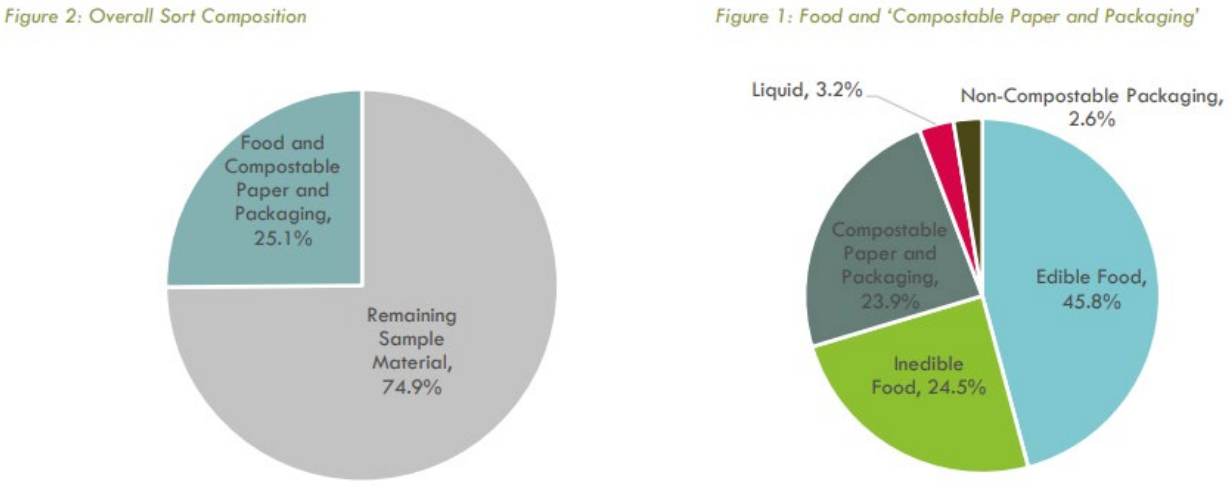


Table 6. Data Set to Quantify Environmental Justice Populations

Category	Fraction
Food and Compostable Paper and Packaging (FCPP)	25.1% of full MSW
Edible Food + Inedible Food = **All Food (F)**	45.8% + 24.5% = 70.3% of FCPP = **17.6% of MMSW**

Table 7. Summary of MPCA Organics Fraction Composition

Material (2013)	**Mean Composition by Weight (2013)**	**Mean Composition by Weight (2021)**
Compostable Paper	9.8%	6.0%
PLA & Compostable Plastics	0.0%	n/a
Yard Waste	2.8%	n/a
Food Waste	17.8%	17.6%
Wood	5.7%	n/a
Other Organic Material	4.7%	n/a
TOTAL COMPOSTABLE	**40.8%**	**23.6%**

- For the purposes of this report, only food waste was considered for diversion. The 17.6 percent as observed in 2021 was used for further modeling which is nearly equal to the 17.8 percent observed in 2013.

Table 8. Waste Composition Modeling Summary

Municipality	Reported Residential MSW 2022 (tons/yr)	Single-Family Assumed MSW (tons/yr)	Multi-Family Assumed MSW (tons/yr)	Single-Family Food Waste (17.6% of MSW) (tons/yr)	Remaining Single-Family MSW (tons/yr)
Dakota County	**96,958.76**	**80,294.63**	**16,664.13**	**14,131.86**	**66,162.78**
Apple Valley	11,346.53	9,256.02	2,090.51	1,629.06	7,626.96
Burnsville	13,748.12	9,076.72	4,671.40	1,597.50	7,479.22
Eagan	12,665.55	9,180.42	3,485.13	1,615.75	7,564.66
Farmington	8,352.76	8,183.85	168.91	1,440.36	6,743.49
Hastings (partial)*	6,597.82	5,563.84	1,033.98	979.24	4,584.60
Inver Grove Heights	8,088.88	6,422.73	1,666.15	1,130.40	5,292.33
Lakeville**	16,695.24	16,493.36	201.88	2,902.83	13,590.53
Mendota Heights	2,827.33	2,368.84	458.49	416.92	1,951.93
Rosemount	6,862.64	6,751.81	110.83	1,188.32	5,563.49
South Saint Paul	4,713.15	3,829.68	883.47	674.02	3,155.66
West Saint Paul	4,432.51	2,539.14	1,893.37	446.89	2,092.25
Empire	155.42	155.42	0.00	27.35	128.07
Sunfish Lake	130.67	130.67	0.00	23.00	107.67
Lilydale	10.44	10.44	0.00	1.84	8.60
Mendota	331.70	331.70	0.00	58.38	273.32

Table 9. Waste Composition Modeling Summary

Municipality	Reported Yard Waste 2022 (tons/yr)	Yard Waste plus Food Waste as 17.6% of MSW (tons/yr)
Dakota County	15,232.50	29,364.36
Apple Valley	1,612.13	3,241.19
Burnsville	2,380.82	3,978.32
Eagan	1,203.08	2,818.83
Farmington	2,502.99	3,943.35
Hastings (partial)*	2,313.70	3,292.94
Inver Grove Heights	483.21	1,613.61
Lakeville**	2,680.42	5,583.25
Mendota Heights	338.64	755.56
Rosemount	709.88	1,898.20
South Saint Paul	712.47	1,386.49
West Saint Paul	291.71	738.60
Empire	0.00	27.35
Sunfish Lake	3.30	26.30
Lilydale	0.00	1.84
Mendota	0.15	58.53

Yard waste quantities presented here and used for modeling purposes are those reported as residential yard waste by waste haulers. We assumed that these include only single-family households, and that multifamily would be managed and reported as commercial yard waste.

- Collection Containers
  - Cart size options and prices obtained from https://www.uline.com/BL_445/Uline-Trash-Cans-with-Wheels?keywords=Bins+And+Totes

Table 10. U-Line Waste Cart Pricing and Options

ULINE TRASH CANS WITH WHEELS — Black Green Blue Red Yellow

MODEL NO.	DESCRIPTION	SIZE L x W x H	WT. (LBS.)	PRICE EACH			ADD TO CART
				1	3	6+	
H-4202	35 Gallon	24 x 19 x 38"	22	$100	$95	$90	Specify Color
■H-7937	65 Gallon	27 x 27 x 44"	29	135	130	125	Specify Color
■H-7938	95 Gallon	34 x 29 x 45"	33	155	150	145	Specify Color

Table 11. Annualized Cart Costs

Cart Size	Price	Interest	Period (years)	Annual Payment	Annual Maintance ($/cart/yr)	Annualized Cart Cost ($/yr)
35-gallon	$90.00	10%	10	$14.65	$0.32	**$14.96**
65-gallon	$125.00	10%	10	$20.34	$0.32	**$20.66**
95-gallon	$145.00	10%	10	$23.60	$0.32	**$23.92**

Table 12. Modeled Travel Distances

Municipality	Roadway Class (miles)						Total Residential Roadways (miles)
	Freeway (excluded)	Ramp (excluded)	Primary	Secondary	Local	Private	
Dakota County	**109.8**	**76.5**	**108.8**	**612.6**	**1,557.6**	**24.3**	**2,303.3**
Apple Valley	7.1	4.9	-	69.8	175.0	9.2	254.0
Burnsville	16.9	10.8	11.6	76.5	188.7	3.1	279.8
Eagan	27.4	21.5	19.9	89.6	227.8	0.7	337.9
Farmington	-	-	4.8	24.0	94.9	-	123.8
Hastings (partial)	-	0.1	12.1	26.2	84.2	-	122.5
Inver Grove Heights	21.7	16.2	15.5	65.5	149.4	-	230.5
Lakeville	12.2	5.8	-	132.1	288.6	-	420.7
Mendota Heights	13.2	8.1	19.5	14.9	59.6	-	93.9
Rosemount	-	1.4	15.3	54.0	121.9	-	191.2
South Saint Paul	5.4	4.8	0.2	23.6	64.6	-	88.4
West Saint Paul	2.4	1.0	1.1	22.1	53.2	-	76.4
Empire	-	-	6.4	12.5	38.9	11.2	69.1
Sunfish Lake	0.5	0.5	0.2	0.1	2.3	-	2.6
Lilydale	0.2		0.6	0.2	2.0	-	2.8
Mendota	2.8	1.4	1.7	1.5	6.6	-	9.7

GIS was used to calculate total residential roadway miles for each municipality (on-route miles).

Table 13. Hauler Market Share Efficiency Factor

Market Type	Munis	Assumptions	Efficiency Factor (to be multiplied by total route miles)	Example Pie Chart
Organized	Farmington	The majority of the municipality is serviced by a single hauler, hauling efficiency is codified and maximized by direct planning with municipal staff to prevent overlapping routes.	1.0	
Open (low variation)	Empire	The majority of the municipality is serviced by a single hauler, municipal staff is not involved in route planning and opportunity exists for overlapping routes and new haulers to enter the market at will, but existing service is generally performed by a single hauler who therefore is able to maximize efficiency over singularly serviced routes.	1.1	
Open (mid variation)	Lakeville, Hastings, West St. Paul, South St. Paul	Greater than 45% of the municipality is serviced by a single hauler, municipal staff is not involved in route planning, existing service is dominated by a single hauler, but the remaining portion of the market is made up of multiple haulers and significant opportunity exists for overlapping routes and shift in market composition.	2.0	
Open (high variation)	Apple Valley, Burnsville, Inver Grove Heights, Eagan, Rosemount, Brooklyn Park	Less than 45% of the municipality is serviced by a single hauler, municipal staff is not involved in route planning, existing service is split amongst numerous haulers likely leading to significant overlap in routes, high turnover in customers, and little opportunity for haulers to efficiently design their routes.	3.0	

Table 14. Hauler Market Share Efficiency Factor Applied to Modeling

Municipality	Total Residential Roadways (Miles)	Gray Cart Existing Market Share Hauling Efficiency Factor (miles/mile)	Gray Cart Existing Market Factor Adjusted Residential (Miles)	YW Existing Market Share Hauling Efficiency Factor (miles/mile)	YW Existing Market Factor Adjusted Residential (Miles)
Dakota County	**2,303.3**	**2.4**	**5,587.2**	**2.1**	**4,858.5**
Apple Valley	254.0	3.0	762.1	2.0	508.0
Burnsville	279.8	3.0	839.4	2.0	559.6
Eagan	337.9	3.0	1,013.7	3.0	1,013.7
Farmington	123.8	1.0	123.8	1.0	123.8
Hastings (partial)	122.5	2.0	245.0	1.0	122.5
Inver Grove Heights	230.5	2.0	461.0	3.0	691.5
Lakeville	420.7	2.0	841.3	2.0	841.3
Mendota Heights	93.9	3.0	281.6	2.0	187.8
Rosemount	191.2	3.0	573.6	2.0	382.4
South Saint Paul	88.4	2.0	176.9	2.0	176.9
West Saint Paul	76.4	2.0	152.7	2.0	152.7
Empire	69.1	1.1	76.0	1.1	76.0
Sunfish Lake	2.8	2.0	5.5	1.0	2.8
Lilydale	2,303.3	2.4	5,587.2	2.1	4,858.5
Mendota	254.0	3.0	762.1	2.0	508.0

- Primary Tipping Destination
  - Once each collection truck is filled while on-route, it must leave the route to discharge, then return to the route to continue collections.
  - GIS was used to calculate the centroid point for each municipality, then to measure the distance from that centroid to each potential destination for each cart.
  - Gray Cart Destination
    - An even split between the two major landfill destinations was assumed and the smaller fractions of waste to other destinations were not considered in this analysis for baseline and separate cart scenarios.
    - A theoretical mixed waste processing facility located somewhere in the vicinity of SET was used for co-collection scenarios.
  - Green Cart Destination
    - The green cart destination for all scenarios was modeled as SET
  - Yard Waste Cart Destination
    - Yard waste carts were modeled as being hauled to the nearest commercial hauler yard waste tipping destination.

Table 15. Green Cart Destinations and Distances Modeled

Municipality	Baseline Gray Cart Destination	Miles to Pine Bend	Miles to Burnsville LF + Freeway Transfer	Baseline Green Cart Destination	Miles to SET SSO
Dakota County	**127.4**	**79.5**	**47.9**	**144.6**	**144.6**
Apple Valley	Burnsville	7.7	4.3	SET	7.6
Burnsville	Burnsville	11.3	0.9	SET	11.6
Eagan	Pine Bend	6.1	6.1	SET	9.0
Farmington	Burnsville	10.2	9.9	SET	6.8
Hastings (partial)	Pine Bend	10.3	21.0	SET	10.0
Inver Grove Heights	Pine Bend	3.2	11.1	SET	7.8
Lakeville	Burnsville	12.2	7.1	SET	10.0
Mendota Heights	Pine Bend	8.3	9.8	SET	12.5
Rosemount	Pine Bend	2.4	10.6	SET	2.5
South Saint Paul	Pine Bend	7.5	13.8	SET	12.2
West Saint Paul	Pine Bend	8.6	12.7	SET	13.2
Empire	Pine Bend	7.3	11.6	SET	2.9
Sunfish Lake	Pine Bend	6.8	11.1	SET	11.2
Lilydale	Pine Bend	9.8	11.6	SET	14.2
Mendota	Pine Bend	9.2	9.5	SET	13.2

Gray	Gray Cart Landfill Value Used
Green	Green Cart Value Used

Plum	YW Cart Value Used
Salmon	Gray Cart Processing Value Used

Table 16. Yard Waste Destinations and Distances Modeled

Municipality	Baseline YW Cart Destination	Miles to SET Rosemount	Miles to Pine Bend	Miles to SKB	Miles to SET Burnsville	Miles to B&D	Miles to Gertens Inver Grove	Miles to Gertens Eagan
Dakota County	**60.3**	**9.7**	**2.4**	**7.5**	**12.1**	**-**	**3.9**	**24.6**
Apple Valley	SET Burnsville YW	7.6	7.7	9.6	4.0	15.4	8.5	7.5
Burnsville	SET Burnsville YW	11.6	11.3	13.4	1.0	17.6	10.2	8.2
Eagan	Gertens Inver Grove	9.0	6.1	8.9	5.9	20.2	2.4	5.7
Farmington	SET Rosemount YW	6.8	10.2	10.3	9.8	9.1	12.1	12.2
Hastings (partial)	SKB	10.0	10.3	7.5	20.5	22.0	12.2	16.7
Inver Grove Heights	Gertens Inver Grove	7.8	3.2	5.6	10.8	21.4	1.5	3.3
Lakeville	SET Burnsville YW	10.0	12.2	13.2	7.0	11.4	12.9	13.5
Mendota Heights	Gertens Eagan	12.5	8.3	11.0	9.6	24.7	5.7	3.5
Rosemount	Pine Bend	2.5	2.4	3.0	10.2	16.1	4.7	6.7
South Saint Paul	Gertens Eagan	12.2	7.5	9.4	13.6	25.8	5.5	4.5
West Saint Paul	Gertens Eagan	13.2	8.6	11.0	12.4	26.3	6.4	4.8
Empire	SET Rosemount YW	2.9	7.3	6.6	11.3	11.1	10.3	11.1
Sunfish Lake	Gertens Eagan	11.2	6.8	9.3	10.8	24.3	3.4	2.8
Lilydale	Gertens Eagan	14.2	9.8	12.4	11.4	26.7	6.8	5.3
Mendota	Gertens Eagan	13.2	9.2	11.9	9.3	25.1	5.9	3.7

Table 17. Mixed Waste Processing Destinations and Distances Modeled

Municipality	Baseline Mixed Waste Processing Destination	Miles to Theoretical Mixed Waste Processing Near SET	Miles to R&E
Dakota County	**170.7**	**144.6**	**145.3**
Apple Valley	SET Hypothetical	7.6	13.3
Burnsville	SET Hypothetical	11.6	15.5
Eagan	SET Hypothetical	9.0	8.8
Farmington	SET Hypothetical	6.8	17.5
Hastings (partial)	SET Hypothetical	10.0	13.2
Inver Grove Heights	SET Hypothetical	7.8	4.8
Lakeville	SET Hypothetical	10.0	18.6
Mendota Heights	SET Hypothetical	12.5	6.3
Rosemount	SET Hypothetical	2.5	9.9
South Saint Paul	SET Hypothetical	12.2	1.4
West Saint Paul	SET Hypothetical	13.2	3.8
Empire	SET Hypothetical	2.9	14.9
Sunfish Lake	SET Hypothetical	11.2	4.1
Lilydale	SET Hypothetical	14.2	6.0
Mendota	SET Hypothetical	13.2	7.3

Table 18. Gray and Green Cart Tipping Fees Modeled

Municipality	LF Gray Cart Tip Fee ($/ton)	Pine Bend Tip	Burnsville Tip	Green Cart Tip Fee ($/ton)	SET SSO Tip	Dakota Prairie Tip	Processing Tip Fee ($/ton)	R&E Tip
Dakota County	$152.50	$180.00	$125.00	**$ 33.00**	**$ 33.00**	**$ 50.00**	**$ 121.00**	**$ 121.00**
Apple Valley	Burnsville	$180.00	$125.00	SET	$ 33.00	$ 50.00	R&E	$ 121.00
Burnsville	Burnsville	$180.00	$125.00	SET	$ 33.00	$ 50.00	R&E	$ 121.00
Eagan	Pine Bend	$180.00	$125.00	SET	$ 33.00	$ 50.00	R&E	$ 121.00
Farmington	Burnsville	$180.00	$125.00	SET	$ 33.00	$ 50.00	R&E	$ 121.00
Hastings (partial)	Pine Bend	$180.00	$125.00	SET	$ 33.00	$ 50.00	R&E	$ 121.00
Inver Grove Heights	Pine Bend	$180.00	$125.00	SET	$ 33.00	$ 50.00	R&E	$ 121.00
Lakeville	Burnsville	$180.00	$125.00	SET	$ 33.00	$ 50.00	R&E	$ 121.00
Mendota Heights	Pine Bend	$180.00	$125.00	SET	$ 33.00	$ 50.00	R&E	$ 121.00
Rosemount	Pine Bend	$180.00	$125.00	SET	$ 33.00	$ 50.00	R&E	$ 121.00
South Saint Paul	Pine Bend	$180.00	$125.00	SET	$ 33.00	$ 50.00	R&E	$ 121.00
West Saint Paul	Pine Bend	$180.00	$125.00	SET	$ 33.00	$ 50.00	R&E	$ 121.00
Empire	Pine Bend	$180.00	$125.00	SET	$ 33.00	$ 50.00	R&E	$ 121.00
Sunfish Lake	Pine Bend	$180.00	$125.00	SET	$ 33.00	$ 50.00	R&E	$ 121.00
Lilydale	Pine Bend	$180.00	$125.00	SET	$ 33.00	$ 50.00	R&E	$ 121.00
Mendota	Pine Bend	$180.00	$125.00	SET	$ 33.00	$ 50.00	R&E	$ 121.00

Table 19. YW Tipping Fees Modeled

Municipality	YW Tip Fee ($/ton)	SET	Pine Bend	SKB	B&D	Gertens
Dakota County	**$ 13.60**	**$ 11.00**	**$ 15.00**	**$ 15.00**	**$ 15.00**	**$ 20.00**
Apple Valley	Mulch Store	$ 11.00	$ 15.00	$ 15.00	$ 15.00	$ 20.00
Burnsville	Mulch Store	$ 11.00	$ 15.00	$ 15.00	$ 15.00	$ 20.00
Eagan	Gertens	$ 11.00	$ 15.00	$ 15.00	$ 15.00	$ 20.00
Farmington	Mulch Store	$ 11.00	$ 15.00	$ 15.00	$ 15.00	$ 20.00
Hastings (partial)	SKB	$ 11.00	$ 15.00	$ 15.00	$ 15.00	$ 20.00
Inver Grove Heights	Gertens	$ 11.00	$ 15.00	$ 15.00	$ 15.00	$ 20.00
Lakeville	Mulch Store	$ 11.00	$ 15.00	$ 15.00	$ 15.00	$ 20.00
Mendota Heights	Gertens	$ 11.00	$ 15.00	$ 15.00	$ 15.00	$ 20.00
Rosemount	Pine Bend	$ 11.00	$ 15.00	$ 15.00	$ 15.00	$ 20.00
South Saint Paul	Gertens	$ 11.00	$ 15.00	$ 15.00	$ 15.00	$ 20.00
West Saint Paul	Gertens	$ 11.00	$ 15.00	$ 15.00	$ 15.00	$ 20.00
Empire	Mulch Store	$ 11.00	$ 15.00	$ 15.00	$ 15.00	$ 20.00
Sunfish Lake	Gertens	$ 11.00	$ 15.00	$ 15.00	$ 15.00	$ 20.00
Lilydale	Gertens	$ 11.00	$ 15.00	$ 15.00	$ 15.00	$ 20.00
Mendota	Gertens	$ 11.00	$ 15.00	$ 15.00	$ 15.00	$ 20.00

- From EPA WARM
  - EPA WARM assumes composition of relevant generation categories:
    - Food Waste: Beef 9 percent, Poultry 11 percent, Grains 13 percent, Fruits and Vegetables 49 percent, Dairy Products 18 percent
      - Food Waste (non-meat): Grains 16 percent, Fruits and Vegetables 61 percent, Dairy Products 22 percent
  - Food Waste (meat only): Beef 46 percent, Poultry 54 percent
    - Yard trimmings: 50 percent grass, 25 percent leaves, and 25 percent tree and brush trimmings
    - Mixed Organics: Food Waste 53 percent, Yard Trimmings 47 percent
    - Mixed MSW: the entire municipal solid waste stream as disposed
  - These generalized compositions in the EPA WARM are then utilized to generate impact factors for Labor Hours per Ton of Material Source Reduced.

Table 20. WARM Values

Relevant Per Ton Estimates of GHG Emissions for Baseline and Alternative Management Scenarios

Material	GHG Emissions per Ton of Material Produced (MTCO2E)	GHG Emissions per Ton of Material Source Reduced (MTCO2E)	GHG Emissions per Ton of Material Recycled (MTCO2E)	GHG Emissions per Ton of Material Landfilled (MTCO2E)	GHG Emissions per Ton of Material Combusted (MTCO2E)	GHG Emissions per Ton of Material Composted (MTCO2E)	GHG Emission per Ton of Material Anaerobically Digested (MTCO2E)
Food Waste	3.66	(3.66)	NA	0.50	(0.13)	(0.15)	(0.04)
Yard Trimmings	NA	NA	NA	(0.20)	(0.17)	(0.11)	(0.09)
Mixed MSW	NA	NA	NA	0.31	0.01	NA	NA

- Energy and Fuel Consumption for mixed waste sorting:
  - Based on "Preliminary Design for Processing Enhancements at the Recycling & Energy Center," prepared by Foth for Ramsey/Washington Recycling & Energy Board, March 2019, https://recyclingandenergy.org/wp-content/uploads/2020/12/2019-03-Foth-R-Preliminary-Design-for-Processing-Enhancements.pdf

- Mixed waste processing cost:
  - Based on "Peer Review of "Preliminary Design for Processing Enhancements at the Recycling & Energy Center," Prepared by Foth Infrastructure & Environment, LLC, January 2019" prepared by SCS Engineers for Ramsey/Washington Recycling & Energy Board, March 2019, https://recyclingandenergy.org/wp-content/uploads/2020/12/2019-03-SCS-R-Peer-Review-of-Preliminary-Design-for-Processing-Enhancements.pdf

Table 21. Mixed Waste Processing Cost

High-Estimate Annual Costs for Mixed Waste Sorting (Adjusted for Inflation)

Cost Category	DCB System (building and equipment)	Recyclables Recovery (equipment only)	TOTAL
Amortized Capital Costs (includes financing)	$2.1 million	$2.3 million	$4.4 million
O&M Costs	$3.0 million	$3.2 million	$6.2 million
Program Costs (bags to households and education/outreach/support)	$3.6 million	n/a	$3.6 million
Composting or Commodity Sale (includes transportation and tipping)	$7.5 million	($2.9 million)	$4.6 million
Disposal Cost Savings (includes transportation and tipping)	($2.0 million)	($0.4 million)	($2.4 million)
TOTAL	**$14.2 million**	**$2.2 million**	**$16.4 million**
Material Diverted @ 225,000 tons MSW per year	31,000 tons	9,200 tons	40,200 tons
Cost of Recovery	**$458 per ton**	**$240 per ton**	**$408 per ton**
Table Notes: (1) inflation rate from 2019 to 2024 equals 21.4% (2) processing cost $63 per ton of MSW @ 225,000 tons per year			

Appendix D, Attachment D3
Environmental Justice Areas Detailed Information

Organics Collection Analysis Report
SCS Engineers Project #25224046.00

In reference to:

- https://gisdata.mn.gov/dataset/env-ej-mpca-census
- https://mpca.maps.arcgis.com/apps/MapSeries/index.html?appid=f5bf57c8dac24404b7f8ef1717f57d00
- 2017-2021 ACS 5-year estimates
- Table Titles:
  - 200x = At least 35 percent of residents reported income less than 200 percent of the federal poverty level
  - POC = At least 40 percent of residents are people of color
  - Lan. = At least 40 percent of residents have limited English proficiency

Table 22. Legend of Colors for Environmental Justice Populations Table

Color	Meaning
Green	> 35% of residents reported income < 200% of the federal poverty level
Blue	> 40% of residents are people of color
Pink	> 40% of residents have limited English proficiency

Table 23. Data Set to Quantify Environmental Justice Populations

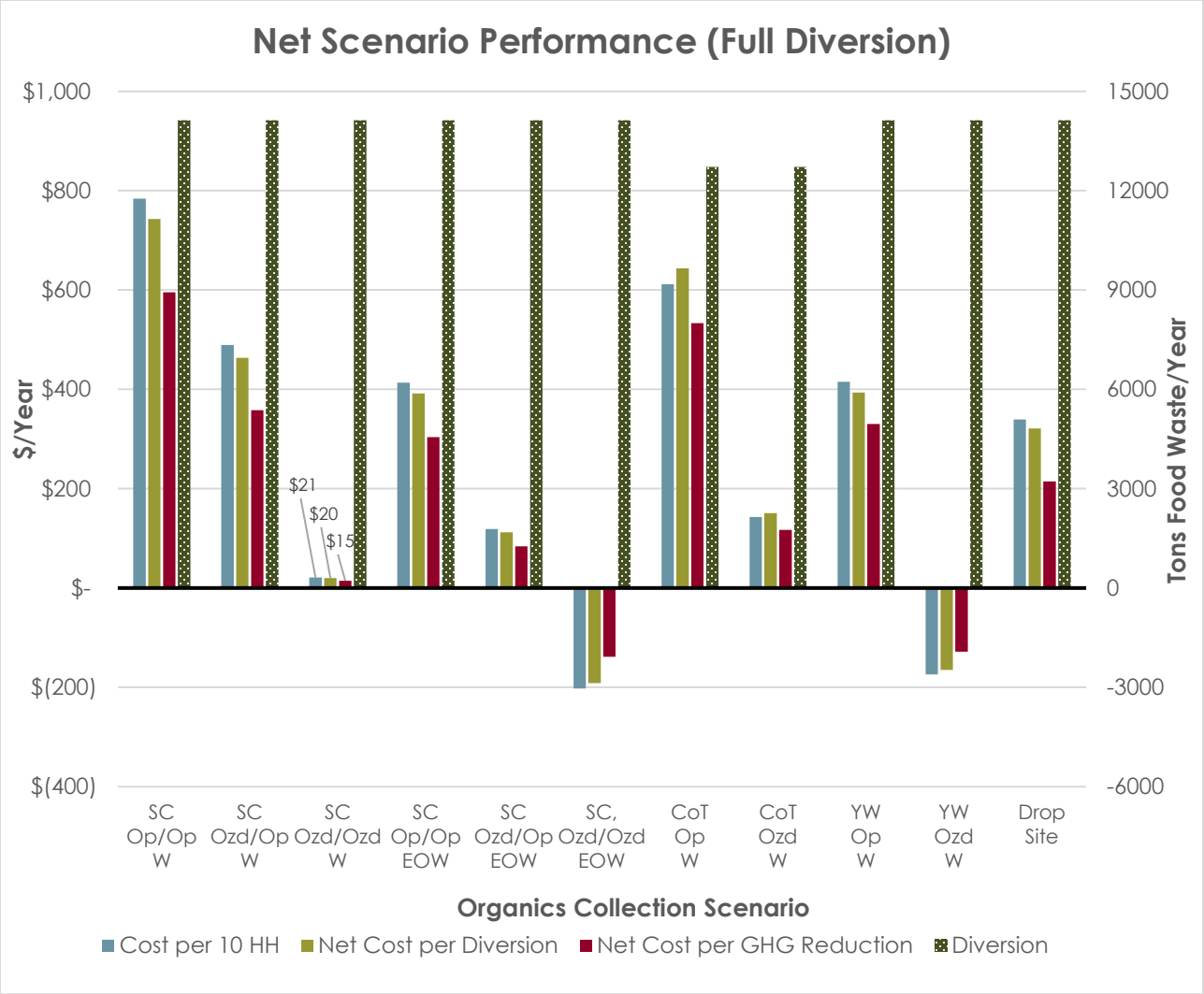
Tract #	Census Tract Description	200x	%	Pop.	POC	%	Pop.	Lan.
27037060101	Census Tract 601.01, Dakota County, Minnesota	YES	47%	1,721	YES	41%	1,506	NO
27037060105	Census Tract 601.05, Dakota County, Minnesota	YES	57%	3,011	YES	54%	2,956	NO
27037060402	Census Tract 604.02, Dakota County, Minnesota	YES	43%	1,545	YES	51%	1,830	NO
27037060505	Census Tract 605.05, Dakota County, Minnesota	YES	38%	2,515	YES	46%	3,043	NO
27037060605	Census Tract 606.05, Dakota County, Minnesota	YES	65%	1,693	YES	73%	1,928	NO
27037060709	Census Tract 607.09, Dakota County, Minnesota	YES	43%	2,721	YES	50%	3,153	NO
27037060710	Census Tract 607.10, Dakota County, Minnesota	YES	60%	2,779	YES	64%	2,947	NO
27037060711	Census Tract 607.11, Dakota County, Minnesota	YES	51%	2,195	YES	48%	2,141	NO
27037060714	Census Tract 607.14, Dakota County, Minnesota	YES	38%	1,803	YES	42%	2,008	NO
27037060717	Census Tract 607.17, Dakota County, Minnesota	YES	39%	900	YES	41%	965	NO
27037060725	Census Tract 607.25, Dakota County, Minnesota	YES	41%	1,630	YES	52%	2,058	NO
27037060726	Census Tract 607.26, Dakota County, Minnesota	YES	41%	1,100	YES	45%	1,283	NO
27037060737	Census Tract 607.37, Dakota County, Minnesota	YES	51%	2,646	YES	50%	2,619	NO
27037060738	Census Tract 607.38, Dakota County, Minnesota	YES	40%	1,406	YES	51%	1,799	NO
27037060739	Census Tract 607.39, Dakota County, Minnesota	YES	39%	2,357	YES	44%	2,625	NO
27037060743	Census Tract 607.43, Dakota County, Minnesota	YES	46%	685	YES	67%	1,000	NO
27037060745	Census Tract 607.45, Dakota County, Minnesota	YES	40%	1,610	YES	42%	1,676	NO
27037060747	Census Tract 607.47, Dakota County, Minnesota	YES	38%	1,545	YES	54%	2,222	NO
27037060753	Census Tract 607.53, Dakota County, Minnesota	YES	39%	880	YES	72%	1,629	NO
27037060805	Census Tract 608.05, Dakota County, Minnesota	YES	61%	2,102	YES	75%	2,568	NO
27037060812	Census Tract 608.12, Dakota County, Minnesota	YES	37%	2,508	YES	59%	3,958	NO
27037060829	Census Tract 608.29, Dakota County, Minnesota	YES	37%	1,281	YES	55%	1,891	NO
27037060836	Census Tract 608.36, Dakota County, Minnesota	YES	38%	1,832	YES	49%	2,436	NO
27037060102	Census Tract 601.02, Dakota County, Minnesota	YES	41%	1,203	NO	37%	1,081	NO
27037060104	Census Tract 601.04, Dakota County, Minnesota	YES	47%	2,599	NO	40%	2,178	NO
27037060301	Census Tract 603.01, Dakota County, Minnesota	YES	50%	2,155	NO	40%	1,703	NO
27037060302	Census Tract 603.02, Dakota County, Minnesota	YES	41%	1,452	NO	34%	1,224	NO
27037060502	Census Tract 605.02, Dakota County, Minnesota	YES	40%	1,640	NO	36%	1,507	NO
27037060503	Census Tract 605.03, Dakota County, Minnesota	YES	41%	2,159	NO	36%	1,890	NO
27037060735	Census Tract 607.35, Dakota County, Minnesota	YES	53%	2,546	NO	39%	1,930	NO
27037060746	Census Tract 607.46, Dakota County, Minnesota	YES	49%	1,591	NO	29%	959	NO
27037060748	Census Tract 607.48, Dakota County, Minnesota	YES	41%	1,545	NO	41%	1,575	NO
27037060749	Census Tract 607.49, Dakota County, Minnesota	YES	38%	582	NO	32%	493	NO
27037060750	Census Tract 607.50, Dakota County, Minnesota	YES	40%	1,749	NO	37%	1,607	NO
27037060822	Census Tract 608.22, Dakota County, Minnesota	YES	37%	692	NO	25%	463	NO
27037060832	Census Tract 608.32, Dakota County, Minnesota	YES	40%	2,430	NO	26%	1,593	NO
27037061005	Census Tract 610.05, Dakota County, Minnesota	YES	38%	925	NO	31%	751	NO
27037061008	Census Tract 610.08, Dakota County, Minnesota	YES	44%	934	NO	24%	509	NO
27037061010	Census Tract 610.10, Dakota County, Minnesota	YES	36%	1,319	NO	22%	814	NO
27037061109	Census Tract 611.09, Dakota County, Minnesota	YES	57%	2,016	NO	24%	871	NO
27037061110	Census Tract 611.10, Dakota County, Minnesota	YES	41%	1,388	NO	15%	508	NO
27037061501	Census Tract 615.01, Dakota County, Minnesota	YES	35%	866	NO	8%	195	NO
27037060401	Census Tract 604.01, Dakota County, Minnesota	NO	35%	935	YES	42%	1,131	NO
27037060716	Census Tract 607.16, Dakota County, Minnesota	NO	34%	1,381	YES	55%	2,270	NO
27037060721	Census Tract 607.21, Dakota County, Minnesota	NO	35%	942	YES	56%	1,498	NO
27037060727	Census Tract 607.27, Dakota County, Minnesota	NO	34%	1,321	YES	57%	2,195	NO
27037060754	Census Tract 607.54, Dakota County, Minnesota	NO	30%	1,442	YES	53%	2,581	NO
27037060806	Census Tract 608.06, Dakota County, Minnesota	NO	27%	1,724	YES	44%	2,757	NO
27037060828	Census Tract 608.28, Dakota County, Minnesota	NO	35%	1,747	YES	48%	2,427	NO
TOTAL (73)	**Dakota County, Minnesota**	**YES (42)**	**16%**	**72,255**	**YES (30)**	**15%**	**65,101**	**NO**

Appendix E

Full Diversion Results

Appendix E
100% Diversion Modeling Results
Organics Collection Analysis Report

COUNTY-WIDE SCENARIO PERFORMANCE (FULL DIVERSION)



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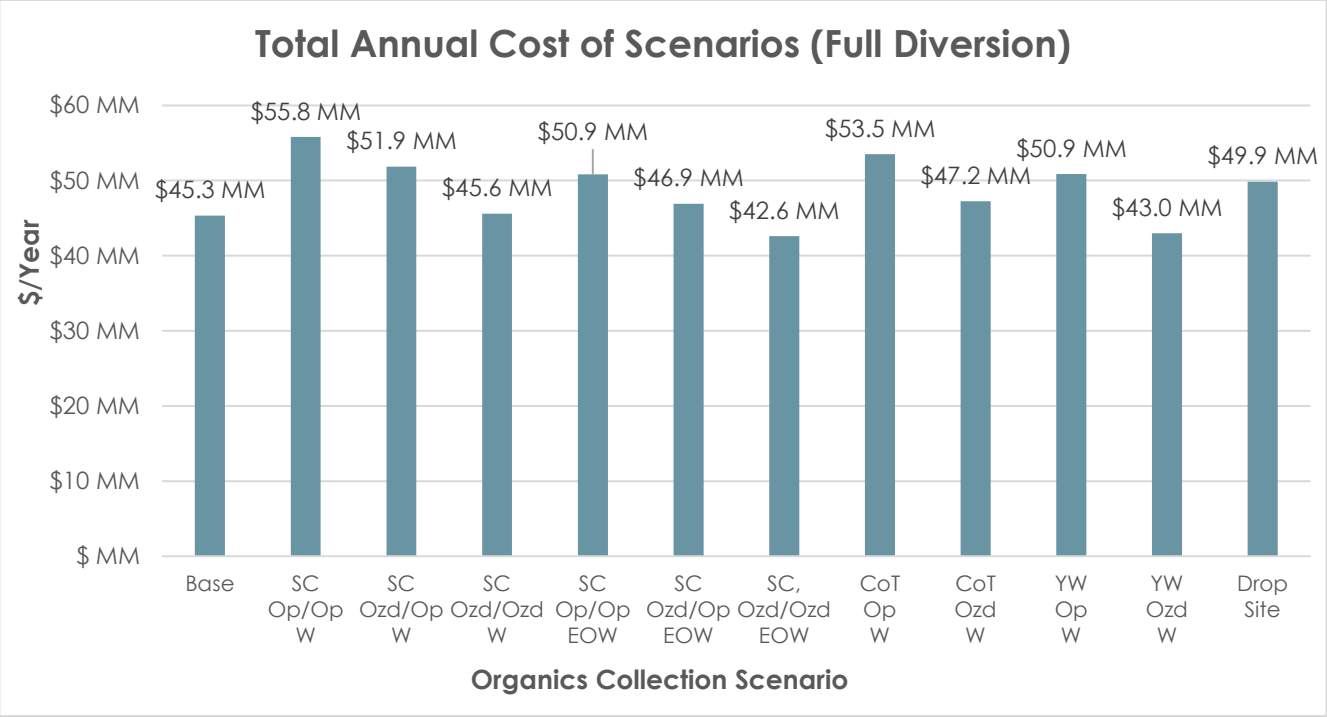
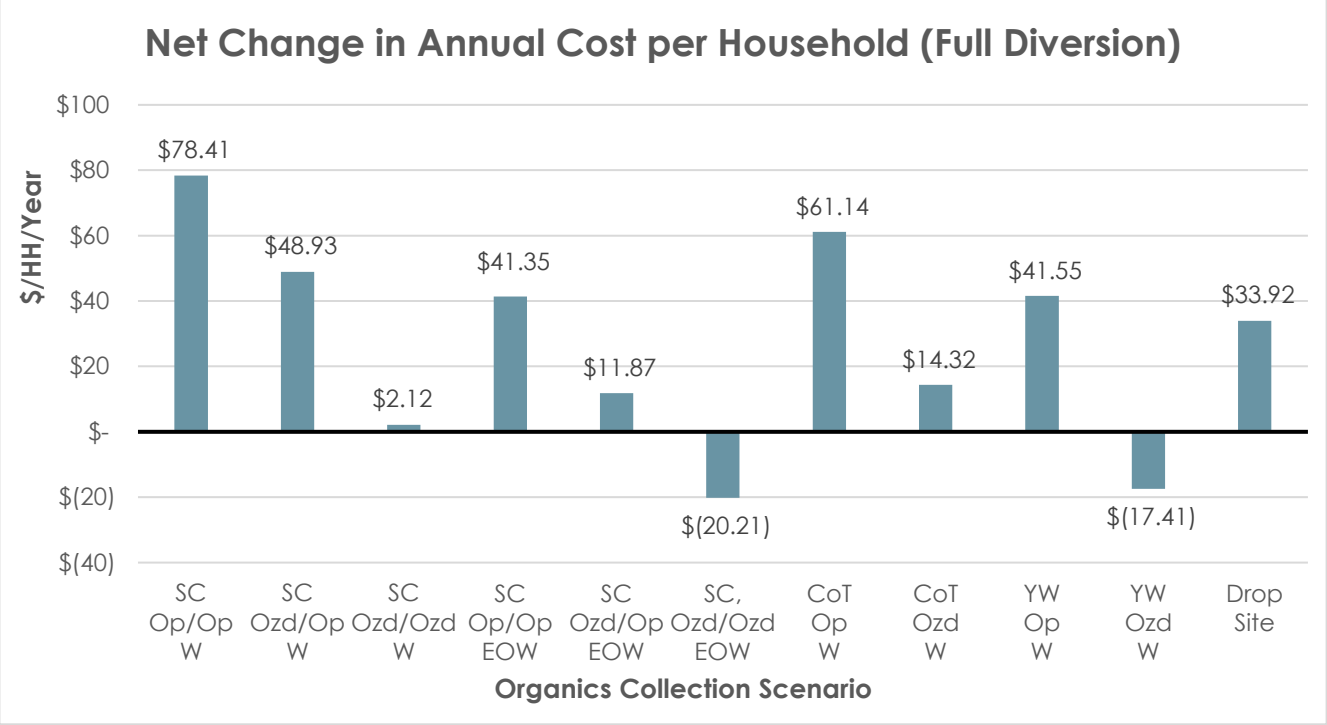
100% Diversion Modeling Results
Organics Collection Analysis Report

COSTS





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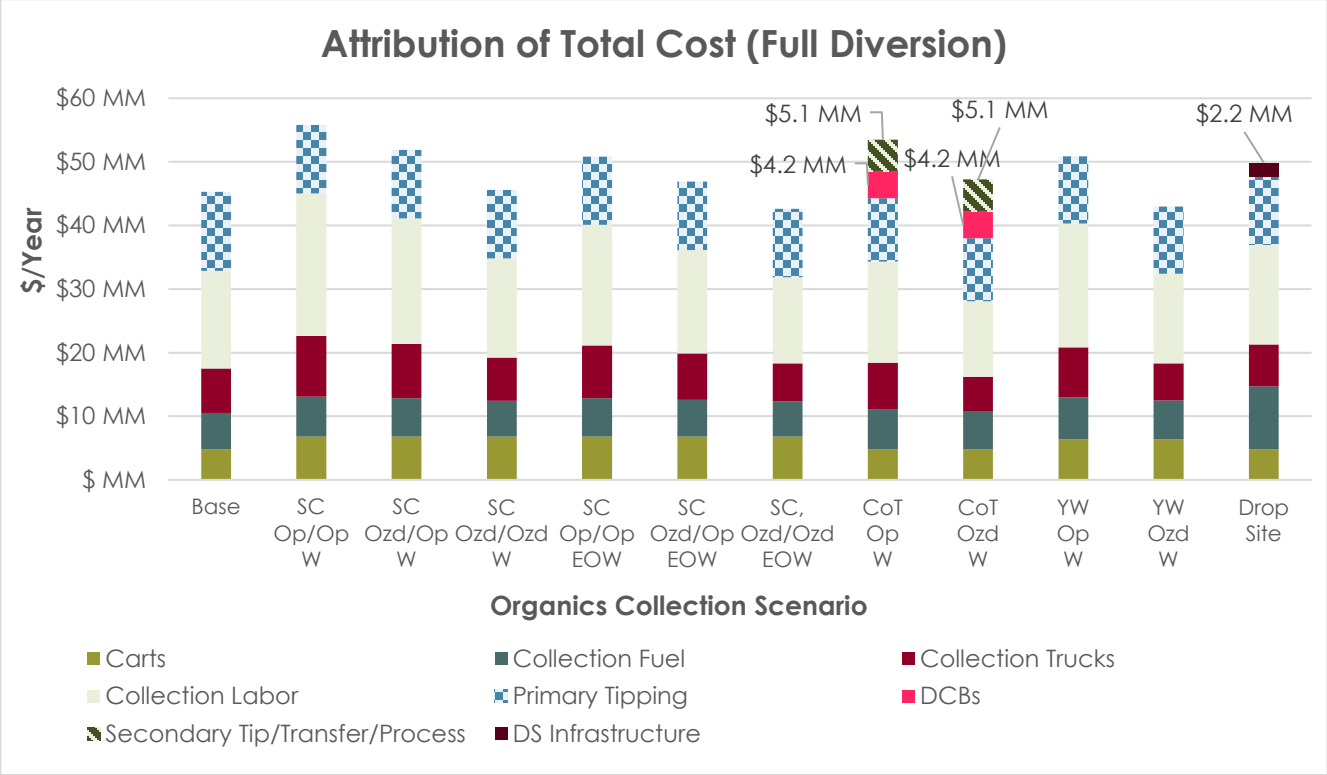
100% Diversion Modeling Results
Organics Collection Analysis Report



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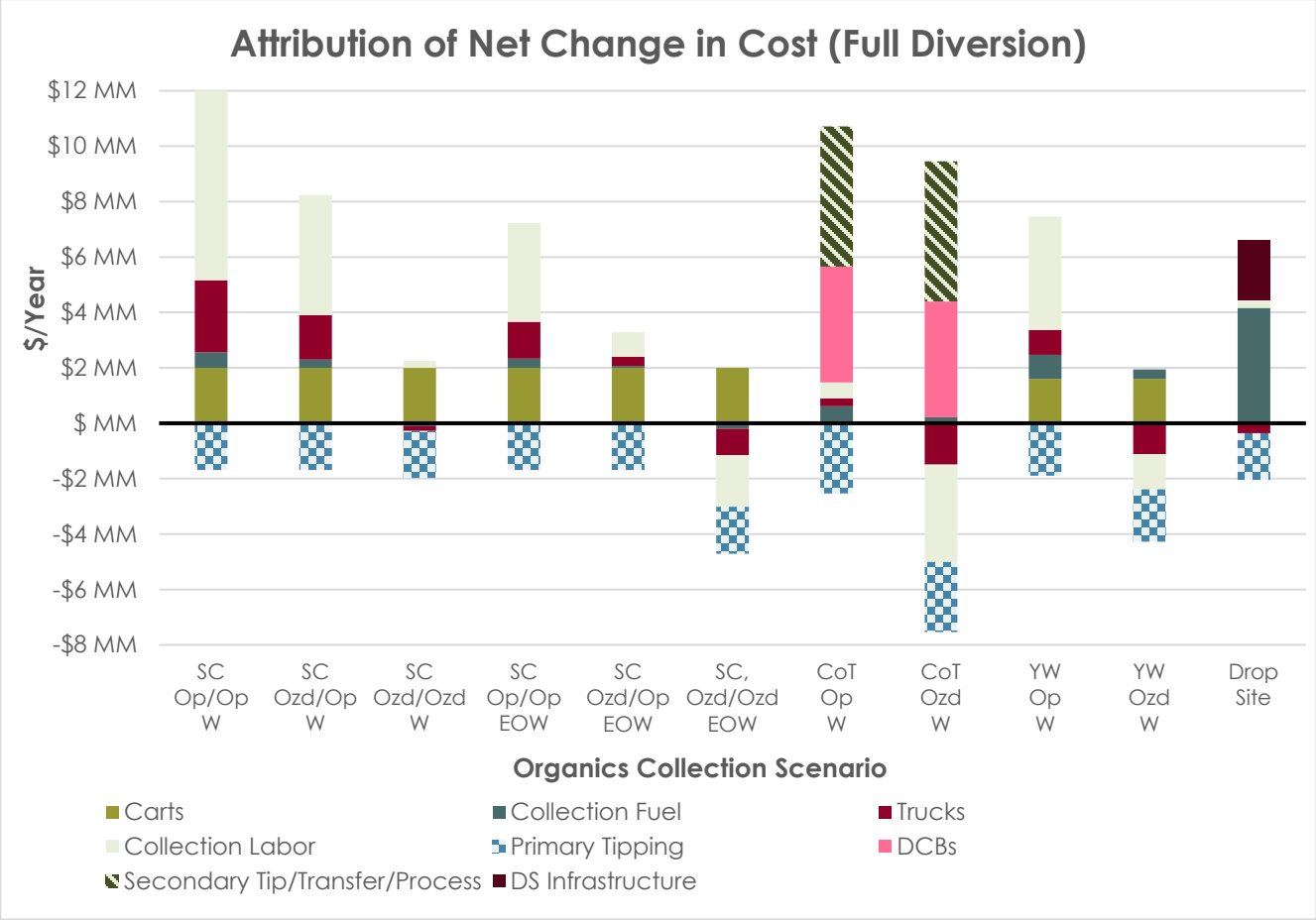
100% Diversion Modeling Results
Organics Collection Analysis Report



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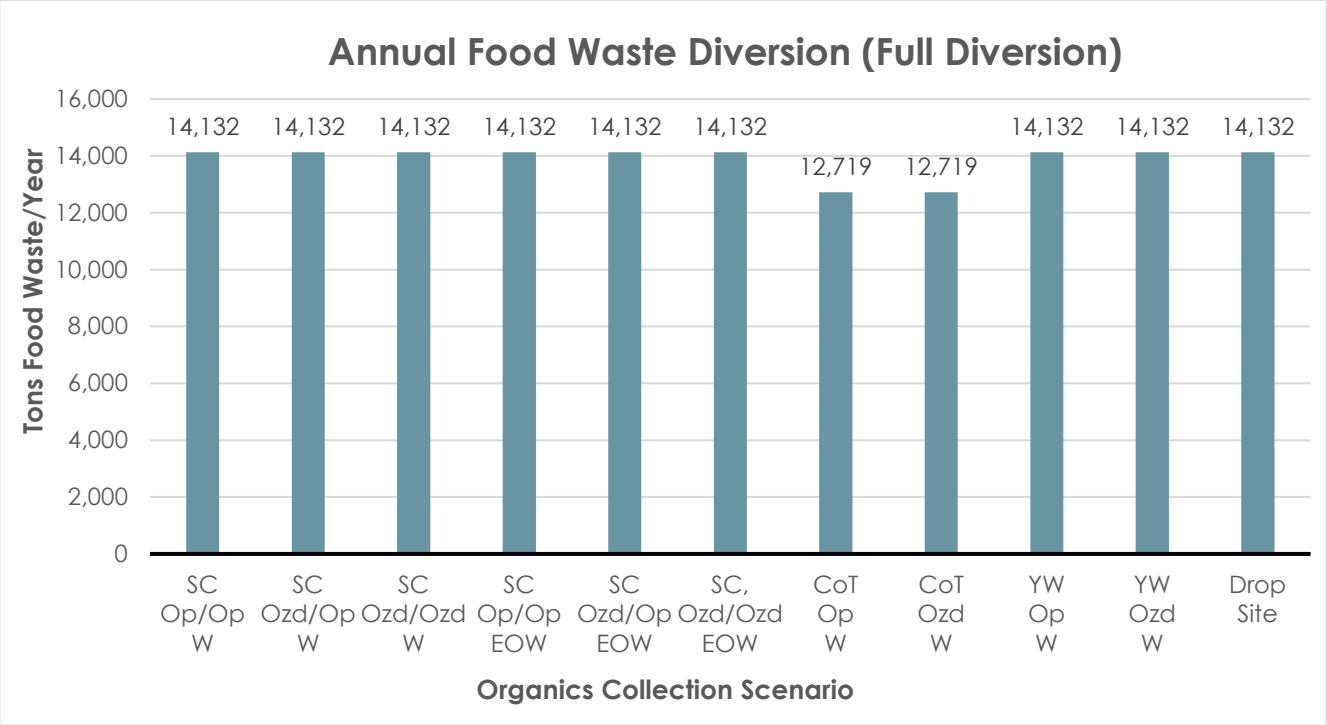
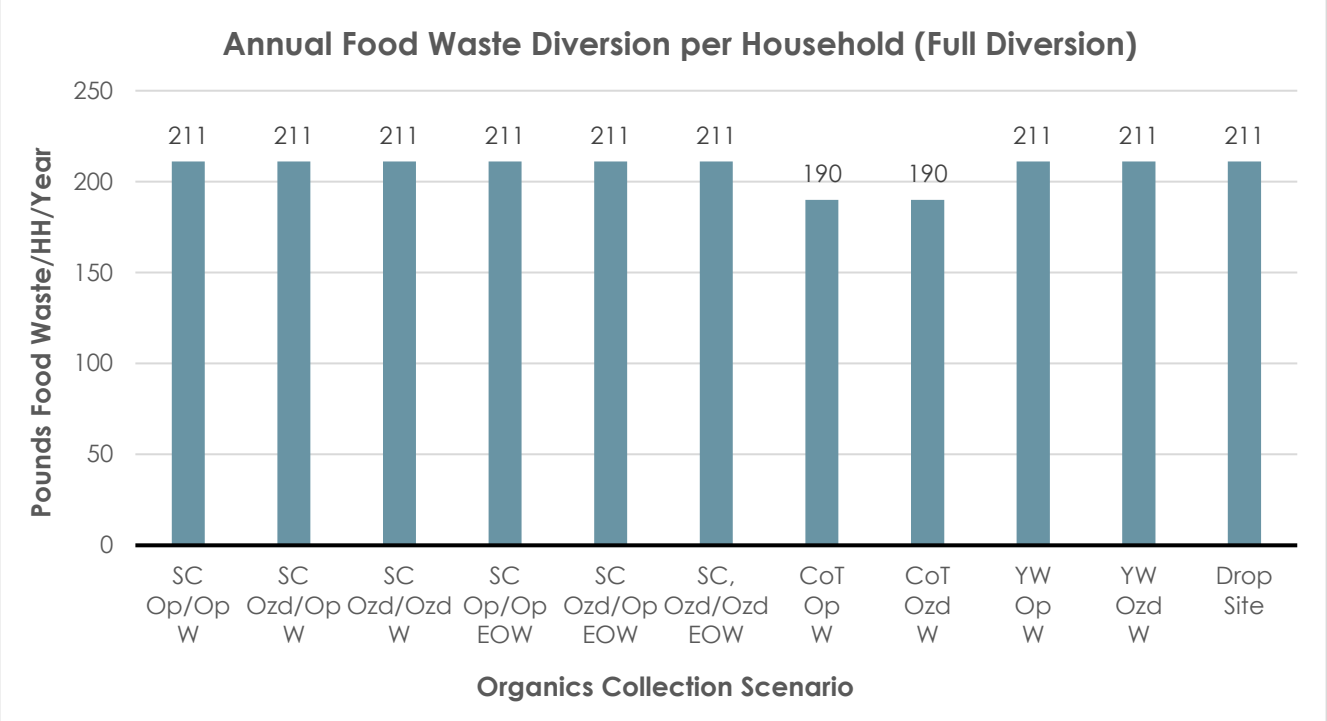
Organics Collection Analysis Report

DIVERSION





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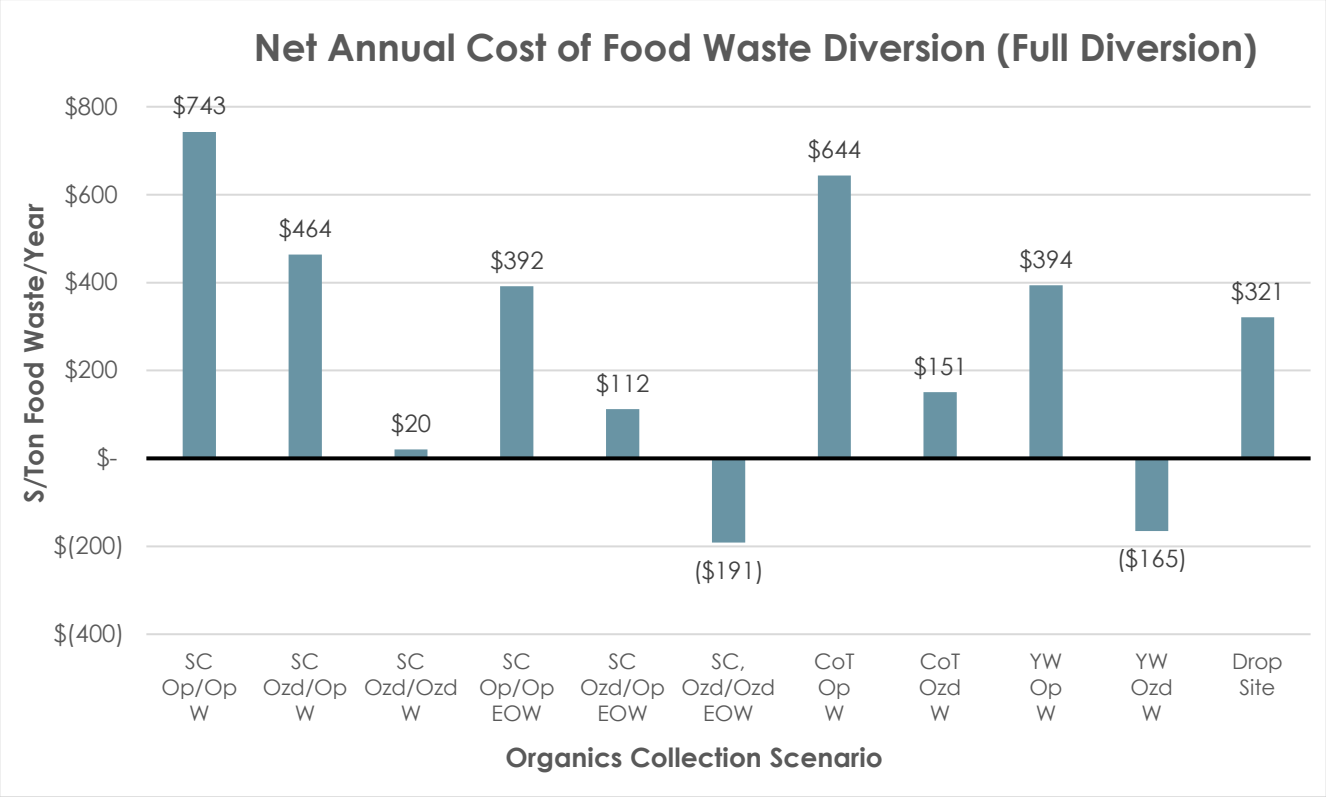
100% Diversion Modeling Results
Organics Collection Analysis Report



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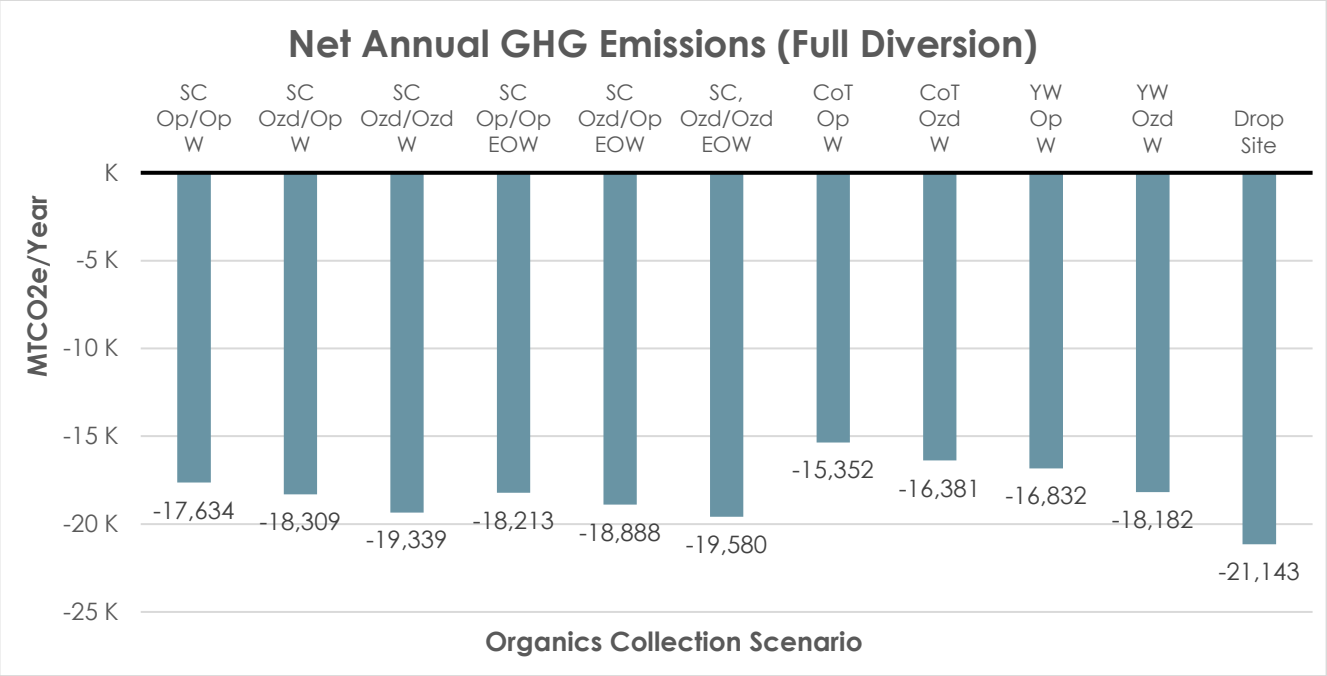
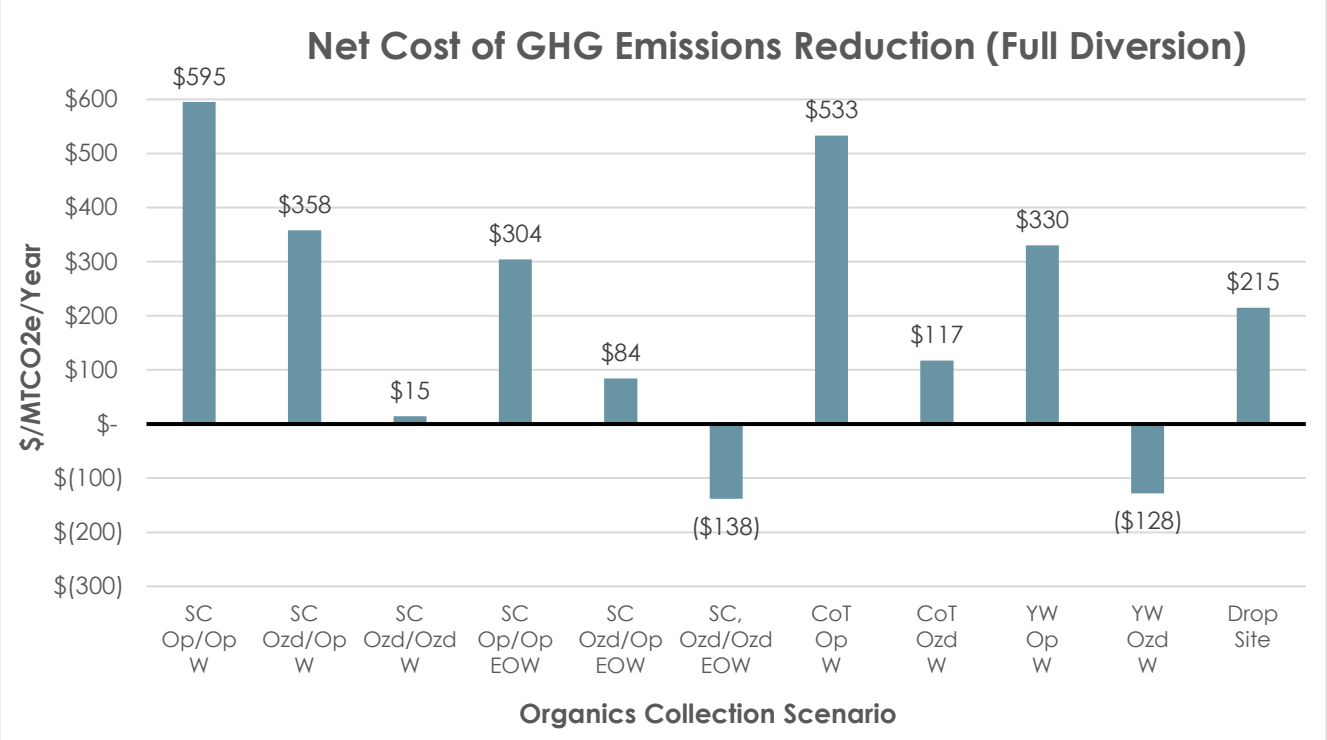
Organics Collection Analysis Report

GHG





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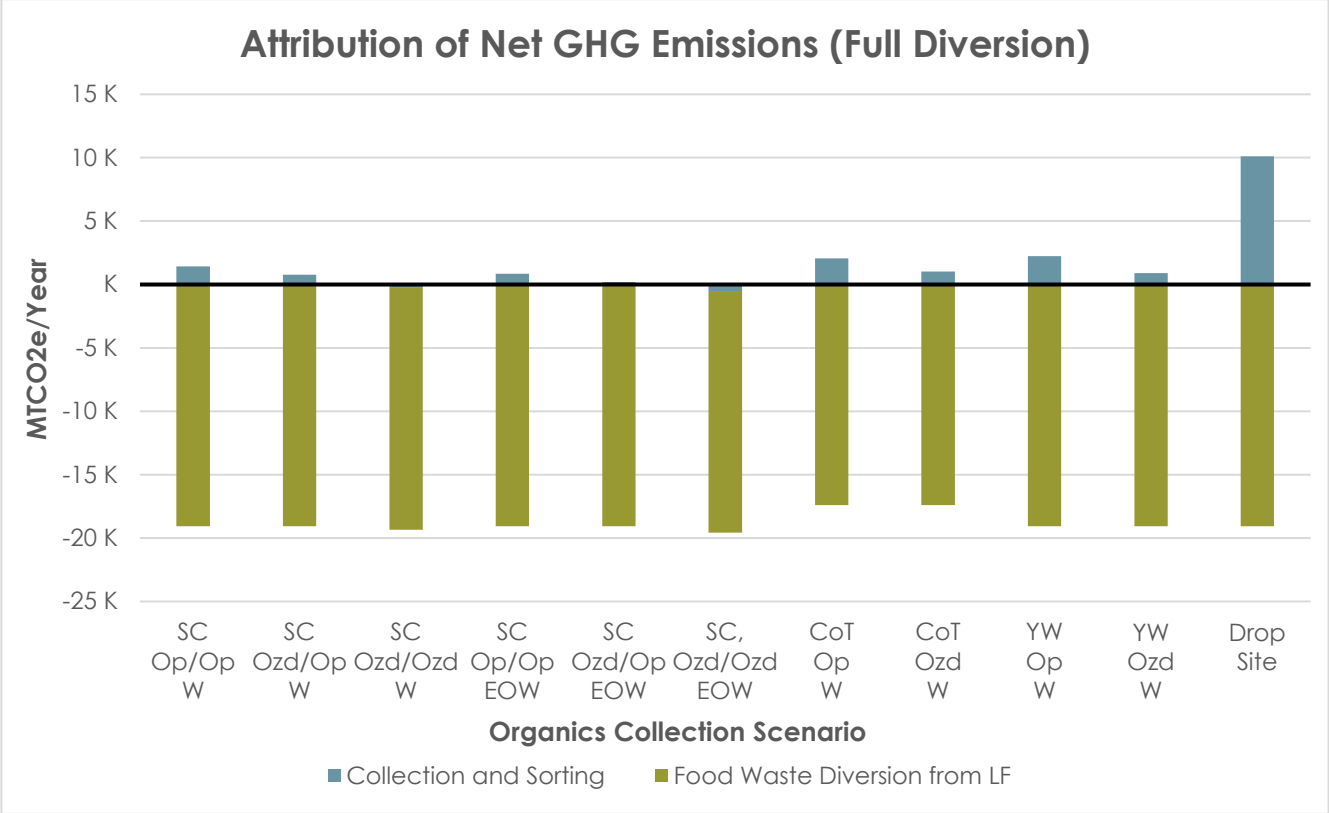
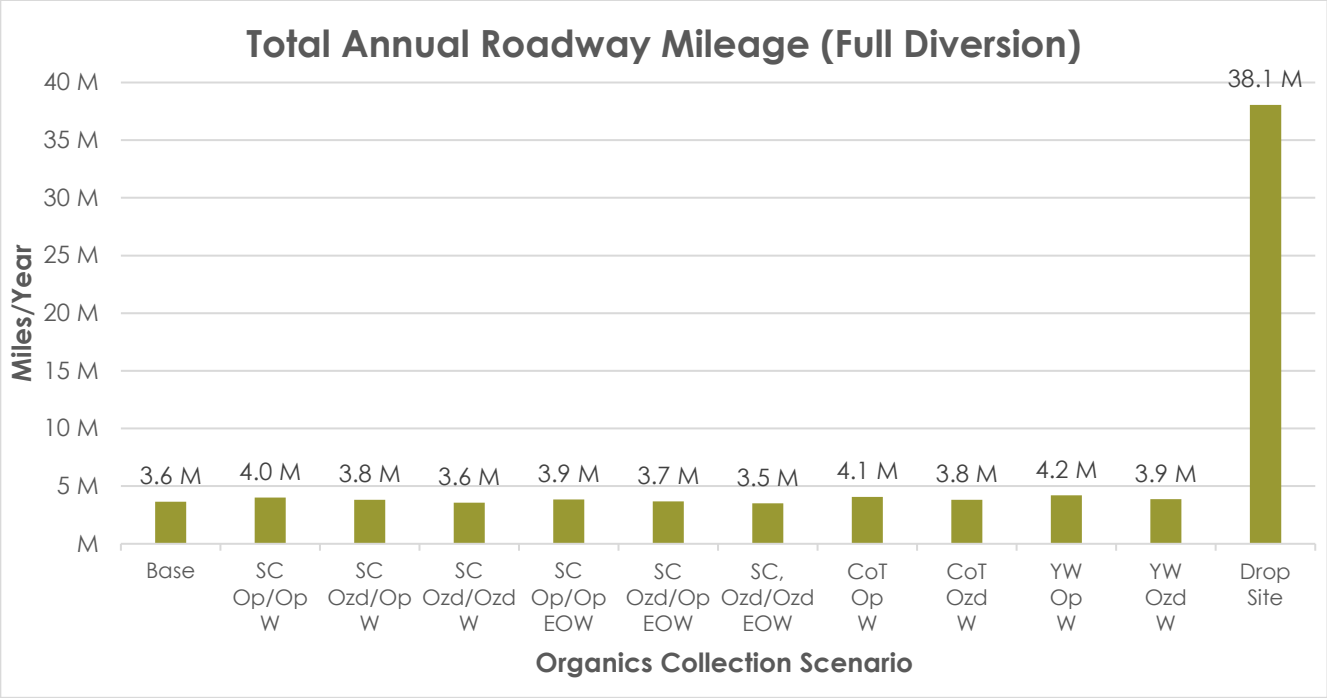
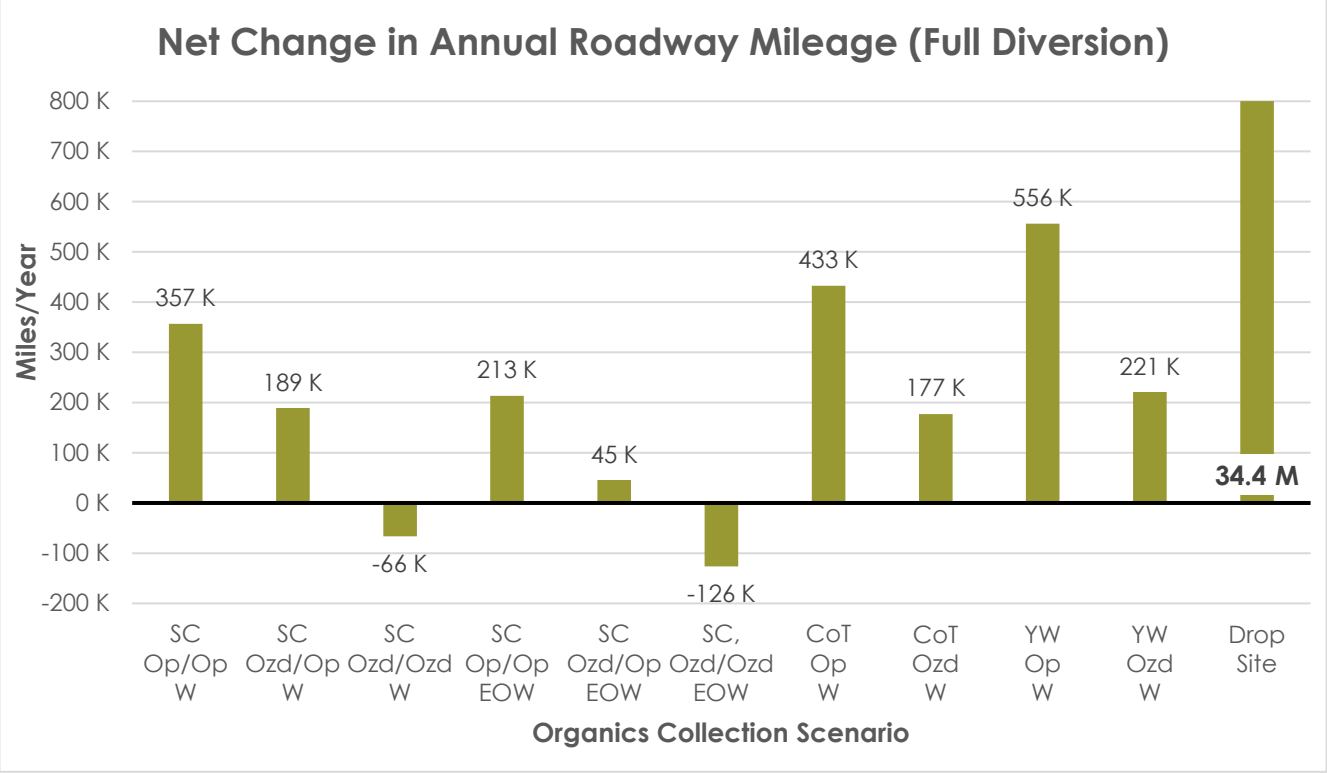
100% Diversion Modeling Results
Organics Collection Analysis Report



Appendix E
100% Diversion Modeling Results
Organics Collection Analysis Report

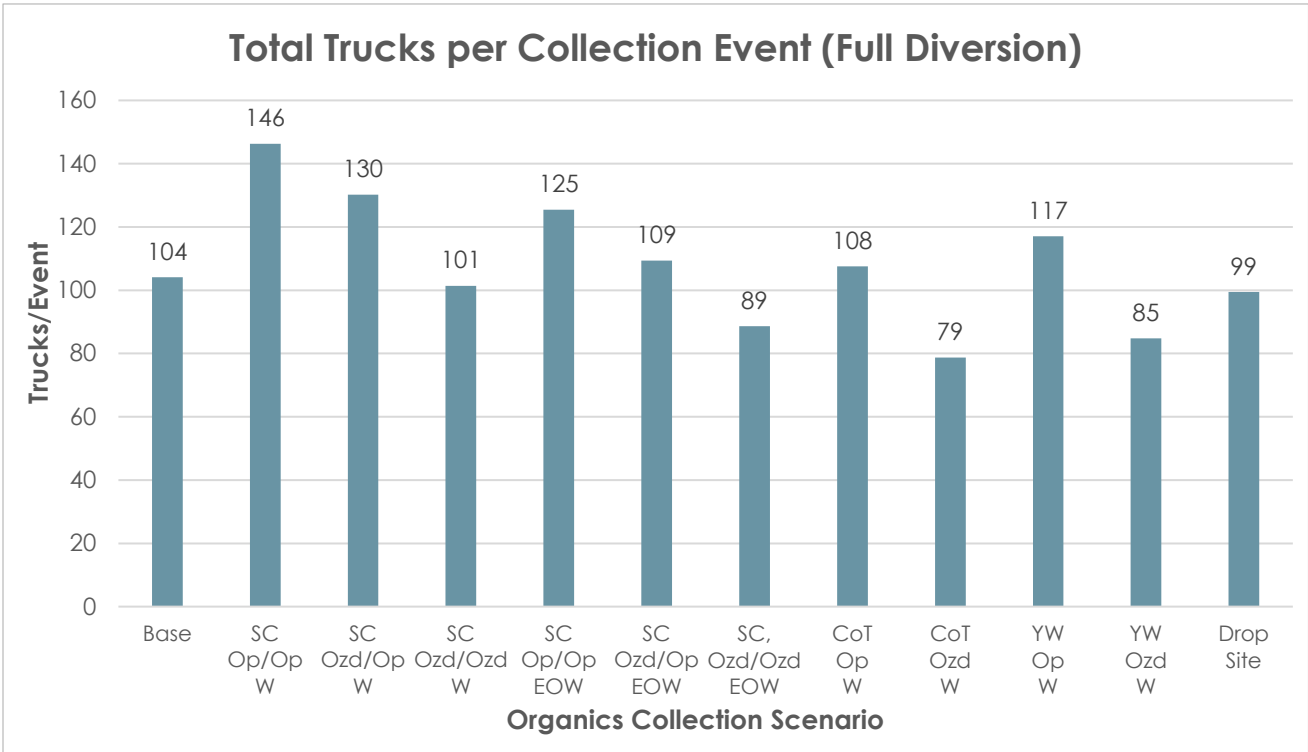
MILEAGE

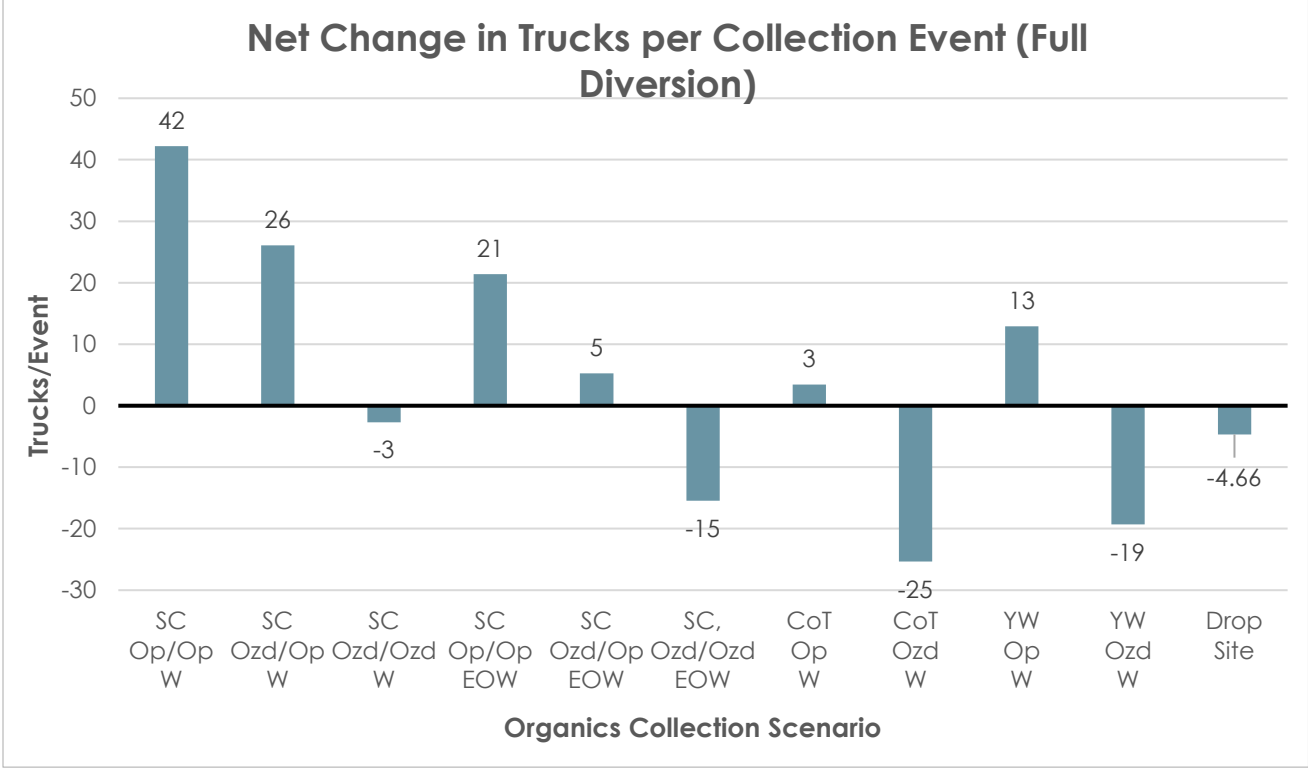




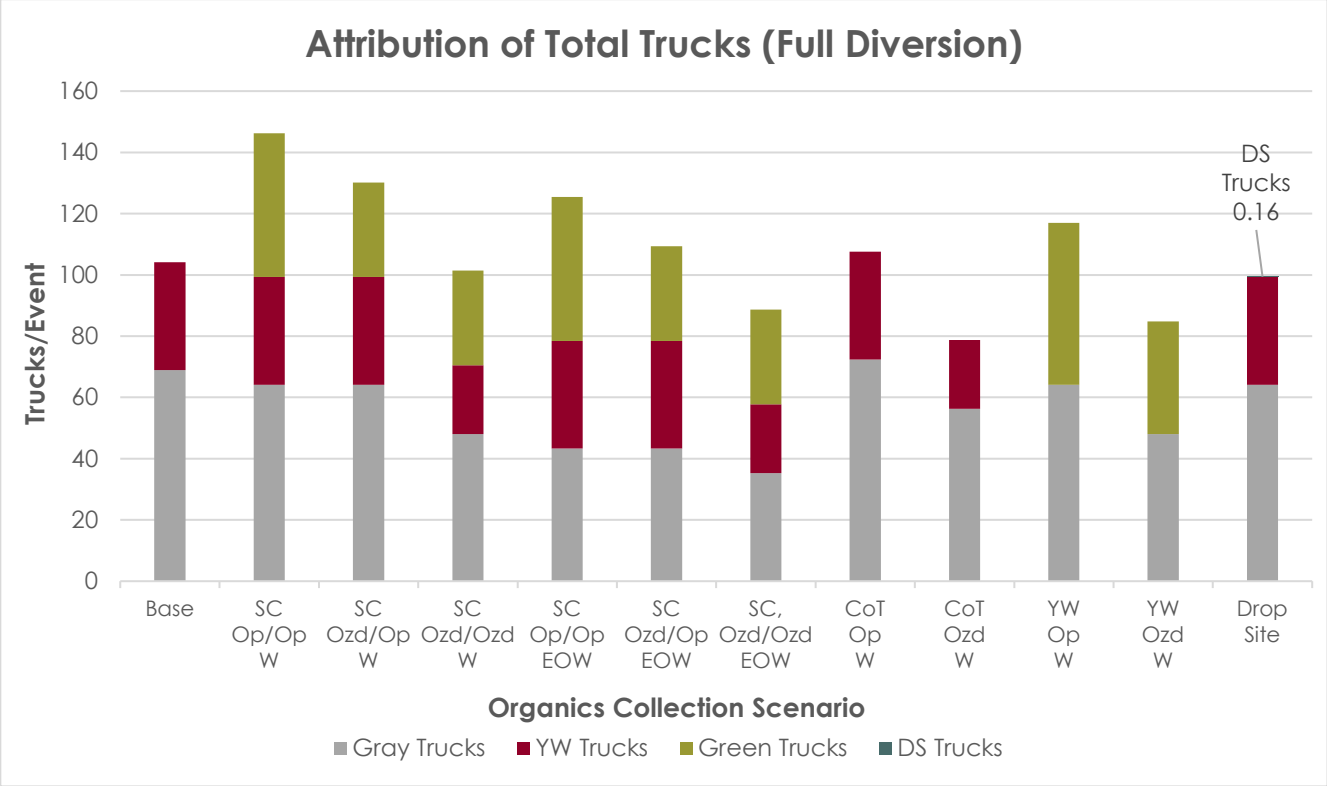
Appendix E
100% Diversion Modeling Results
Organics Collection Analysis Report

COLLECTION VEHICLES





Appendix E
100% Diversion Modeling Results
Organics Collection Analysis Report



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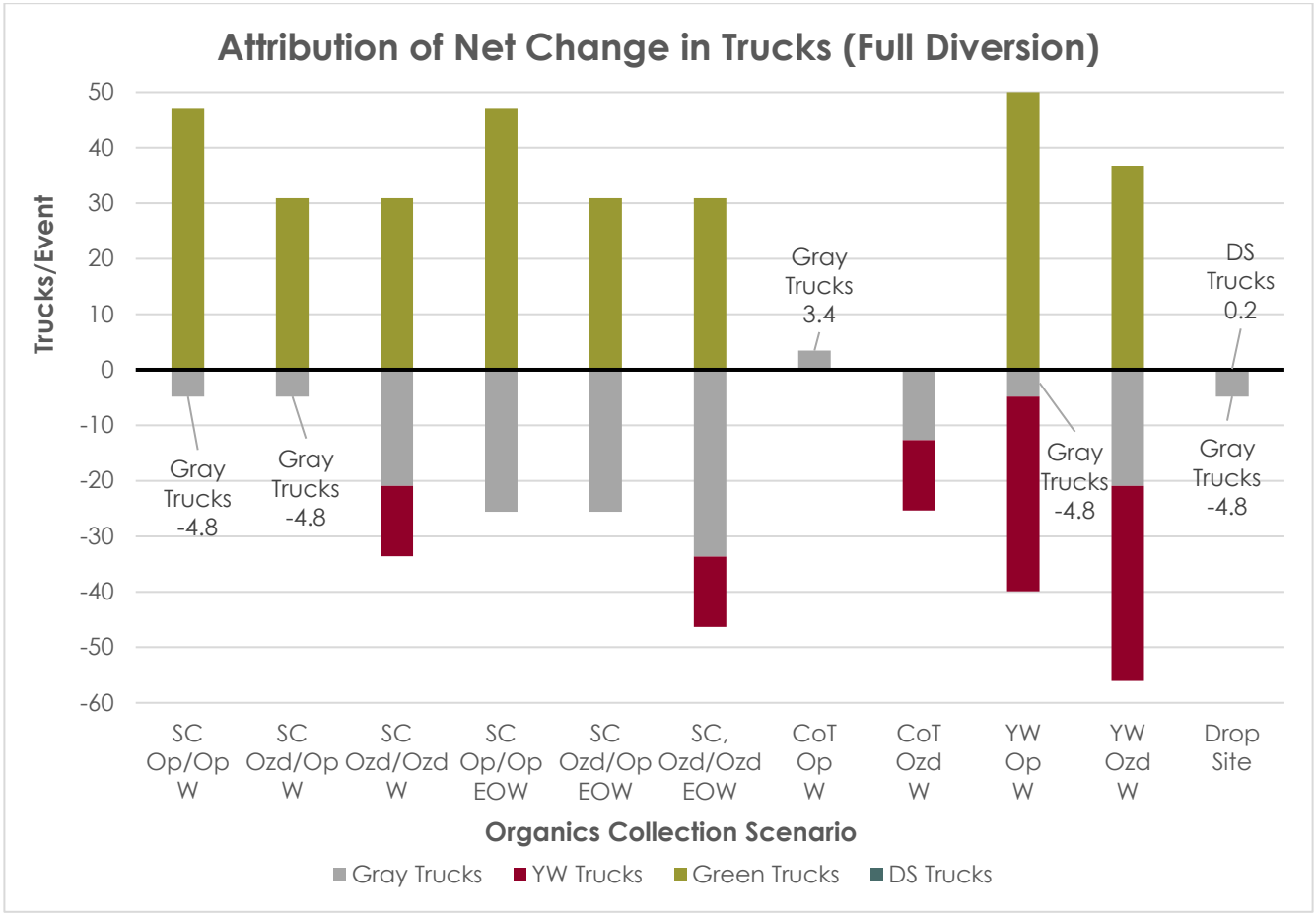
100% Diversion Modeling Results
Organics Collection Analysis Report



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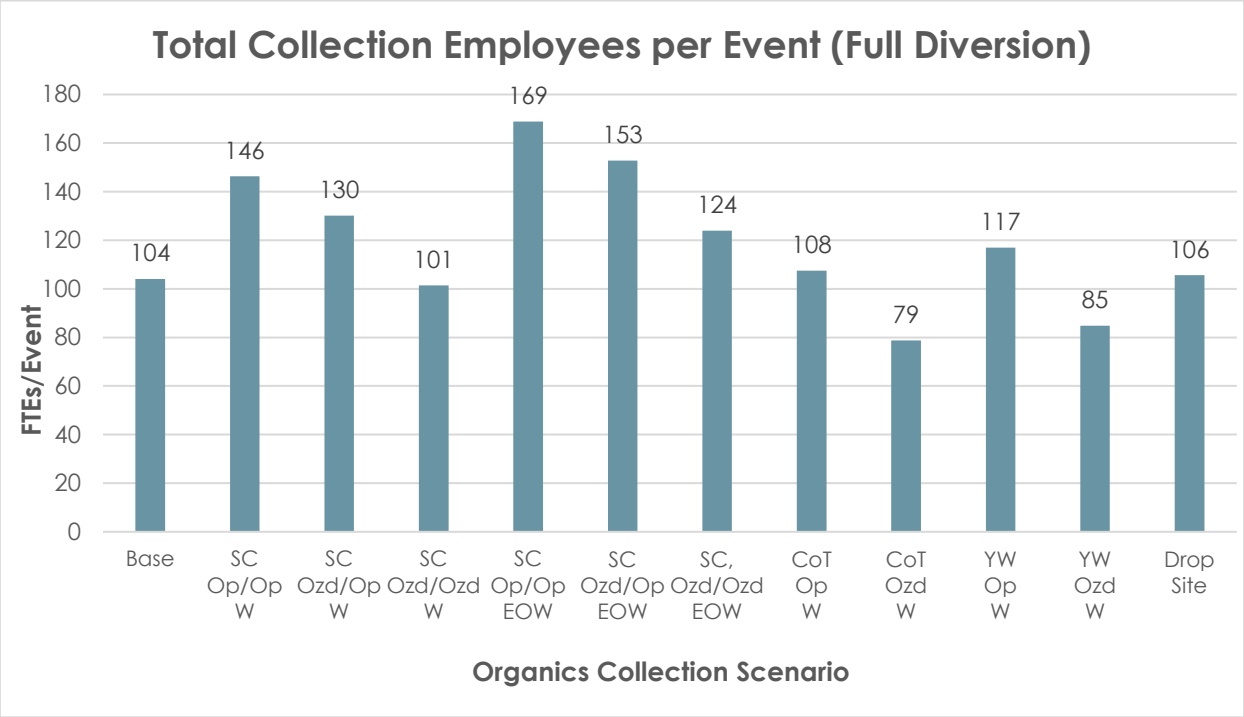
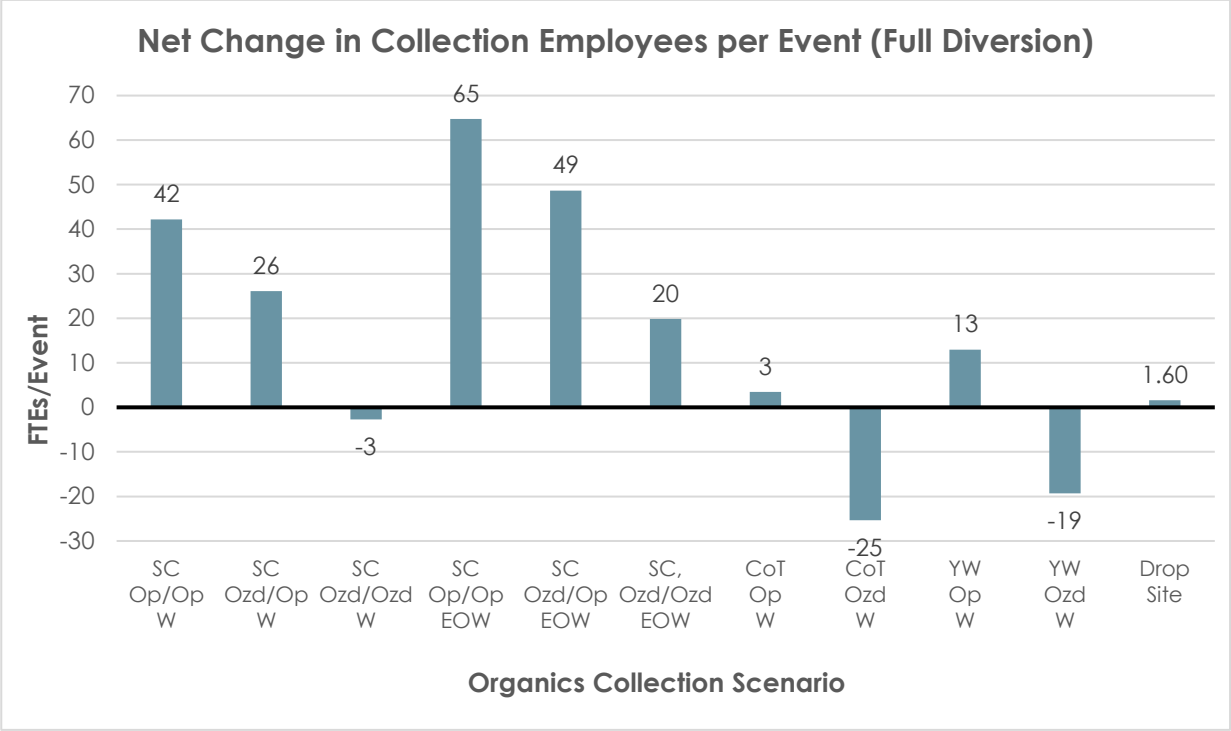
Organics Collection Analysis Report

LABOR





Appendix F

Minnesota Community Organics Program Matrix

Appendix F
MN Community Organics Waste Program Matrix[1]

County	City	Organics Management Program(s)			Additional Information	Organics Hauling Market				Curbside Collection Method[4]	New Curbside Adopted Since 2017
		Curbside Collection	Drop-off Sites	Backyard Composting		Organized[3]	Municipal	Open	Unknown		
Hennepin[2] (Ordinance 13 mandates that cities with 10,000+ residents include curbside organics collection in hauler license)	Bloomington	x	x		Drop-off sites (3) are available to residents who live in townhomes, condos, and apartment buildings that sign-up. Once registered, residents receive a starter kit including details on how to recycle organics. Organics from small businesses are ONLY accepted at the Hennepin County drop-off site and are limited to no more than 5 bags per day. City contracted haulers include Waste Management, Republic Services, and Aspen Waste. Haulers are split between home addresses.	x				separate collection	x
	Brooklyn Center	x	x		Hennepin Recycling Group (HRG) is a joint powers organization consisting of the cities of Brooklyn Center, Crystal, and New Hope. HRG manages waste/recycling education and licenses haulers. Residential households select a licensed hauler to collect garbage and the hauler must also offer yard waste pickup and curbside organics collection. However, HRG contracts with a single recycling hauler, Waste Management, to provide curbside recycling. A "recycling fee" is added to utility bills to cover yard waste site operation and other programs, but residents pay for curbside recycling and organics services directly to their hauler of choice. Carts are opt-in but everyone pays.			x		separate collection	x
	Brooklyn Park	x		x	All residents and businesses must choose and set up their own garbage service with a licensed hauler from a list on the City website. Residents can purchase backyard compost bins at the Hennepin County Drop-off Facility in Brooklyn Park. All haulers must provide organics collection but their collection method may differ.			x		unknown	x
	Champlin	x			Currently an open market where the hauler bills the customer directly. The price of the service is $60 /month but may be reduced as the number of participants increase. City is transitioning to contracted service.			x		separate collection	x
	Corcoran	x		x	City website promotes home composting and instructs that residents can take yard waste to the Maple Grove compost site for a small fee. Website does not currently have information on the curbside program offered by haulers.			x		unknown	x
	Crystal	x	x		Hennepin Recycling Group (HRG) is a joint powers organization consisting of the cities of Brooklyn Center, Crystal, and New Hope. HRG manages waste/recycling education and licenses haulers. Residential households select a licensed hauler to collect garbage and the hauler must also offer yard waste pickup and curbside organics collection. However, HRG contracts with a single recycling hauler, Waste Management, to provide curbside recycling. A "recycling fee" is added to utility bills to cover yard waste site operation and other programs, but residents pay for curbside recycling and organics services directly to their hauler of choice. Carts are opt-in but everyone pays.			x		separate collection	x
	Dayton		x	x	One city drop-off site is available. Organics recycling involves collecting food scraps, non-recyclable paper and other compostable products to be recycled into compost at a large-scale composting facility.						
	Deephaven		x		One city drop-off site is available. Residents contact the city clerk and will be provided access to the dumpster and educational material as to what can and cannot be included in the organics drop-off dumpster.						
	Eden Prairie	x		x	Instructs residents to bag their organics in certified compostable bags (BPI certified). Cannot include yard waste with organics. Residents must choose a licensed hauler for collection (Republic Services, Suburban Waste Services, or Waste Management).			x		separate collection	x

Appendix F
MN Community Organics Waste Program Matrix[1]

County	City	Organics Management Program(s)			Additional Information	Organics Hauling Market				Curbside Collection Method[4]	New Curbside Adopted Since 2017
		Curbside Collection	Drop-off Sites	Backyard Composting		Organized[3]	Municipal	Open	Unknown		
Hennepin [Continued] (Ordinance 13 mandates that cities with 10,000+ residents include curbside organics collection in hauler license)	Edina	x	x	x	Free rolls of compostable bags are available at the Edina Senior Center reception area. The city has diverted over 3,500 tons of organics from the landfill since its start in 2020. The city contacts with Republic services for pickup of both recycling and organics.	x				separate collection	
	Excelsior	x			Republic Services offers organic recycling on as a monthly subscription service. Organics are picked up weekly.	x				unknown	x
	Golden Valley	x		x	Organics recycling is picked up every week while traditional recycling is every two weeks. Golden Valley has a backyard compost ordinance with rules about how/where a compost structure is built. The City contracts with Republic Services for recycling and organics pick up.	x				separate collection	x
	Greenfield		x		A drop-off site was indicated by Hennepin County's spreadsheet, but drop-off site location could not be determined from the City's website.						
	Greenwood		x	x	The city holds a "Spring Clean-Up" day (typically the 3rd Saturday in May) where they provide free curbside collection for items not usually picked up by garbage haulers. This can include yard waste (in compostable or paper bags) and brush.						
	Hanover		x		Need a combination to use the organics collection container at the drop-off site.						
	Hopkins	x	x		All Hopkins residential recycling customers are eligible to participate in the City's curbside organics recycling program. Residents who have recycling provided by Republic via the City contract will see an additional $5.89 on their utility bills, regardless of whether or not they choose to participate in the curbside organics recycling program. All material MUST be bagged - no loose material - in either a BPI certified compostable bag or paper bag.	x				separate collection	x
	Independence		x	x	One drop-off site is located at the City Hall and requires gate access. New users must stop in to City Hall to register and will be provided with organics recycling bags to use. The City is making the required organics bags available to residents, and residents may return as needed to pick up more. To drop off organics, residents must call to share their name and that they are dropping off organics, then pull up to the gate and city staff will open it for them. Bagged organics must be carefully placed into the green organics-only bin so that it doesn't break. The website also provides guidance on home composting.						
	Long Lake	x			The City of Long Lake has three licensed residential refuse haulers for residents to choose from: Curbside Waste, Republic Services, and Waste Management.			x		separate collection	x
	Loretto	x			Blue Bag Organics (BBO) collection: compostable blue bags of SSOM are co-collected with trash for later separation at Republic's Delano facility. The city contracts with Republic Services for collection.	x				co-collection (trash)	
	Maple Grove	x		x	Maple Grove residents who want to recycle organics can sign up with their refuse hauler. Due to state law and county mandate, starting in 2024, all Maple Grove residents will be charged for curbside organics collection. Residents may notice the new organics charge on their trash hauler invoice. Haulers are not allowed to charge fees for providing organics bags or containers to residents who participate in organics recycling. The website also has information on home compost bin sales.			x		unknown	x

Appendix F
MN Community Organics Waste Program Matrix[1]

County	City	Organics Management Program(s)			Additional Information	Organics Hauling Market				Curbside Collection Method[4]	New Curbside Adopted Since 2017
		Curbside Collection	Drop-off Sites	Backyard Composting		Organized[3]	Municipal	Open	Unknown		
Hennepin [Continued] (Ordinance 13 mandates that cities with 10,000+ residents include curbside organics collection in hauler license)	Maple Plain	x	x		Blue Bag Organics (BBO) collection: compostable blue bags of SSOM are co-collected with trash for later separation at Republic's Delano facility. City website indicated curbside organics collection is an extra fee only for those who participate, but the drop-off sites are free for everyone (may no longer be the case due to 2023 recycling charge clarification by MPCA). The city contracts with Republic Services for collection.	x				co-collection (trash)	
	Medina	x	x		Blue Bag Organics (BBO) collection: compostable blue bags of SSOM are co-collected with trash for later separation at Republic's Delano facility. The city contracts with Randy's Environmental Services, a Republic Services Company, for collection.	x				co-collection (trash)	
	Medicine Lake	x			Specific information about organics collection could not be found on the City's website. Republic provides organics collection in the area.	x				separate collection	
	Minneapolis	x	x		The City has a mix of franchise zones of organized collection and City collection service. City crews or the contracted private hauler pick up recyclables and organics weekly. The crews use a green education tag to inform residents about a problem with collection. If a resident receives three notices, their cart gets taken by the City. The City also operates 20 drop-off sites.	x	x			separate collection	
	Minnetonka	x	x		Residents choose a licensed hauler to pick up their garbage and organics.			x		separate collection	
	Minnetonka Beach		x		A drop-off site was indicated by Hennepin County's spreadsheet, but drop-off site location could not be determined from the City's website.						
	Minnestrista		x		The city operates one drop-off site.						
	Mound		x		When residents sign up for organics drop-off program, they receive a starter pack with a key for the organics recycling dumpster and 5 compostable bags. Countertop kitchen pails are sold by the City for a discounted price.						
	New Hope	x	x		Hennepin Recycling Group (HRG) is a joint powers organization consisting of the cities of Brooklyn Center, Crystal, and New Hope. HRG manages waste/recycling education and licenses haulers. Residential households select a licensed hauler to collect garbage and the hauler must also offer yard waste pickup and curbside organics collection. However, HRG contracts with a single recycling hauler, Waste Management, to provide curbside recycling. A "recycling fee" is added to utility bills to cover yard waste site operation and other programs, but residents pay for curbside recycling and organics services directly to their hauler of choice. Carts are opt-in but everyone pays.			x		separate collection	x
	Osseo	x			The city of Osseo has a contracted hauler for all single family residences (Walter's Recycling & Refuse). Organics may be bagged in any BPI-certified bag and placed in regular garbage containers to be separated after hauling.	x				co-collection (trash)	x
	Orono		x		The City of Orono's Organics Recycling Program allows residents to bring their organics to a drop-off site in Orono. This program is free to all residents of Orono but registration is required. Residents must sign up online and will be included on a list to receive periodic emails with information and important reminders for participating in the program. After registering, residents may stop by city hall for a start up package which includes brochures and a couple compost bags. There is a limited supply of bags available, they will be distributed on a first come first serve basis.						

Appendix F
MN Community Organics Waste Program Matrix[1]

<table>
<tr><th rowspan="2">County</th><th rowspan="2">City</th><th colspan="3">Organics Management Program(s)</th><th rowspan="2">Additional Information</th><th colspan="4">Organics Hauling Market</th><th rowspan="2">Curbside Collection Method[4]</th><th rowspan="2">New Curbside Adopted Since 2017</th></tr>
<tr><th>Curbside Collection</th><th>Drop-off Sites</th><th>Backyard Composting</th><th>Organized[3]</th><th>Municipal</th><th>Open</th><th>Unknown</th></tr>
<tr><td rowspan="9">Hennepin [Continued]

(Ordinance 13 mandates that cities with 10,000+ residents include curbside organics collection in hauler license)</td><td>Plymouth</td><td>x</td><td>x</td><td>x</td><td>The city's contractor is Republic Services. Weekly curbside organics collection is not available to those in apartment complexes. Their website has a table that shows the monthly organics fee on residents' utility bill based on participation. Rates are shown to increase as participation increases.
<table><tr><th>Maximum Participation Percentage (% of homes with an organics cart)</th><th>Monthly Price Per Home (all 26,000 homes)</th></tr><tr><td>10%</td><td>$3.00</td></tr><tr><td>15%</td><td>$3.50</td></tr><tr><td>20%</td><td>$4.00</td></tr><tr><td>25%</td><td>$4.50</td></tr><tr><td>30%</td><td>$5.00</td></tr><tr><td>40%</td><td>$5.50</td></tr><tr><td>50%</td><td>$6.00</td></tr></table></td><td>x</td><td></td><td></td><td></td><td>separate collection</td><td>x</td></tr>
<tr><td>Richfield</td><td>x</td><td>x</td><td>x</td><td>The city contracts with 3 haulers for organics collection (Waste Management, Aspen Waste Systems, and Republic Services). All properties are now charged a flat fee for organics recycling.</td><td>x</td><td></td><td></td><td></td><td>separate collection</td><td>x</td></tr>
<tr><td>Robbinsdale</td><td>x</td><td></td><td></td><td>Bagged organics are to be placed in the organics recycling cart provided by the hauler, Curbside Waste. Curbside Waste picks up weekly and brings organics to a commercial composting facility. Every dwelling unit will be charged a monthly fee of $3.50 for organics recycling service, reflected as $7.00 on your bimonthly utility bill. A 32-gallon organics recycling cart is used.</td><td>x</td><td></td><td></td><td></td><td>separate collection</td><td>x</td></tr>
<tr><td>Rogers</td><td>x</td><td></td><td></td><td>Rogers must comply with Hennepin County Ordinance 13 or the County will implement a program and charge the City directly, to be paid by utility/recycling customers. Rogers is currently developing hauler licensing such that all residential garbage haulers offer curbside organics, and haulers charge residents equally regardless of participation.</td><td></td><td></td><td>x</td><td></td><td>unknown</td><td>x</td></tr>
<tr><td>Shorewood</td><td></td><td>x</td><td>x</td><td>Residents need a combination to use the organics collection container at the drop-off site.</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Spring Park</td><td></td><td>x</td><td></td><td>The City offers a free organics drop-off site located at City Hall available 24 hours a day. The container is equipped with a combination padlock to prevent illegal dumping, and the code can be obtained at City Hall once a resident registers. The City encourages the use of compostable bags to control odor and keep the site clean, and all compostable bags must be labeled with the BPI certification logo. Paper grocery bags may also be used. The program is for food scraps, food soiled paper, and certified compostable products.</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>St. Anthony</td><td></td><td>x</td><td></td><td>St. Anthony (also know as St. Anthony Village) is locate on the border of Hennepin and Ramsey Counties. One drop-off site is located on the Ramsey County side of the City and is operated by Ramsey County.</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>St. Bonifacius</td><td>x</td><td></td><td></td><td>Blue Bag Organics (BBO) collection: compostable blue bags of SSOM are co-collected with trash for later separation at Republic's Delano facility. The city contracts with Randy's Environmental Services, a Republic Services Company, for all waste collection.</td><td>x</td><td></td><td></td><td></td><td>co-collection (trash)</td><td></td></tr>
</table>

Appendix F
MN Community Organics Waste Program Matrix[1]

County	City	Organics Management Program(s)			Additional Information	Organics Hauling Market				Curbside Collection Method[4]	New Curbside Adopted Since 2017
		Curbside Collection	Drop-off Sites	Backyard Composting		Organized[3]	Municipal	Open	Unknown		
Hennepin [Continued] (Ordinance 13 mandates that cities with 10,000+ residents include curbside organics collection in hauler license)	St. Louis Park	x	x		All organics have to be placed in compostable bags except for pizza boxes and egg cartons. Carts are available in 30- and 60-gallon sizes. All participants receive a yearly allotment of compostable bags from the city for free. The hauler can come collect bins from a different place on the property for an additional fee (the weekly rate for organics walk-up is $10 per month plus taxes and fees). Organics and yard waste are collected separately (started beginning of 2019). The City contracts with 3 haulers - Buckingham's collects garbage and recycling, Republic Services collects organics, and Waste Container Systems (WCS) collects yard waste.	x				separate collection	
	Tonka Bay		x	x	A drop-off site was indicated by Hennepin County's spreadsheet, but drop-off site location could not be determined from the City's website. The City provides information on home composting.						
	Wayzata	x			Residents can place organics in a BPI-certified bag and place bags inside their regular garbage cart for curbside pickup. The City contracts with Republic Services for waste collection. This program is referred to as both "green bag" and "blue bag", so it was not definitive whether the city is collecting with the "blue bag program" found with other Randy's/Republic co-collection programs.	x				co-collection (trash)	
	Woodland		x		A drop-off site was indicated by Hennepin County's spreadsheet, but drop-off site location could not be determined from the City's website.						
Anoka	Columbia Heights	x		x	Residents previously recycled food waste with their yard waste (dual-purpose carts) provided by Walter's. Carts were emptied weekly during the yard waste season and every other week during the winter. Beginning April 2024, food organics and yard waste can no longer be collected in the same cart. Food organics collection will transition to a new vendor (Better Futures) that will collect 7-gallon organics pails on a weekly basis. Website language indicates participants must opt in and a $12 charge is added to their quarterly city utility bill (may no longer be the case due to 2023 clarification about organics inclusion in recycling charges).	x				separate collection	x
	Columbus		x								
	Coon Rapids		x		The City provides a container with a vented lid for collection in the home. It is recommended to empty the container at one of the organics drop-off sites weekly. All residents of Anoka County can use organics recycling at the Coon Rapids Recycling Center.						
	Fridley	x		x	The City licenses waste haulers, but organics collections only offered by Republic Services. Buildings with more than 4 units are not eligible for curbside organics collection. Residents who sign up receive weekly curbside collection, a free 32-gallon organics collection cart, and a free kitchen pail and compostable bags. Website language indicates the fee is only billed to residents that sign up and service costs $11.36/mo (may no longer be the case due to 2023 clarification about organics inclusion in recycling charges). Yard waste and pet waste are not accepted in the organics cart.			x		separate collection	x
	Ham Lake		x		When residents sign up (via email or phone) they can then collect a starter kit at City Hall.						
	Lino Lakes	x	x	x	Curbside organics collection is available to residents who have Walter's as their waste hauler. Organics may be bagged in any BPI-certified bag and placed in regular garbage containers to be separated after hauling. There are 4 drop-off sites and residents who sign up for drop-off receive a free organics recycling pail and a free roll of compostable bags.			x		co-collection (trash)	x

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MN Community Organics Waste Program Matrix[1]

County	City	Organics Management Program(s)			Additional Information	Organics Hauling Market				Curbside Collection Method[4]	New Curbside Adopted Since 2017
		Curbside Collection	Drop-off Sites	Backyard Composting		Organized[3]	Municipal	Open	Unknown		
Anoka (continued)	Ramsey		x		Residents can sign up online or in-person at the Planning Division at the Ramsey Municipal Center. Organics recycling kits are available to pickup at the Planning Division. Kits include a 5-gallon pail with a lid, one roll of 13-gallon compostable bags, one roll of 2.5-gallon compostable bags, a BioBag 3-gallon bin, and an information sheet. Cardboard can be placed directly into the organics container.						
	Spring Lake Park		x		Residents can pick up bags or a starter kit from City Hall.						
Dakota			x	x	Currently there is no curbside collection of organics in Dakota County. A small organics hauler operates in Northfield but the majority of the city is located within Rice County. The Recycling Association of Minnesota hosts an annual sale where residents of Dakota County can get a 30 percent discount on compost bins or rain barrels. Dakota County operates 11 drop-off sites for residents.						
Scott	Jordan		x		Drop-off sites for food waste are free for Jordan, St. Lawrence Township, and Sand Creek Township residents. Yard waste drop-off is free for Jordan residents and a fee is charged for St. Lawrence and Sand Creek Township residents. Once residents sign up, they get a key fob to gain access to the organics recycling drop-off site.						
	Prior Lake		x		The Buckingham Company collects waste and recycling from the communities of Prior Lake, Savage, and Jordan. Currently, the hauler does not offer curbside collection for organics, but residents place organics in compostable bags and drop them off at the hauler's facility in Prior Lake.						
	Savage		x	x	The Savage community is served by Suburban Waste Services which does not offer organics curbside collection at this time. All Scott County residents can collect organics in compostable bags and drop them off at 5 different drop-off site locations.						
	Shakopee		x		The Shakopee Mdewakanton Sioux Community (SMSC) operates an Organics Recycling Facility on tribal land that receives SSOM and yard waste from drop-off sites across several counties and functions as a drop-off site open to the public. The cost is generally $5/load of SSOM and $10-25/load of yard waste, sod, etc. based on size. SMSC is relocating food waste composting operations to an industrial area in Louisville Township in summer of 2024 and it is unknown whether both sites will operate will function as drop-off sites.						
Carver		x	x	x	Residential organics collection is offered by different vendors in the area - Randy's Environmental Services (a Republic company), Republic Services, Suburban Waste Services, and Waste Management. There are a couple of compost sites owned by private entities that are open to both residents and businesses year-round. Collection of organics is open hauling in rural areas. In addition to curbside collection being composted as SSOM, there is a commingled YW site operated by Carver County.			x		separate collection, commingled (yard waste)	x
	Victoria	x	x	x	Residential organics collection is offered by different vendors in the area - Randy's Environmental Services (owned by Republic), Republic Services, Suburban Waste Services, and Waste Management. There are a couple of compost sites owned by private entities that are open to both residents and businesses year-round. The City of Victoria also has a compost collection site available to residents. Collection of organics is organized in the City and surrounding areas.	x				separate collection	x

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MN Community Organics Waste Program Matrix[1]

County	City	Organics Management Program(s)			Additional Information	Organics Hauling Market				Curbside Collection Method[4]	New Curbside Adopted Since 2017
		Curbside Collection	Drop-off Sites	Backyard Composting		Organized[3]	Municipal	Open	Unknown		
Ramsey		x	x	x	Drop-off sites in Ramsey are also open to Washington County residents. Businesses, nonprofits, and institutions can not use the drop-off sites. Ramsey and Washington Counties are gradually rolling out their co-collection curbside program, know as "Food Scraps Pickup Program", that collects SSOM in compostable bags with trash picked up via an open market. This program is currently available by opt-in registration to residents of Maplewood and North St. Paul. Trash haulers are licensed by cities but not organized, with the exception of St. Paul which is delineated into franchise zones.			x		co-collection (trash)	x
Washington		x	x	x	Residents can pick up free compostable bags at Washington County food scraps drop-off sites and drop off at either Ramsey or Washington sites. Ramsey and Washington Counties are gradually rolling out their co-collection curbside program, know as "Food Scraps Pickup Program", that collects SSOM in compostable bags with trash picked up via an open market. This program is currently available by opt-in registration to residents of Cottage Grove, Grey Cloud Island Township, Landfall, Newport, Oakdale, St. Paul Park and Woodbury. Trash haulers are licensed by cities but not organized.			x		co-collection (trash)	x
Blue Earth	Mankato (North Mankato and Lake Crystal)		x	x	Minnesota Paving and Materials operates a compost site north of Mankato. Compost items from non-residents are collected for a fee.						
Carlton			x		Residents can drop organics off at the Carlton County Transfer Station for composting. Compostable bags are provided free for residents at the transfer station (4 bags are allotted per visit).						
Douglas			x	x	Residents can drop bagged organics off at several different locations. Organics collected will be taken to the Glacial Ridge Compost Facility to be turned into compost. Residents need to use BPI certified compostable bags for bagging organics. If using a compost/food scrap bucket provided by Pope/Douglas County, use 3 gallon or larger compostable bags. Pope/Douglas County offers free starter kits at their Household Hazardous Waste Facility.						
Hubbard			x		Residents must register to participate in the organics program. All organics have to be brought to the South Transfer Station in either compostable bags (BPI certified) or a reusable container.						
McLeod	Hutchinson	x			Residents are provided a green lid cart for curbside collection of organics (SSOM and yard waste). Organics are collected the same day as trash collection. Hutchinson has a "Compost it Right!" campaign advocating to decrease contamination of organics collection (currently at 9%). Residents can either use BPI compostable bags or paper bags to collect organics. Bags are available to residents every 4 months at the McLeod County Fairgrounds. Hutchinson owns and operates its own compost facility (CreekSide Soils) and profits from sales often exceed $100,000 per year.				x	commingled (yard waste)	x
Nicollet	St. Peter		x		The City of St. Peter began their Food Waste "Green" composting program in 2019. Residents must sign up for the program after which they receive a code to grant them access to open the food waste compost dumpster at the collection site. Residents cannot dispose of food waste in plastic bags - either place in compostable bags or no bags.						

Appendix F
MN Community Organics Waste Program Matrix[1]

County	City	Organics Management Program(s)			Additional Information	Organics Hauling Market				Curbside Collection Method[4]	New Curbside Adopted Since 2017
		Curbside Collection	Drop-off Sites	Backyard Composting		Organized[3]	Municipal	Open	Unknown		
Otter Trail			x	x	Residents can sign up for a backyard composting program run by the County. This program includes attending a compost workshop and committing to backyard composting for 12 months. The County supplies free compost bins and kitchen compost pails to the first 500 residents that sign up. Residents are also encouraged to build their own compost bins. Residents can also sign up to participate in drop-off sites. After signing up, the County provides a pail and starter bags. Collected materials are brought to the Glacial Ridge Compost Facility in Douglas County.						
Pope			x	x	Pope County is serviced with Douglas County. Both have the same organics collection programs.						
Rice	Northfield	x	x		Residents can collect food in biodegradable bags and bring them to the Northfield Compost Site for disposal. Topsoil compost from the facility is available to residents for free. Residents of Northfield can also subscribe to curbside organics collection. Collection is in 5-gallon buckets and comes once a week. Fees are based on a sliding scale, residents pay what they can afford in order to keep prices low. **Sliding Scale Tiers** *Prices vary for Faribault service area. Enter your address in the tool above to see Faribault prices.* Tiers / Monthly / Yearly Tier 1 / $15 / $180 Tier 2 / $20 / $240 Tier 3 / $25 / $300 Tier 4 / $30 / $360 Extra Bucket / $3 / $36			x		separate collection	x
Sherburne	Elk River		x		City supplies free bins and a free supply of compostable bags when residents sign up. Elk River operates a free, voluntary organics drop-off program. There is no information on curbside collection of organics. Garbage and recycling collection is organized and serviced by Republic.						
Stevens			x		Residents can drop bagged organics off at the Stevens County Organics drop-off sites. All organics must be bagged in BPI compostable or paper bags. The Stevens County Organics Recycling Program has free starter kits available for pick up that include a 3-gallon bucket, compostable bags, and information on composting.						
St. Louis	Duluth - Western Lake Superior Sanitary District		x	x	Residents in the Western Lake Superior Sanitary District (WLSSD) can collect food scraps in compostable bags and dispose of them at drop-off sites located in the region. Free compostable bags are available at the Materials Recovery Center, Household Hazardous Waste Facility, Yard Waste Site, and at most food waste drop-off sites. WLSSD accepts only BPI certified compostable products.						

Appendix F
MN Community Organics Waste Program Matrix[1]

County	City	Organics Management Program(s)			Additional Information	Organics Hauling Market				Curbside Collection Method[4]	New Curbside Adopted Since 2017
		Curbside Collection	Drop-off Sites	Backyard Composting		Organized[3]	Municipal	Open	Unknown		
Swift		x			Compostables must be placed in an untied clear bag or a container such as a box or garbage can. Compostables are collected curbside and delivered to the Swift County Recycle/Compost Center.	x				commingled (yard waste)	x

Notes:

1) List of communities that offer some form of organics collection is based off of the Minnesota Composting Council records maintained on the MNCC website, found at: http://www.mncompostingcouncil.org/residential-collection--drop-off-programs.html which provides links to community programs, used here for information.
2) Hennepin County information was cross-checked and revised where applicable with data provided by Hennepin County staff in spreadsheet "Hennepin County Organics Recycling program by City - As of April 2024".
3) For hauling market type, "organized" here may refer to either: 1) markets organized by the legal definition of "organization" per MN Statute 115A.94 Subdivision 1. or 2) organized *in practice* . See Section 4 of the report for more details on hauling market structures.
4) A few communities that collect materials curbside through "separate collection" use containers other than a cart which are collected by haulers manually.

Appendix G

TCMA Program Updates

Appendix G
Changes to Residential Curbside Organics Collection Programs in the Greater Twin Cities Metropolitan Area[1,2]

City	County	Organics Collection Method		Who Pays?		Program Cost to Customer		Updates September 2017 - March 2024	Organics Hauling Market (2024)
		2017	2024	2017	2024	2017	2024		
Organized Trash Collection Cities (as of 2017)									
Elk River	Sherburne	Co-collected (trash)	Discontinued	Subscribers only	Discontinued	Additional cost	Discontinued	Elk River operates a free, voluntary organics drop-off program. There is no information on curbside collection of organics. Garbage and recycling collection is organized and serviced by Republic.	N/A
Loretto	Hennepin	Co-collected (trash)	No change	Subscribers only	All residents	Additional cost	Included in recycling rate	Organics recycling is covered by the residential recycling fee.	Organized
Maple Plain	Hennepin	Co-collected (trash)	No change	Subscribers only	No change	Additional cost	No change	No significant changes since 2017.	Organized
Medicine Lake	Hennepin	Co-collected (trash)	Separate Collection	All residents	Unknown	Included in recycling rate	Unknown	Specific information about organics collection could not be found on the City's website. Republic provides organics collection in the area.	Organized
Medina	Hennepin	Co-collected (trash)	No change	All residents	No change	Included in recycling rate	Included in recycling/solid waste rate	No significant changes since 2017.	Organized
Minneapolis	Hennepin	Separate Collection	No change	All residents	No change	Included in solid waste rate	No change	No significant changes since 2017.	Organized/ Municipal
St. Bonifacius	Hennepin	Co-collected (trash)	No change	Subscribers only	Unknown	Additional cost	Unknown	The city website indicates that the organics recycling service is free to St. Bonifacius' residents (serviced by Randy's, a Republic company).	Organized
St. Louis Park	Hennepin	Commingled (yard waste)	Separate Collection	All residents	Unknown	Included in solid waste rate	Unknown	Organics and yard waste are collected separately (change put in place in 2019).	Organized
Wayzata	Hennepin	Co-collected (trash)	No change	All residents	Unknown	Included in recycling rate	Unknown	No changes appear to have been made since 2017.	Organized
Open Trash Collection Cities (as of 2017)									
Coon Rapids	Anoka	Co-collected (trash)	Discontinued	Subscribers only	Discontinued	Additional cost	Discontinued	Organics must be dropped-off at the recycling center. There is no current curbside collection of organics.	N/A
Edina	Hennepin	Commingled (yard waste)	Separate Collection	Subscribers only	All residents	Additional cost	Included in recycling rate	Organics and yard waste are collected separately.	Organized
Minnetonka	Hennepin	Co-collected (trash)	Separate Collection	Subscribers only	All residents	Additional cost	No change	All residents are charged for organics recycling. Organics are collected in a container (provided by a waste hauler) separate from trash or yard waste.	Open
		Commingled (yard waste)		Subscribers only		Additional cost			
Orono	Hennepin	Co-collected (trash)	Discontinued	Subscribers only	Discontinued	Additional cost	Discontinued	The City offers a free drop-off program for residents. There is no current curbside collection of organics.	N/A
		Commingled (yard waste)		Subscribers only		Additional cost			
Shorewood	Hennepin	Commingled (yard waste)	Discontinued	Subscribers only	Discontinued	Additional cost	Discontinued	The City offers a free drop-off program for residents. Organics previously were collected by multiple haulers in an open market. There is no current curbside collection of organics.	N/A

Notes:

1) This table provides an update to the known residential curbside organics programs summarized in Table 2 of the 2017 Foth Report. Additional curbside programs have come online since the 2017 Foth report and are noted in the MN Community Organics Program Matrix included in Appendix F.

2) Updated information obtained through personal communications with municipality representatives, review of municipal/county webpages, and cross-checking with the list of MN communities with some form of organics collection maintained on the Minnesota Composting Council website, found at: http://www.mncompostingcouncil.org/residential-collection--drop-off-programs.html.

Appendix H

National Case Studies

Appendix H
National Curbside Organics Collection Case Studies

Organics Collection Analysis Report
SCS Engineers Project #25224046.00

PORTLAND, OREGON

- Commingled with YW
- Organized Organics (Franchise Zones)
- EOW Trash
- (included in Foth 2017 Report)

In 2009, Portland, Oregon, started an organics collection pilot program with 2,000 homes. Starting in October 2011, weekly curbside collection of food scraps was available to all residents. **Food scraps and yard debris are collected in the same 60-gallon green roll carts. Residents have the choice to set out excess bagged yard debris for an extra fee.** All waste collection services are provided to residents through a franchise system. **The City regulates the rates that the franchised haulers can charge customers.** Organics disposal costs are determined on a yearly basis by considering the average amount of organics generated per household and the tip fee. Portland estimated the household organics disposal amount to be 1,099 pounds per year for Fiscal Year 2023-2024.

SEATTLE, WASHINGTON

- Commingled with YW
- Organized Organics (Contracted)
- (included in Foth 2017)

In 2005, Seattle, Washington, began offering voluntary curbside food waste collection; and later, in 2009, the City required all residential properties to either participate in food and yard waste collection or compost in their backyard. In 2015, **Seattle passed a law requiring residents and businesses to not put food scraps, compostable paper, yard waste, and recyclables in their garbage.** In 2021-2022, a residential and commercial organics composition study was conducted in Seattle.[1] The contamination in the residential organics stream was less than multi-family and commercial, totaling about 1.7 percent; however, **the largest share of the residential stream was yard waste, while the largest share for the commercial and multi-family streams was food waste.** Seattle currently contracts with two waste haulers (WM and Recology) for all waste collection services.

KING COUNTY, WASHINGTON

- Commingled with YW
- Organized and Open Organics
- (included in Foth 2017)

In 2007, King County, Washington, began a curbside collection pilot program in the City of Renton. After the program's success, the County expanded bi-weekly organics collection to include more jurisdictions. The organization of organics curbside programs varies throughout the County. **Some**

[1] What's In Seattle's Collected Organics Streams? | BioCycle

jurisdictions automatically supply organics collection to all residents and lump the fee into the existing solid waste collection service. Other jurisdictions require residents to sign up to receive an organics cart and collection at an additional cost. Three commercial haulers collect most residential organics in King County either through a contract with a municipality or through a permit from the Washington Utilities and Transportation Commission. The most recent Organics Characterization Study (2022) found that jurisdictions with embedded service (organized) on average collected more tons of organics per capita than jurisdictions with subscription service. It was also found that suburban jurisdictions collected more organics per capita than urban ones.

CAMBRIDGE CITY, MASSACHUSETTS

- Separate Collection
- Organized Organics (Contracted)

Cambridge City, Massachusetts' pilot program ran from April 2014 to March 2015. A total of 647 households in 424 residences diverted 85 tons (170,000 pounds) of organics, avoiding 76 tons of carbon dioxide emissions. When residents signed up, they received a green kitchen container, a year's supply of BioBags, a free curbside bin (share at multi-family homes), free pickup on the normal collection day, as well as updates about the program. Residents also had access to the finished compost at the Recycling Center. The City expanded the program in Fall of 2015 to all residents and multi-family residents on a case-by-case basis.

Best Management Practices

1. Provide free supplies to encourage participation.
   a. Require households to sign up and request a green bin/kitchen container (pilot program – resulted in about 30 percent participation).

2. Provide households with a kitchen container and use compostable bags to reduce the "yuck factor." Emphasize the importance of changing out the bags frequently to reduce odor.

3. Provide regular communication with participants – during the pilot program the city issued doc surveys to collect feedback on the program.

HOWARD COUNTY, MARYLAND

- Commingled with YW
- Organized Organics (Municipal)
- Continued use of drop-off site

Howard County, Maryland, launched a pilot program in 2010 to a 5,000-household collection route in Ellicott City and Elkridge. After the success of the pilot, the "Feed the Green Bin" program expanded to over 43,000 households, with about 16,000 of them participating. Multiple Howard County Public Schools (HCPS) have joined curbside collection for food scraps. The collected material is transported to the Alpha Ridge Landfill (ARL) in the County where they have a state-of-the-art Composting Facility. The County offers three sizes of green carts: 12-gallon, 35-gallon, and 65-gallon. They also offer a small, lidded countertop container to collect kitchen scraps. It is important to NOT use plastic bags; paper and verified (bags with a BPI logo) compostable bags are acceptable. Food waste is collected in the same truck as yard waste.

MILAN, ITALY

- Separate Collection
- Organized Organics (Municipal)

Milan, Italy, began its city-wide organics recycling system in 2012 and is currently the largest city in the world running a separate collection program for organics. Milan has the highest capture rates in Europe, with an average of 200 pounds of food waste being collected per inhabitant per year. **Despite almost 90 percent of the population living in multi-family buildings, contamination stays below 5 percent.** Bins are brought to the curb on certain days for pickup. It is important to note here that Milan operates a "kerbside" collection scheme, or door-to-door collection scheme, which allows direct feedback to specific residents on the contents of their bin.

Best Management Practices

1. Use biobags and vented kitchen caddies to reduce the "yuck factor." Because of the vented bins, they tend to lose up to 20 percent of their weight through water vapor. This reduces the amount of liquid at the bottom of the bags and prevents leaks.

2. Milan started communicating the program two months in advance, beginning with street advertising, mailing brochures, and making both a website and an app. Participation started off high because of the influx of information and awareness, and **the City would reach out with feedback about the program to keep participants from losing interest**.

Appendix I

Applicability of Compostable Products to Increasing Food Waste Diversion

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Applicability of Compostable Products to Increasing Food Waste Diversion

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Compostable products may be used generally across organics collection methods for food service, takeout or delivery, and in-kitchen collection of food scraps.

Consistent messaging from top to bottom is essential to public understanding of acceptable materials in composting. MNCC regularly updates the Organics Recycling Outreach Guide[1] which is a statewide resource contributed to by composters accepting materials from the TCMA, municipal program managers, and other industry experts. This statewide guidance document, written in conjunction with composters, includes acceptable packaging and containment materials:

- BPI certified compostable products*:
  - Cups, plates, and bowls*
  - Utensils and straws*
  - Compostable plastic bags*
  - Containers*
  - Bamboo products*
  - Bagasse products*
  - *Must have BPI logo on product or product container
- Paper bags (recycle if not soiled)

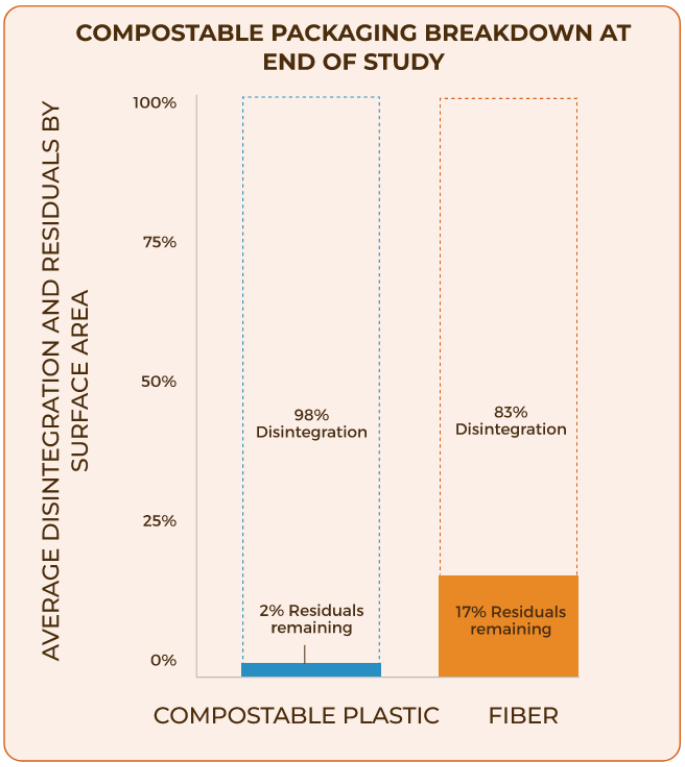
At the food producer and vendor level, compostable produce stickers are one of the most impactful changes that can help composters to avoid contamination. Due to their small size and inclusion on the often-composted outer peels of produce, non-compostable produce stickers are one of the greatest difficulties for composters to remove from finished product and are some of the most commonly noted contaminants in finished compost.

Recent findings have generated a significant body of data contrary to common belief that compostable plastics do not successfully break down in the composting process. This is highlighted in an in-depth study published by Closed Loop Partners in April 2024 titled “Compostable Packaging Disintegration at Composting Facilities[2].” Key takeaways noted in this study include:

- Certified food-contact compostable packaging successfully disintegrates at commercial composting facilities that meet minimum operating parameters for moisture, temperature, and oxygen.
- On average, compostable plastic packaging and products broke down 98 percent by surface area when composted. Compostable plastic broke down successfully regardless of composting method or compost process time.
- Compostable fiber packaging and products broke down 83 percent by surface area when composted. Agitation helps fiber break down in compost piles.

[1] http://www.mncompostingcouncil.org/uploads/1/5/6/0/15602762/organics_recycling_outreach_guide_-_7.19.22.pdf

[2] https://www.closedlooppartners.com/research/compostable-packaging-disintegration-at-composting-facilities/



* Reasonable operating conditions defined in Table 2.1 of *The Composting Handbook.*
** Data corresponds to mesh bag results only.
*** Compost Manufacturing Alliance (CMA) is a composting industry group that uses in-field disintegration thresholds, which are specific to each compostable material (i.e., compostable plastic, fiber)

Further best practice guidance for composters accepting compostable products is provided by USCC in "Compostable Products: A Primer for Compost Manufacturers[3]." Note that these recommendations and testing of compostability are for commercial composting sites only; home composting typically does not achieve the same temperatures or levels of monitoring as commercial sites and compostable products generally do not break down to the same level in home composting.

[3] https://www.biocycle.net/compostable-products-primer-for-compost-manufacturers/