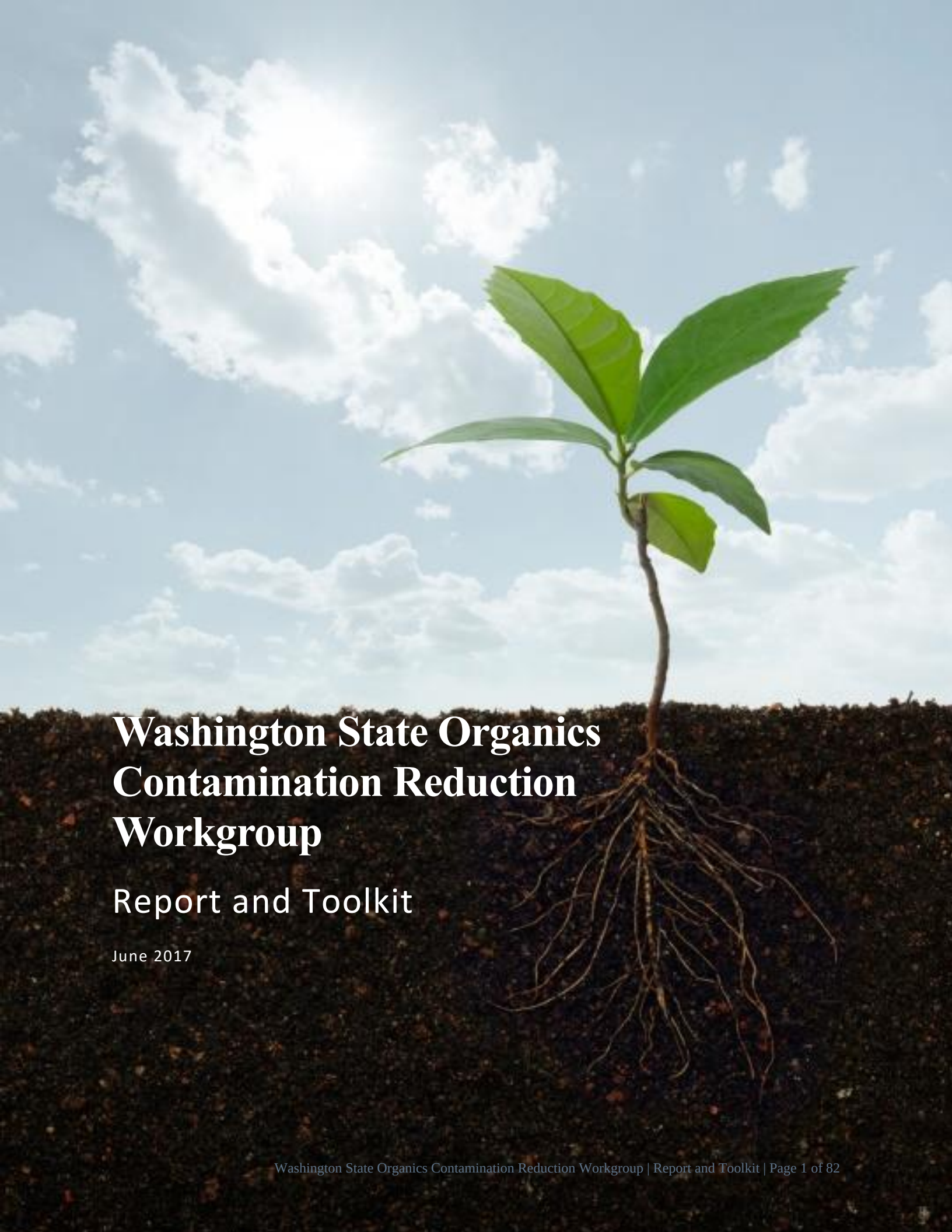

Washington State Organics Contamination Reduction Workgroup

Report and Toolkit

June 2017

Contents

Introduction

Commercial Composting in Washington State

Commercial Composting provides a host of benefits to both the economy and the environment. Not only can it reduce waste management costs relative to disposal, the commercial composting industry creates jobs associated with collection, processing, and use of finished product. A 2013 study out of Maryland found that composting employs two times more workers on a per-ton basis than landfilling and estimated that for every million tons of material composted and used in local green infrastructure projects, up to 1,400 new full-time equivalent jobs could be created. Use of compost itself also has environmental benefits through improved soil quality, stormwater management, and soil carbon storage.[1] [2]

Washington State local governments have worked for decades to divert yard debris from landfill disposal. By the mid-2000s, many municipalities began to expand their existing yard debris collection programs to include some food scraps. This shift was encouraged both by state and local directives to reduce the amount of material disposed as well as the rising costs of landfilling (especially in Western Washington). As old contracts expired, paving the way for new approaches and agreements, more formalized municipal food scraps collection programs began to roll out in 2009 and 2010.

During the next several years, commercial composters ("composters") in Washington State saw significant annual increases in the amount of material arriving at their facilities to be processed. From 2009 to 2013, the amount of pre-consumer food composted rose from about 3,609 tons to about 65,550 tons, and the amount of post-consumer food composted increased from about 850 tons to about 65,221 tons.[3] [4]

By 2014, residents in nearly every jurisdiction within King County had the option to discard food scraps in their organics service carts. Excluding Seattle, which is tracked separately, this amounted to 99 percent of households in 2014 compared to 57 percent in 2007. During that year, single-family residents set out nearly 162,600 tons of material in their organics carts, compared with 151,000 tons in 2011–a 7.6 percent increase. Contaminants, or non-compostable items, accounted for 2.4 percent of the collected material.[5][6]

Over the same period, the City of Seattle saw a 3.5 percent increase in curbside organics recycling.[7] The City began collecting detailed organics composition data in 2012 and (at the time of this report's

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[1] Institute for Local Self-Reliance. (2014). *State of Composting in the US*.
[2] Soils for Salmon. *Why Build Healthy Soil?* (accessed May 2017).
[3] Commingled food and yard debris are not included in these composting totals.
[4] In 2009, most facilities were not yet reporting food scraps separately from yard debris, so these numbers are an approximation.
[5] Cascadia Consulting Group. (2012). *King County Organics Characterization Report*.
[6] Cascadia Consulting Group. (2015). *King County Organics Characterization Report*.
[7] Seattle Public Utilities. (2016). *Fourth Quarter Organics Report*.

publication) is finalizing the 2016 study. Contamination rates in 2012 varied by sector: the study found that contaminants accounted for 1 percent of single-family organics, 3 percent of commercial organics, and 5 percent of multifamily organics.[8]

Composting Feedstocks are in Transition

Composting feedstocks are the materials coming into a composting site that serve as the main ingredients in the compost recipe. Feedstocks are comprised of materials from a variety of sources; in Washington State, a major source is residential and commercial organics collection jurisdictions. The volume and composition of incoming feedstocks are in a period of transition due to a variety of circumstances, outlined below.

- As solid waste jurisdictions are being charged with increasingly ambitious landfill diversion goals, they are implementing policy, infrastructure, and collection frequency changes that—by design—are increasing feedstock quantities.
- As feedstock volumes grow, agriculture will be the primary market segment with sufficient demand for the corresponding increase in cleaner finished compost volumes.
- As participant awareness of the availability of composting services continues to grow, well-meaning participants unwittingly contaminate feedstocks based on the assumption that any errors will be fixed during processing. This behavior - and its subsequent impacts on contamination removal costs and product quality - is analogous to “wishful recycling” often found in the recycling industry. Unfortunately, because it is a natural product whose intended purposes include growing food, finished compost has an even lower tolerance for contamination than do recycled commodities.

Organics Participants by Sector

Organics service is provided across four participant sectors in Washington: single-family, multifamily, self-haul, and commercial.

- The **single-family sector** typically includes households that set out organics for collection at the curb. They may also backyard compost some food and yard debris at their homes.
- The **multifamily sector** includes apartment and condominium buildings. These buildings typically contain five or more units and use dumpsters instead of carts for garbage and recycling, but many still use carts for organics.
- The **self-haul sector** includes material brought (or “self-hauled”) by residents, businesses and governmental agencies to centralized city- or county-owned recycling and disposal (transfer) stations and private composting facilities open to the public.
- The **commercial sector** includes organics collected from businesses and institutions.

[8] Cascadia Consulting Group. (2012). *Seattle Public Utilities Organics Stream Composition Study*.

The Washington State Organics Contamination Reduction Workgroup

Along with these newly collected food scraps, composters in Washington State have seen an increase in the types and amounts of physical contaminants mixed with incoming loads of organics. The increased volume and variability of contamination contributes to increased labor and equipment costs and, in some cases, makes the finished product more difficult to market.

In 2013 the Department of Ecology updated Washington's organics management rule to lower contamination levels in collected organics and regulate finished compost. This set the stage for subsequent attempts by various stakeholder groups to address contamination at the source.

Cedar Grove, a composter near Seattle, started composting post-consumer residential and commercial food scraps in 2004. After observing an increase in contamination associated with the newly accepted food scraps, Cedar Grove attempted to reduce contaminant levels through a multifaceted, collaborative approach including:

- Engaging municipal stakeholders (King County, cities) via periodic stakeholder meetings.
- Holding large stakeholder events for supply chain vendors, commercial end users, and cities. Investing in technology that provided a feedback loop with haulers by enabling photos to be attached to route loads.
- Offering facility tours for various cities and haulers to show the level of investment in labor and technology that had been added over time to deal with contamination.
- Daily feedback to generators regarding contaminated loads.
- Rejecting contaminating loads as a last resort.

When contamination issues persisted, Cedar Grove—along with other composters in Washington State—were forced to adopt contamination surcharge fees to deter contamination and help to cover the costs of contamination removal.

In an effort to avoid having to absorb or pass along these costs to their participants, the City of Kirkland decided to see if upstream education and initiatives—collaboratively designed and implemented—might still prove an effective solution for producing cleaner feedstocks. This led to a stakeholder discussion at the Washington State Recycling Association's Annual Conference in May 2015 and ultimately led to the formation of the Washington State Organics Contamination Reduction Workgroup (OCRW). The group consists of more than 90 municipal officials, composters, regulators, and representatives of various commercial businesses whose mission is to "collaborate to eliminate contamination in organic feedstocks while expanding end products and markets." A full listing of OCRW contributors can be found in Appendix K.

A Whole-System View

The compost industry in Washington State is comprised of a wide range of stakeholders, including:

- Local and State Agencies and Environmental Departments
- Residential and Commercial Organics Waste Generators
- Commercial Composters (also known as Organics Processors or Compost Manufacturers)
- Compostable Product Manufacturers and Distributors
- Compost Customers
- Industry Advisors (consultants, researchers)

As such, OCRW organized itself to tackle contamination issues strategically across the supply chain, not just at the post-consumer stage. To achieve this, the group defined four goal areas, developed objectives, and formed subcommittees to strategize how to meet those objectives:

- The **Contractual Policies** subcommittee was formed to research and recommend policy options and contractual best management practices to contribute toward the elimination of contaminants in the residential and commercial organics streams.
- The **Participant Education and Outreach** subcommittee was formed to identify gaps in perceived versus actual contaminants and develop an Organics Educator Toolkit to aid in bridging those gaps.
- The **Upstream Systems** subcommittee was formed to seek opportunities to connect the dots between known approaches while exploring new strategies across the entire product manufacturing supply chain, including but not limited to packaging design and related participant sorting behavior.
- The **Processing** subcommittee was formed to identify and recommend contaminant removal best management practices at processing facilities.

On the following page is a conceptual diagram illustrating the whole-systems approach that OCRW took in forming its subcommittees and scope areas.

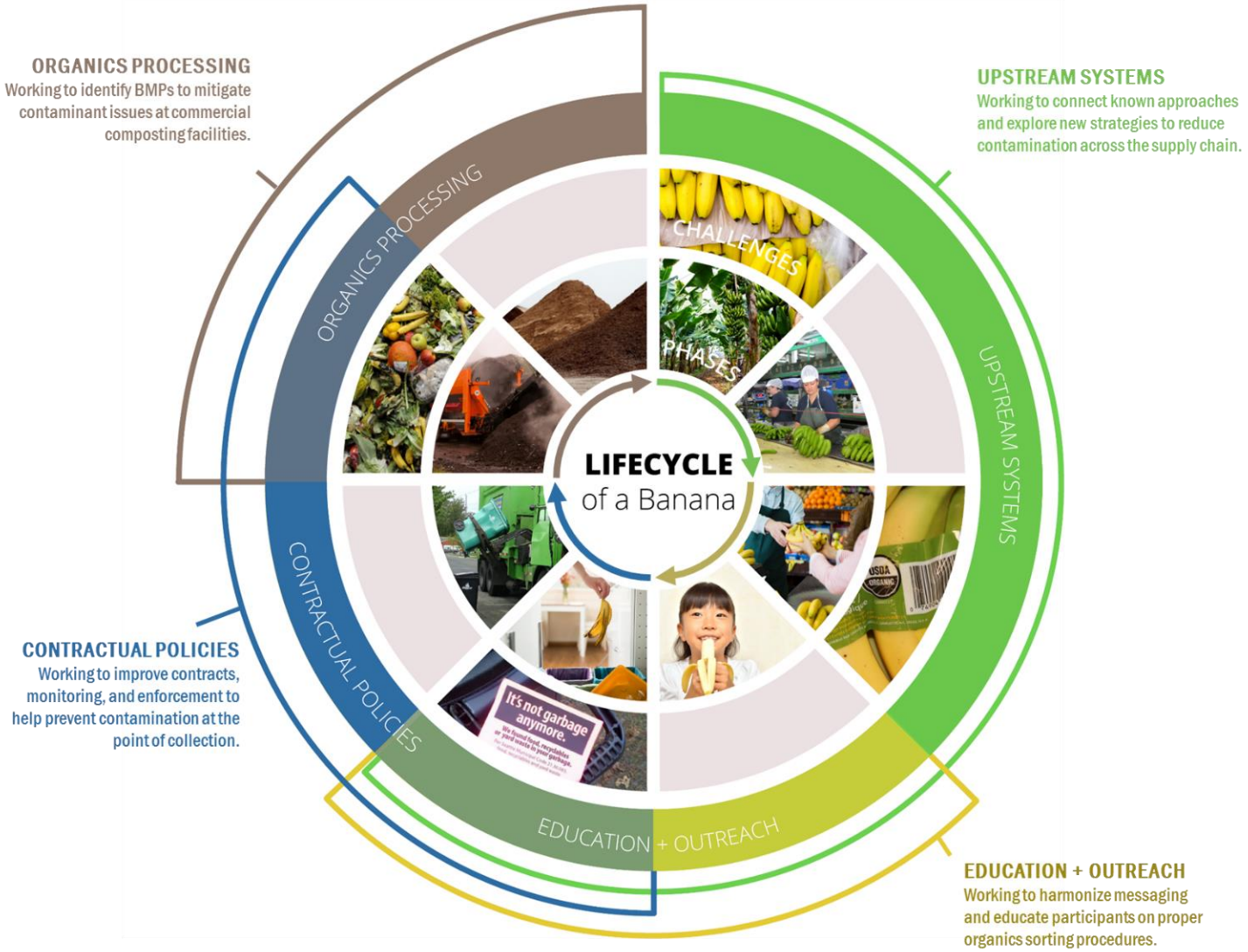


Figure 1. Organics Contamination Reduction Workgroup Scope and Subcommittees

Executive Summary

Below is a summary of the group's key findings and recommended next steps for reducing contamination of composting feedstocks. These findings and recommendations are outlined in greater detail in the body of this report.

Shared Accountability is Key

Composting is a desirable and beneficial alternative to landfilling organic materials. However, the compost bin is not a disposal bin; rather, it is an input into a manufacturing process. All members of the composting supply chain must share accountability for maintaining optimal compost quality by working together to reduce contamination. As such, contracts between municipalities, haulers, and composters are a crucial tool for building shared accountability and minimizing contamination. Contract enforcement can be hampered by a variety of factors, including automated collection methods, limited staff availability in smaller jurisdictions, and participant confusion. However, cart tagging programs that incorporate consistent, audience-focused education, are an effective and efficient tool for changing participant behavior, enforcing contracts, and ultimately minimizing contamination.

Jurisdictional Inconsistencies Contribute to Participant Confusion

Variability within and between jurisdictions regarding cart colors, accepted items, and audience demographics (housing type, culture, language, age, family type, etc.) creates participant confusion about what can and cannot be composted. This confusion is compounded by jurisdictional inconsistencies for participants who cross boundaries between work and home. One strategy does not fit all: program inconsistencies present challenges for educators trying to implement consistent regional education strategies on limited budgets.

An Ounce of Prevention is Worth a Pound of Cure

Contamination prevention through program education and enforcement prior to collection is more effective than contamination removal during the composting process. Unfortunately, education and enforcement tactics can be resource intensive, and jurisdictions often have limited budgets.

Contamination Management is Costly but Necessary

Although the ideal way to manage contamination is to prevent it from entering the compost stream in the first place, commercial composters may always need effective methods and technologies to aid them in identifying, removing, and disposing of contaminants. Unfortunately, these methods and technologies are typically expensive and their effectiveness vary widely depending on several factors**.** Composters scored Airlift Separators, picking stations, and proper screening as the most effective methods for removing low-density materials such as film plastics. Picking stations also provide the added bonus of facilitating removal of other easily identifiable contaminants.

Not All Contaminants are Created Equal

The four most common contaminants in the organics stream are plastic film, plastic garbage bags, rigid plastics, and glass. (Note: unless otherwise noted, the term "plastic" is used throughout this document to refer to conventional petroleum-based plastic that is non-compostable.) While agreeing that the goal is to eliminate all non-compostable items from composting feedstocks, the workgroup explored the concept of common versus problematic contaminants. For example, film plastics are the most common contaminant; although composters do have effective means for removing some portion of film plastics during processing, they are costly and not 100% effective. Glass is less prevalent but equally problematic to composters because it is difficult to identify and remove, especially when composting feedstocks are ground early in the composting process. Glass also represents a safety concern for customers of finished compost, which is less of a concern for film plastics.

Growing Interest in Compostable Packaging Presents both Opportunities and Challenges

There is a growing body of evidence that shows the use of compostable foodservice packaging may lead to an increase in food scrap diversion. Additionally, if it is used in conjunction with a full suite of best practices such as conscientious purchasing of compostable products where appropriate, outreach, and education, contamination can be measurably reduced relative to environments where packaging is not uniformly compostable and/or best practices are not applied[9]. At the same time, packaging can present challenges for composters, including:

- Difficulty in discerning between compostable and non-compostable items that look alike.
- Non-compostable products that are labeled and tinted in such a way that participants assume they are compostable when in fact they are not.
- Requirements that food distributors and vendors apply stickers to pre-packaged food containing nutrition and allergen information. Although there are compostable stickers available, the market has not yet reached sufficient scale to provide a viable alternative to conventional stickers.

The workgroup is encouraged by the depth and breadth of dialogue occurring on these topics, both within the workgroup and elsewhere in the industry. However, there remains a lack of consensus among all stakeholders regarding the best path forward. We look forward to continued collaboration in this area.

It's Still Early Days: Opportunities for Innovation and Study Abound

The workgroup identified several opportunities for further study, including:

[9] "Literature Review on the Impacts to the Composting Value Chain When Introducing Compostable Foodservice Packaging," *Foodservice Packaging Institute,* January 2017,

- What truly influences participant "behavior at the bin"?
  - What items are most confusing, and why?
  - What influence does signage have on disposal behavior?
  - How does the participant's environment influence their behavior?
  - How do packaging labels and design influence behavior?
  - Can prompts and cart tags result in durable improvements in participant sorting, yield higher participation, and lower contamination levels?
- What compostable alternatives exist to conventional produce and nutritional stickers that still meet requirements for both cost-effectiveness and functionality?
- How effective are current policies in reducing contamination, e.g., enforcement strategies, bans and fines regarding plastic bags, expanded polystyrene, and food bans?

Washington State Can Lead Organics Contamination Reduction Efforts

The workgroup identified several opportunities where Washington State can leverage our collective experiences and expertise to play a leadership role in advocating for collaborative approaches for addressing organics contamination, including:

- Advocating for adequate resources to fund the **collective, regional collaboration** necessary to produce strategies, audience-tested tactics, education materials, and tools for our industry.
- Building, testing, and ultimately sharing an **Organics Educator Toolkit** with the broader organics recycling community.
- Building cross-stakeholder consensus around **best management practices** for **packaging design and labeling**.
- Contributing to the national conversation about **packaging testing standards**.
- Sharing **sample contract language** and tools with solid waste agencies, haulers, and composters.
- Sharing **cart tagging program implementation guidelines and best practices** with solid waste jurisdictions.
- Presenting **findings and recommendations** in local, regional, and national solid waste forums.

Contractual Policies

The Contractual Policies subcommittee was formed to research and recommend policy options and contractual best management practices to contribute toward the elimination of contaminants in the residential and commercial organics streams.

Key Concepts and Current Practices

Role of Contracts in Organics Waste Stream

In municipal areas, the provision of organics collection service to residential and commercial participants is governed by a contract between the municipality and the hauler. In unincorporated county areas, it is governed by an agreement between a certificated hauler and the Washington Utilities and Transportation Commission (WUTC).

For single-family residential participants, the cost of organics collection is either included in the garbage rate at no additional cost (embedded), or offered as a separate elective service for additional monthly fee (non-embedded). For commercial and multifamily participants, organics service is almost always elective and non-embedded. In some instances, food scrap collection service is partially or fully embedded for multifamily properties and businesses.

Municipal contracts outside of Seattle require haulers to transport collected organic material to a private composting facility. The hauler pays a negotiated per ton unit price through a private contract with the compost facility. The cost of collecting and processing the organic material is then passed on to the residential and commercial participants through one of the means described above. In Seattle, organic material collected by contracted haulers is delivered to Seattle's transfer stations where it is consolidated and transferred to one of the City's contracted composting facilities.

Monitoring, Accountability, and Enforcement

All successful solid waste management programs, including those offering organics service, must find effective methods for monitoring adherence to contracts, engendering shared accountability in all parties, and enforcing contracts where necessary.

Common current practices for each of these activities include:

- **Monitoring**, when conducted, is typically performed by organics haulers at the time of collection. In most organics contracts, the hauler is prohibited from hauling loads containing obvious contamination and must provide one or more forms of feedback to the participant to educate and change behavior.
- **Shared Accountability** between agencies, haulers, composters, and participants is essential to reducing contamination.

  - Composters require clean feedstocks to affordably meet regulations, and meet customers' expectations of quality. Some methods that composters use to promote accountability of generators and haulers include contamination policies, feedstock quality reports, and outreach coordinator "picking parties," where these educators have the opportunity to experience the contamination removal process first hand.
  - Solid waste jurisdictions and agencies are invested in supporting the generation of clean feedstocks to support composting as a means for meeting landfill diversion goals.
  - Accountability in organics participants is promoted through a variety of methods including both participant education and enforcement. Cart tagging is a commonly used method for both educating participants and as the first step in enforcement.
  - Contamination prevention through program enforcement at the source, or prior to collection, is more effective than contamination removal during the composting process. Shared accountability between agencies, haulers, composter, and participants is a critical component to effective program enforcement.

- **Enforcement** of the terms and conditions of the contract is typically performed in partnership between the hauler and the solid waste program agency. For example, a contract may stipulate that, after contaminated carts are tagged, service will not be provided until the contamination is removed. If the contamination is not removed, the agency may then contact the participant or levy fines for either a return trip and/or disposal of the materials as trash.

Known Challenges

While most contracts require the hauler to refuse contaminated organic materials, in practice contractual requirements are often either not observed by the driver or not enforced by the local jurisdiction. Close inspection of cart contents is hampered by automated collection methods, and the necessary follow-up and enforcement is often critically limited due to staff availability in smaller jurisdictions.

There is no "one size fits all" suite of solid waste policies and contractual best management practices (BMPs) that can eliminate contamination in the organics stream, for a variety of reasons outlined below:

- The ability for local solid waste agencies to affect policy change, adopt new ordinances, and amend hauler contracts varies widely by jurisdiction.
- Contamination monitoring and enforcement provisions in existing solid waste contracts vary by jurisdiction.
- Haulers may have operational approaches to collecting organic materials which affect their ability to monitor contamination.
- The implementation and enforcement of any new ordinances or contractual provisions is dependent upon a jurisdiction's resources and political will. Additionally, given recent court challenges regarding a participant's right to privacy of their garbage, municipalities must navigate and assess new and rapidly changing risks associated with contract enforcement.

Goals

In the context of the challenges outlined above, the Contractual Policies subcommittee identified the following goals:

- Identify commonalities and distinctions among jurisdictions and service providers with respect to organics contract language, monitoring, accountability, and enforcement.
- Develop recommendations for effective organics contract language.
- Develop recommendations to improve consistency and effectiveness of monitoring and enforcement of contracts at the point of collection.
- Develop guidelines for jurisdictions seeking to implement an effective cart tagging program.

Activities

The subcommittee took several steps to inform the development of the items outlined above. These activities are outlined below.

Contract Language Review

The subcommittee reviewed several municipal solid waste contracts in Western Washington, including those of Bothell, Bellevue, Federal Way, Kirkland, Redmond, and Sammamish. Below are our findings from this review.

- Most solid waste contracts in Western Washington require the hauler to reject any noticeably contaminated organic materials and affix an informational “Oops!” tag to the cart.
- The allowable contamination threshold to trigger tagging ranges from nominal to as much as 20%.
- Some contracts require the hauler to provide education and outreach to participants with contaminants in their carts or to conduct periodic audits of organics carts to gauge the level of contamination.
- Some contracts permit the hauler to stop service for problem participants after making a reasonable number of attempts to correct the behavior.
- While the foundation of effective cart tagging and contamination reduction programs exists in current solid waste contracts, the provisions are often not regularly or consistently enforced by solid waste management agencies, haulers, and their drivers.

Hauler Interviews

To better understand the challenges involved with managing contamination at the point of collection—and to gauge the viability of conducting a cart tagging pilot—the subcommittee interviewed three individuals from hauler Waste Management: an Operations Manager, a Yard Debris Route Manager, and a Yard Debris Route Driver. These individuals all serve single-family residential yard debris participants in

the City of Kirkland. Kirkland has a relatively mature curbside organics collection program (implemented in 2003), offering weekly embedded organics service, with residents who are dedicated to recycling. The subcommittee learned several things from these interviews, including:

- Cart tagging is generally effective at changing participant behavior. A participant tagged one week usually does not repeat the contamination the next week.
- The number of contaminated carts tagged can be dependent upon a driver's attention to detail and initiative.
- On average, less than 10% of the participants on a residential route have contaminants in their carts.
- Language barriers can cause contamination issues.
- Some participants will purposely hide garbage under yard and food scraps in their carts to avoid paying extra garbage fees if their garbage carts are full or too small.
- Many participants use non-compostable, black plastic garbage bags for yard debris.
- Drivers do not take photos of contamination but do contact dispatch to approve disposing of the contaminated organic material as garbage ("Haul or Call").
- The style of collection vehicle varies by hauler but most use the "Curotto-style", i.e., front loading collection method versus side loading for residential yard debris collection.

Cart Tagging Pilot

Legal Review of Tagging Protocols

In support of the subcommittee's goal to develop guidelines for jurisdictions seeking to implement an effective cart tagging program, a pilot was planned in the City of Kirkland. However, during the planning stages of the pilot, the nearby City of Seattle's ordinance requiring haulers and Seattle Public Utility employees to inspect residential carts for food and recyclable materials banned from the garbage was legally challenged in *Bonesteel v. City of Seattle* on the grounds that the ordinance violated residents' constitutional right to privacy. The ban itself was upheld by the King County Superior Court but the judgement "... renders invalid the provisions of the ordinance and rules that authorizes a warrantless search of residents' garbage cans when there is no applicable exception to the warrant requirement, such as the existence of prohibited items in plain view."

Consequently, the subcommittee sought a legal review by the Kirkland City Attorney's Office (CAO) of its proposed protocols for the organics cart tagging pilot. It was the opinion of the CAO that there is no presumption of privacy if the organics contamination is observed in plain view during the normal course of performing collection activities, such as opening the cart lid and dumping the cart via residential side-load or Curotto can service. For commercial and multifamily participants, carts are typically pulled from the enclosure to the truck and the lids opened before being emptied into the truck, which places any contaminants in plain view of the operator. If the participant is notified via a cart tag or through some other means that the contents of the cart may be inspected on subsequent collection days for

contamination, then there can be no reasonable expectation of privacy. Therefore, the subcommittee went forward with its cart tagging pilot.

Pilot Overview

The subcommittee designed and oversaw a residential and commercial/multifamily cart tagging pilot over a five-week period in September and October 2016. Visual flowcharts of the pilot's cart tagging protocols can be found in Appendix A. During the single-family residential portion of the pilot, drivers were asked to check all collected carts for visible contamination using an on-board camera for sideload collection vehicles or directly through the windshield for Curotto-equipped vehicles. If the driver observed contamination, he or she recorded the type of contamination on a mobile PC tablet and affixed an educational tag to the cart.

Figure 2. Cart "Oops" Tag

Beginning on the second week of the pilot, drivers exited their vehicles and physically rechecked previously tagged carts before providing service. If contamination was found for a second consecutive week, the participant was contacted and advised that a fee would be charged to dispose of the material as garbage. If contamination was found for a third consecutive week, then the materials would be disposed of as garbage and the participant would be advised that yard debris service would be stopped due to chronic contamination. If a cart was free of contamination during the recheck, it was not physically checked again the next week. During the fifth week of the single-family pilot, drivers rechecked previously tagged carts but did not apply new tags.

In the multifamily and commercial pilot, drivers could check carts before dumping them because of the standard practice of physically rolling carts from the trash enclosure to the truck. During the pilot, if the driver observed contamination, he or she took a photo and did not provide service. The City or hauler then contacted the participant and gave them the option of removing the contaminants within 24 hours and paying for a return trip to collect the organics, or clearing the contamination and waiting for service until the next scheduled pick-up day to avoid the return fee. If the participant failed to choose an option within 24 hours, a truck was sent to dispose of the materials as garbage and the participant was billed accordingly for a return trip and garbage disposal.

Single-family Residential Pilot Summary

During the pilot, drivers checked carts on one single-family residential route on each day of the week. Over the course of the pilot, the hauler checked approximately 17,020 single-family residential carts.

Of the 17,020 single-family residential carts checked during the pilot, drivers tagged 90 carts at 81 households, or 0.53 percent of total carts checked. Of the 90 carts tagged, nine were repeat offenders, equating to a recidivism rate of 11.1 percent. Of those nine repeat offenders, three households were tagged a second time for contamination after at least one week without contamination.

Six material types accounted for 93.2 percent of observed contaminants in the 90 tagged carts. The below table summarizes the number of occurrences of each contaminant type.

Table 1. Single-family Residential Observed Contaminants

Contaminant	Carts Observed	Percentage
Plastic/Plastic Bags*	33	32%
Painted/Treated Wood	20	19.4%
Garbage	18	17.5%
Cardboard with non-compostable adhesives, e.g. tape, labels	12	11.7%
Mixed Recycling	8	7.8%
Styrofoam	5	4.9%
Other	7	6.8%
Total	103	100%

*Refers to conventional petroleum-based plastic that is not compostable.

Commercial and Multifamily Pilot Summary

On the commercial and multifamily route, the hauler checked carts weekly on the route's regular Tuesday and Friday service days. Over the course of the pilot, the hauler checked approximately 936 commercial/multifamily carts.

Of the 936 commercial and multifamily carts checked during the pilot, drivers placed tags on ten carts, or 1.07 percent of carts checked. Of the ten carts tagged, two were previous offenders, equating to a recidivism rate of 25 percent (2 out of an original 8 offenders for a total of 10 offenses). Three multifamily/commercial participants were charged for a return trip once the contaminants were removed by the participant.

Plastic bags and garbage accounted for 53.9 percent of observed contaminants in the ten tagged carts. The remaining 46.1 percent of contaminants were comprised of recycling, Styrofoam, foil, chip bags, milk jugs, and aluminum cans. The below table summarizes the number of occurrences of each contaminant type.

Table 2. Multifamily/Commercial Observed Contaminants

Contaminant	Carts Observed	Percentage
Plastic* Bags	4	30.8%
Garbage	3	23.1%
Other	6	46.1%
Total	13	100%

*Refers to conventional petroleum-based plastic that is not compostable.

Pilot Outcomes and Next Steps

The level of contamination found in both the single-family residential and multifamily/commercial waste streams was lower than anticipated. The initial tag was effective at changing behavior in single-family and only one in ten participants repeated an offense in a subsequent week. The tags were also effective at encouraging a few participants to contact the City and hauler with questions. City staff reported that many participants they spoke with believed they were disposing of their organics correctly, so the pilot provided an opportunity for participant education. When interviewed as part of a pilot debriefing session, drivers indicated that the tagging program did not negatively impact the efficiency of their routes.

Of the total carts observed to have contamination, the predominant observed contaminant was plastic or plastic bags (32%) with treated or painted wood or wood with a significant number of nails coming in second at 19 percent. Other contaminants included general garbage and cardboard contaminated with tape, bubble wrap, or shipping peanuts.

As a result of the findings outlined above, the City of Kirkland and Waste Management intend to fully implement the single-family residential tagging program in 2017 on the four regular residential yard debris and food scraps routes once a more robust electronic tablet tracking system is in place. The multifamily/commercial tagging program, which was intermittent before the pilot, will continue as a regular practice.

Findings and Recommendations

Through the above activities, the subcommittee identified several findings and areas for further research and investment. These are outlined below.

Sample Contract Language and Tools

The subcommittee gathered sample contract language from local agencies and composters to consider including as an amendment to existing contracts or in new agreements.

Sample #1: Solid Waste Agency Contract with Hauler

This sample contract language is open-ended and designed to encourage collaboration between the solid waste agency and the hauler, to allow for the variations outlined in Known Challenges above.

> "The Contractor and City shall **jointly develop** a protocol to address Multifamily Complex and Commercial recycling contamination issues. The protocol will address **thresholds** for when contamination levels trigger Customer contact, when to put a Customer on "probation" for possible discontinued collection, when to suspend collection service and remove the subject Container, and finally, **procedures** for allowing a Customer to resume service after it has been suspended due to contamination. The Contractor shall implement the protocol consistently for all Customers and shall **notify** the City via e-mail of any Customer being handled under the protocol."

Sample #2: Composter Contamination Policy[10]

This sample contractual policy language is specific and designed to set clear expectations and develop shared accountability for reducing contamination.

Contamination Policy Effective 6-1-11

As an OMRI Listed Facility Dirt Hugger endeavours to have the cleanest feedstock possible in order to create a high-quality, organic product.

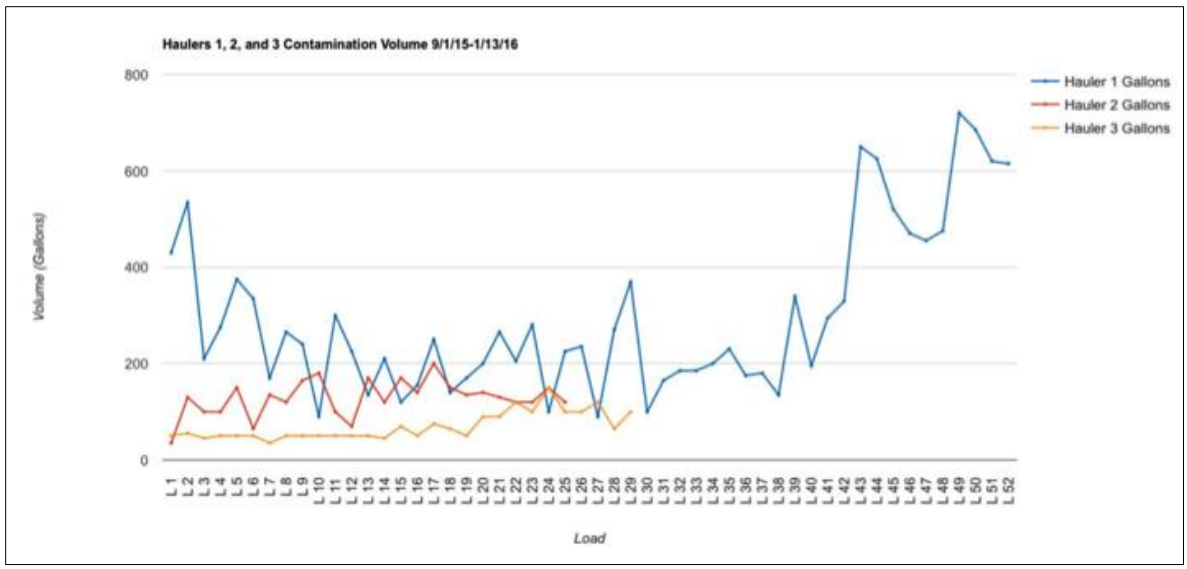
The following contamination fees apply to any material being delivered to Dirt Hugger. For all loads tipped at Dirt Hugger, any load with contamination will be documented, including date, time, material, and a photo displaying volume and contamination material. Contamination material is anything that is not organic or synthetic as defined by the National Organics Standards Board, including plastic, glass, metal, rubber, rocks, sod, or dirt. Contamination is measured in 'picks' and / or volume, whichever is greatest. 'Picks' are described as a piece/or pieces of contamination that one can pick up with one hand at one point time. The volume of contamination is measured specifically in gallons.

- 0-5 gallon / 20 Picks – there is no charge to the customer
- 6-20 gallon / 21-50 Picks - Load is accepted, date, material, time are logged, and a photo is taken of contamination, a $25 contamination fee is charged to customer
- 21-50 gallon / 51-80 Picks – Load is accepted, date, material, time are logged, and a photo is taken of contamination, a $50 contamination fee is charged to customer
- 51-100 gallons / 81-120 Picks – Load is accepted, date, material, time are logged, and a photo is taken of contamination, a $100 contamination fee is charged to customer
- 101-200 gallons / 121 - 150 Picks – Load is accepted, date, material, time are logged, and a photo is taken of contamination, a $200 contamination fee is charged to customer
- Over 200 gallons / 150 Picks – Load is rejected, if material is already dropped on pad, Dirt Hugger will load material back into the delivery truck for a $150 / hr loading fee, minimum of 1 hr will be charged.

[10] Sample Contamination Policy provided by Dirt Hugger, a commercial composter located in southern Washington State.

Sample #3: Composter Feedstock Quality Report[11]

This sample report is used to provide transparency and develop shared accountability between a composter and its haulers for reducing contamination over time.



Cart Tagging Implementation Guidelines

The subcommittee developed two sets of guidelines for jurisdictions interested in developing effective cart tagging programs: one for residential single-family participants and another for commercial and multifamily participants.

We recognize that there can be significant differences between communities in their approach to implementing a tagging program. For this reason, the guidelines contained in this section are designed to be adaptable to the unique needs and culture of each jurisdiction.

Program Design Considerations

Below is a list of questions that should be considered when designing a cart tagging program:

- Should single-family residential and multifamily/commercial be managed differently?
- How will the success of the tagging program be evaluated?
- Will drivers be equipped with cameras to take photos of contamination?
- Will the tracking process require a computer tablet for drivers?
- Will the drivers need additional training to effectively implement the tagging program?

[11] Sample Composter Feedstock Quality Report provided by Dirt Hugger, a commercial composter located in southern Washington State.

- What should be the allowable contamination threshold to trigger tagging?
- What should the tags say? Should the tags provide positive or negative reinforcement?
- Who will be responsible for outreach to participants?
- What should be used as the baseline fee for contaminated organics disposed of as garbage?
- At what point should service to a participant be stopped?
- How should service stoppage be addressed in cities with embedded organics service?
- Should there be a probationary period before stopping service?
- How can participants earn their service back?
- What will be the reporting requirements from the hauler to the city?

Single-family Residential Specific Guidelines

This section outlines specific recommendations for implementing an effective single-family cart tagging program.

- **Visual Monitoring:** Automated collection vehicles used when collecting single-family residential organics are operated from the cab of the truck, so drivers should monitor contamination via a cab-mounted video screen in side-loading trucks or visually in front-loading Curotto-style trucks.
- **Documenting Contamination:** Once the contents are in the truck, the contaminants should not be removed due to safety concerns. Drivers should take photos to substantiate claims of contamination and provide backup for any disposal and return trip fees charged.
- **Tagging Contaminated Carts:** The participant should receive a tag stating what non-compostable materials were seen in the cart. Separate tags with both positive and negative reinforcement messaging should be used.
- **Flagging Accounts for Follow Up:** The driver should flag the account for the tagged household. The hauler should provide a list of flagged participants to each driver each week. Drivers should recheck flagged participants' carts for contamination before providing service. If the cart contents are clean, i.e. not contaminated, the driver should tag the cart with a positive feedback tag and unflag the account. If the contents are contaminated, the driver should take a photo and log the contamination.
- **Participant Outreach & Enforcement:** The agency or hauler should provide participant outreach—preferably verbal—to complement tagging. Examples include:
  - Contacting participants to warn them to either remove the contaminants before their next service day or be subject to fines.
  - Notifying participants that their cart contents have already been disposed of as extra garbage at the agency's stated rate. The participant's account should remain flagged.
  - Notifying participants that their service has been placed on probation or stopped due to chronic contamination.

- **Administration:** The effectiveness of a tagging program should be periodically monitored and evaluated.

Commercial and Multifamily Specific Guidelines

This section outlines specific recommendations for implementing an effective commercial and multifamily cart tagging program.

- **Vetting Participants:** Commercial and multifamily organics collection should be an optional service, unless otherwise specified in city or county code. Moreover, participants should be required to undergo an approval process through the agency or the hauler before receiving organics service. The approval process should ensure that the participant receives training and outreach materials to prevent contamination, is committed to regularly using the service, and already has an established regular recycling program. Commercial and multifamily participants should be advised that a city or hauler may levy garbage disposal fees based upon established garbage extra rates for contaminated loads. If composting service is embedded and provided to participants at no additional cost, cities or haulers should consider charging participants a portion of the cost of service to encourage investment in eliminating contamination.
- **Monitoring:** Most commercial and multifamily organics collection service is cart-based, although some service providers offer larger detachable containers for higher volume generators. In either case, there is an opportunity, unlike with single-family residential collection, for the driver to inspect the contents of the collection container for contaminants before service is provided.
- **Documenting Contamination:** If contamination is found in the cart, the driver should take a photo to document the contamination.
- **Tagging Contaminated Carts:** Driver feedback indicated that the weather-resistant paper upon which the tags were printed performed well but recommended that a stronger adhesive be applied to the back of the stickers.
- **Participant Outreach & Enforcement:** The agency or hauler should contact the participant to give them 24 hours to remove the contamination from the container and the choice to pay for a return trip or wait until their next regular service day. If the participant opts for a return trip, then the participant should be required to notify the hauler or city within 24 hours that the contamination has been removed. Otherwise it will be disposed as garbage, and the cost of disposal will be charged to the participant. If the participant opts to wait until the next service day and the contamination is not removed, the contents should be disposed as garbage with the cost of disposal passed onto the participant.
- **Administration:** The effectiveness of a tagging program should be periodically monitored and evaluated.

Subcommittee Next Steps

Cart tagging programs have proven to be effective at changing participant behavior and reducing contamination in organic feedstocks. However, to achieve a measurable and meaningful reduction in contamination to the region's compost facilities, a critical mass of municipalities and haulers serving unincorporated WUTC areas must adopt and implement tagging policies and programs.

A critical next step for the OCRW is to provide education to municipal and county policy makers and solid waste program managers to encourage them to consider implementing consistent and persistent tagging programs and other best management practices to reduce contamination in their programs. Subcommittee members will look for opportunities to present at local city council meetings, regional solid waste forums like county Solid Waste Advisory Committees (SWACs), the King County Metropolitan Solid Waste Advisory Committee (MSWAC), and the WUTC; recycling industry associations such as the Washington State Recycling Association (WSRA) and the Washington Organics Recycling Council (WORC); and state and county legislators.

Participant Education and Outreach

Key Concepts and Current Practices

As described in the Contractual Policies section above, participant education and outreach are instrumental tools in engendering participant accountability and—when necessary—assisting in the enforcement of organics disposal policies. Participant education and outreach, relative to promoting correct sorting habits and behaviors, are divided into three categories:

- **Distribution of physical education collateral to commercial and residential participants**, including posters, stickers, and guidelines. These materials typically incorporate both recycling and composting topics into one combined set of messaging. The suite of materials should have the same "look and feel" so that participants easily recognize the material as being from the same source.
- **Provision of in-person education, tools, and technical assistance,** such as kitchen food scrap containers, scrapers, compostable bags, or other resources intended to promote participation and correct sorting. These offerings are typically made available to commercial, multifamily, and residential participants.
- **Leveraging traditional and new media** such as radio, television, and online social media to raise awareness of available programs on a regional scale.

Known Challenges

Historically, the emphasis in organics management has been on growing the tonnage diverted from the disposed waste stream, not on minimizing residual contamination. However, over the last ten years, the availability of collection infrastructure has expanded, the range of 'allowed' compostable items has broadened, and an increase in packaging marketed as "green" regardless of its actual compostability, has created fresh sources of confusion for a large and rapidly growing audience.

Sector-specific Challenges

- In the **single-family residential** sector, participants have historically been allowed to put yard trimmings in a compostable bag. As more items are allowed in residential yard debris – now organics – carts, the perception that anything that goes into this "magic bag" will be composted requires educators to unwind internalized norms around incorrect behavior. **Based on 2012 Seattle waste characterization data, single-family organics contamination ranges from .5% to 4.3%. The 2014 King County characterization study (which did not include City of Seattle) found a single-family organics contamination rate of 2.4%.**[12]

[12] Cascadia Consulting Group. (2015). *King County Organics Characterization Report*.

- In the **multifamily** sector, the need to educate many independent households in a variety of languages within a single building presents both logistical and behavioral challenges. For example, if a resident looks in an organics cart and sees that another resident has placed a non-compostable item into the cart, he or she may conclude that this item is acceptable and subsequently follow the same behavior. Additionally, because the organics service account holder and the resident are typically not the same person, there is no accountability for contaminating the shared organics carts and messaging encouraging behavior change must travel further to reach their target. **Based on 2012 Seattle waste characterization data, multifamily organics contamination ranges from 3% to 5.9%.**
- In the **commercial** sector, specifically the foodservice sector where organics are more prevalent, educators face many challenges in promoting correct sorting behaviors, including: language barriers, hurried and distracted participants, incorrect placement of bins, and confusing marketing claims by foodservice packaging manufacturers that lead to mixing compostable and non-compostable materials. There are also often communication barriers between the material generators and the janitorial staff who transport the material from inside to the outdoor containers. **Based on 2012 Seattle waste characterization data, commercial organics contamination ranges between 2.8% to 3%.**

Broad-based Challenges

Variable Organics Collection and Pricing Structures

There are a variety of organics collection and pricing scenarios which make consistent regional education strategies challenging. Examples of common scenarios are listed below:

- Automatic and/or embedded organics service when a participant signs up for garbage service.
- Organics service available upon request for an additional fee.
- Fee for organics cart delivery.
- Optional or reduced winter organics service.
- Both every-other-week and weekly collection.

Variance in Accepted Items

As the Washington organics infrastructure has grown and become more accessible, the variety of material types accepted in organics carts has also grown. While many programs remain limited in what items they will accept—allowing only yard debris and some vegetative waste, for example—a growing number of programs also accept all types of food and food-soiled papers (such as napkins, paper towels, and pizza boxes), and certain approved brands of compostable foodservice ware or packaging. Most programs will accept material in compostable bags, which are easily confused with plastic film or bags. Another challenge is that accepted items differ between backyard composting programs (e.g., no animal protein) and curbside composting. This variability in accepted materials and program types poses challenges to educators in their ability to provide clear and consistent messages targeting behavior change in participants who regularly cross city and county lines as they travel between home and work

in their daily lives. This challenge persists even in communities with educated and enthusiastic program participants.

Non-Compostable Look-Alikes

Consumers' growing interest in "green" products has led to an increase in the quantity and variety of available products made using compostable papers and plastics, especially in foodservice ware and packaging. However, it is often difficult to discern compostable products from their non-compostable counterparts. Further, an individual restaurant can utilize dozens of distinct foodservice products, often mixing compostable and non-compostable materials, for example a compostable cup with a non-compostable lid or straw. This variability, compounded by the thousands of restaurants statewide, poses further challenges for educators in providing clear and consistent messaging.

Busy Participants Who Sort on the Run

With busy lives being the norm, educators must provide messaging that addresses the complexities outlined above while facilitating quick comprehension across a variety of age groups, cultures, and languages.

Need for Accessible Educational Materials

The use of transcreated, image-based educational materials for non-dominant audiences is important for making educational messaging widely accessible to all audiences. Although this practice is growing in Washington State, some educators are struggling to develop these types of materials due to a need to prioritize limited education funding. When local census data show that non-dominant groups comprise a minority of a jurisdiction's participants, these participants can be left behind.

Inconsistent Cart Colors

Many jurisdictions in Washington State and nationwide have worked to apply a consistent cart color scheme, i.e., black or grey for garbage, blue for recycling, and green for organics. A consistent color scheme across jurisdictions assists educators in creating clear and consistent messaging in educational materials and signage. However, some cities have yet to implement this scheme, or have implemented a modified version to meet their own unique needs, leading to further complexities that educators must navigate.

Variable Need for and Access to Education Funding

Some solid waste jurisdictions are better funded than others to provide education support to businesses and residents, leading to inconsistent education strategies and varying accessibility to clear messaging. Additionally, as participant awareness of the availability of composting services continues to grow, well-meaning participants unwittingly contaminate feedstocks based on the assumption that any errors will be fixed during processing. Education for these participants becomes increasingly important and can be resource intensive for jurisdictions with limited budgets. Resources must be allocated annually for education and accountability tactic implementation.

Goals

In the context of the challenges outlined above, the Education and Outreach subcommittee identified the following goals:

- Identify gaps, if any, between educators' and composters' perceptions of problematic contaminants in the composting process.
- Draft an Organics Educator Toolkit for solid waste program educators that enables clear, consistent participant messaging about correct organics sorting behavior at home and at work.

Activities

The subcommittee took several steps to inform the development of the items outlined above. These activities are outlined below.

Research Current Practices

The subcommittee conducted research across the residential, commercial and multifamily sectors, including:

- Reviewed accepted items lists from various Washington cities and counties.
- Identified common contaminants through hauler audits, composting facility site tours, interviews with outreach coordinators from public events, and public comments and questions received at call centers.

Educator Survey

The subcommittee surveyed twelve solid waste program educators on perceived contaminants and recommended practices for reducing organics contamination by sector (single-family, multifamily, commercial, and special events). A summary of the survey results is provided below. The detailed survey results can be found in Appendix B.

- Respondents were asked to identify the top five contaminants in each sector. Of all the material types provided by respondents, three received over half the votes across all sectors: plastic bags and film, non-compostable paper, and non-compostable paper cups. A fourth material type, recyclable plastic containers, was identified as a top-five contaminant in three of four sectors.
- Respondents were asked to identify the top five most effective messaging for reducing contamination in each sector. Image-heavy signage presenting visual examples of both accepted materials and common contaminants rose to the top across all sectors. Additionally, simple and direct messaging connecting participant actions to outcomes were provided, e.g., "Keep Compost Clean – No Plastics."
- Respondents were asked to provide the top five most effective practices, beyond specific messaging, for reducing contamination in each sector. Consistent cart colors, consistent labels at all points of disposal (curbside carts, kitchen scrap containers, signage), free tools (e.g. kitchen

scrap containers, compostable bags), and in-person education and technical assistance were identified by a majority of respondents.

Composter Contamination Survey

The subcommittee surveyed ten commercial composters in Washington State about accepted items and common and problematic contaminants. Respondents represent facilities that process approximately 608,203 tons annually, or 51 percent of tonnage processed in Washington State.[13] A summary of the survey results is provided below. Detailed survey results can be found in Appendix C.

- Respondents identified the **five most common contaminants in their facilities as glass, non-compostable rigid plastics, non-compostable plastic film (including produce and shopping bags), beverage containers and other recyclables, and garbage.**
- Respondents identified the **five most problematic contaminants in their facilities as glass, non-compostable rigid plastics, non-compostable plastic film (including produce and shopping bags), and non-compostable plastic garbage bags.** Respondents cited safety concerns, costs, and technology limitations as key challenges in removing these items from their products.
- Respondents identified the **five most persistent contaminants in their facilities, i.e., items that resist identification and/or removal, showing up in finished compost, as glass, non-compostable rigid plastics, non-compostable produce stickers, and non-compostable plastic film (including produce and shopping bags).** Respondents cited safety concerns, costs, and technology limitations as key challenges in removing these items from their products.

Organics Educator Toolkit

The subcommittee began development of an Organics Educator Toolkit that will be comprised of the below tools and resources. An early draft of the Toolkit can be found in Appendix D.

- **Checklists to success:** Audience- and sector-specific checklists containing key considerations and good management practices to guide program managers and educators in program design and operation.
- **Messaging map:** Clear and consistent messaging to promote correct sorting behavior.
- **Standardized graphics and educational materials:** Audience tested documents, images, and graphics.
- **Supporting education tools**: Tools to track the impact and supplement educational messaging, using accessible technologies such as Google tools and SurveyMonkey.
- **Recommended jurisdictional codes and policies**: Tips for promoting local codes and policies that support effective education.

[13] Washington State Department of Ecology. (2016). *WA State Composted Materials for 2015.* http://www.ecy.wa.gov/programs/swfa/organics/pdf/2015CompostedMaterials.pdf (accessed May 2017).

- **Strategies, tactics, and materials for promoting participant accountability:** Follow up education and outreach to keep participants accountable.

Findings and Recommendations

Through the above activities, the subcommittee both validated known good management practices and identified several findings and areas for further research and investment. These are outlined below.

Educating for Success

Successful education and outreach programs:

- Focus on the most impactful materials.
- Connect behaviors to outcomes.
- Provide clear, consistent, and simple messages and images about what to compost and what NOT to compost.
- Are audience-tested.
- Incorporate face-to-face interactions and trainings to reinforce messaging.
- Provide tools to incentivize participation, increase convenience, and decrease the "ick factor."

A Little Glass Goes a Long Way

The reason it is important to teach and enforce proper sorting practices prior to collection is that removing contaminants during processing increases the cost of producing high-quality compost. Further, some contaminants cannot be fully removed once in the feedstock.

For this reason, composter survey respondents identified glass is a major challenge. Glass bottles, while not a big contaminant in terms of tonnage, shatter upon entry into the feedstock and are then carried through the composting process. This can result in entire loads being rendered unusable because the broken shards of glass are difficult to remove from finished compost and present safety and quality concerns. For example, compost customers may be cut on a shard that made it through the screening process. Also, farmers have voiced concerns that compost containing glass (or hard plastic) applied to root crops could result in the glass or plastic being incorporated into a root vegetable such as a potato.

Stuck with Produce Stickers

Similarly, composter respondents indicated that produce stickers, although not as problematic as glass, present a persistent challenge to product quality because they do not break down and are difficult to remove from finished compost. See the Upstream Systems section for more discussion about produce stickers and other adhesives.

Participant Accountability

The subcommittee identified the need to educate participants about the connection between their sorting behavior and the compost they purchase for home gardening and landscaping.

Subcommittee Next Steps

In 2017, the subcommittee will seek funding to continue building, testing, and refining the Organics Educator Toolkit, with a goal of eventually sharing with the broader organics recycling community by publishing it on the Washington Organic Recycling Council (WORC) website.

Upstream Systems

Key Concepts and Current Practices

Contractual Policy and Education and Outreach, discussed above, are established and well-known methods for addressing contamination in the compost stream. In contrast, the Upstream Systems subcommittee sought to connect the dots between known approaches while exploring new strategies across the entire supply chain. For this report, Upstream Systems encompasses all interventions on the organics waste stream from the point of generation through the point of disposal by the participant, except those directly covered by other subcommittees.

Known Challenges

The Composting Supply Chain is Simultaneously Hyper-Local and International

Of the four subcommittees, Upstream Systems was unique in that was comprised of stakeholders from across the composting supply chain, including: local and state government officials, foodservice distributors, campus dining service operators, compostable product manufacturers, environmental consultants, and commercial composters. As such, the subcommittee spent a good deal of time in discussion about the unique challenges and opportunities facing today's composting supply chain, particularly in relation to the growing interest in compostable foodservice packaging.

On average, commercial composters sell their products to customers within a 50-mile radius of where it is made. In contrast, the growing compostable product industry is part of an international business supply chain whose members are subject to a wide range of national, state, county, and local regulations governing—or in some cases not governing – the manufacture, distribution, and sale of their products. This dichotomy, combined with the challenges outlined in the Education and Outreach section above, contribute to a variety of challenges explored by the Upstream Systems subcommittee, some of which are outlined below.

Multiple Compostability Standards and Certifications Contribute to Confusion and Mixed Results Regarding Compostability

There are several established material compostability standards and certifications which are aligned with global compostability requirements. Unfortunately, no one standard can predict performance in all compost manufacturing processes. The existence of multiple standards, combined with differences in compostability terminology and labeling, contributes to confusion and inconsistencies throughout the supply chain—from manufacturers to purchasing managers to consumers to composters—ultimately contributing to increased contamination. Additionally, this creates scenarios in which packaging may meet ASTM standards but not successfully compost in existing industrial compost systems.

Greenwashing, Labeling, and Tinting

The market's recognition of growing consumer interest in environmentally friendly products has led some businesses to engage in "greenwashing," or marketing products using "green" images, colors, and terminology, thus confusing consumers and contributing to contamination. Further, some packaging types, such as molded fiber products, have limits to how they can be labeled—either due to their configuration, technology, or impracticality of the costs.

Image Source

Produce Stickers and Other Adhesives

As discussed in Participant Education and Outreach, composters have indicated that non-compostable produce stickers present a challenge to product quality. Additionally, foodservice operators and distributors that are working to transition to compostable foodservice ware for prepackaged food indicate they face challenges in finding compostable stickers that are large enough to accommodate required nutritional and branding information.

Purchase with the Consumer in Mind

When foodservice operators purchase packaging types that are designed to work together, mixing material types (i.e., a compostable cup with a non-compostable lid or straw) greatly increases the likelihood of incorrect sorting at the bin.

Goals

In the context of the challenges outlined above, the Upstream Systems subcommittee identified the following goals:

- Understand the factors that contribute to contamination prior to the point of purchase and disposal, including but not limited to the role of packaging design and labeling.
- Understand participant sorting behavior at the bin.
- Identify innovative approaches and opportunities for reducing contamination.

Activities

The subcommittee took several steps to inform the development of the items outlined above. These activities are outlined below.

Literature Review

To understand previous work to address contamination of the organics stream, the subcommittee compiled a library of existing studies and resources. Through this exercise, the team identified outcomes and gaps in existing research, which led to our recommendations for future studies. Appendix E contains a detailed listing of reviewed resources, which included characterization studies, observational behavior studies at the point of disposal, testing of compostable products, and more.

Tour of Product Distributor and Quick Service Restaurant

In June 2016, working group members had the opportunity to learn more about upstream considerations in the business supply chain and composting supply chain by participating in tours of two local businesses: Food Services of America (FSA), a major broadline foodservice distributor located in Kent, Washington, and Taco Time Northwest, a quick service restaurant chain in the Pacific Northwest.

During the tour of FSA, attendees learned about market dynamics, distribution, and other factors affecting businesses' ability to source certified compostable products, including quality, cost, food presentation, and managing customer perceptions. As discussed in the Known Challenges section above, customer perceptions on product compostability can be based on various "greenwashing" techniques designed to give the impression that products are compostable when they are not. The group also discussed the impacts of false compostability claims on distributors' attempts to source compostable products.

At Taco Time, Sustainability Manager Wes Benson described the company's transition from a three-bin front-of-house disposal system to a one-bin compost only collection system using compostable serviceware. Taco Time made the decision to make the transition after realizing that 90 percent of what was sorted at the bin ended up going to landfill due to contamination of both the recycling and organics bins. Today, 70 to 75 percent of their waste is diverted from landfill through composting and recycling and other system enhancements such as converting used cooking oil to biodiesel. Further, since the transition, Taco Time has experienced limited contamination, positive customer engagement, and a more sustainable business and environmental model. Taco Time attributes several factors to their success, including: proper signage, the conversion to fully compostable food serviceware, and temporarily staffed bins to gather customer feedback and insights before full-scale program implementation. More details about Taco Time's journey to reducing contamination while increasing diversion can be found in a 2016 case study which is referenced in Appendix E.

Discussion of Possible Upstream BMPs Related to Compostable Packaging and Serviceware

On behalf of the Upstream subcommittee, member Sego Jackson drafted a set of proposed best management practices (BMPs) related to upstream design, labeling, and testing of compostable packaging and serviceware. These proposed practices were largely based on work done in the past several years by Seattle Public Utilities with broad stakeholder engagement on this topic. SPU's primary strategic approach is "Solving Problems at Their Source" which supports looking upstream for packaging solutions.

Engaging the Upstream subcommittee in a discussion about the proposed practices provided an opportunity for stakeholders beyond Seattle to share ideas, raise potential barriers to adoption, and offer solutions. Although the subcommittee did not finalize the BMPs, Appendix F contains a white paper summarizing the key themes that emerged as part of these discussions to inform future efforts. Note: some of the proposed practices outlined in this white paper have been implemented by the City of Seattle since the beginning of this body of work and are not discussed here.

Separately, Jackson also drafted a white paper outlining a variety of challenges associated with fiber-based foodservice packaging in some composting systems. Although some of the issues outlined also apply to other packaging materials, this paper is intended to specifically address the common misperception that fiber-based packaging materials are free of issues during the composting process. This white paper can be found in Appendix G.

Sorting Behavior Observation Study Design

In partnership with the Port of Seattle's Seattle-Tacoma International Airport (STIA), the subcommittee scoped a Foodservice Observation & Intercept Study to be conducted at STIA in early 2017. Specifically, the proposed study will be designed to determine the extent to which various alternate participant education protocols can improve sorting behavior in a three-bin setting. The proposed study approach can be found in Appendix H. The subcommittee will ensure study findings are incorporated into the Education and Outreach subcommittee's draft Organics Educator Toolkit and into any continuing conversations about best management practices for foodservice packaging.

Subcommittee Findings and Next Steps

Through the above activities, the subcommittee identified several findings and opportunities for further research and investment. In 2017, the subcommittee will partner with STIA to conduct the Foodservice Observation & Intercept Study outlined above and detailed in Appendix H. Additionally, the subcommittee will seek partners and funding to explore additional opportunities for study. These are outlined below.

Opportunities for Future Study

Compostable Products and Packaging

- What are some upstream best management practices for design, labeling, and testing of compostable packaging and serviceware that could be adopted to help to minimize downstream contamination?
- How do packaging design and labels influence customer behavior?
- What industry-wide definitions can be established for various terminology related to compostable products, e.g., bio-based, compostable, biodegradable, etc.?
- How should coatings, additives, grease-resisters/-inhibitors, and other chemicals of concern be taken into consideration when determining appropriate materials for composting?

- For what applications do compostable products make the most and least sense? For example, when does the use of compostable products provide the optimal benefit in terms of the solid waste management hierarchy?[14]

Innovation

- What compostable alternatives to produce stickers exist that meet requirements for both cost-effectiveness and functionality?
- What kind of interventions could occur in grocery stores to assist in preventing contamination?

Understanding Participant Behavior

- How do participants decide whether and how to sort their waste at the point of disposal?
- What influence does signage have on disposal behavior?
- What items are most confusing for people at disposal and why?
- How does the participant's environment influence their behavior?

Policy

- How effective are current policies and practices in reducing contamination, e.g., Seattle bag ordinance, Thurston County study at Hawks Prairie Transfer Station?

[14] US EPA. *Sustainable Materials Management: Non-Hazardous Materials and Waste Management Hierarchy.* https://www.epa.gov/smm/sustainable-materials-management-non-hazardous-materials-and-waste-management-hierarchy (accessed May 2017).

Organics Processing

Key Concepts and Current Practices

The role of commercial composters, or organics processors, in the overall solid waste management system is to provide support services to local government, commercial and industrial ventures, and local citizens for conversion of their organic solid wastes to useable and saleable products. Most of these products are currently used as soil amendments.

In recent years, there has been increasing attention to managing the organic portion of waste streams. Of the 164 million tons of garbage that Americans discard annually, almost half—food scraps, yard debris, and soiled paper—are compostable.[15] As cities and the solid waste industry increasingly turn their attention to reducing the life cycle impacts of waste generation and disposal, many are adopting ambitious goals to divert more compostable materials from landfill through composting.

Local solid waste diversion targets to reduce landfill rates, decrease greenhouse gases, and provide other environmental and economic benefits, have resulted in associated challenges to composters—mainly in the form of greater concentrations of contamination in incoming feedstocks. Although managing contamination has not historically been a significant part of composters' business operations, it has become an unexpected byproduct of a rapidly evolving supply chain that includes feedstock generation, collection, handling, and transporting.

It is important to note that the type and concentration of contamination can and does change based on feedstocks accepted. Most commercial composters in Washington State process only yard debris and other clean greens. These feedstocks carry a low-risk of contamination (and low concentrations when found) and therefore do not require the composter to invest significant time or money into contaminant removal.

When it does occur, composters believe the ideal way to manage contamination is to prevent it from entering the compost stream in the first place. Unfortunately, due to a variety of challenges outlined in this report, current methods of contamination prevention are not 100% effective in achieving this goal. These challenges have led composters to implement mitigation tactics to reduce the impacts of contamination on their composting process. However, these methods and technologies are typically expensive and only partially successful. As composters constantly seek ways to produce a clean, quality, saleable, and profitable product while investing in innovative methods and technologies to reduce contamination, many have evolved into de facto research facilities.

[15] Institute for Local Self-Reliance. (2014). *State of Composting in the US*.

Known Challenges and Limitations of Current Practices

Composters face a wide variety of challenges in their efforts to prevent, identify, remove, and dispose of contamination in recycled organics.

- **Identifying** contamination in the composting process is difficult due to:
  - Variable contaminant concentrations from different types of generators, locations and feedstock types.
  - The lack of industry standards for marking compostable and non-compostable products.
- **Removing** contamination is difficult because:
  - In the ***receiving*** stage, feedstocks are mixed together and many compostable and non-compostable products look alike, making it difficult to quickly identify contaminants.
  - In the ***processing*** stage, materials have been ground or shredded.
  - In the ***screening*** stage, mechanical separation—which is primarily dependent on size fraction or density differences—is difficult because the materials have achieved a uniform size and density.
- **Disposing** of contamination is difficult because—although many contaminants that are removed at compost facilities are traditional recyclables such as metal, plastics, and glass—some do not fit into traditional recycling streams.

Goals

In the context of the challenges outlined above, the Processing subcommittee identified the following goals:

- Identify technologies and practices used by Washington commercial composters.
- Evaluate technologies and practices based on effectiveness, cost, and ease of implementation.
- Identify alternatives to disposal of removed contaminants at commercial compost facilities.

Activities

The subcommittee took several steps to inform the development of the items outlined above. These activities are outlined below.

Online Research and Vendor Outreach

The subcommittee compiled a comprehensive list of all available methods and technologies for contaminant removal in commercial composting settings. To do this, the subcommittee first conducted extensive online research. They then contacted equipment vendors to better understand the functionality and capabilities of each technology and to understand which technologies are currently being used in Washington State.

Contamination Methods and Technologies Evaluations

To evaluate the effectiveness of available methods and technologies for contamination removal, the subcommittee asked six major composters in Washington State to rate them based on their direct experiences. Composters were asked to rate the relative effectiveness of each method or technology on a scale of 1 to 10, as defined by the following categories:

- **Removal efficiencies:** percent of material this method or technology removes (according to whatever measurement approach they use; some measure, some visually estimate).
- **Cost:** capital, operation and maintenance.
- **Overall ease of operation**.
- **Maintenance**.
- **Implementation**.

Findings

Contamination Removal Methods and Technologies

Findings varied widely depending on several factors, including:

- Types of feedstocks accepted.
- Types and concentrations of contaminants received.
- Volumes processed.
- Base composting technologies used (Turned Windrow Composting, Aerated Static Pile Composting, In-vessel Composting).
- Handling methods used during active composting.
- Compost customer types (agricultural, commercial, road projects, LID projects, etc.).
- Compost sales types (bulk, bagged).

Only a few commercial composters surveyed manage heavy loads of contamination (up to five percent physical contaminants by volume). These composters have significant experience in both composting processes and contaminant removal and were well educated on the methods and technologies available and in use around the world. A summary of the survey respondents' feedback on available methods and technologies is outlined in the following section.

Respondents were asked to rate each method or technology, based on their experience, according to its overall effectiveness, capital and operating costs, ease of use, and flexibility of the process. An average efficiency score was then calculated for each method or technology. Below is a list of the top ten technologies in use by respondents in order of average efficiency score. A complete listing of known methods and technologies can be found in Appendix I.

Table 3. Most Effective Contamination Removal Methods and Technologies as Scored by Washington State Commercial Composters.

Technology	Sortable Material Types	Specific Sortable Possibilities	Average Score
Air Lift Separators	Density-specific Materials	Plastics, paper	7.4
Picking Station	Large visible materials	Plastics, wood, cans, bottles	7.4
Star Screens	Size-dependent Materials	Size fractions larger/smaller	7.25
Hand Sorting	Large visible materials	Plastics, wood, cans, bottles	6.6
Conveyor separation w/air	Density-specific Materials	Plastics, glass	6.5
Flotation Separation	Floatables/Sinkers	Rocks, glass, metals, plastics	6.5
Air Classifiers (generic)	Density-specific Materials	Plastics, paper	6
Gravity Separation (Oliver)	Density-specific Materials	Rocks, Glass	6
Magnets	Metals	Ferrous Metals	6
Trommel Screens	Size-dependent Material	Size fractions larger/smaller	6

Composters scored Airlift Separators, picking stations, and proper screening as the most effective methods for removing low-density materials such as film plastics. Picking stations also provide the benefit of facilitating removal of other easily identifiable contaminants.

Research also identified several available technologies that had not been used at any of the surveyed facilities. These technologies include flotation separation, air knifes, disc screens, eddy current separation, infrared (IR) optical sorting and removal methods, Zig-Zag separation, and other proprietary processes. When asked why they had not used these technologies, composters cited cost and a hesitancy to invest in unproven technologies.

Feedstock Contracts

Through its discussions with composters, the subcommittee determined that contract language between composters and feedstock generators is a crucial tool for minimizing contamination. Effective contract language places the responsibility for minimizing contamination with the generator by requiring remuneration to the composter for the removal and disposal of contaminants. See the Contractual Policies section of this document for specific contract language recommendations.

The Processing subcommittee also identified municipal buy-back programs as a potential key component in contracts for reducing contamination by curbside generators. The idea is that if municipalities are contractually required to purchase some portion of the compost that is manufactured from organic residuals generated in their area, compost customers (who also contributed to the organic residuals to make the compost) will see first-hand any contamination issues associated with their own recycling life-cycle.

Contaminant Disposal Alternatives

The subcommittee identified some possible alternatives for disposing of contaminants removed at commercial compost facilities, the principal one being to recycle cleaned removed contaminants (e.g. metal, glass, and hard plastic) directly or through partner organizations.

Findings and Recommendations

Careful consideration must be used when evaluating the potential effectiveness of a method or technology. Important considerations are outlined below.

- **Understand the Source.** To better understand how to mitigate feedstock contamination, accurate information must be collected and analyzed to identify and prioritize source contamination issues.
- **Pilot the Technology.** If possible, equipment demonstrations or method pilot tests should be performed prior to capital expenditure or significant processing changes.
- **Mind the Sequencing.** A key factor impacting the efficacy of any contaminant removal methods or technologies is that each one can significantly affect, or be significantly affected by, other technologies. This is a key point in determining what method or technology to use in a process and in what order.
- **Assess the Costs.** Any of the identified methods or technologies can help to reduce contamination in compost end-products. Capital, implementation and operating costs for each will be relative to the size of the composting operation, the complexity of feedstock constituents and many other factors.

Subcommittee Next Steps

In 2017, the Processing subcommittee will continue to track the introduction and implementation of new contamination management methods and technologies at major compost facilities along with their relative efficiencies. To support this activity, we recommend the development of a standard data tracking and scoring method to enable objective comparisons from site to site.

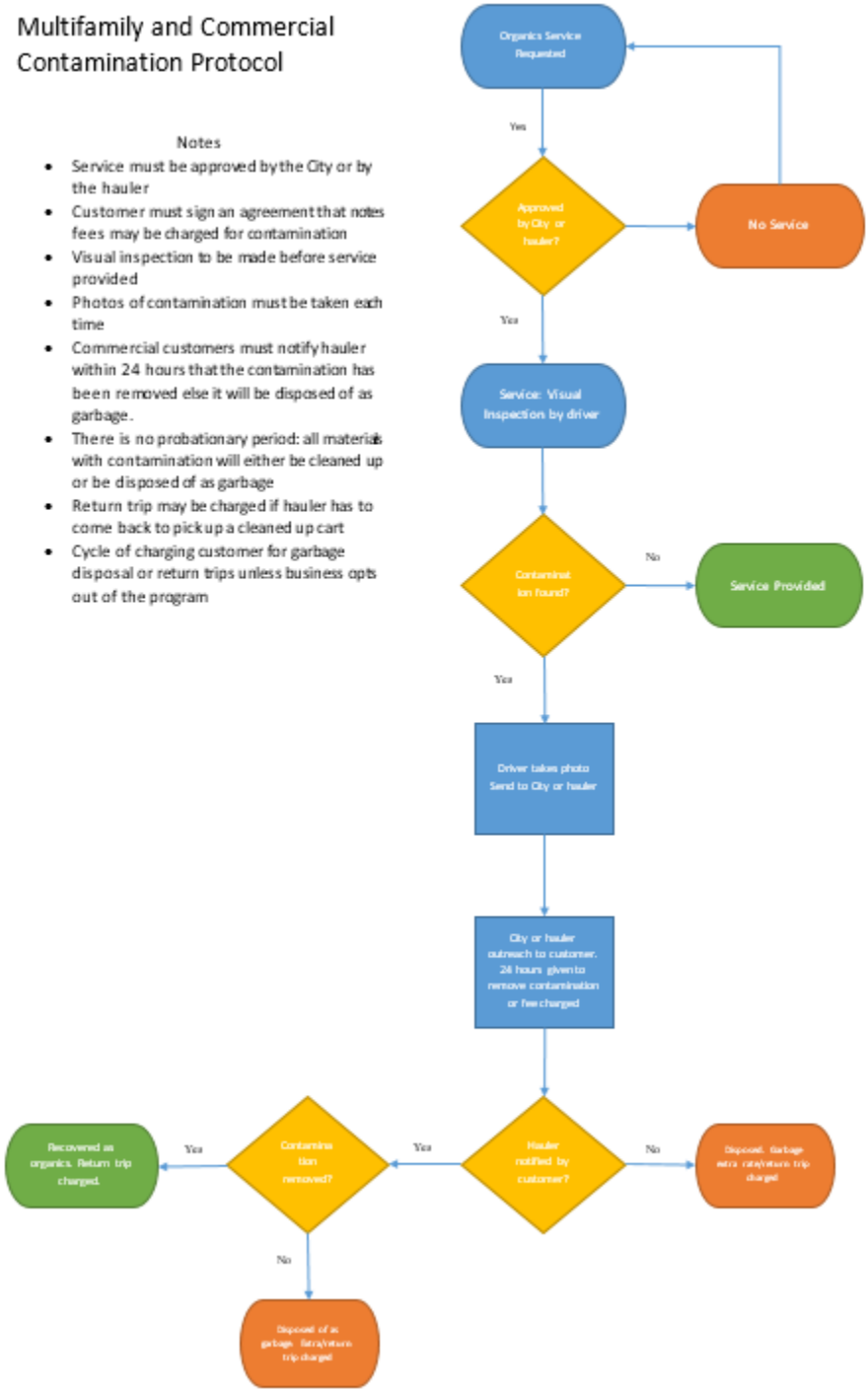
Appendix A

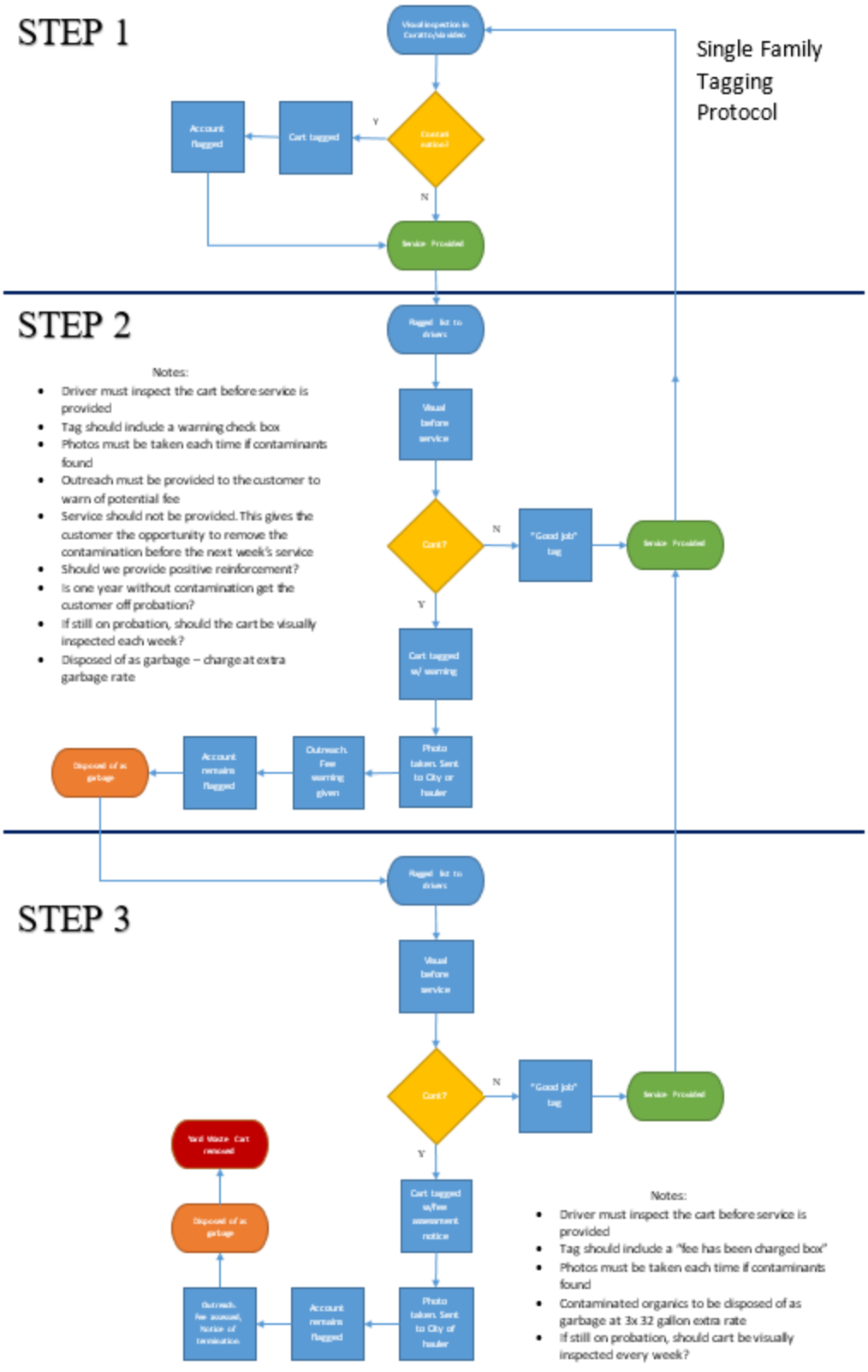
Cart Tagging Pilot Protocols

Multifamily and Commercial Contamination Protocol

Notes

- Service must be approved by the City or by the hauler
- Customer must sign an agreement that notes fees may be charged for contamination
- Visual inspection to be made before service provided
- Photos of contamination must be taken each time
- Commercial customers must notify hauler within 24 hours that the contamination has been removed else it will be disposed of as garbage.
- There is no probationary period: all materials with contamination will either be cleaned up or be disposed of as garbage
- Return trip may be charged if hauler has to come back to pick up a cleaned up cart
- Cycle of charging customer for garbage disposal or return trips unless business opts out of the program




STEP 1
Single Family Tagging Protocol
Account flagged
Cart tagged
Y
N
Service Provided
STEP 2
Notes:
Driver must inspect the cart before service is provided
Tag should include a warning check box
Photos must be taken each time if contaminants found
Outreach must be provided to the customer to warn of potential fee
Service should not be provided. This gives the customer the opportunity to remove the contamination before the next week's service
Should we provide positive reinforcement?
Is one year without contamination get the customer off probation?
If still on probation, should the cart be visually inspected each week?
Disposed of as garbage – charge at extra garbage rate
Visual before service
Cont?
N
"Good job" tag
Service Provided
Y
Cart tagged w/ warning
Photo taken. Sent to City or hauler
Outreach. Fee warning given
Account remains flagged
Disposed of as garbage
STEP 3
Visual before service
Cont?
N
"Good job" tag
Service Provided
Y
Cart tagged w/fee assessment notice
Photo taken. Sent to City of hauler
Account remains flagged
Disposed of as garbage
Yard Waste Cart removed
Notes:
Driver must inspect the cart before service is provided
Tag should include a "fee has been charged box"
Photos must be taken each time if contaminants found
Contaminated organics to be disposed of as garbage at 3x 32 gallon extra rate
If still on probation, should cart be visually inspected every week?

Appendix B

Educator Survey

Please draw upon your experience and/or research to answer the following questions as best as you can:

Question 1: Identify top five contaminants by sector (SF, MF, Commercial, Other).

Responses:

	Number of respondents who included in Top 5			
Material Type	**Single Family**	**Multifamily**	**Commercial**	**Festivals/Events**
Plastic Bags (includes film)[2]	11	12	11	2
Non-Compostable Paper[7]	7	4	6	3
Recyclable Plastic Containers[4]	6	5	4	
Non-Compostable Paper Cups[6]	5	5	5	2
Produce Stickers	4	3	2	
Feces[1]	4	1		
Foodservice Ware (take out contair	3	4	3	
Plastic Utensils	3	2	4	3
Twist ties, Rubber Bands	3	1	3	
Garden/Outdoor Plastics/Toys	3			
Garbage	2	4	5	
Glass	2	3	1	
Cleaning Wipes	2		1	
Plastic Trash Bags[5]	1	3	1	
Small Non-Compostable Compone	1	1	3	2
Soda Cans		2	1	
Plastic Cups		1	3	1
Foil		1	2	1
Metal Utensils			3	
References				
(1): Dog poop, used cat litter; bagged or loose.				
(2): Excluding black plastic garbage bags.				
(3): Excluding containers of ingredients that can be purchased at a store and prepared at home.				
(4): Including plastic bottles and food containers.				
(5): Plastic garbage bags, commonly found in opaque black or white.				
(6): Coffee cups, hot cups, paper cups with plastic liner.				
(7): Paper plates w/plastic liner, paper with plastic coating, polycoated containers (e.g., milk cartons).				
(8): Plastic condiment containers, small plastic wrappers, straws, pizza box acetates, credit card shred mixed in with paper shred, stir sticks, creamer cups, etc.				

Question 2: Recommend most effective messaging for reduction of contamination in organics for each sector.

Responses:

Recommended most effective messaging for reduction of contamination in organics for each sector							
Single Family Messaging	**Freq.**	**Multifamily Messaging**	**Freq.**	**Commercial Messaging**	**Freq.**	**Festival/Event**	**Freq.**
images of accepted materials	3	images of accepted materials	3	images of accepted materials	3	Large Posters w/ pictures	3
images of contaminants	2	images of contaminants	3	images of contaminants	2	example board	2
"keep compost clean - no plastics" messaging on sticker or container	2	"keep compost clean - no plastics" signage	3	short trainings for staff	2	Cafeteria monitors	2
strike through images of contaminants	2	Face to face info session before service starts	2	Large posters (image heavy)	2	Stop! Think! Sort!	1
Refuse to pick up contaminated loads & explain what materials were contaminants (photo if possible)	1	Refuse to pick up contaminated loads & explain what materials were contaminants (photo if possible)	1	Color coded containers	2	Zero Waste	1
Stop! Think! Sort!	1	Stop! Think! Sort!	1	Labels on carts	2	"Keep your compost clean for our farmers" (messaging for Farmers Markets)	1
"Turn scraps into soil"	1	"Turn scraps into soil"	1	Contamination fines	2	"Turn scraps into soil"	1
"Compost More: Waste Less"	1	"Compost More: Waste Less"	1	Refuse to pick up contaminated loads & explain what materials were contaminants (photo if possible)	1	Compost food scraps, help create rich compost for our farms	1
"foodcycling"	1	"foodcycling"	1	Stop! Think! Sort!	1	Meet vendors/volunteers	1
Collection calendar	1	follow ups	1	"keep compost clean - no plastics"	1	Charge for contamination	1
Utility insert	1	Brochure w/ pictures	1	"Turn scraps into soil"	1	Pre event meetings	1
Container labeling	1	Clearly labeled carts	1	Zero Waste	1	Develop a zero-waste step-by-step manual, including recommendations on disposable items approved for composting	1
Cart tagging for educational messaging	1	Explain diff. between landfilling and composting food waste	1	Quick follow up on customer problems	1	face to face education	1
Explain diff. between landfilling and composting food waste	1	site visits	1	Steer away from compostable packaging - emphasize food and paper waste	1		
Environmental reasons	1	color coded carts	1	multilingual	1		
tips to solve odors and pests issues	1	tips to solve odors and pests issues	1	example board of contaminants	1		
Highlight in newsletters the issues that arise when contaminants go into the organics bin.	1	Environmental reasons	1	Enforcement of existing packaging laws to decrease contamination	1		
"pet waste goes in the garbage"	1	multilingual	1	more clarity on compostable packaging	1		
Produce sticker trading card	1	food packaging messaging	1	What Goes Where infographic	1		
Face to face education	1	explain compost process	1	Face to face education	1		
		$ savings, environment, tenants like it	1				
		display next the organics cart to highlight the type of items that don't belong there	1				
		highlight in newsletters the issues that arise when contaminants go into the organics bin.	1				
		Place only food in the cart, zero plastic, zero bags	1				

Question 3: Identify BMP list by sector to reduce contamination.

Responses:

Identify BMP list by sector to reduce contamination							
Single Family	**Freq.**	**Multifamily**	**Freq.**	**Commercial**	**Freq.**	**Festival/Event**	**Freq.**
labels on curbside containers (images of accepted/contaminants)	4	co-located containers	5	Consistent color for containers and signage (green)	5	large visible signage with relevant images for target audience	2
Consistent color for containers and signage (green)	3	Consistent color for containers and signage (green)	4	labels on curbside containers (images of accepted/contaminants)	5	using "COMPOSTABLE" in large, easy to read text.	1
labels on kitchen scrap containers (images of accepted/contaminants)	2	giving tools - kitchen scrap containers, biobags, how to guide	4	staff training	5	Clear stream bins color coded	1
giving tools - kitchen scrap containers, biobags, how to guide, info on where to buy biobags	2	site visits/ D2D education	3	waste assessment before start to right size containers	4	Volunteers monitor waste stations, education about what goes where and remove contamination	1
cart tagging	1	train/engage residents to watch for contamination	2	multilingual materials	3	vendors required to use compostable ware and signage that it is compostable	1
embedded rates	1	Signage in enclosure	2	educate janitorial staff	2	event staff training	1
provide toolkit	1	indoor labels cordinated with outdoor container labels (multilingual)	2	Charge as garbage when contamination is high	2	verbal messaging in lunchroon	1
site visits	1	visual guide to accepted materials	2	co-located containers	2	line monitors	1
checking carts	1	provide biobag samples & totes. Have carts lined and have biobag dispenser	2	signage including physical items representing what goes in each bin. Bulletin board under formal signage to pin the representative items.	2	continue to work with students and get support from school staff/district	1
indoor labels cordinated with outdoor container labels	1	Manager/maintenance meetings	2	periodic trainings and visits to ensure initiative stay on track	2	Only accept food	1
prompt or collection card for produce stickers	1	regular follow up	2	driver take photo and send to staff for review and outreach follow up	2		
"no plastics" sticker on containers	1	clearly mark cart to show it is different from garbage/rec	1	signage in enclosure	1		
contamination tag	1	checking carts	1	instructions to keep container closed unless adding to it	1		
Guides mailed annually	1	"no plastics" sticker on containers (multilingual)	1	custodial staff removes contamination before material goes to outside container	1		
only accept food, plus pizza boxes, napkins	1	prompt or collection card for produce stickers	1	remove repeat offenders from program	1		
		assign a champion(s) to advocate for composting at property - ensures signs and bins are in order and does outreach to residents	1	Consider collecting only pre-consumer material at restaurants	1		
		driver take photo and send to staff for review and outreach	1	provide biobag samples & have carts lined	1		
		remove repeat offenders from program	1	support toolkit	1		
		reminder at rent payment	1	Only accept food	1		
		policy supporting program	1				
		"Protect" organics container by placing it farthest from the direction from where the residents approach.	1				
		Right size containers	1				
		decontaminate cart asap because residents use the cart as a model for what they are supposed to do: if they see bags in there, they will use their own plastic bags.	1				
		only accept food, plus pizza boxes, napkins	1				

Question 4: Recommendations for what goes into tool kit (commonly used images/logos or stickers).

Responses:

Recommendations for what goes into the toolkit							
Single Family	**Freq.**	**Multifamily**	**Freq.**	**Commercial**	**Freq.**	**Festival/events**	**Freq.**
Kitchen scrap container	4	Kitchen scrap container	5	"How to" brochure - visual with pictures of items	5	signage at waste stations	4
"How to" brochure - visual with pictures of items	4	"How to" brochure - visual with pictures of items showing process - fill the scrap catcher, dump it into the cart, rinse it out	5	signage stickers on indoor collection containers	4	"How to" brochure - visual with pictures of items	3
prompts/stickers for indoor collection receptacles	4	multi-language materials & stickers	4	printed materials with most effective messaging from Q2	3	pre meeting with vendors and staff	2
biobag samples	3	Biobag samples	3	contact number for questions	2	Color coded clear stream bins	2
printed materials with most effective messaging from Q2	2	printed materials with most effective messaging from Q2	3	poster	2	"no plastic bags" sticker for outdoor container	1
web link	2	web link	2	organics poster above container	2	weblink	1
contact number for questions	2	poster	2	Lists of indoor container types for different businesses	1	phone number for questions	1
poster	1	contact number for questions	2	multiple sizes of signs	1	compost instructions tailored to the event	1
clear directions	1	prompts/stickers for indoor collection receptacles	2	information on carts vs. dumpsters	1	Electronic files of material that can be downloaded by anyone	1
fruit sticker collection cards	1	Prominent signage in enclosures (multilingual)	2	sticker for container	1	decals	1
"no plastic bags" sticker for outdoor container	1	clear directions	1	clear directions	1	SIMPLE guidelines with colorful photos	1
contamination tag	1	fruit sticker collection cards	1	color coded bins	1		
images used on guides should be ready to dispose food (not a whole uneaten apple)	1	"no plastic bags" sticker for outdoor container	1	"no plastic bags" sticker for outdoor container	1		
Food and Yard waste label for cart	1	contamination tag	1	weblink	1		
Transcreated Compost flyers	1	compost bag dispenser	1	Contamination tag	1		
SIMPLE guidelines with colorful photos	1	Welcome kit overview	1	purchasing guide to appropriate packaging	1		
		electronic flyers, posters, stickers, etc that can be easily downloaded	1	Visual guide for setting up customer facing organcis collection & for use at recycle and compost stations	1		
		promotional handout for property managers/maintenance staff that outlines the pros of composting	1	multilingual transcreated material	1		
		SIMPLE guidelines with colorful photos	1	SIMPLE guidelines with colorful photos	1		

Appendix C

Composter Contamination Survey

Facility Information, Service & Collection Information, Materials Accepted for Composting

From what sectors do you accept feedstocks? Choose all that apply.

- Single-family residential curbside: 80%
- Multifamily residential curbside: 40%
- Commercial collection curbside: 50%
- Drop off loads at compost facility: 70%
- Other (please specify): 70%

Responses to "other":

- Dairy farm manure composting only
- City & County transfer stations get self-haul
- City of Tacoma
- Primarily non-bagged yard debris from commercial landscapers
- Orchard fruit waste, cherry processing sludge, brewery wastewater
- Organics residuals from some municipalities, pre-consumer organics residuals generators
- Commercial pre- & post-consumer food scraps

Which of the below material types do you accept at your facility?

Material	Accepted By
Yard debris	9 out of 10
Food scraps	7 out of 10
Food soiled paper (pizza boxes, paper towels, napkins, coffee filters, paper plates that are non-shiny and uncoated, etc.)	6 out of 10
Compostable packaging (i.e. Ecotainer, Cedar Grove approved packaging line, etc.)	4 out of 10
Certified compostable bags for food scraps collection	4 out of 10

Into which markets do you sell your compost products? Choose all that apply.

Material	Accepted By
Agriculture	9 out of 10
Commercial building contractors and landscapers	7 out of 10
Retail	6 out of 10
Government	5 out of 10
Special promotional events	5 out of 10

Other markets specified:

- Wholesale
- General growing medium
- Erosion control
- Stormwater treatment
- Reclamation sites
- Disease and pest control for plants
- Nursery potting mixes
- Low Impact Development (LID) projects, LEED/Green certified buildings and projects
- Agricultural nutrients, carbon sources, soil restoration
- Private and community gardens
- Planting media for constructed or artificial wetlands
- Biofiltration media
- Compost tea
- Water conservation projects
- Bioremediation
- Landscape mulch
- Silviculture
- Sod production media

Contamination Specific Questions

How do you measure contamination? Choose all that apply.

Material	Accepted By
Visual	8 out of 10
Weight	4 out of 10
Volume	4 out of 10
% of Load	3 out of 10
Other	4 out of 10

What are your five most common contaminants?

Answers given:

- Glass
- Rigid plastics
- Plastic film, including produce and shopping bags
- Beverage containers and other recyclables
- Garbage

What are your five most problematic contaminants?

Answers given:

- Glass
- Rigid plastics
- Plastic film, including produce and shopping bags
- Plastic garbage bags

Reasons given:

Contaminant	Reason stated why material causes the most problems
All	• Any contaminant that makes it past pre-processing line is a problem.
Plastics - General	• Prevalence & tendency to subdivide endlessly during processing. Creates unsightly product. Good technology exists to remove plastics but is costly & must be continually monitored to ensure functionality. • Plastic is worst - gets into finished fine and medium grades.
Film Plastic	• Film plastic can be removed manually & mechanically at approximately 85-90% effectiveness. • Can blow around but can be removed during final screening utilizing expensive equipment.
Garbage Bags	• They shred & become airborne contaminant screened product & become so small you can't screen it out.
High Density / Rigid Plastics	• Materials too heavy to be removed by airlift separator during screening & end up in compost overs, or if < 3/8" they will end up in our finished product. • Tends to fracture into smaller pieces & no economically effective way to remove manually & no mechanically effective equipment exists to date that removes rigid plastic from organic material. • Due to food safety risk in applying contaminated product to root crops. • Difficult to remove past pre-processing since grinder will grind in to sizes smaller than anyone can pick.
Glass	• Agricultural market has a near zero tolerance for glass. • Glass is bad because there is no way to protect from it. • Major issue due to legal implications & lack of good technology to remove this constituent. • Materials too heavy to be removed by airlift separator during screening & end up in compost overs, or if < 3/8" they will end up in our finished product. • Due to food safety risk in applying contaminated product to root crops. • Difficult to remove past pre-processing since grinder will grind in to sizes smaller than anyone can pick.

What is the most persistent contaminant, i.e., resists identification/removal, shows up in finished compost?

Answers given:

- Glass
- Rigid plastics
- Small stickers
- Plastic film, including produce and shopping bags
- Plastic garbage bags

Comments provided:

Contaminant	Comments
Small glass & hard plastic particulates & fruit sticker labels	Shows up in compost from ground feedstock
Hard plastic particulates & fruit sticker labels	Shows up in compost from un-ground feedstock

Appendix D

In-progress Organics Educator Toolkit

Checklists to Success

Residential Single-family

Organics Contamination Reduction Education & Outreach Checklist to Success Best Management Practices Single family				
Operational	☐	Color code carts		
	☐	Ensure cart has decal w/ images of accepted and/or not accepted items		
	☐	Embedded Organics rate in garbage rate		
	☐	Tag contaminated carts (use cart tagging policy)		
	☐	Refuse pick up of chronically contaminated carts with customer follow up. Request customer remove contamination.		
	☐	Provide weekly pick up of Organics		
Research	☐	Know your audience, conduct GIS analysis, usability studies, community engagement surveys to collect information specific to your area.		
	☐	Find out your city's code enforcement policy and requirements		
	☐	Work with compost processor to get a list of regularly contaminated trucks/routes		
Educational	☐	Kitchen scrap container (variety of options and resources for purchasing)		
Provide the following materials and tools to ensure success	☐	Sample of compostable bags w/ resource for where to buy more		
	☐	Decal on kitchen container w/ image of accepted items		
	☐	"How to" brochure with tips for success		
	☐	Provide culturally appropriate trans-created guidelines that have been usability tested.		
	☐	Color code signage/materials with cart		
	☐	Post card follow up on contaminated routes		
	☐	Consider further accountability measures		
Promotional	☐	Provide CBSM strategies as incentives to increase participation		
	☐	Educate on the environmental impact of composting vs. landfilling		
	☐	Educate on potentail cost savings of diverting material from MSW		

Multifamily

Organics Contamination Reduction Education & Outreach Checklist to Success Best Management Practices Multifamily				
Operational	☐	Color code carts		
	☐	Co-locate containers		
	☐	Ensure cart has decal w/ images of accepted and/or not accepted items		
	☐	Enclosure signage/posters for ALL containers		
	☐	"No ____" sticker for top contaminants on containers		
	☐	Embedded Organics rate in garbage rate		
	☐	Provide weekly (or more often) pick up of Organics		
	☐	Conduct a site visit before starting service		
	☐	Call customer within 24 hours of a contamination notice		
	☐	Refuse pick up of chronically contaminated carts with customer follow up.		
		Request customer to remove contaminants or provide option to "dump as garbage" for a fee.		
	☐	Remove cart and stop service after 3 contamination strikes		
Research	☐	Work with compost processor to get a list of regularly contaminated trucks/routes		
	☐	Find out your city's code enforcement policy and requirements		
	☐	Conduct research on languages spoken		
Educational	☐	Kitchen scrap container (variety of options and resources for purchasing)		
	☐	Sample of compostable bags w/ resource for where to buy more		
	☐	Compostable bag dispenser at the cart		
	☐	Decal on kitchen container w/ image of accepted items		
	☐	"How to" brochure with tips for success		
	☐	Color code signage/materials with cart		
	☐	Provide trans-created guidelines		
	☐	Provide door-to-door resident outreach at the start of service		
	☐	Provide a manage/maintenance meeting		
	☐	Provide helpful tips that property manager can include in emails to residents		
Promotional	☐	Provide CBSM strategies as incentives to increase participation		
	☐	Assign a champion(s) to advocate for composting at property		
	☐	Educate on the environmental impact of composting vs. landfilling		
	☐	Educate on potentail cost savings of diverting material from MSW (to manager)		

Commercial

Organics Contamination Reduction Education & Outreach Checklist to Success Best Management Practices Commercial				
Operational	☐	Color code carts		
	☐	Co-locate containers		
	☐	Ensure cart has decal w/ images of accepted and/or not accepted items		
	☐	Enclosure signage/posters for ALL containers		
	☐	"No ____" sticker for top contaminants on containers		
	☐	Embedded Organics rate in garbage rate		
	☐	Provide weekly (or more often) pick up of Organics		
	☐	Conduct a site visit before starting service		
	☐	Waste assessment to right size containers		
	☐	Call customer within 24 hours of a contamination notice		
	☐	Refuse pick up of chronically contaminated carts with customer follow up.		
		Request customer to remove contaminants or provide option to "dump as garbage" for a fee.		
	☐	Remove cart and stop service after 3 contamination strikes		
Research	☐	Work with compost processor to get a list of regularly contaminated trucks/routes		
	☐	Find out your city's code enforcement policy and requirements		
Educational	☐	Provide indoor collection containers in lunch rooms, prep kitchens, etc.		
	☐	Decal on indoor containers w/ image of accepted items		
	☐	Color code signage/materials with cart		
	☐			
		Signage including physical items representing what goes in each bin.		
		Bulletin board under formal signage to pin the representative items.		
	☐	Training for janitorial/maintenance staff to remove contaminants		

Sample Messaging Map

Brand: (Authoring agency or business name) brand or tag, e.g., *Compost More. Waste Less.*	**Primary audience:** Single-family and multifamily households in X. Commercial businesses in X.

Campaign Goals: Create a suite of materials and tools which will be used by regional partners in the jurisdictions represented by the membership of the Organics Contamination Reduction Workgroup, as a result of the collaboration of the education and outreach committee which will improve compost quality by reducing contamination in organic feedstocks while expanding end products and markets. The goal is to eliminate contamination from organic feedstock originating with residential and commercial sources.

Objectives of the education and outreach committee:

- Increase participation in food and food-soiled paper composting
- Encourage correct curbside composting
- Develop and implement regional outreach campaigns
- Change adverse composting behavior through consistent messaging
- Reduce and eliminate contamination in compost (Divert food scraps and food-soiled paper from landfill)

Target audiences: Single-family homeowners/Multifamily housing managers, Property managers of multifamily housing, commercial buildings and mixed use buildings, staff and tenants/Commercial property managers, staff and participants.

Value statement about understanding our audience and developing successful outreach strategies:

There is no one outreach program, tactic or strategy which fits all audiences. Audience habits, beliefs, attitudes, cultural identity, language, housing type, infrastructure and motivations must all be considered when developing the *suite of tactics* necessary to produce a clean compost feedstock.

It is necessary to *meet our audience where they* are in terms of broad awareness about what to put in, what not to put in and their willingness, ease and access to composting organic materials to produce a clean compost product.

Desired Behavior Change: Place all compostable materials in the composting collection container and dispose of non-compostable materials in the refuse container.

Main Message: You can reduce waste to landfill by properly segregating compostable from non-compostable materials and putting them in the correct containers. Properly segregated residuals can produce a high-quality compost product, from both residential and commercial generators.

The product we create by composting these materials is a nutrient-rich compost used for local yards, gardens and farms. Composting is good for the environment and could save you money. Our compost is processed locally creating opportunities for residents and businesses to close the loop by composting properly and buying and using locally produced compost.

Value Proposition: Compostable materials are valuable and must be diverted from the garbage waste stream to attain the highest level of sustainability possible. Composting without contaminants supports the creation of high-quality compost products essential to a sustainable process. Eliminating contamination in the compost stream requires a coordinated effort and effective education and outreach tactics.

Campaign Elevator Speech: More than 60% of what ends up in the landfills could have been recycled or composted. To boost recycling rates, education campaigns provide recycling and composting education and tools to help residents recycle better and compost their food scraps and food-soiled paper in the yard debris bin without contamination. Composting materials properly will help local jurisdictions reach Zero Waste of Resources.

Terms for desired behavior:

Single-family	**Multifamily**	**Commercial**
Composting	Composting	Composting
Foodcycling	Foodcycling	Foodcycling
Food Recycling	Food Recycling	Food Recycling
Organics	Organics	Organics
Food & Compostables	Food & Compostables	Food & Compostables

2016 recommendation: Audience based research to determine:

1. Audience preference for terms of behavior/ tag lines, etc. Audience understanding of behavior
2. Imagery, format and content for education collateral (guide, ads, social media content, toolkit components, incentive types, etc.) which will resonate with audience(s)
3. Communication platforms which audience prefers
4. Research on property managers/commercial attitudes, beliefs and barriers to organics collection

Appendix E

Upstream Subcommittee Literature Review Sources

Source	Key Findings
As You Sow and Natural Resources Defense Council. (2015*). Waste and Opportunity 2015: Environmental Progress and Challenges in Food, Beverage, and Consumer Goods Packaging.*	– As You Sow and the Natural Resources Defense Council distributed a survey to learn more about packaging environmental attributes and end-of-life policies at 47 quick service restaurants and beverage, consumer packaged goods, and grocery companies. – The survey and related research were designed to recognize initiatives taken by companies to use environmentally preferable materials in manufacturing packaging, to use high levels of recycled content, to design materials to be recycled or composted, and to encourage proactive policies and practices that would significantly increase recycling or composting of postconsumer packaging.
Cascadia Consulting Group for Seattle-Tacoma International Airport. (2012). *Concessions Food Service Ware and Packaging Study.*	– Cascadia Consulting Group conducted research on compostable food service ware options and best practices for SeaTac Airport. For this study, Cascadia collected data on existing SeaTac food service ware and compostable alternatives, review market conditions, researched best practices and developed recommendations for shifting food and beverage concessionaires to compostable service ware. – Recommendations suggest the airport support concessionaires in transitioning to all compostable products, and that staff and customer education and support will assist.
Cascadia Consulting Group for King County, WA. (2012-2015). *Organics Characterization Report.*	– In 2014, the King County Solid Waste Division (SWD) completed a characterization study of the single-family organics collection program as part of the County's ongoing waste monitoring program. – The composition and quantity data in this report provide the following information: – The composition of material collected from organics routes throughout King County. – The proportion of subscribers setting out an organics cart for collection.

Source	Key Findings
	– The proportion of carts that contain food scraps. – The average quantity of food scraps set out by each household.
Cascadia Consulting Group for San Jose, CA. (2012). *Testing Compostable Products: A Review of Management Practices and Testing Protocols for San Jose, CA.*	– There are no clear standards for compostability that work for all facilities. – An increasing number of products displaying the labels biodegradable, compostable, biocompostable, or other claims of compostability are arriving at commercial composting facilities. – To ensure the quality of their compost products and to control adverse effects on their composting process, commercial composters must navigate the complexities of compostable plastic products and their potential impacts on facility operations. – Composters frequently receive requests from distributors, municipalities, haulers, and generators for recommendations or approval of "compostable" products.
Cascadia Consulting Group for Seattle Public Utilities. (2013). *2012 Organics Stream Composition Study.*	– In 2012, Seattle conducted the first in-depth evaluation of the city's organics stream. The first objective was to evaluate how accurately this sampling methodology can depict the composition of the organics stream over a year, in general and when compared to previous composition estimate techniques. The second objective was to determine the composition of Seattle's combined organics stream that the city's two contracted haulers collect for composting in plastic carts. – The extreme variability in sample results presented and discussed in Chapter 3 provides evidence that the study methodology did not capture the overall composition of the yard waste and food waste portions of the contract collected organics stream. Therefore, the results in Chapter 2: Composition Results only include composition by percent, and are not used to project annual tonnage by material class. – SPU will use the results and lessons learned from the 2012 study to modify the design for the next round of studies.

Source	Key Findings
Cascadia Consulting Group for Portland Metro. (2013). *Organics Stream Composition Study.*	– Organic stream composition study conducted at Portland Metro Central and South Stations. – The Metro Central Station and the Metro South Station currently receive source-separated organics and ship them to compost facilities. – The compost facilities have recently reported significant amounts of contamination in incoming material. – The primary purpose of this study was to examine the amounts and types of contamination in organics loads delivered to the Central and South stations. Over a seven-month study period (October 2012 – April 2013), Cascadia collected and sorted samples of the organic materials that haulers delivered to Metro Central Station and Metro South Station. – Cascadia characterized the amounts and types of organic material and contaminants through this process. This study targeted both residential and commercial organics streams. For this study, Cascadia further divided each substream into two sectors – residential central and south, and commercial packer and roll-off.
Cascadia Consulting Group for Portland Metro. (2014). *Metro Anaerobic Digestion Assessment.*	– Metro commissioned Cascadia to collect data and information that they can use to determine each material's impact on—and potential value to—the AD system. Cascadia conducted the following tasks to complete this work: – Characterization of inbound organics, rejects, substrate, and fibrous digestate at the JC-Bio facility. Cascadia conducted sampling and sorting at JC-Bio to determine composition and quantity of non-food compostables from each of these four processing phases at JC-Bio. – Interviews with JC-Bio and Lane Forest Products staff. Cascadia conducted interviews to collect feedback from facility operators about the value or impact of non-food compostable materials in anaerobic processing and fibrous digestate composting. – A literature review. Cascadia reviewed relevant studies from industry publications

Source	Key Findings
	and other sources to determine the value of non-food compostable materials in anaerobic processing.
Herrera Environmental Consultants for Seattle Public Utilities. (2008). *Alternatives to Disposable Shopping Bags and Food Service Items.*	– All education on disposable food service item use should emphasize minimization of packaging and avoidance of littering when possible, then utilization of compostable products and depositing them with food scraps.
Integrated Waste Management Consulting for the Biodegradable Products Institute. (2012). *Determining the Amount of Plastic and Compostable Plastic in Compost "Overs".*	– The objective of this study was to analyze a random sampling of "overs" at selected composting facilities receiving materials from Portland, OR to determine if compostable plastics account for more than 10 percent of the overs and to characterize the type and amount of remaining plastic residue. – The analysis of the overs showed that the composition of the plastic was overwhelmingly "conventional" plastics (polyethylene, polypropylene, etc.).
Meeks, D., Hottle, T., Bilec, M. M., & Landis, A. E. (2015). *Compostable biopolymer use in the real world: Stakeholder interviews to better understand the motivations and realities of use and disposal in the US.* Resources Conservation and Recycling.	– The use of compostable biopolymers in the United States has grown over the past decade and is predicted to continue to grow over the coming years. – Though many studies have been done to assess biopolymer environmental impacts, few have explored how they are actually being used and disposed of by consumers. – Only with a thorough understanding of real world use will environmental assessments be able to provide meaningful results that can inform best practices for municipal waste management. – This paper identifies and explores where consumers are most likely to come into contact with compostable biopolymers, actual disposal methods, and the motivation behind compostable biopolymer use and disposal.
Natural Resources Defense Council. (2012). *Game Changer: How the Sports Industry is Saving the Environment.*	– Covers all sustainability issues, including food and materials management.
Natural Resources Defense Council & Green Sports Alliance. (2015). *Champions of Game Day Food Report.*	– Doesn't directly address contamination but illustrates the need for and benefits of cross-stakeholder engagement in addressing

Source	Key Findings
	complex issues related to serving healthy, environmentally-friendly food at sports venues.
Cedar Grove, NatureWorks, & Taco Time. (2016). *Case Study: Taco Time Embraces Seattle Waste Ordinance by Redefining Quick Service Restaurant Industry.*	– Prior to introducing compostable serviceware and converting to a single bin disposal system in front-of-house in 2012, Taco Time was diverting roughly 30 percent of their total waste volume from landfill. That number has more than doubled, and today 70 to 75 percent of their waste is diverted from landfill through composting and recycling and other system enhancements such as converting used cooking oil to biodiesel. – Signage was cited as key in engaging and educating customers, and the conversion to fully compostable food serviceware was also noted as a key to program success. Additionally, collection areas were temporarily staffed throughout the stores to acquire feedback and insights before full-scale program implementation program implementation across 57 restaurants.
Novamont. (2014). *Separate Collection of Organic Waste in Milan.* YouTube, https://youtu.be/zSjBbp-Q3lU.	– Milan saw a significant increase in organic capture rates – mostly food scraps – after implementation of separate organics collection and widespread rollout of compostable shopping bags.
The Organic Stream. (2015). *The Final Frontier: Best Practices for Organics Recycling in Multistory Residential Buildings, Part 2.* http://www.organicstream.org/tag/compostable-plastic/	– Explores San Francisco's best practices in gaining trust with their outreach strategies; go in-depth with Seattle's excellent education program; demonstrate the hands-on tracking system in Los Angeles; and discuss key policy measures that can impact a program's success.
Packaging Digest. (2015). *Sustainable Packaging: What's Hot? What's Not?*	– Packaging professionals are still enthusiastically engaged with sustainability, with more saying they care about sustainability this year than last. – Important tactics include: lightweighting, use of renewable materials, increased amount of recycled content and recyclable packaging. – Environmental marketing claims are important, and can be challenging.
U.S. Composting Council. (2009). *Best Management Practices (BMPs) for Incorporating*	– Best Management Practices for Incorporating Food Residuals into Existing Yard Debris Composting Operations is designed as a

Source	Key Findings
Food Residuals into Existing Yard Debris Composting Operations.	written tour guide for composters embarking on the process of expanding into managing food residuals. – Information is presented in four sections, with a summary at the conclusion of each sub-section. – Readers are encouraged to review summaries but not rely upon them as being comprehensive. – Expanding into food residuals composting involves many facets which cannot be fully understood by reading only the summaries.
Vande Kamp, Mark. Seattle-Tacoma International Airport. (2011). *Recycling Behavior during a Pilot Food-scrap Recycling Program in the Central Terminal of Seattle-Tacoma International Airport*	– Observed traveler behaviors in sorting and disposing material and waste stations at the airport. – The largest source of contamination occurs when travelers incorrectly dump all their waste in the recycling or food scrap bins.

Appendix F

Discussion of Possible Upstream BMPs Related to Compostable Packaging and Serviceware

Proposed BMPs: Product Compostability Standards

- Compostable packaging should be tested to and meet ASTM standards D6868 or D6400 and be certified by BPI.
- If required by the local composter or government, compostable packaging should be field-tested and approved prior to inclusion in a residential or commercial collection program.

Barrier #1: ASTM standards don't match industrial composting conditions

- ASTM standards and related testing do not necessarily match industrial composting conditions and do not use active composting in the test. This creates scenarios in which packaging may meet ASTM standards but still not successfully compost in existing industrial compost systems.

Proposed Solutions

- Revise the ASTM standards to better reflect real industrial composting practices in the U.S.
- Document and share successful composting parameters and technical guidance for a variety of composting technologies and processes.

Summary of Stakeholder Discussion

On the purpose and value of ASTM standards as they stand:

- ASTM methods are designed to learn about properties of materials, not performance in the application. This is the case not only in the composting industry, but almost every industry involving chemistry. It is rare to find an ASTM lab test which will always correlate directly to performance in the field for any type of manufacturing process.
- The current ASTM methods have been in use a long time. We can debate whether the parameters and method are good or bad. What we do know is that we have a long history of testing products against this standard; because of this large data set, the test itself has meaning. The composting industry is new relative to other industries, and that makes the historical importance of this test greater.
- The value of ASTM methods is that they can be conducted in a laboratory with sufficient rigor as to measure statistical significance.
- The current ASTM methods are aligned with international standards, which is important because the compostable product supply chain is global.

On the purpose and value of field testing as separate from lab testing:

- Laboratory analyses are not intended to be comparable to in-situ analyses. ASTM standards should be looked at as a first step in the process, i.e., if materials pass the ASTM standard, the next step is in-situ testing. These limitations are clearly stated in the standards. Regardless of the laboratory test method(s) used, it is always recommended that materials also be tested in the field.
- There are a variety of composting technologies and approaches. Cedar Grove uses the Gore method; windrows and aerated static piles are two other common approaches. In addition, variations in climate impact composting operational practices. An ASTM standard is, by definition, one standard. More coordination is a good idea, but the notion that there is one way to do it is not realistic.
- We need better standards, but we also need more guidance from those composters who are composting successfully. As of this writing, the USCC Compostable Products Task Force is working on this.

In support of revisions to ASTM standards:

- An ASTM test should test the behavior of materials under actual compost conditions that are regulated. The minimum requirement for compost regulations should be used versus any single technology. In other words - both, 3 days at 131F for static pile - and - 14 days and 5 turns above 131F for windrow, should be tested.

Barrier #2: Multiple Compostability Standards and Certifications

- Multiple compostability standards and certifications (e.g., ASTM, BPI, Cedar Grove) exist and are not comparable, complementary, or coordinated. This creates confusion in the marketplace and leads to mixed results regarding compostability.

Proposed Solution

- Encourage standard-setting entities to complement, integrate, and communicate in such a way as to improve compostability and clarity in packaging design and in the marketplace. This includes better communication about the value of various certifications and testing.

Summary of Stakeholder Discussion

Ideas for exploring standards harmonization opportunities:

- Conduct a postmortem on existing data. If composters can look at their lists to see what has passed and failed, maybe one could correlate that a) for a given process, that b) runs under given conditions, that c) specific materials pass.
- Ask Cedar Grove to propose their ideal laboratory screening test to see if it does a better job of predicting performance in their process. Perhaps this could be done through USCC or similar.
- Finding mutually advantageous reasons for collaboration is key, because each of these entities have different goals and objectives. Perhaps a coordinated lobbying effort from state compost associations, municipalities, and other end-users would provide the necessary motivation?

In support of accepting a multi-standard environment:

- There will likely never be a lab test that will demonstrate everything that will happen with a given product in a single composting process, let alone how that product might perform in all types of composting processes and conditions. Despite this, lab tests are important for determining the properties of the material, and are still an important tool for understanding compostability.
- It would be helpful to educate everyone on the differences between national standards, certifications, and individual composter standards. It is often the case that manufacturers have their own in-house testing standards.

Other stakeholder comments:

- Agree this is an issue, but if we can solve Issue #1 (updating ASTM standards to incorporate field testing) this becomes a moot point.

Barrier #3: Product Performance vs. Compostability

- Some compostable packaging and serviceware materials that are considered desirable due to price and performance are not successfully composting at Cedar Grove or other compost facilities during the active composting stage. This leads to mixed results regarding compostability and contributes to composter reluctance to accept compostable products.

Proposed Solutions

- Encourage product manufacturers to further explore the composting conditions that inhibit compostability to resolve these technical issues.
- Encourage product manufacturers to further develop and use other renewable substrates that are more compatible with composting conditions that also meet performance and pricing desirability.

Stakeholder Feedback

In support of exploring proposed solutions:

- This is a new industry and there are many fundamental studies which have not yet been completed. Consider making a list of areas for future study, then seek resources to achieve them. [Editor's note: see Opportunities for Future Study.]
- Explore solutions that product manufacturers can implement directly.
- Regarding the term "renewable": Not all compostables are renewable, and not all renewables are compostable. Not all renewable sources are necessary desirable from a total life cycle perspective.
- Even products made from "natural fibers" should be required to be tested to ASTM methods.
- Explore the USDA's push to reduce agricultural waste by promoting the use of agricultural by-products in manufacturing "natural" products; this is good for reducing agricultural waste and mitigating concerns about conventional plastics, but the resulting products are not always compostable.

In support of a greater focus on education:

- Although it is not realistic at the national level, it is important to strive for consistency within local and regional areas regarding accepted items, education, and outreach. This will minimize confusion and improve participant sorting practices.
- Work with larger, multi-state organizations to inform their purchasing practices.
- Educate restaurants and suppliers about what is compostable. A local restaurant supply store stocks an entire aisle of bagasse serviceware that restaurants and customers feel good purchasing, but they are not compostable in our regional composting facility.
- Consider engaging the National Restaurant Association.
- Until new ASTM standards are developed that reflect current industrial composting practices, consider outreach and education to raw material suppliers and manufacturers, possibly through BPI and FPI. Help them to develop materials/products more in line with current industrial composting practices by providing more real-world parameters, e.g., active composting/curing time in x days, not y; temperatures of x, not y.

In support of other approaches:

- Product manufacturers are driven by price and customer satisfaction. Some have huge R&D budgets and some do not. Those companies that do a lot of research do not want to share that research with their competitors. Efforts to encourage changes in manufacturing practices may be most effective through a combined campaign by customers and government entities. For example, is there a way to apply for R&D funds from the government? Is there a way to prepare and advertise customer satisfaction studies that show people are dissatisfied with products that don't do what they are purported to do, i.e., people who buy compostable products expect them to be compostable?
- Consider alternative organic waste processing methods, e.g., anaerobic digestion and vessel systems. Anything that allows high performance options to be used successfully in the system is important. A poorly performing compostable option will not be embraced by purchasers or users.
- This is likely happening because products are being developed according to ASTM standards, not what composters accept. Products that pass in one facility sometimes fail at another facility using the same technology. These issues highlight the importance of field testing

Other comments:

- Performance versus cost is not a new issue. Costs of new product development typically start high, then decline as performance is proven and economies of scale are achieved. On the other hand, a cheap product that doesn't perform gains nothing; if it is desirable due to performance, ask: performance as what? If it doesn't compost, it doesn't perform.

Proposed BMPs: Product Labeling

- Compostable packaging/serviceware should be clearly labeled as compostable. Labeling is not needed for some compostable paper products, such as napkins and wood chopsticks.

- Labeling should be clearly visible to the participant when holding the package. Labeling on only the bottom of containers is not effective or acceptable.
- Color and other images can be useful in helping to identify compostable packaging and serviceware, but should not replace text clearly identifying the packaging as compostable.
- Non-compostable packaging and serviceware should not use images, colors, or words that, to the typical consumer, are likely to be misconstrued as compostable. Examples are images of leaves, trees, terms such as "earth," "biodegradable," or "degradable." If non-compostable packaging uses these terms and images, it should be clearly marked "Do Not Compost."
- Specific colors and images that are commonly associated with recycling should be avoided on compostable packaging to avoid confusion, e.g., prominent use of chasing arrows, or the color blue.
- The Sustainable Packaging Coalition is developing a "How to Compost" label system, similar to its "How to Recycle" label system. When this system is established, compostable packaging should use this system when possible/practical.
- Some packaging may be either compostable or recyclable under some or all conditions. For example, empty PLA lined paper coffee cups are accepted for recycling in Seattle. Pizza boxes with food are compostable, pizza boxes without food are recyclable. How to label and communicate for these dual system materials needs to be considered; the "How to Recycle" and "How to Compost" label system might address such materials.

Summary of Stakeholder Discussion

On the importance of consistency:

- It is critical to use consistent, simple language that is obvious to all. The use of multiple forms of communication is also useful.
- Consider a marketing campaign that establishes a catch phrase or icon that – after being explained in detail at first – over time becomes widely recognizable and requires no explanation.
- It would be helpful to provide specific lists of products impacted—or not impacted—by these guidelines, not just examples, to ensure clarity and consistency. This is especially important when referring to compostable paper products that do not require labeling "such as napkins and wood chopsticks."
- It is important to specify the scope of these guidelines, i.e., would they apply nationally, by state, by city, by composter?

On other applicable guidelines and laws:

- Any labeling BMPs should be in accordance with the FTC Green Guides as well as state laws.
- Washington State should follow California (SB-567) and prohibit the use of misleading words such as "degradable," "biodegradable," and "decomposable" on plastic products. This law also requires that items labeled with the term "compostable" meet ASTM D6400/D6868 or D7081.

- Refer to the Model Compostable Plastics Labeling Bill provided by the US Composting Council and US Composting Council Labeling Guidelines for Compostable Plastics Associated with Food Scraps or Yard Trimmings.

On potential barriers to manufacturer adoption:

- Changing and dictating manufacturer marketing habits is unlikely and potentially outside of our control. Outreach to packaging manufacturers may help.
- The importance of product branding and appearance may be a barrier for some manufacturers.
- Compostable labels may prove economically challenging in an already competitive marketplace. The decision to pay for and use the "How to Compost" label system should be up to the brand owner or manufacturer.
- Manufacturers may not always know where their products ultimately end up, given that many go through distributors.
- Coordination and education regarding "dual system" materials will be complicated and potentially problematic.
- Chasing arrow diagrams contain the resin ID code, which is required on rigid plastic containers—including PLA—in many states, including Washington.
- Space limitations on packaging may be problematic.
- It is not possible to print on some packaging types, e.g., rigid PLA clamshells and fiber-based products.
- Compostable labels may interfere with POP label positioning.
- Printing on the top of packaging may be covered by labels identifying the item, branding, or nutrition information.

Additional stakeholder ideas:

- Consider including specific language regarding utensils, as these can be particularly obscure and difficult to read.
- Compostable bags should be labeled "compostable" in large lettering, i.e., at least 1 inch tall or covering some portion of the bag.

Proposed BMPs: Product Coloring and Tinting

- Compostable meat and deli trays composed of blown compostable plastic should be tinted brown, beige, or tan; they should not be white.
- Compostable bags should be tinted green; they should not be other colors or non-tinted. Conversely, non-compostable bags should not be tinted green.
- Tinting and coloration alone are inadequate for communicating with consumers. Compostability should be further communicated through text (see above section).

Summary of Stakeholder Discussion

On the importance of consistency:

- Coloring should be consistent across all industries regardless of the item, i.e., participants should be able to put items of one color into a bin of matching color, e.g., green items in the green bin.
- Explore whether green or brown is the more widely recognized color for compostability.

On potential barriers to manufacturer adoption:

- A leaf, dot, or stripe would be preferable to tinting green which can negatively impact appeal of product or conflict with a brand's color scheme.
- Adding artificial colorant to create brown, beige, or tan adds economic burden, as well as adding a potentially environmentally-unfriendly component to the package.

On the importance of communicating via multiple methods:

- It's important to utilize multiple practices including both color and text.

Proposed BMPs: Adhesive Labels Applied to Compostable Packaging and Food

- Adhesive labels that are applied to compostable packaging and food should be eliminated when unnecessary or other technology is available. For example, produce labels may be replaced with emerging technology such as laser-etching or tattooing. Starbucks, in some areas, has eliminated use of non-compostable green tape to close deli packages, both eliminating the non-compostability issues and reducing costs associated with procuring, supplying, and stocking the tape in stores.
- When unavoidable or desired for marketing or branding purposes, labels applied to compostable packaging should be certified compostable and marketed as such.

Summary of Stakeholder Discussion

On potential barriers to manufacturer adoption:

- Label printing quality is very important from a brand management perspective.
- Manufacturers and distributors will want to be able use any new label types in existing printing operations without jamming or smudging.
- The efficacy of the adhesive is important, as nutritional information is required for compliance with health regulations.
- Cost will be a significant consideration. Packaging is already expensive and can add meaningful cost to the customer. Finding a comparable price point to existing labels is important.

In support of adhesive label innovation:

- A requirement to use compostable labels would encourage further development upstream and could change the shape of the industry.

Other stakeholder ideas and questions:

- Consider a city-based implementation strategy. For example, Seattle could pass an ordinance that prohibits non-compostable produce stickers, in the same way the fast food packaging ordinance has dictated packaging terms.
- Who certifies labels? BPI doesn't, per their catalogue.

Proposed BMPs: Consistency to Help the Consumer

- Foodservice operators that offer compostable serviceware and front of house composting should strive to be as consistent and complete as possible to avoid confusion. For example, those providing compostable cups and directing them to the compost bin should also provide compostable straws and lids. Mixing compostable and non-compostable packaging and serviceware is not effective.
- Whenever possible, non-compostable items should be eliminated or replaced with compostable items when part of a package that is predominately compostable. For example, non-compostable (and often non-recyclable) portion cups or pizza stands should be eliminated or replaced with compostable alternatives when included in pizza boxes, which are compostable.

Summary of Stakeholder Discussion

On the importance of consistency:

- Consistency is the key to compliance.
- Waste management is a regional concern, not a county, city, or neighborhood one. Materials are constantly being transported across municipal and county borders, and the education must follow. Guidelines regarding labeling and coloring should be set at the state level.
- Materials today are very complex, i.e., many paper materials have plastic linings. This presents significant challenges to ensuring consistency in education.
- There are many schools of thought and studies on effective signage. It would be ideal if all foodservice operators and distributors in a specified area came to common agreement on signage. Consider engaging with the local National Restaurant Association chapter.

On potential barriers to manufacturer adoption:

- Eliminating the use of non-compostable items when the package is mostly compostable is a good goal but may be difficult due to price and product availability.

On the importance of education:

- Although some stakeholders would like all packaging to be compostable, that may or may not be possible for all foodservice operators. Consider providing guidance to operators when both compostables and recyclables are present in FOH. Keep in mind operators will always have recyclables in the BOH, so staff training will be important.

Appendix G

Draft White Paper on Challenges with Fiber-based Compostable Packaging

This white paper was drafted by Upstream subcommittee member Sego Jackson along with input from several subcommittee members. Jackson is Strategic Advisor for Waste Prevention and Product Stewardship at Seattle Public Utilities. His position includes, in part, programmatic and policy work to significantly increase the diversion of food scraps, compostable paper and compostable packaging from waste disposal as well as work with industry to steward their products. SPU's primary strategic approach is "Solving Problems at Their Source" which supports looking upstream for packaging solutions.

In this draft white paper, Mr. Jackson outlines a variety of challenges associated with fiber-based foodservice packaging in some composting systems. Although some of the issues outlined below also apply to other packaging materials, this paper is intended to specifically address the common misperception that fiber-based packaging materials are free of issues during the composting process. Topics presented include:

- Inadequacy of ASTM standards and certifications to address compostability of some fiber-based products.
- Issues around performance of some fiber-based products in compost field testing.
- Lack of field testing of some fiber-based products currently on the market.
- Emerging concerns about potentially toxic or problematic additives, coatings, dyes, and inks being used on fiber-based products.

Difficulty distinguishing plastic-lined non-compostable foodservice ware and packaging from compostable products

Some fiber-based foodservice materials are lined to help products resist water and oil in foods. These linings include clay, other minerals, and PLA. However, many people do not realize that some fiber-based packaging have a conventional plastic lining (sometimes referred to as "poly-lined") that makes it unsuitable for composting. Unfortunately, it is often difficult to distinguish between these poly-lined non-compostable products and compostable products. There are also mixed messages that add to the problem; in some areas, non-compostable plastic-lined paper products have been accepted in organics streams, adding to participant confusion. This practice is ill-conceived, as the plastic linings on the paperboard do not compost, creating contamination and contributing to rising costs in compost programs. Further, it creates the potential for plastic particle pollution to enter the environment through our soil.

While compostable products must be clearly identified as such, it is equally important that non-compostable products are clearly identified as non-compostable. Responsible packaging manufacturers should play a key role in informing the public that their poly-lined packaging is not compostable so that

they do not enter compost systems. Also, organics collection and processing programs should never accept poly-lined products for composting.

Lack of clear labeling and identification of compostable fiber-based products

Many forms of fiber based compostable packaging, such as molded fiber products, have limits to how they can be labeled as compostable (either due to their configuration, technology, or impracticality of the costs). Manufacturers of these should determine how these products can be readily identified by the public as compostable. Responsible manufacturers should ensure that easily labeled compostable fiber products are labeled as such.

Existing ASTM standards and certifications do not detect compostability issues with some fiber-based products.

Some fiber-based products meet ASTM standards and are certified by BPI, but they are not composting in all greater Seattle area facilities. Coordinated investigation is needed to understand why this is occurring.

If the issue is operational parameters including duration of active composting, are there any accommodations that can be made to address that issue?

If the issue is additives or coatings added to repel water or grease, or as a binder (whether potentially toxic or not), how can manufacturers reformulate these products?

What standards can be developed to predict performance in composting processes common to industrial composters? What can existing organizations such as ASTM, BPI, USCC, etc., do to address this?

Lack of field testing of some fiber-based products currently on the market.

Some fiber based products entering the Seattle area marketplace that have not been field tested, or have not passed field testing, yet are sold and used anyway. What can be done to:

1. Ensure that the manufacturers of those products have them field tested, and if they fail, work to reformulate their products?
2. Remove those untested or failed products from the local market place?
3. Ensure that those untested or failed products do not unfairly compete with alternatives that are tested and compost successfully?

Emerging concerns about potentially toxic or problematic additives, coatings, dyes, and inks being used on fiber-based products

Some fiber-based foodservice materials that claim to be, or have been third-party certified as compostable, may contain highly fluorinated compounds (sometimes referred to as highly fluorinated chemicals). These compounds help products to resist water and oil in foods. Some of these compounds have been banned from use in the U.S., but others have been approved by the U.S. FDA for food contact

packaging. However, highly fluorinated compounds do not easily break down in the environment and have been associated with aquatic toxicity, cancers, and other negative human health impacts. Unfortunately, the ASTM D6868 and D6400 standards for compostability only test for common contaminants such as heavy metals, but they do not test for fluorinated compounds. The Green Science Policy Institute,[16] Responsible Purchasing Network,[17] and others are working to better understand and address emerging concerns about these issues.

To mitigate these health and safety concerns:

- Manufacturers should proactively ensure that toxic chemicals and chemicals of concern are not utilized in their foodservice packaging, additives, coatings, dyes, or inks. All materials entering the composting stream should be safe—and preferably beneficial—to compost and soil.
- Industry stakeholders should engage in a discussion of whether compostability standards should be updated to address concerns about fluorinated compounds.
- Manufacturers should provide both customers and composters with assurances that paper-based products—such as napkins, which are commonly assumed to be compostable but are not subject to compostability testing or labeling—do not have toxic chemicals or chemicals of concern as additives, coatings, dyes, or inks.

[16] Green Science Policy Institute. *Consumers' Guide to Highly Fluorinated Chemicals.* http://greensciencepolicy.org/highly-fluorinated-chemicals/ (accessed May 2017).
[17] Responsible Purchasing. *Green Purchasing Best Practices: Compostable Food Service Ware*. http://www.responsiblepurchasing.org/purchasing_guides/compostable_service_ware/naspo_rpn_compostable_food_service_ware_purchasing_guide.pdf (accessed May 2017).

Appendix H

Planned Scope for Upstream Organics Disposal Behavior Study at Seattle-Tacoma International Airport

Overview

The Seattle-Tacoma International Airport (STIA) is a leader among its peers in airport waste reduction and recycling. However, previous food-scrap recycling behavior observations at STIA have shown that substantial opportunities remain to both increase diversion of recoverable materials and decrease contamination of recyclable materials. In particular, the complexity of recycling guidelines and the need to keep signs simple may leave travelers confused and limit successful sorting.

As part of its mission to reduce contamination in organics streams in Washington State, the Washington Organics Contamination Reduction Workgroup (OCRW) would like to partner with STIA to better understand what drives sorting behavior at the bin. Specifically, we are proposing a study designed to determine the extent to which:

- Customer sorting accuracy differs between environments using detailed vs. conceptual bin signage.
- Contamination-to-diversion ratios differ between detailed and conceptual signage scenarios, i.e. does one scenario produce greater diversion but higher contamination, and vice versa.
- Specific items or categories of items are commonly sorted incorrectly in each scenario, and why.

This document outlines a proposed approach for a study researching these questions.

Approach Overview

The approach outlined in this document includes six tasks:

- Task 1: Design Study Protocol
- Task 2: Conduct Round One Waste Bin Audits (Detailed Signage)
- Task 3: Design and Develop Conceptual Bin Signage
- Task 4: Conduct Round Two Waste Bin Audits (Conceptual Signage)
- Task 5: Conduct Preliminary Analysis
- Task 6: Develop and Conduct Customer Interviews
- Task 7: Prepare Final Report

Brief descriptions of each of these tasks are provided below.

Task 1. Design Study Protocol

STIA Business Intelligence staff will prepare a detailed study design and research protocol for the project with input and support from OCRW representatives, which will include:

- Study objectives.
- Study locations.
- Audit material list.
- Data requirements and data collection methods.
- Expectations for final deliverables.
- Study schedule and budget.

Task 2. Conduct Round One Waste Bin Audits (Detailed Signage)

STIA janitorial contractors will conduct a waste bin audit in the N Terminal food court using existing STIA (detailed SPU-based) bin signage. The audit will capture the following data for the composting, recycling, and garbage bins at each disposal station:

- Total weight of collected bin sample.
- Count and/or weight of items in agreed upon material categories, e.g.,
  - Food
  - Compostable foodservice items
    - Beverage containers (cups, straws, lids)
    - Clamshell food containers
    - Plates and trays
    - Food-soiled paper
  - Clean Recyclables
    - Beverage containers (cups, straws, lids)
    - Clamshell food containers
    - Plates and trays
  - Dirty Recyclables (contain food)
    - Beverage containers (cups, straws, lids)
    - Clamshell food containers
    - Plates and trays
  - Garbage

Task 3. Design and Develop Conceptual Bin Signage

OCRW representatives will seek funding and resources to support design and development of conceptual bin signage for the composting, recycling, and garbage bins in the study area, for example:

- Bottles, Cups, and Cans -> RECYCLE
- Food -> COMPOST
- Everything Else -> LANDFILL

Task 4. Conduct Round Two Waste Bin Audits (Conceptual Signage)

STIA staff will apply the conceptual signage to the bins located within the study area. STIA janitorial contractors will then conduct a second waste audit using the same protocol as the first audit.

Task 5. Conduct Preliminary Analysis

After the completion of both waste bin audits, STIA Business Intelligence staff will analyze the collected data and identify:

- Differences in customer sorting accuracy between detailed vs. conceptual bin signage.
- Differences in contamination-to-diversion ratios between detailed and conceptual signage, i.e. does one scenario produce greater diversion but higher contamination, and vice versa.
- Specific items or categories of items that are commonly sorted incorrectly in each scenario.

Task 6. Develop and Conduct Customer Interviews

STIA Business Intelligence staff will develop and conduct brief customer interviews in the study location to collect qualitative data about why the items identified in Task 5 cause confusion.

Task 7. Prepare Final Report

At the conclusion of the study, STIA Business Intelligence staff will create a final report to document activities completed, study findings, and recommended next steps with support from OCRW representatives as necessary and appropriate.

Appendix I

Contamination Removal Methods and Technologies

Technology	Sortable Material Types	Specific Sortable Possibilities	Average Score
Air Classifiers (generic)	Density Specific Materials	Plastics, paper	6
Air Drum Separator	Density Specific Materials	Plastics, paper	Not used*
Air Knives	Density Specific Materials	Plastics, paper, foil - in conjunction with other technologies	5
Air Lift Separators	Density Specific Materials	Plastics, paper	7.4
Ballistic Separation	Density/Size Specific Materials	Most	4
Conveyor separation w/air	Density Specific Materials	Plastics, glass	6.5
Deck Screens	Size Dependent Materials	Size fractions larger/smaller	3.5
Disc Screens (OCC?)	Size Specific Materials	Paper	5
Eddy Current Separation	Component Specific Materials	Dependent (e.g. Non-ferrous metals)	Not used
Flotation Separation	Floatables/Sinkers	Rocks, glass, metals, plastics	6.5
Fluidized Inclined Bed (Air)	Density Specific Materials	Rocks, Glass	Not used
Gravity Separation (Oliver)	Density Specific Materials	Rocks, Glass	6
Hand Sorting	Large visible materials	Plastics, wood, cans, bottles	6.6
Inclined conveyor	Density Specific Materials	Rocks, glass	5.4
Magnets	Metals	Ferrous Metals	6
Microwave Detection Systems	Light Refractables	Glass	Not used
Nihot Drum Separator	See above	Most	Not used
Optical (IR) Sorting	Light Refractables	Glass	Not used
Picking Station	Large visible materials	Plastics, wood, cans, bottles	7.4
Shredding	Pre-conditioning	Helps other separation technologies	5.25
Star Screens	Size Dependent Materials	Size fractions larger/smaller	7.25
Trommel Screens	Size Dependent Material	Size fractions larger/smaller	6
Vibratory Screens	Density Specific Materials	Heavy and Light	4.5
Zig-Zag Air Separator (Impacts)	Size, Density	Paper Plastics	Not used

* Technologies that had not yet been used by any survey respondents are noted as Not Used.

Method	Average Score
Hand Picking of Compost	6.5
Selection of Generators actively pursuing contaminant mitigation	5.75
Research, Identification and Use of Feedstock Generator Demographics	5
Contamination research, documentation and action of types and quantities	4
On-site awareness and outreach including tours/hauler awareness and education (other?)	3

Appendix J

Glossary of Terms

- **Agency (Solid Waste):** Organization in a Municipal or County government that is responsible for the oversight and administration of solid waste functions.
- **Broadline Foodservice Distributor:** A company that provides food and non-food products to restaurants, cafeterias, industrial caterers, hospitals and nursing homes.
- **Commercial Sector:** Commercial sector waste comes from all businesses, small and large, including wholesale and retail sales, restaurants, manufacturing, and transport. The commercial sector also includes government, schools, institutions, fairs and expositions, and other special events.
- **Commercial Composter:** Centralized facility that accepts organic feedstocks from commercial, residential, institutional, and/or municipal generators in the surrounding region and converts them to compost for subsequent sale.
- **Composted Material, or Compost:** Organic solid waste that has undergone biological degradation and transformation under controlled conditions designed to promote aerobic decomposition at a solid waste facility. Natural decay of organic solid waste under uncontrolled conditions does not result in composted material.
- **Composting:** The biological degradation and transformation of organic solid waste under controlled conditions designed to promote aerobic decomposition. Natural decay of organic solid waste under uncontrolled conditions is not composting. Composting is a form of organic material recycling.
- **Contaminant:** Any chemical, physical, biological, or radiological substance that does not occur naturally in the environment or that occurs at concentrations greater than natural background levels.
- **Facility:** All contiguous land (including buffers and setbacks) and structures, other appurtenances, and improvements on the land used for solid waste handling.
- **Feedstock:** Source separated waste material used as a component of composting.
- **Foodservice Packaging and Foodservice Ware:** Often used interchangeably to describe single-use items intended for serving, conveying, and consuming food (e.g., cups, plates, utensils, and takeaway containers). Can refer to both paper- and plastic-based materials.
- **Garbage**: Putrescible solid wastes.
- **Jurisdiction:** A city, county, a combined city and county, or a regional agency with the responsibility for meeting solid waste management requirements.
- **Landfill**: A disposal facility or part of a facility at which solid waste is permanently placed in or on land including facilities that use solid waste as a component of fill.

- **Organic Material, or "Organics":** Any solid waste that is a biological substance of plant or animal origin capable of microbial degradation. Organic materials include, but are not limited to, manure, yard debris, food scraps, food processing wastes, wood waste, and garden wastes.
- **Plastic:** Material consisting of any of a wide range of synthetic or semi-synthetic organic compounds that are malleable and can be molded into solid objects. In this document, refers to petroleum-based conventional plastics that are not compostable.
- **Post-consumer Food Scraps:** Food that has been served but uneaten.
- **Pre-consumer Food Scraps:** Food scraps that are generated during food preparation or that are prepared but unserved.
- **Processing:** An operation to convert a material into a useful product or to prepare it for reuse, recycling, or disposal. In the context of this report, processing refers to converting organics into compost.
- **Program Participant:** Residents or businesses who contribute material to the organics stream via curbside or commercial collection programs.
- **Solid Waste:** All putrescible and non-putrescible solid and semisolid wastes including, but not limited to, garbage, rubbish, ashes, industrial wastes, swill, sewage sludge, demolition and construction wastes, abandoned vehicles or parts thereof, contaminated soils and contaminated dredged material, and recyclable materials.
- **Solid Waste Handling, or Solid Waste Management:** Management, storage, collection, transportation, treatment, use, processing or final disposal of solid wastes, including the recovery and recycling of materials from solid wastes, the recovery of energy resources from such wastes or the conversion of the energy in such wastes to more useful forms or combinations thereof.
- **Source Separation:** Separation of different kinds of solid waste at the place where the waste originates.
- **Transcreation:** The process of adapting a message from one language to another, while maintaining its intent, style, tone and context.
- **Yard Debris, or Yard Waste:** plant material commonly created in the course of maintaining yards and gardens and through horticulture, gardening, landscaping or similar activities. Yard debris includes, but is not limited to, grass clippings, leaves, branches, brush, weeds, flowers, roots, windfall fruit, and vegetable garden debris.

Appendix K

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