

CITY OF SEATTLE

RESOLUTION 32082

A RESOLUTION adopting Seattle's 2022 Solid Waste Plan Update: Moving Upstream to Zero Waste; revising the 2011 Revision: Picking Up The Pace Toward Zero Waste; and superseding certain requirements adopted by Resolution 30990.

WHEREAS, the City Council approved Resolution 29805, adopting Seattle's Comprehensive Solid Waste Management Plan "On the Path to Sustainability" in August 1998; and

WHEREAS, the City Council approved Resolution 30750 adopting the 2004 Comprehensive Solid Waste Plan Amendment to the 1998 Plan "On the Path to Sustainability" in March 2005; and

WHEREAS, the City Council approved Resolution 31426 adopting the 2011 Revision: Picking Up The Pace Toward Zero Waste in February 2013, accelerating recycle goals established in Resolution 30990 to recycle 70 percent of the municipal solid waste produced within the city by 2022 and 70 percent of the construction and demolition waste produced within the city by the year 2020; and

WHEREAS, the City implemented industry-leading diversion policies and practices that resulted in an all-time high overall recycle rate of approximately 59 percent in 2016, but has been unable to achieve the recycling goals set in Resolution 31426 due to changes in products and packaging beyond the City's control that dramatically altered the composition and volumes of materials in the waste stream; and

WHEREAS, the City's vision of Zero Waste strives for a waste-free society by creating new practices and policies to reduce or reuse waste and build an economy supported by re-use of resources; and

1 WHEREAS, this Zero Waste vision involves looking at the entire life cycle of materials used to
2 make products and packaging to eliminate waste, prevent pollution, encourage product
3 durability and reusability, conserve natural resources, and build a circular economy; and

4 WHEREAS, best management practice in the solid waste industry now focus “upstream” to
5 prevent waste, which yields the greatest environmental benefits by reducing resource use
6 and climate-changing greenhouse gas pollution; and

7 WHEREAS, the City Council approved Resolution 32000 adopting the 2021-2026 Seattle Public
8 Utilities Strategic Business Plan in May 2021, establishing the Utility’s vision of
9 “Community Centered, One Water, Zero Waste” where advancing Zero Waste means
10 supporting and promoting policies and practices that reduce Seattle waste and carbon
11 pollution as fast as possible and create a circular economy; and

12 WHEREAS, continuing to recycle in conjunction with preventing waste from being generated is
13 a more effective approach to addressing waste and achieving Zero Waste and a circular
14 economy; and

15 WHEREAS, by addressing waste at its source, waste prevention can: enhance the resilience of
16 the solid waste management system by reducing the amount of waste and toxics
17 produced; support other local environmental priorities like reducing litter, decreasing
18 greenhouse gases and toxicants, and preventing stormwater pollution; and minimize the
19 overall life cycle impacts of materials; and

20 WHEREAS, the State of Washington requires local governments develop comprehensive solid
21 waste management plans and that they be reviewed and revised, if necessary, every five
22 years; and

WHEREAS, Seattle developed a Plan Revision, which has included opportunities for public input on its crucial program elements; and

WHEREAS, the City's Solid Waste Advisory Committee participated in and supports the Plan Revision; NOW, THEREFORE,

**BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF SEATTLE, THE
MAYOR CONCURRING, THAT:**

Section 1. Seattle's 2022 Solid Waste Plan Update: Moving Upstream to Zero Waste, attached to this resolution as Attachment 1, is adopted as the Solid Waste Management Plan for The City of Seattle to provide long-term planning direction and guide solid waste program development over the next five years.

Section 2. To determine whether the City is making progress toward Zero Waste and building a more circular economy, Seattle Public Utilities will, no later than December 31, 2024, provide the City Council's Transportation and Seattle Public Utilities Committee, or its successor committee, a report identifying the new metrics it will use to quantify waste reduction and diversion in the city. Upon receipt of that report by the committee, those new metrics will supersede the goal established in Resolution 30990 to recycle 70 percent of the municipal solid waste produced within the city by 2022 and 70 percent of the construction and demolition waste produced within the city by the year 2020.

Section 3. SPU will report to City Council by October 1 of each year on the previous year's progress preventing, reducing, and diverting waste. Each annual report shall contain the comments of the Solid Waste Advisory Committee. This requirement supersedes the reporting requirement established in Section 5 of Resolution 30990.

Adopted by the City Council the 11th day of April, 2023,
and signed by me in open session in authentication of its adoption this 11th day of
April, 2023.



President _____ of the City Council

The Mayor concurred the 20th day of April, 2023.



Bruce A. Harrell, Mayor

Filed by me this 20th day of April, 2023.



Elizabeth M. Adkisson, Interim City Clerk

(Seal)

Attachments:

Attachment 1 – Seattle's 2022 Solid Waste Plan Update: Moving Upstream to Zero Waste



City of Seattle

2022 Solid Waste Plan Update

Moving Upstream to Zero Waste (2022-2027)

December 2022 v.2



**Seattle
Public
Utilities**

Department of Ecology Approval

*Department of Ecology's letter of approval
(forthcoming after filing with Ecology)*

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The Honorable Bruce Harrell

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Sound Resource Management Group, Inc.
Washington State Department of Ecology

Public Engagement

CISC
ECOSS
Horn of Africa Services

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Appendix J City Council Resolution of Adoption

Forthcoming after adoption by the Seattle City Council

Acronyms

ADC	alternative daily cover
BIA	business improvement area
BPI	Biodegradable Products Institute
BYO	bring your own
C&D	construction and demolition
CAP	Clear Alleys Program
CBO	community-based organization
CBSM	community-based social marketing
CCB	Customer Care and Billing (a database)
CFC	chlorofluorocarbons
CFL	compact fluorescents lights
CIP	capital improvement program
COOP	<i>Continuity of Operations Plan</i>
CROP	<i>Contamination Reduction and Outreach Plan</i>
DRS	deposit return system
ECOSS	(formerly) Environmental Coalition of South Seattle
EJSE	Environmental Justice and Service Equity
EOP	<i>Emergency Operations Plan</i>
EPA	Environmental Protection Agency
EPR	extended producer responsibility
EPS	expanded polystyrene (includes Styrofoam™)
FAS	Finance and Administrative Services
FEMA	Federal Emergency Management Agency
G&A	general and administrative
GHG	greenhouse gas
GIS	geographical information systems

Acronyms

HHW	household hazardous waste
HID	high-intensity discharge
IT	information technology
LEED	Leadership in Energy and Environmental Design
MRF	materials recovery facility
MRW	moderate risk waste
MSW	municipal solid waste
NGO	nongovernmental organization
NTS	North Transfer Station
NWPSC	Northwest Product Stewardship Council
O&M	operations and maintenance
OECD	Organisation for Economic Co-operation and Development
PAC	Packaging Consortium
PAYT	pay-as-you-throw
PCC	Pacific Coast Collaborative (different from PCC Community Markets)
PET	polyethylene terephthalate
PHSKC	Public Health – Seattle & King County
PNW	Pacific Northwest
PPP	packaging and paper products
PRO	Producer Responsibility Organization
PSI	Product Stewardship Institute
PSCR	Puget Sound Regional Council
PVC	polyvinyl chloride
RAI	Refuge Artisan Initiative
RCW	Revised Code of Washington
ReFED	Rethink Food Waste through Economics and Data
RPA	Recycling Potential Assessment (model)
RRTF	Responsible Recycling Task Force
RSJI	Race and Social Justice Initiative
RV	recreational vehicle
SDCI	Seattle Department of Construction & Inspections
SDM	Seattle Discards Model

Acronyms

SDOT	Seattle Department of Transportation
SMC	Seattle Municipal Code
SNAP	Supplemental Nutrition Assistance Program
SODO	South of Downtown
SPC	Sustainable Packaging Coalition
SPS	Seattle Public Schools
SPU	Seattle Public Utilities
SQG	small quantity generator
STS	South Transfer Station
SWAC	Solid Waste Advisory Committee
SWLOB	Solid Waste Line of Business
TANF	Temporary Assistance to Needy Families Program
WAC	Washington Administrative Code
WIC	Women, Infants and Children Program
WRAP	Waste and Resources Action Program
WSDOT	Washington State Department of Transportation

Glossary

TERM	DEFINITION
alternative daily cover (ADC)	Materials used instead of soil to cover the surface of a landfill where waste is actively being deposited.
anaerobic digestion	The process by which organic material is broken down by micro-organisms in the absence of oxygen. This process results in emission of a CO ₂ and methane-rich biogas that can be collected and used as an energy source. The digestate can then be landfilled or composted.
beneficial use	The use of solid waste as an ingredient in a manufacturing process, or as an effective substitute for natural or commercial products in a manner that does not pose a threat to human health or the environment. Avoidance of processing or disposal cost alone does not constitute beneficial use. One example is using clean wood as industrial boiler fuel in a manner that does not pose a threat to human health or the environment.
biosolids	Municipal sewage sludge that is a primarily organic, semisolid product resulting from the wastewater treatment process and can be beneficially recycled.
circular economy	In a circular economy, end waste products become inputs for new production instead of ending with disposal in a linear economy.
clean wood waste	Solid waste consisting of wood pieces generated as byproducts from manufacturing of wood products, hauling and storing of raw materials, tree limbs greater than four (4) inches in diameter and wood demolition waste (lumber, plywood, etc.) thrown away in the course of remodeling or construction, and waste approved for wood-waste recycling. It excludes clean yard waste, treated lumber, wood pieces, or particles containing chemical preservatives, composition roofing, roofing paper, insulation, sheetrock, and glass.

Glossary

TERM	DEFINITION
commercial	Nonresidential locations from which solid waste is collected by the City's contractor. It includes the nonresidential portion of mixed-use buildings. Examples include stores, offices, restaurants, warehouses, and other non-manufacturing facilities.
commercial waste	All types of solid waste generated by stores, offices, restaurants, warehouses, and other non-manufacturing activities, excluding residential and industrial wastes.
commingled recycling	A method of recovery and/or collection where recyclable commodities are mixed together and sorted at a material recovery facility (MRF).
Compostable	A product that completely breaks down into a stable product due to the action of microorganisms in a controlled, aerobic commercial process that results in a material safe and desirable as a soil amendment meeting the compost quality standards found under WAC 173-350-220 for metals, physical parameters, pathogens, manufactured inert material, and other testing parameters set by the local Health Department, has been found to degrade satisfactorily at the composting facility receiving the material, meets standard specification ASTM D6400, and has been certified as compostable by the Biodegradable Products Institute or similar national or international certification authority.
compostable waste	Any organic waste materials that are source separated for processing or composting, such as yard waste and food waste.
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.
conditionally exempt small quantity generator (CESQG)	A dangerous waste generator whose dangerous wastes are not subject to regulation under Chapter 70A.300 RCW, Hazardous Waste Management, solely because the waste is generated or accumulated in quantities below the threshold for regulation and meets the conditions prescribed in WAC 173-303-070 (8)(b).

Glossary

TERM	DEFINITION
construction and demolition debris (C&D)	The waste material that results from construction, remodeling, repair or demolition of buildings, roads or other structures and requires removal from the site of construction and demolition. Consists of, but is not limited, to the following materials: wood, concrete, asphalt, gypsum wallboard, glass, scrap metal, and other building materials.
construction, demolition and landclearing debris (CDL)	Includes all accepted C&D material and natural vegetation and minerals, such as stumps, brush, blackberry vines, tree branches, and associated dirt, sand, tree bark, sod, and rocks.
contamination	Materials not accepted for commingled recycling or for composting that are set out for collection with recyclable or compostable materials.
dangerous waste	Solid wastes designated in WAC 173-303-070 through WAC 173-303-103 as dangerous or extremely hazardous waste. Dangerous waste is discarded, useless, unwanted, or abandoned substances, including but not limited to certain pesticides, or any residues or containers of such substances that are disposed of in such quantity or concentration as to pose a substantial present or potential hazard to human health, wildlife, or the environment because such wastes or constituents or combinations of such wastes: a) have short-lives, toxic properties that may cause death, injury, or illness or have mutagenic, teratogenic, or carcinogenic properties, or: b) are corrosive, explosive, flammable, or may generate pressure through decomposition or other means.
deconstruction	Taking apart a structure in an orderly and systematic manner to maximize salvage, reuse, and recycling.
deposit return system (DRS)	DRS programs place a small monetary deposit on a product, paid by the consumer at the time of purchase, which is refunded when the consumer returns the product packaging to a designated return location for reuse. Also called container deposit systems.
designated recyclables	Wastes separated for recycling or reuse, such as paper, metals and plastics that are identified as recyclable material pursuant to a local comprehensive solid waste plan.

Glossary

TERM	DEFINITION
detachable container	Also referred to as dumpster, it is a watertight, all-metal container, not less than one-half (½) cubic yard in capacity and equipped with a tight-fitting metal or other City-approved cover. The term also applies to containers of other material of similar size when approved by the Director of Seattle Public Utilities. Containers two (2) cubic yards and under are equipped with at least three (3) wheels.
discards	Items or materials cast aside because they are no longer wanted or needed.
disposable food serviceware	Non-compostable and non-recyclable containers, plates, "clamshells," serving trays, meat and vegetable trays, hot and cold beverage cups, wrappers, and utensils that are intended only for one-time use, including so-called biodegradable products where any portion is not compostable.
diversion	Materials that are taken out of the municipal solid waste stream by any method of recycling, composting and organics processing, energy production, or beneficial use that prevents disposition of material in landfills or incinerators.
drop box	Also referred to as "rolloff" or "lugger" or "dino," it is a metal container, of three (3) to forty (40) cubic-yard-capacity, capable of being mechanically loaded onto a collection vehicle for transport to a disposal facility.
Dumpster	Also called detachable container.
electronic waste (e-waste)	Waste products produced as a result of spent, unusable, or unwanted electronics. Examples include computer monitors, televisions, cellphones, and computers.
end market (for recycling)	A manufacturer or recycling center which accepts recyclable materials to use as feedstock in a manufacturing process.
environmental justice	The fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies.

Glossary

TERM	DEFINITION
extended producer responsibility (EPR)	A mandatory type of product stewardship that includes, at a minimum, the requirement that the manufacturer's responsibility for its product extends to post-consumer management of that product and its packaging. There are two related features of EPR policy: (1) shifting financial and management responsibility, with government oversight, upstream to the manufacturer and away from the public sector; and (2) providing incentives to manufacturers to incorporate environmental considerations into the design of their products and packaging.
flow control	A local or state government having the authority to direct municipal solid waste (MSW) to certain facilities.
food rescue	Capturing surplus food that would otherwise go to waste from grocery stores, food service businesses, and other venues by diverting it to local food banks and meal programs. Food rescue is sometimes called edible food recovery.
garbage	All discarded putrescible waste matter, including small dead animals weighing not over fifteen (15) pounds, but not including sewage or sewage sludge or human or animal excrement or yard waste.
grasscycling	Leaving grass clippings on the lawn after mowing to decompose and provide nutrients; also known as mulch mowing.
green building	The practice of creating structures and using processes that are environmentally responsible, resource-efficient, comfortable, and healthy throughout a building's life cycle from siting to design, construction, operation, maintenance, renovation and deconstruction.
green purchasing	Also known as environmentally preferable purchasing (EPP) or responsible purchasing. The procurement of products or services that cause less harm to human health and the environment when compared with competing products or services that serve the same purpose.

Glossary

TERM	DEFINITION
household hazardous waste (HHW)	Discarded liquid, solid, contained gas, or sludge, including any material, substance, product, commodity or waste used or generated in the household, regardless of quantity, that exhibits any of the characteristics or criteria of dangerous waste set forth in Chapter 173.303 WAC.
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.
leachate	A liquid that is formed when rain water filters through wastes placed in a landfill. When this liquid comes in contact with buried wastes, it leaches, or draws out, chemicals or constituents from those wastes.
light-weighting	The trend of packaging becoming lighter due to improved container design and engineering, which has made weight-based recycling rates less reliable as a measure of recycling practices because the weight of recyclables can decrease even when higher numbers of containers are recycled.
litter	Solid waste such as, but not limited to, disposable packages and containers dropped, discarded or otherwise disposed of upon any property.
material recovery facility (MRF)	Any facility that collects, sorts, processes, compacts, repackages, or bales for transport source-separated solid waste for recycling.
moderate risk waste (MRW)	Solid waste that is limited to conditionally exempt small quantity generator (CESQG) waste and household hazardous waste (HHW) as defined in Chapter WAC 173-350.
municipal solid waste (MSW)	Solid waste excluding unacceptable wastes, recyclable materials, compostable wastes, and CDL.
nonresidential waste	Solid waste that does not come from residential sources.
organics (organic materials)	Organic materials that include landscaping and yard waste, food waste, wood, and soiled/low-grade paper. While manures, crop residues, and biosolids are also organic materials, the <i>2022 Solid Waste Plan Update</i> addresses primarily organics that can be collected and processed through local processing facilities or backyard composting.

Glossary

TERM	DEFINITION
product stewardship	An environmental management strategy that means whoever designs, produces, sells, or uses a product takes responsibility for minimizing the health, safety, environmental, and social impacts of a product and its packaging throughout all life cycle stages, while also maximizing economic benefits, including end-of-life management. The manufacturer, or producer, of the product has the greatest ability to minimize adverse impacts, but other stakeholders, such as suppliers, retailers, and consumers, also play a role. Stewardship can be either voluntary or required by law.
public place	Includes streets, avenues, ways, boulevards, drives, places, alleys, sidewalks and planting (parking) strips, squares, triangles, and rights-of-way, whether open to the use of the public or not, and the space above or beneath the surface of the same.
racial equity	Racial equity is the condition that would be achieved if racial identity no longer predicted, in a statistical sense, how a person fares. Equity is the outcome, not just access to opportunity. As one part of racial justice, racial equity includes work to address root causes of inequities.
recycle / recycling	Transforming or remanufacturing waste materials into usable or marketable materials for use other than incineration (including incineration for energy recovery) or other methods of disposal
recycling rate	A weight-based metric that measures the percentage of generated waste that is diverted from the landfill by recycling and composting. Seattle also includes available reuse data in the calculation of its recycling rate
residential	Any house, dwelling, multiunit residence, apartment house, trailer court or any building put to residential use. The term does not include mixed use buildings.
residuals	Materials left over after sorting or processing that are not included in commodity bales or finished organic products. Residuals can include recyclable or compostable materials as well as contaminants.

Glossary

TERM	DEFINITION
resiliency	The ability to plan, adapt, and respond to disruptions, changes, and opportunities. For SPU, resiliency means the capacity to recover in the face of sudden or gradual stressors that impact utility services and the community.
Responsible Recycling Framework	A framework developed by the King County Responsible Recycling Task Force consisting of seven elements or practices that help define, support, and lead to a commingled curbside recycling system that produces recyclable materials that are clean and suitable for remanufacture and do not contribute to environmental pollution or endanger human health and safety.
reuse	Using an object or material again, either for its original purpose or for a similar purpose, without significantly altering the physical form of the object or material.
salvage	Recovery of valuable or useful C&D materials for reuse.
self-haul	When generators of solid waste transport their own materials to one of Seattle's transfer stations rather than using the hauling services of the Seattle's contracted haulers or a third-party. Self-haul includes residents and businesses who bring waste they create for drop-off at City-owned transfer stations. It also includes waste from nonresidential generators that do not use the City's solid waste contractors, including the Seattle Housing Authority, University of Washington, and military establishments
small quantity generator (SQG)	A business that generates of any discarded liquid, solid, contained gas or sludge, including any material, substance, product, commodity or waste that exhibits any of the characteristics or criteria of dangerous waste set forth in Chapter 173.303 WAC, but which is exempt from regulation as dangerous waste.
soil amendment	Any material, such as compost, added to soil to improve its physical, biological, and chemical properties.

Glossary

TERM	DEFINITION
solid waste	All putrescible waste and non-putrescible waste, solid, semisolid and liquid wastes, including but not limited to garbage, rubbish, yard waste, ashes, industrial wastes, infectious wastes, swill, construction, demolition and landclearing wastes, abandoned vehicles or parts thereof, and recyclable materials. This includes all liquid, solid and semisolid materials which are not the primary products of public, private, industrial, commercial, mining, and agricultural operations. Solid waste includes but is not limited to sludge from wastewater treatment plants, seepage from septic tanks, wood waste, dangerous waste, hazardous substances, and problem wastes.
Solid Waste Advisory Committee (SWAC)	An advisory committee established at the local level within each planning jurisdiction and at the state level. Assists in development of programs and policies concerning solid waste handling and disposal and to review and comment on proposed rules, policies, or ordinances prior to their adoption.
source separation	The separation of different kinds of solid waste at the place where the waste originates.
State Environmental Policy Act (SEPA)	A way to identify possible environmental impacts that may result from governmental decisions.
sustainability	Meeting the needs of the present without compromising the ability of future generations to meet their own needs.
sustainable materials management	An approach to minimize negative health and environmental impacts of materials along their entire life cycle including design, manufacturing, and use—not just end-of-life.
transcreation	A culturally relevant translation conducted with the help of audience research. Where translation simply changes words into another language, transcreation ensures the meaning is clear, appropriate, and relevant in another culture.
transfer station	A permanent, fixed, supplemental collection and transportation facility used by persons and route collection vehicles to deposit collected solid waste from offsite into a larger transfer vehicle for transport to a solid waste handling facility.

Glossary

TERM	DEFINITION
triple-bottom line	An accounting framework that incorporates three dimensions of performance: social, environmental, and financial
unacceptable waste	All waste not authorized for disposal at the Columbia Ridge Landfill and Recycling Center or successor site designated by the City, by those governmental entities having jurisdiction or any waste the disposal of which would constitute a violation of any governmental requirement pertaining to the environment, health or safety. Unacceptable Waste includes any waste that is now or hereafter defined by federal law or by the disposal jurisdiction as radioactive, dangerous, hazardous or extremely hazardous waste and vehicle tires in excess of those permitted to be disposed of by the laws of the disposal jurisdiction.
waste characterization	The composition and ratio of materials in the total waste stream. Also sometimes referred to as a “waste audit.”
waste management hierarchy	The prioritization of methods for managing solid and hazardous waste that places reducing waste at the highest priority, followed by recycling, and safe disposal.
waste prevention	Also sometimes referred to as waste reduction or “precycling.” The practice of minimizing waste through responsible purchasing and consumerism. Essentially, removing waste from the waste stream by not creating it in the first place.
yard waste	Plant material (leaves, grass clippings, branches, brush, flowers, roots, wood waste, etc.); debris commonly thrown away in the course of maintaining yards and gardens, including sod and rocks not over four (4) inches in diameter; and biodegradable waste approved for the yard waste programs.

Glossary

TERM	DEFINITION
zero waste	<i>Definition from 2021–2026 SPU Strategic Plan:</i> Zero Waste means we strive for a waste-free society by creating new practices and policies to reduce or reuse waste and build an economy where the continual use of resources is supported. <i>Definition from Zero Waste International:</i> The conservation of all resources by means of responsible production, consumption, reuse, and recovery of products, packaging, and materials without burning and with no discharges to land, water, or air that threaten the environment or human health.



Executive Summary

Executive Summary

An international leader in solid waste management for decades, Seattle has advanced a zero-waste vision thanks to public support for environmentally focused programs and thoughtful planning. Today, Seattle's vision of a zero waste future builds toward an inclusive and circular economy, where all materials with value are reused or recycled, and nothing is wasted. To advance toward zero waste, Seattle looks at the whole life cycle of how products and packaging are made to eliminate waste and toxics, prevent pollution, reduce carbon emissions, and conserve natural resources from the start.

Seattle's life cycle view of materials reflects industrywide shifts toward solid waste management approaches focused on preventing waste in the first place. We get closer to zero waste by producing and using less. That is why Seattle's *2022 Solid Waste Plan Update: Moving Upstream to Zero Waste (2022 Plan Update)* prioritizes waste prevention in solid waste system planning. As part of our emphasis on waste prevention, Seattle will work to address the root causes of waste to reduce impacts on health and the environment.

Though Seattle plans for a zero-waste future in which resources with value stay out of the landfill, we will have to continue to manage some garbage, recycling, and organic materials. The *2022 Plan Update* describes how Seattle will manage and finance waste management services and facilities over the next six years, and projects system management needs over 20 years. The *2022 Plan Update*:

- Highlights historic solid waste trends, including progress toward goals, and details solid waste system projections
- Describes how Seattle advances waste prevention and diversion from landfill through policy, customer outreach and education, investments in the circular economy, and enforcement of solid waste rules, regulations, and contracts
- Describes the solid waste system and how Seattle provides essential solid waste management services to about 750,000 people in the City
- Recommends 39 actions for Seattle to continue innovating in solid waste management



The zero waste component of Seattle Public Utilities' vision (Source: 2021–2026 SPU Strategic Business Plan)

- Suggests creating new goals consistent with Seattle's growing emphasis on reducing waste at the source

The *2022 Plan Update* reflects goal areas and guiding principles that are at the center of Seattle's work:

- Understanding and responding to customers and community
- Ensuring affordability and accountability
- Addressing risk and resilience
- Enhancing equity and empowerment
- Delivering service and safety

With the *2022 Plan Update*, Seattle aligns its waste-related goals not only with the City Council-adopted [*SPU Strategic Business Plan \(2021-2026\)*](#), but also with the City's sustainability and climate goals in the [*Climate Action Plan \(2013\)*](#), as well as the overarching vision of a [*Washington State's Solid and Hazardous Waste Plan - "Moving Washington Beyond Waste and Toxics" \(2021\)*](#).¹

Working alongside partners in the community and in the solid waste industry, Seattle is leading the way to zero waste and toward a healthier, more sustainable, and inclusive way of managing resources.

Recommendations

The table on the following page lists the 39 recommendations described in the *2022 Plan Update*. Recommendations cover either a short-term planning period within the next five years, or a long-term planning period of five or more years.

¹ https://www.seattle.gov/Documents/Departments/SPU/AboutUs/SBP_2021-2026.pdf
http://www.seattle.gov/Documents/Departments/Environment/ClimateChange/2013_CAP_20130612.pdf
<https://apps.ecology.wa.gov/publications/documents/1504019.pdf>

Seattle's 2022 Solid Waste Plan Update

Executive Summary

Recommendation	Short-Term (S) / Long-Term (L)	Chapter and Page
Overarching		
Rec 01. Lead with race and incorporate racial justice in solid waste programs, education, and outreach in support of SPU's commitment to providing racially equitable, inclusive, and culturally competent services.	S	1.24
Maximizing and Measuring Impact		
Rec 02. Keep developing overarching goals consistent with waste prevention and reduction activities instead of continuing to emphasize recycling rate goals focused on diversion.	S	2.13
Rec 03. Expand solid waste data analytics, metrics, and evaluation to improve assessment of services and operations.	S	2.25
Waste Prevention and Reuse		
Rec 04. Prioritize and support waste prevention with program research, data analysis, and metrics.	S	4.6
Rec 05. Increase community awareness of waste prevention through coordinated outreach.	S	4.7
Rec 06. Expand food waste prevention to reduce food waste.	S	4.17
Rec 07. Expand efforts to rescue safe, edible food from the waste stream by getting it to those that need it most.	S	4.18
Rec 08. Reduce single-use items and promote durable or reusable alternatives.	S	4.30
Rec 09. Expand support for community organizations working to prevent waste.	S	4.34
Rec 10. Expand support of the City's sustainable and green purchasing policies.	S	4.42
Rec 11. Explore and expand market opportunities for reused material and repair services.	S	4.46
Rec 12. Promote and support waste prevention for textiles and monitor emerging textiles recycling technologies.	L	4.47
Recycling and Composting Policy and Markets		
Rec 13. Advocate for responsible recycling policies recommended by the Responsible Recycling Task Force.	S	5.14
Rec 14. Continue and expand efforts to reduce the amount of contamination, or non-recyclable material, in the recycling and food and yard waste.	S	5.14
Rec 15. Support market and infrastructure development for recycling.	S	5.18
Rec 16. Continue to explore and implement product stewardship policies and programs that require producers, manufacturers, and/or retailers to take back and recycle the products they sell.	S	5.35
Rec 17. Continue to support and expand industry-led, voluntary retail take-back of plastic wrap and bags.	S	5.36
Rec 18. Require all single-use food service packaging to be compostable and harmonize acceptance standards for compostable products.	S	5.40
Rec 19. Continue to refine and develop strategies to keep more food waste and compostable paper out of the garbage.	S	5.41
Rec 20. Continue to support market development for compost products.	S	5.41
Rec 21. Assess options for diaper and pet waste recovery.	L	5.42

Seattle's 2022 Solid Waste Plan Update

Executive Summary

Recommendation	Short-Term (S) / Long-Term (L)	Chapter and Page
Solid Waste Handling, Collection, and Removal		
Rec 22. Conduct research to inform future collection, processing, and disposal contracts.	L	6.22
Rec 23. Adopt collection infrastructure incentives or requirements in multifamily construction to ensure tenants have sufficient solid waste services and convenient access to solid waste containers.	S	6.22
Rec 24. Explore collection infrastructure requirements for new construction of townhomes and live-work units.	S	6.23
Rec 25. Improve alley and public right-of-way access for collection vehicles.	S	6.23
Rec 26. Expand the Clean City education campaign to increase awareness of the City's litter and cleanup programs.	L	6.30
Solid Waste Transfer, Processing, Disposal, and Emergency Management		
Rec 27. Continue to explore opportunities for adaptive reuse of historic landfills, including opportunities to control costs at closed landfills and to bring the land into productive use.	S	7.25
Construction and Demolition Debris		
Rec 28. Expand construction and demolition debris industry outreach and education.	S	8.7
Rec 29. Improve enforcement of and incentives for compliance with construction and demolition system rules.	S	8.7
Rec 30. Promote salvage and deconstruction for reusable building materials.	S	8.9
Rec 31. Require deconstruction (instead of demolition) for select project sizes and/or project types to increase construction and demolition debris recovery.	S	8.9
Rec 32. Expand recycling market development construction and demolition debris to support diversion of these materials from landfill.	S	8.21
Rec 33. Enhance diversion of construction and demolition debris at transfer stations.	S	8.21
Outreach, Education, Code Enforcement, and Compliance Support		
Rec 34. Continue and expand use of large, color-coordinated, multilingual, and icon-based container decals to encourage proper sorting of waste.	S	9.11
Rec 35. Continue and expand use of available metrics to inform outreach strategy and measure outcomes.	S	9.19
Rec 36. Continue participating in the regional Communication Consortium to unify solid waste messaging between Seattle and King County municipalities.	S	9.20
Rec 37. Expand waste prevention and diversion outreach and education in schools.	S	9.21
Rec 38. Expand efforts to increase compliance with solid waste code and requirements across customer sectors.	S	9.30
Administration and Financing of the Solid Waste System		
Rec 39. Continue to regularly review rates to ensure they provide incentives for program success, are set equitably, and balance affordability and program costs.	L	10.16



1

Development of the 2022 Solid Waste Plan Update

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Chapter 1 Development of the 2022 Solid Waste Plan Update

Overview

Guided by zero waste principles since at least 1998, the City of Seattle has built a reputation as an international leader in solid waste management. Among many achievements, Seattle has reduced City waste generation and disposal to a landfill and increased recycling and composting despite tremendous population growth. Seattle can credit its pace-setting role to public support for new and environmentally focused programs and policies combined with Seattle Public Utilities' (SPU's) thoughtful planning. The City's newest solid waste comprehensive plan, the *2022 Solid Waste Plan Update: Moving Upstream to Zero Waste (2022 Plan Update)*, represents another step forward on the path toward zero waste.

The *2022 Plan Update* reflects Seattle's increased emphasis on eliminating or minimizing waste from the start. Using frameworks that consider the entire life cycle of materials, from extraction of natural resources to final disposal, the City is working to identify opportunities for preventing waste as early or as far "upstream" in that life cycle as possible to reduce environmental and health impacts.

This chapter provides background on the development of the *2022 Plan Update*, including context for Seattle's increased emphasis on eliminating or minimizing waste from the start. Specifically, this chapter discusses:

- Progress implementing recommendations from the *2011 Solid Waste Plan Revision*
- New key laws and policies affecting solid waste management since the *2011 Solid Waste Plan Revision*



*Materials Lifecycle Perspective Graphic
(Source: EPA)*

Chapter 1 – Development of the 2022 Solid Waste Plan Update

- Material sustainability and responsible recycling frameworks that Seattle is using to place greater emphasis on approaches that prevent waste in the first place
- Goal areas that guide the *2022 Plan Update's* approach to solid waste management, with special emphasis on supporting racial equity in Seattle and resiliency of the solid waste management system
- A recommendation for making racial equity central to solid waste planning
- Collaborators who helped develop the recommendations in this plan and who will be responsible for implementing it
- SPU's process for developing the *2022 Plan Update* recommendations based on qualitative and quantitative data analysis and stakeholder input
- Improving measurement of waste prevention and reduction efforts, environmental impacts, and program performance



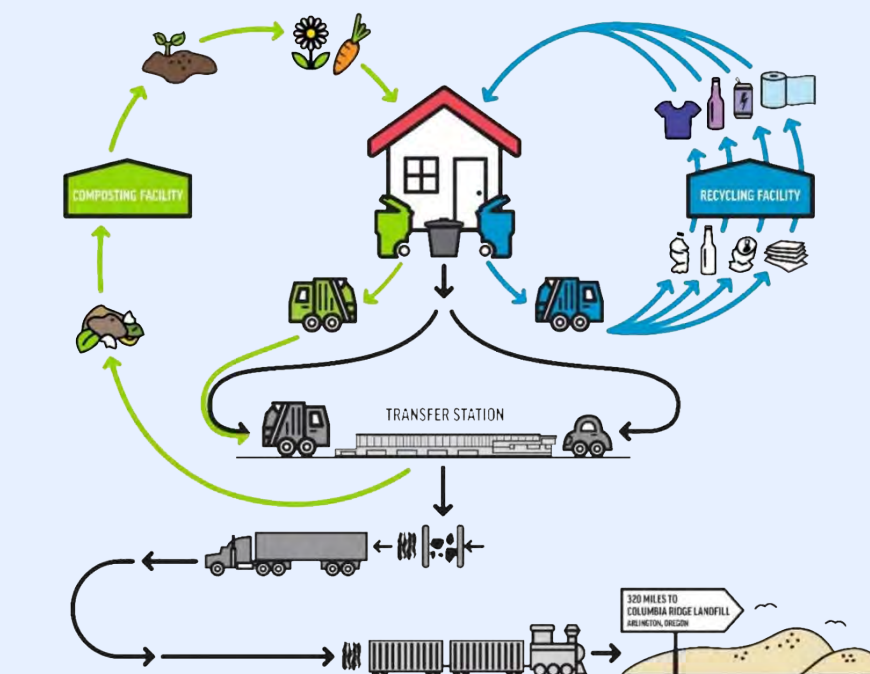
Food waste collection bags ready for Clear Alleys Program collection service next to public space waste containers (Source: SPU Image Library)

In Brief: Solid Waste Management in Seattle

Seattle Public Utilities provides high quality solid waste services that promote public health and safety, quality of life, and environmental stewardship. In 2020, Seattle's solid waste system handled more than 700,000 tons (1.4 billion pounds) of recycling, composting, and garbage created by the City's residents, workers, and visitors. Construction and demolition projects in Seattle generated another 560,000 tons (1.12 billion pounds) of solid waste.¹

SPU manages contracts with private companies who collect recyclables, compostable materials, and garbage from residential and nonresidential customers. Recycling and composting materials are taken to processing facilities. The contractors deliver garbage to SPU's transfer stations where, along with waste from self-haulers and small contractors, it is compacted and put in sealed shipping containers, which are then transported by rail to a privately-owned regional landfill in eastern Oregon for final disposal.

The City owns and operates two transfer stations, two household hazardous waste facilities, a fleet of trucks and heavy equipment, and several closed landfills. The Solid Waste Capital Improvement Plan (CIP) supports the transfer stations, heavy equipment, and post-closure projects on landfills previously used by the City.



Seattle's solid waste system from the residential perspective (source: Seattle Public Utilities)

Along with waste handling and disposal activities, the Solid Waste Utility within SPU engages its customers in environmental sustainability programs and policies that promote waste prevention, recycling, and composting. SPU also works to keep Seattle clean by targeting illegal dumping, supporting community cleanups, and providing public litter and recycling cans across Seattle.

¹ Seattle Public Utilities, "Just the Facts – 2020," 2021, [https://www.seattle.gov/documents/Departments/SPU/AboutUs/SPU-Just the Facts.pdf](https://www.seattle.gov/documents/Departments/SPU/AboutUs/SPU-Just%20the%20Facts.pdf).

Plan Organization

The *2022 Plan Update* contains 10 chapters that describe different elements of Seattle's solid waste planning and system. Within the chapters, Seattle offers 39 recommendations for solid waste programs and policies, as the City continues to pursue environmental, economic, and social goals. Chapter contents are described below:

- 1 Development of the 2022 Solid Waste Plan Update** provides an overview of how Seattle created the *2022 Plan Update* and the recommendations to implement in the next six years.
- 2 Maximizing and Measuring Impact** describes Seattle's increasing emphasis on preventing waste in the first place and adjusting solid waste goals accordingly.
- 3 Solid Waste Data and Trends** describes Seattle's data-driven approach to waste management and summarizes the factors that influence waste generation. It also presents historic waste trends, composition data, and forecasts for waste generation and recycling.
- 4 Waste Prevention and Reuse** describes Seattle's work to reduce the amount of waste generated through food waste prevention, reducing single-use items, industry and community partnerships, natural yard care, reuse, and other efforts.
- 5 Recycling and Composting Policy and Markets** describes the policies that define what materials must be collected for recycling and composting in Seattle, the impacts of and Seattle's actions to ensure access to recycling markets, and the role of extended producer responsibility and voluntary product stewardship in Seattle's solid waste system.
- 6 Solid Waste Handling, Collection, and Removal** describes the system to collect solid waste from residential, commercial, and self-haul customers and to address litter and illegal dumping. It also briefly describes SPU's hazardous waste drop-off sites.
- 7 Solid Waste Transfer, Processing, Disposal, and Emergency Management** describes how collected solid waste is transferred to and managed at recycling and compost facilities or at the landfill that accepts discarded material for final disposal. It also describes Seattle's plans to manage waste during emergencies.
- 8 Construction and Demolition (C&D) Debris** describes Seattle's policies to encourage prevention, reuse, and recycling of C&D debris. It also describes the collection, processing, and disposal system for C&D debris generated in Seattle.
- 9 Outreach, Education, Enforcement, and Compliance Support** describes how SPU communicates with its customers, uses outreach and education to promote waste prevention and recycling, and supports compliance with Seattle solid waste codes and contracts.
- 10 Administration and Financing of the Solid Waste System** describes how Seattle administers and finances solid waste services and facilities and details current and projected revenues and rates.

Planning Background

The *2022 Plan Update* updates Seattle's *2011 Solid Waste Plan Revision: Picking Up the Pace Toward Zero Waste (2011 Plan Revision)*, which City Council adopted in 2013. The *2022 Plan Update* builds on the momentum created by the successful implementation of many of the recommendations in the *2011 Plan Revision* and the lessons learned from the recommendations that SPU could not implement.

Prior to the *2022 Plan Update*, the *2011 Plan Revision* proposed 116 recommendations to enhance solid waste management in Seattle. SPU has studied, is on track to complete, or has implemented all 116 of those recommendations. In addition to the top accomplishments highlighted below, Seattle has continued to evaluate and improve its customer programs; incentivize diversion; conduct outreach, education, and enforcement efforts; engage in an ongoing regional partnership to improve recycling quality; and provide essential collection, processing, transfer, and disposal services to Seattle residents and businesses. Appendix A, *Planning History and Progress on Prior Recommendations*, documents the status of all 116 recommendations from the *2011 Plan Revision*.

Top Accomplishments Since the 2011 Plan Revision

Waste prevention

- Offered junk mail and yellow pages directory opt-out services to reduce paper use, which noticeably reduced Seattle's waste and recycling quantities.
- Passed a local plastic bag ban that reduced the use of plastic bags, increased the use of reusable alternatives, and served as a model for other cities in Puget Sound and beyond.

Recycling quantity, quality, and access

- Helped pass a statewide law to reduce contamination in compost by making it easier for consumers to tell compostable and non-compostable packaging apart.
- Implemented universal multifamily food and yard waste collection service to encourage composting of food waste and compostable food packaging for these residents.
- Added food waste and compostable paper to single-family and commercial food and yard waste disposal bans to increase diversion of compostable materials from landfill.
- Banned disposal of plastic film in construction and demolition debris.
- Banned disposal of asphalt, bricks, and concrete paving at construction jobsites and City and private transfer stations.
- Banned disposal of clean wood at construction jobsites and private transfer stations.

Policy solutions for problem waste materials

- Supported development of the regional manufacturer-financed Secure Medicine Return program that provides secure ways to dispose of unwanted medications, prevents them from polluting waterways, and reduces accidental poisonings and drug abuse. Effective 2021, this program is now offered statewide as the Safe Medicine Return Program.
- Played a key role in creating a manufacturer-financed paint recycling take-back program for Washington State.
- Helped pass a statewide extended producer responsibility law creating a recycling take-back program for mercury-containing lighting.

Solid waste system operations

- Rebuilt both the North and South Transfer Stations to increase the size and flexibility of both facilities; met LEED Gold standards at both new facilities with green energy, water, and stormwater infrastructure; improved safety, odor control, noise control, and improved traffic flow; and added education and public access areas to enhance community access and improve service to customers.
- Added a recycling facility at the North Transfer Station to provide convenient options to divert recyclable or reusable material from landfill.
- Developed and awarded new collection and recycling processing contracts that include innovative provisions, such as a requirement to use electric or renewable-fuel vehicles in support of Seattle's climate action goals.

Plan Development

Building on the *2011 Plan Revision*, the *2022 Plan Update* considers new developments in the solid waste industry and in social, environmental, and economic concerns over the past 10 years. The following sections provide background on how Seattle developed the *2022 Plan Update*. These sections detail:

- Regulations, policies, and related plans with which the *2022 Plan Update* aligns
- Material sustainability and responsible recycling frameworks that inform solid waste management in Seattle
- Government entities, the Solid Waste Advisory Committee, other community members, and interest groups interested in solid waste management with whom Seattle collaborated to create the *2022 Plan Update* and who have responsibility for authorizing or implementing it

Regulations, Policies, and Related Plans

The *2022 Plan Update* must comply with solid waste planning requirements outlined in the Revised Code of Washington (RCW) and provide a roadmap for solid waste management and facilities in Seattle for the next six years, with an outlook toward the next 20 years. Various state and local regulations, guidelines, and plans influence Seattle's solid waste planning. Because many of these documents have been amended since Seattle's *2011 Plan Revision*, SPU reviewed them for potential impacts on the solid waste system, including:

- Seattle's *Climate Action Plan* (2013)
- Washington State *Contamination Reduction and Outreach Plan* (2020)
- Seattle Public Utilities' *Strategic Business Plan* (2021—2026)
- Washington's *State Solid and Hazardous Waste Plan: Moving Washington Beyond Waste and Toxics* (2021)

The following sections detail these four key plans.²

² SPU also reviewed other plans and regulations, including [Seattle's Comprehensive Plan](#), to determine that they align with or do not alter SPU's Plan or current programming. These appear in Appendix C, *Plans and Regulations Consulted*.

Seattle's Climate Action Plan

Seattle's [Climate Action Plan](#) focuses on City actions that reduce greenhouse gas (GHG) emissions while supporting vibrant neighborhoods, economic prosperity, and social equity.³⁴ Actions focus on three areas of greatest need and impact: road transportation, building energy, and waste. In the area of waste, the Climate Action Plan explains why the waste sector is important for reducing emissions and outlines a set of actions to achieve by 2015 and 2030, respectively, to help achieve the City's goal of a 58% reduction in GHG emissions by 2030.

The Climate Action Plan organizes actions around reducing emissions from waste into three categories: 1) waste reduction and product stewardship, 2) recycling and composting, and 3) collection, processing, and disposal. The Climate Action Plan, for the first time in the city's history, drew attention to GHG emissions associated with waste and offers actions for how to reduce or avoid them. Further discussion of SPU's efforts to measure GHG emissions from waste appears in Chapter 2, *Maximizing and Measuring Impact: Moving Upstream Beyond the Recycling Rate*.

Washington State Recycling Contamination Reduction and Outreach Plan (CROP)

In 2019, Governor Inslee signed House Bill 1543 into law to improve recycling quality. The act required Ecology to "create and implement a statewide recycling contamination reduction and outreach plan based on best management practices." The State's contamination reduction and outreach plan provides guidance to help local jurisdictions examine contamination in their recycling programs and to develop local contamination reduction and outreach plans.⁵ As a city with its own solid waste management plan, Seattle created a contamination reduction and outreach plan by July 1, 2021. Seattle's contamination reduction and outreach plan appears in Appendix B, *Contamination Reduction & Outreach Plan*.

³ http://www.seattle.gov/Documents/Departments/Environment/ClimateChange/2013_CAP_20130612.pdf

⁴ City of Seattle, "Climate Action Plan," June 2013, www.seattle.gov/Documents/Departments/Environment/ClimateChange/2013_CAP_20130612.pdf.

⁵ Washington State Department of Ecology, "Washington State Recycling Contamination Reduction and Outreach Plan (CROP)," September 2020, apps.ecology.wa.gov/publications/documents/2007021.pdf.

Seattle Public Utilities' Strategic Business Plan

SPU's [2021–2026 Strategic Business Plan](#) (SBP) sets the priorities of the utility and contains a three-year rate path designed to provide customers with predictable rates while ensuring long-term sustainability and excellent utility services.⁶ SPU revisits the *Strategic Business Plan* every three years to adjust the rate path, if necessary.

The SBP includes SPU's vision and mission statements and describes the desired outcomes for its customers as well as strategies to achieve these outcomes. The *Strategic Business Plan* also outlines SPU's guiding principles, along with four focus areas for the utility: 1) delivering equitable essential service; 2) stewarding environment and health; 3) empowering our customers, community, and employees; and 4) strengthening the utility's business practices. This *2022 Plan Update* echoes these guiding principles.

Our Mission:

Seattle Public Utilities fosters healthy people, environment, and economy by partnering with our community to equitably manage water and waste resources for today and for future generations.

Our Vision:

COMMUNITY Centered,
ONE Water, ZERO Waste

CARES Principles:

Customers and Community
Affordability
Risk and Resilience
Equity and Empowerment
Service and Safety

Washington State Solid Waste Plan

In 2021, the Washington State Department of Ecology (Ecology) updated the *State Solid and Hazardous Waste Plan*, subtitled *Moving Washington Beyond Waste and Toxics*.⁷ The state's plan uses a sustainable materials management approach like the U.S. Environmental Protection Agency and the Oregon Department of Environmental Quality, explaining, "By managing materials that become waste through all stages of their life cycle, we are best able to reduce harmful environmental, health, and climate effects." Sustainable materials management is discussed in more detail later in this chapter on page 1.13.

State priorities are to mitigate climate change through reducing waste, focus upstream on manufacturing and use, reduce toxic threats in products and industrial processes, and maximize the effectiveness of recycling systems (see Figure 1.1). SPU's plans to address these priorities are described throughout this *2022 Plan Update*, particularly in Chapter 3, *Seattle Waste Data and Trends*, and Chapter 4, *Waste Prevention and Reuse*.

⁶ Seattle Public Utilities, "2021–2026 Strategic Business Plan," 2021, www.seattle.gov/Documents/Departments/SPU/AboutUs/SBP_2021-2026.pdf.

⁷ Washington State Department of Ecology, "State Solid and Hazardous Waste Management Plan," 2021, ecology.wa.gov/Regulations-Permits/Plans-policies/Washington-state-waste-plan.

Figure 1.1 Washington 2021 Statewide Solid Waste Plan Vision and Priorities



Source: Ecology, “2021 State Solid and Hazardous Waste Management Plan”

Related to the State’s priorities on focusing upstream, beginning in 2019, Ecology de-emphasized the recycling rate as a primary measure of progress in favor of lowering waste generation.⁸ Waste reduction generally results in lower GHG emissions than recycling and other waste management scenarios. The State has also set a quantitative goal to reduce food waste by 50% by 2030, compared to 2015. Seattle supports Ecology goals and plans to expand its metrics beyond the recycling rate to better measure waste prevention and the environmental benefits and impacts of solid waste in Seattle.

Other Related Plans and Regulations

SPU also reviewed changes in other related plans and regulations and determined that they align with or do not alter Seattle’s current programming or *2022 Plan Update*. These plans and regulations are listed in Appendix C, *Plans and Regulations Consulted*.

The next section discusses the frameworks guiding solid waste planning and management in Seattle. A life cycle perspective underlies many of these frameworks and helps Seattle understand how materials are used and how they impact people and the environment.

⁸ Washington State Department of Ecology, “Changes in Washington State’s Solid Waste Metrics—FAQ,” April 2019, www.ezview.wa.gov/Portals/_1962/Documents/Water2Resources/SWAC19-05MetricsChangesFAQ.pdf.

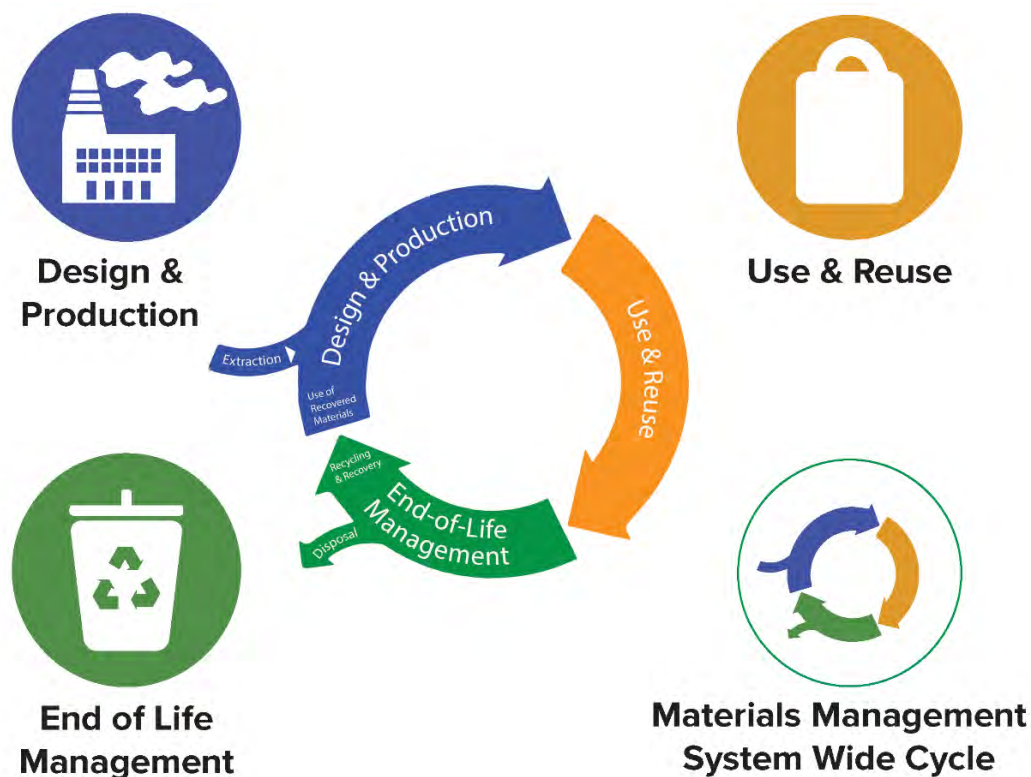
Material Sustainability and Responsible Recycling Frameworks

For 30 years, Seattle has sought to examine externalities, considering greenhouse gas emissions reductions, and other environmental and public health impacts to make decisions around solid waste management. For example, SPU has historically used life cycle assessment as a decision-making tool. Life cycle assessment is a technique used to quantitatively evaluate environmental impacts associated with some of (or ideally all) the stages of a product's life from raw material extraction through materials processing, manufacture, distribution, use, repair and maintenance, and disposal or recovery.

Increasingly, Seattle has focused on minimizing waste further upstream in the life cycle of a given material to reduce its environmental and human health impacts. Instead of focusing on end-of-life management of waste such as recycling or disposal, Seattle and other solid waste industry leaders, like the EPA, the Oregon Department of Environmental Quality, and the Washington State Department of Ecology, have shifted toward considering the impacts of the full life cycle of materials used to make products and packaging.

A life cycle view of materials considers the environmental and social impacts, such as climate-changing GHG emissions and their impacts on communities, throughout the entire life cycle—not just at the end of it. A material's full life cycle includes material design; extraction of raw materials or reuse of recovered materials; material production and transport; material use and repair; and end-of-life management of materials. With a wholistic view of materials, Seattle's evolving approach to waste management places even more emphasis on preventing waste in the first place to minimize environmental and social impacts of waste.

Figure 1.2 Materials Management Life Cycle



Source: Ecology, "2015 State Solid and Hazardous Waste Management Plan"

Several material sustainability frameworks that reflect this life cycle approach inform Seattle's circular view of materials and growing emphasis on waste prevention and minimizing environmental impacts. Though they contain overlapping elements, each framework offers a slightly different and useful perspective. The following sections describe key material sustainability frameworks that inform Seattle's solid waste strategies.

Sustainable Materials Management

Sustainable materials management aims to minimize negative health and environmental impacts of materials along their entire life cycle including design, manufacturing, and use—not just end-of-life (see Figure 1.2). With a sustainable materials management framework, solid waste planners look not only at recycling and disposal issues, but also at ways to use less energy, water, and toxics during material production and use because the environmental impact of upstream activities is often greater than that of waste management downstream. This framework reflects a gradual shift in approach and priorities underway in the solid waste management industry to identify and address the global and broad environmental impacts that the full life cycle of materials has on the planet.

Seattle's 2022 Solid Waste Plan Update

Chapter 1 – Development of the 2022 Solid Waste Plan Update

Since 2015, Ecology has used sustainable materials management as a framework in statewide solid waste planning to reduce waste and toxics.⁹ Seattle's *2022 Plan Update* similarly aligns with materials frameworks that consider the entire life cycle of materials. Seattle follows trends in both the upstream and downstream portions of the material management life cycle. Upstream examples include shifts toward lighter-weight packaging materials in the processing and manufacturing stage, and the impact of fast fashion and online retail growth on overall waste generation in the use or consumption stage. These types of changes in the marketplace inform Seattle's development of waste prevention strategies and actions.



Source: Ecology, "2015 State Solid and Hazardous Waste Management Plan"

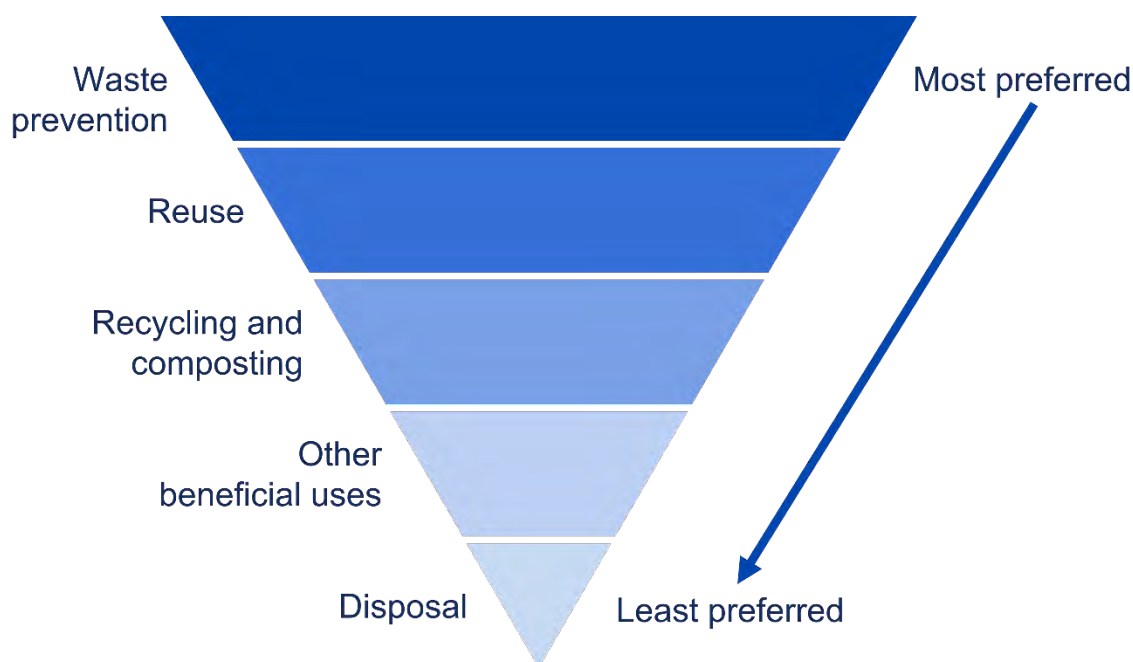
⁹ Washington State Department of Ecology, "The State Solid and Hazardous Waste Plan: Moving Washington Beyond Waste and Toxics," June 2015, fortress.wa.gov/ecy/publications/documents/1504019.pdf.

The Waste Management Hierarchy

The sustainable materials management framework was built on the waste management hierarchy, which ranks materials management strategies from most to least environmentally preferred. This hierarchy aligns with the sustainable materials management framework, emphasizing waste prevention as the preferred option for minimizing impacts associated with resource extraction and materials production and use.

There are many versions of the waste management hierarchy. The United States Environmental Protection Agency (EPA) hierarchy prioritizes waste prevention (including source reduction and reuse) first.¹⁰ Washington has adopted a similar waste management hierarchy, codified in [RCW 70A.205.005](#), which defines the solid waste management goals and priorities for the State.¹¹ Like Ecology and the EPA, Seattle has increasingly prioritized waste prevention and reuse as the key strategy to reduce the impacts of materials on the environment and human health. Seattle's priorities for managing solid waste, aligned with state and federal priorities, are shown in Figure 1.3.

Figure 1.3 Solid Waste Management Hierarchy



Source: Cascadia Consulting Group for Seattle Public Utilities, aligned with Ecology and EPA hierarchies

¹⁰ U.S. EPA, "Sustainable Materials Management: Non-Hazardous Materials and Waste Management Hierarchy," n.d., Accessed October 2021, www.epa.gov/smm/sustainable-materials-management-non-hazardous-materials-and-waste-management-hierarchy.

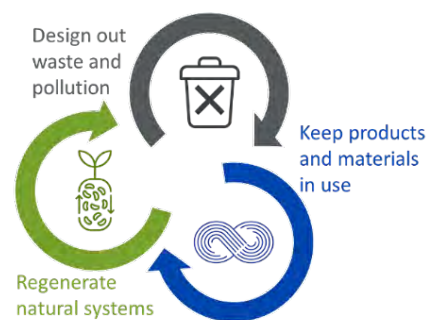
¹¹ <https://app.leg.wa.gov/RCW/default.aspx?cite=70A.205.005>

Ecology also developed a hierarchy specific to food, yard, and wood waste management. Waste prevention (labeled as “source reduction” in Ecology’s organics management hierarchy) is the most preferred method. The next management strategy is feeding people, feeding animals, onsite food and yard waste management, such as backyard composting, offsite food and yard waste management including large-scale commercial composting, and landfill or incineration disposal, both with and without energy recovery.¹²

Outside of the formal waste management hierarchy, solid waste can escape into the environment through improper disposal such as litter, illegal dumping, open burning, and marine debris. Even waste that is originally managed properly can escape during transport, disposal, or recycling and create environmental impacts. Managing waste within the hierarchy and minimizing improper disposal is an important part of meeting environmental goals, reducing impacts of waste management activities, mitigating unintended consequences, such as from plastic pollution, and ensuring materials end up in their highest and best use when they are discarded.

Circular Economy

Circular economy is a newer framework related to sustainable materials management. A circular economy is an alternative to a traditional, extractive linear economy (take → make → dispose) that instead keeps resources in use for as long as possible by designing out waste and regenerating natural systems. In a circular economy, end waste products become inputs for new production. The concept of circular economy has been advanced and popularized by the [Ellen MacArthur Foundation](https://ellenmacarthurfoundation.org/) and applied in its New Plastic Economy work.¹³ The framework has also been adopted by a wide range of business and government interests, including the [Seattle Good Business Network](https://seattlegood.org/).¹⁴



*Ellen MacArthur Foundation's principles for a circular economy
(Source: Cascadia Consulting Group for SPU)*

¹² Washington State Department of Ecology, “Washington State Preferred Organics Management Hierarchy,” October 2016, ecology.wa.gov/Waste-Toxics/Reducing-recycling-waste/Waste-reduction-programs/Organic-materials#gallery.

¹³ <https://ellenmacarthurfoundation.org/>

¹⁴ <https://seattlegood.org/>

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The Ellen MacArthur Foundation notes three underlying principles for a circular economy framework:¹⁵

- 1 Design out waste and pollution
- 2 Keep products and materials in use
- 3 Regenerate natural systems



In Seattle, glass recycling is an example of a local circular economy:

[Strategic Materials, Inc.](#)¹⁶ processes

glass from Seattle's curbside recycling stream and [Ardagh Group](#), a global supplier of recyclable glass packaging, uses it to manufacture glass bottles.¹⁷ SPU is working to identify and promote opportunities for similar circular material processing models at the local level.

Linear compared to circular economy (Source: petovarga, Shutterstock)



Glass sorted by color for recycling at Strategic Materials, Inc. in Seattle (Source: SPU Image Library)

¹⁵ Ellen MacArthur Foundation, "What is a Circular Economy?"
<https://www.ellenmacarthurfoundation.org/circular-economy/concept>.

¹⁶ <https://www.smi.com/>

¹⁷ <https://www.ardaghgroup.com/>

Zero Waste

Where circular economy focuses on minimizing waste through changing product design, manufacture, and recovery, the concept of zero waste takes an even broader view to reduce consumption overall—not just making production more efficient. Like the sustainable materials management framework, zero waste considers the full life cycle of materials while seeking to eliminate—not just minimize—waste. Internationally, the [Zero Waste International Alliance](#) defines zero waste as:¹⁸

The conservation of all resources by means of responsible production, consumption, reuse, and recovery of products, packaging, and materials without burning and with no discharges to land, water, or air that threaten the environment or human health.

To advance zero waste, Seattle adopted the *Zero Waste Resolution* (30990) in 2007 and reaffirmed it in 2012 as part of the *2011 Plan Revision*.¹⁹ The *Zero Waste Resolution* established goals and actions in support of zero waste, including recycling rate targets and a waste prevention goal. With increasing emphasis on waste prevention, Seattle will revisit the goals of the *Zero Waste Resolution*, which focused on improving recycling.

More recently, SPU has set its own zero waste vision in SPU's *Strategic Business Plan Update* (2021—2026) that focuses on waste prevention and waste reduction:

All resources have value, and we strive to waste nothing. We must look at the whole life cycle of materials so we can eliminate waste, prevent pollution, encourage product durability and reusability, conserve natural resources, and ultimately build a circular and inclusive economy.

Zero Waste protects health and the environment through the conservation of all resources from production through consumption without burning or pollution to land, water, or air.

Seattle's commitment to zero waste reinforces its increasing emphasis on waste prevention and minimizing life cycle environmental impacts, not just maximizing the recycling rate. Chapter 2 provides more discussion on how shifting to prioritize waste prevention will impact Seattle's solid waste goals.

¹⁸ Zero Waste International Alliance, "Zero Waste Definition," 2018, <http://zwia.org/zero-waste-definition>.

¹⁹ Seattle City Council, "Zero Waste Resolution 30990," June 2007, <http://clerk.ci.seattle.wa.us/search/results?s1=&s3=30990&s2=&s4=&Sect4=AND&l=20&Sect2=THESON&Sect3=P&Sect5=RESNY&Sect6=HITOFF&d=RESF&p=1&u=%2F~public%2Fresny.htm&r=1&f=G>.

Responsible Recycling

While waste prevention is essential, recycling will remain part of Seattle's waste management system as an option to recover materials used to manufacture new products and reduce the need to extract raw materials to make new products. In the responsible recycling framework, participants in the solid waste system take responsibility for the waste and recyclables they generate so that the recyclables are sorted, processed, and, if necessary, disposed in a responsible manner. In addition, those who generate or collect recyclable materials—such as SPU and its customers—are held accountable for ensuring that the materials they recycle and the recycling process itself do not create harm locally or abroad.



Bales of mixed plastics for recycling (Source: Adobe Stock, Inc.)

A responsible recycling framework also encourages producers and consumers to reduce wasteful packaging and products and to increase the use of recycled and recyclable materials. The goals of responsible recycling in the context of a commingled recycling system are to 1) produce recyclable material that is clean and suitable for remanufacture and 2) ensure that the material does not contribute to environmental pollution or endanger human health or safety.²⁰ SPU strives to ensure responsible recycling occurs in Seattle. Further discussion of responsible recycling and details of Seattle's involvement in the Responsible Recycling Task Force appear in Chapter 5, *Recycling and Composting Policy and Markets*.

²⁰ King County Responsible Recycling Task Force, "Recommendations to Achieve a Responsible Recycling System," January 10, 2019, <https://kingcounty.gov/~media/depts/dnrm/solid-waste/about/planning/documents/task-force-final-recommendations.ashx?la=en>.

Goal Areas for Solid Waste Management

Along with these sustainability-focused frameworks, Seattle developed seven goal areas for the *2022 Plan Update* consistent with SPU's *Strategic Business Plan Update (2021—2026)* to guide solid waste management in Seattle. The four core focus areas and the CARES principles in the *Strategic Business Plan Update (2021—2026)*, as well as citywide sustainability goals, regional trends in solid waste management, and community stewardship interests, are echoed in the seven goal areas of the *2022 Plan Update*, which span all aspects of solid waste management, from waste prevention through disposal:

- 1 Racial equity: center racial equity in the 2022 Plan Update and provide racially equitable, inclusive, and culturally competent services
- 2 Affordability: provide services that are affordable, efficient, and cost-effective
- 3 Environmental impact: minimize global and life cycle environmental impacts of materials and activities
- 4 Risk and resiliency: plan, adapt, and respond to disruptions, changes, and opportunities
- 5 Safety: provide services and facilities that are safe, clean, and secure
- 6 Operational excellence: provide operational excellence in core service delivery
- 7 Markets: support development of strong and resilient waste prevention, recycling, and composting markets to maximize environmental benefits

Of the seven goal areas, **racial equity** and **risk and resiliency** are especially noteworthy elements of the *2022 Plan Update*. The following sections provide in-depth background on how the city- and utility-wide frameworks around racial equity and risk and resiliency play a role in solid waste planning.

Spotlight on Racial Equity

A key element of the *2022 Plan Update* includes deepening Seattle's commitment to race and social justice. Racial equity is the condition that would be achieved if racial identity no longer predicted, in a statistical sense, how a person fares in society. Equity is the outcome, not just access to opportunity. As one part of racial justice, racial equity includes work to address root causes of inequities. To deliver equitable service, focused approaches for specific communities and waste-generating sectors are needed to meet the City's shared recycling and waste reduction goals, following the principles of targeted universalism.²¹ In targeted universalism, Seattle strives to achieve the same universal goal for everyone—so everyone experiences the

²¹ Powell, John a., Stephen Menendian, and Wendy Ake, "Targeted Universalism: Policy & Practice." Haas Institute for a Fair and Inclusive Society, University of California, Berkeley, 2019, belonging.berkeley.edu/targeted-universalism.

same desired outcomes—while focusing extra effort on communities who are furthest from that goal and using strategies that are targeted to meet their needs.

Equity is Not Equality

Equality and equity do not mean the same thing. Some communities have had less access to government services and economic opportunities based on race, disability, and income.

As an example, “equal” means all SPU customers are eligible for a rebate program. Equity means Seattle understands that some customers cannot pay for the upfront costs of the rebate program. When Seattle uses an equity lens, we look at the complete picture of a customer or a community. Seattle plan and focus its resources to provide real access and opportunity for all.

The [Race and Social Justice Initiative \(RSJI\)](#) is the City of Seattle’s commitment to realize the vision of racial equity.²² RSJI is a citywide effort with a vision of ending individual racism, structural racism, and institutional racism in City government and to eliminate racial inequity in Seattle. Consistent with RSJI, SPU is committed to eliminating race-based disparities in its services. These disparities may occur in access to service, education, and opportunities to provide input and make community priorities heard, among other areas. Communities of particular interest to SPU include people of color; low-income individuals; immigrant, refugee, and indigenous people; and people who speak Seattle’s first tier languages other than English.

Seattle defines its top tier languages based on the number of city residents who speak the language, broken into two tiers. The first tier includes languages spoken by at least 10,000 residents: Cantonese (written: Traditional Chinese), Korean, Mandarin (written: Simplified Chinese), Somali, Spanish, Tagalog, Vietnamese. The second-tier languages are spoken by at least 5,000 residents: Amharic, Cambodian/Khmer, Laotian, Oromo, Russian, Tigrinya, and Ukrainian.

²² <http://www.seattle.gov/rsji>



Viet-Wah Supermarket employees and customers engage with an SPU outreach table (Source: SPU Image Library)

Seattle's [Environmental Justice and Service Equity \(EJSE\) Team](#) supports SPU and partner departments to carry out the RSJI and deliver inclusive and equitable services to customers across the city.²³ Environmental justice and service equity are the foundations of SPU's goal to be a community-centered utility. RSJI policies, such as the use of the [Racial Equity Toolkit](#), help SPU identify and overcome service equity gaps when planning a project, program, or policy.²⁴ Table 1.1 on page 1.23 shows the six steps in the Racial Equity Toolkit to guide the development, implementation, and evaluation of policies, initiatives, programs, and budget issues to address the impacts on racial equity. To ensure thoughtful consideration of racial equity throughout the comprehensive planning process, the team working on the *2022 Plan Update* partnered with EJSE staff to:

- Conduct a Racial Equity Toolkit in the early development of the *2022 Plan Update*, so that a racial equity vision was created and outcomes from this vision were identified and embedded into all phases of the planning process
- Apply the Racial Equity Toolkit as a guiding framework for stakeholder engagement, including which audiences were engaged, what strategies and tactics were employed, and how input was received and used

²³ <https://www.seattle.gov/utilities/protecting-our-environment/community-programs/environmental-justice-and-service-equity>

²⁴ <https://www.seattle.gov/Documents/Departments/RSJI/Resources/Racial-Equity-Toolkit-Fillable-RSJI-August-2012.pdf>

- Consider disproportionate impacts of systemic and institutional racism on people of color, low-income individuals, immigrants and refugees, and English language learners; impacts were considered throughout the planning process, including when considering risk and resiliency and developing new metrics to support SPU’s waste management programs and processes for the future

Table 1.1 Racial Equity Toolkit Steps

THE RACIAL EQUITY ANALYSIS CONSISTS OF SIX STEPS
Step 1. Set outcomes. Leadership communicates key community outcomes for racial equity to guide analysis.
Step 2. Involve stakeholders and analyze data. Gather information from both community members and SPU staff on how the issue benefits or burdens the community, in terms of racial equity. What does data show about potential impacts?
Step 3. Determine benefit and/or burden. Analyze issue for impacts and alignment with racial equity outcomes.
Step 4. Advance opportunity or minimize harm. Develop strategies to create greater racial equity or minimize unintended consequences.
Step 5. Evaluate. Raise racial awareness. Be accountable. Track impacts on communities of color over time. Continue to communicate with and involve stakeholders. Document unresolved issues.
Step 6. Report back. Share information learned through analysis and any unresolved issues with Department Leadership and Change Team.

A key outcome of applying the Racial Equity Toolkit in the development of the *2022 Plan Update* was to develop an overarching recommendation to make racial equity a core tenet of solid waste planning in Seattle, which is described in the next section.

Recommendation

In support of Seattle's commitment to RSJI goals, SPU makes the following recommendation that applies to all areas of SPU's solid waste services for the *2022 Plan Update*.

Rec 01. Lead with race and incorporate racial justice in solid waste programs, education, and outreach in support of SPU's commitment to providing racially equitable, inclusive, and culturally competent services

To support SPU's commitment to RSJI, this strategy would **make racial equity central to the development of all SPU solid waste programs, education, and outreach**. SPU will incorporate this approach into activities like regular rate reviews, development of metrics, and other recommendations throughout the *2022 Plan Update*. To support this work, SPU should ensure the availability of adequate staff time and budget to:

- Use the Racial Equity Toolkit consistently in program development, implementation, and evaluation. As SPU staff move forward with work identified in the *2022 Plan Update*, they are expected to use the Racial Equity Toolkit. The Racial Equity Toolkit should be used as early as possible in a work planning and design process and should be completed by people with different racial perspectives.
- Work to engage communities of color at the start of program planning and development. Past approaches have engaged these communities primarily after implementation, adoption of new ordinances, or during the enforcement period. In support of implementing the *2022 Plan Update* with equity, SPU should consider community-designed approaches or community-driven "innovation labs."
- Expand SPU's capacity to work with and serve diverse communities (including diversity in age, ability, race, immigrant or refugee status, and economic status). Expansion may include expanding staff capacity for applying the Racial Equity Toolkit; increasing staff and consultant resources for transcreation and customer usability testing of materials; continuing research to understand key challenges and barriers to best reach intended audiences and select appropriate communication tools; and developing tailored customer messages and approaches that are inclusive of the communities SPU serves.
- Develop a Racial Equity Strategic Plan specific to the Solid Waste Utility.
- Expand data evaluation to understand who is designing, delivering, using, and benefiting from SPU's services and identify when disproportionate impacts on certain groups exist.

SPU recognizes that effective programs include communities during upfront planning, not just implementation. Opportunities to enhance and expand community reach, service, and engagement are discussed throughout the *2022 Plan Update* in the recommendations in the

chapters. Examples of SPU's current efforts to promote service equity across all SPU waste prevention activities include:

- Working with community partners to provide waste prevention education and technical assistance in 12 languages to businesses and residents
- Offering multilingual services under the [Garden Hotline](#), which is managed by Tilth Alliance and provides resources to all residents on natural gardening practices that reduce toxic risks and reuse yard waste on site as mulch and compost²⁵
- Training and supporting volunteers to teach waste prevention in their communities through the [Master Composter / Sustainability Steward Volunteer Program](#)²⁶
- Continuing to transcreate printed educational materials for both residents and businesses to provide information in multiple languages and in a way that is culturally relevant to the audience²⁷
- Posting in-language guides online to educate business owners and employees of safer alternatives to toxic pesticides, fertilizers, solvents, and cleaning supplies
- Providing funding to community organizations and businesses to increase equitable access to waste prevention opportunities and benefits
- Continuing to center food rescue innovations on equitable solutions that address access, cultural relevancy, health, income, and racial disparities

Spotlight on Risk and Resiliency

In addition to deliberately and intentionally applying the RSJI racial equity lens to solid waste planning, SPU is also incorporating the utility-wide **Risk and Resiliency Framework**. SPU's Risk and Resiliency Framework guides investments in infrastructure, operations, and people to enhance SPU's ability to mitigate, adapt, recover, and continue to deliver services in the face of disasters, changing conditions, and new opportunities. Risk is the effect of uncertainty on core services. Resilience is a system's ability to reduce negative impacts and recover more quickly from stresses and shocks, while adapting to new conditions and opportunities. Managing the solid waste system involves both risk reduction and improving adaptation and response capabilities.

The seven focus areas in Seattle's Risk and Resiliency Framework are climate change, disasters, infrastructure, economy, market forces, technology, and workforce (see Table 1.2). All seven focus areas are relevant to SPU's solid waste management system. SPU owns transfer station

²⁵ <https://gardenhotline.org/>

²⁶ <https://www.seattle.gov/utilities/protecting-our-environment/sustainability-tips/landscaping/for-residents/compost-and-soil/backyard-composting/master-composter-program>

²⁷ Where translation simply changes words into another language, transcreation ensures the meaning is clear and relevant in another culture.

infrastructure and relies on privately-owned collection, processing, transport, and disposal infrastructure and operations. Each of these can be affected by disasters, deficiencies in infrastructures, new technologies, workforce challenges, volatile recycling markets, and economic changes such as traffic congestion and population growth. Climate change may affect solid waste management infrastructure, and waste prevention is an important tool to reduce climate change.

Table 1.2 Risk and Resiliency Focus Areas

RISK/RESILIENCY AREA	EXAMPLE OF A VULNERABILITY OR OPPORTUNITY
Climate change	Drought, extreme downpours, sea level rise, wildfires, temperature rise, air quality degradation, climate migration
Disasters	Earthquake, cyberattack, power outage, terrorism, pandemic, flooding, wind and snowstorms, fire, volcanic eruption, dam failure
Infrastructure	Aging and substandard infrastructure/facilities, seismic and climate change upgrades, regulatory requirements, new capacity for growth, projects by others
Economy	Affordability, population growth and traffic congestion, loss of customers and revenues
Market forces	Recycling markets, ability to site facilities, availability of raw materials
Technology	Emerging and current technologies, integration, obsolescence, decentralized systems
Workforce	Retirement wave, staff retention/turnover, loss of institutional knowledge, skill availability and development, competition

Details of the top challenges and areas of risk and opportunity facing solid waste management in Seattle appear below. They are presented by major element of the solid waste system.

Interdependencies within SPU's solid waste system. SPU manages two transfer stations and two household hazardous waste facilities, but relies on private contractors for collection, processing of recycling and food and yard waste, and transport to landfills for disposal. As a result, SPU depends on these contractors' facilities and operations for uninterrupted and responsible management of the City's solid waste materials. For moving solid waste, SPU depends on the transportation network that includes roads, bridges, and railways impacted by aging infrastructure and congestion. SPU's internal staff manage programs and coordinate with a variety of partners, consultants, and customers.

All these interdependencies are vulnerable to a variety of disruptions that may be due to natural disasters or extreme weather as well as social or economic reasons. Resiliency in services requires coordination internally and with external contractors and customers. By tracking trends and planning for disruptions, SPU can work internally and with contractors to provide resilient solid waste services.

Contracted collection services. Waste collection is an essential service for Seattle residents and businesses and is performed by contractors. SPU identifies and manages potential disruptions to collection services to increase resiliency. Some risk and resiliency considerations for solid waste collection include:

- Collection services depend on the road network that is maintained and managed by Seattle and by others, such as the Washington State Department of Transportation. Earthquakes, snowstorms, flooding, high winds, and volcanic ash can impact the transportation system. Population and economic growth can lead to traffic congestion and increased transit times. While Seattle typically has a mild climate, collection services for residents were postponed multiple times in February 2019 due to unusually heavy snow and icy road conditions.
- Disruptions to energy supply systems can affect collection vehicles. For example, in October 2018, one of Seattle's contracted solid waste collectors (Waste Management, Inc.) could not operate its garbage and recycling collection routes in many of its service areas due to a rupture of the natural gas pipeline in British Columbia.
- The availability of drivers is affected by economic conditions. Economic booms could lead to a shortage of drivers due to competition from other jobs with higher wages and more attractive working conditions. Higher cost of living could also lead to drivers leaving the area to work where their salaries go further.

Transfer stations. Seattle's North and South Transfer Stations are the connection point between collection and distribution operations with impacts to surrounding communities. Due to the long hours of operation and complex flow of vehicles and materials, transfer stations are dependent on a well-trained workforce. Transfer stations also depend on energy, water, and information technology. The movement of solid waste to and from transfer stations depends on the road and rail systems, including State Highway 99, Interstate 5, Interstate 90, and rail lines to the north, south, and east. Earthquakes, fires, and floods can also affect transfer stations, as can the availability of a trained workforce. All these dependencies must be considered and managed to make transfer station operations more resilient.

Moderate risk waste collection and disposal facilities. SPU operates two moderate risk waste facilities on behalf of the [Hazardous Waste Management Program in King County](https://kingcountyhazwastewa.gov/) that depend on roads, energy, water, IT systems, and a trained workforce.²⁸ These facilities can be impacted

²⁸ <https://kingcountyhazwastewa.gov/>

by earthquakes, fires, and floods, as well as the lack of a trained workforce. Planning for these facilities is included in the *2021 Hazardous Waste Management Plan* for King County.

Complex waste stream. SPU manages a complex and ever-changing waste stream, including materials whose environmental and health impacts are not fully understood. The quantity, composition, and generators of the waste stream change with new trends in production, consumption, population growth, and economic growth.

Changing materials. Manufacturers continue to produce and sell new materials and combinations of materials that Seattle's existing recycling system was not designed to sort or process. SPU continues to work with processors and use available data to respond to changes and adapt programs as needed. For example, as more compostable packaging enters the solid waste management system, SPU continues to work with its compost processors to monitor these materials and design upstream program changes as needed.

New technology. Existing and emerging technologies present opportunities to improve recycling services and recovery. Radio-frequency identification (RFID) chips in carts can be used to track collection of specific streams. In recycling, continued improvements in sensors and sorting technologies can increase efficiency and help manage contamination at processing facilities. New material processing methods are gaining traction, such as chemical recycling and secondary processing of recyclables that are not effectively sorted at primary material recovery facilities. SPU assesses emerging technologies for risks and benefits when evaluating processing options.

Customer sorting of waste. To maximize recycling and minimize contamination, SPU relies on residents, employees, and businesses to properly separate garbage, recyclables, and compost and to properly dispose of hazardous materials that do not belong in these waste streams. SPU works to mitigate the risks of relying on the actions of individuals to reduce garbage contamination of the recycling and maintain the high quality of recyclables and compost through several strategies, especially outreach, education, technical assistance, and enforcement.

Unprecedented events. The recent COVID-19 pandemic has challenged the resiliency of the solid waste system with, for example, reduced staff availability and the resultant temporary service reductions at transfer stations and Household Hazardous Waste drop off sites. Office functions have shifted to teleworking and face-to-face customer education efforts were paused or modified to accommodate safety protocols, like face coverings and social distancing. However, the solid waste system has adjusted to continue providing essential solid waste services, and many staff have learned to operate more flexibly under unusual circumstances.

While SPU cannot predict the future, by taking a long-term view and planning for a variety of possible future scenarios proactively, SPU can make strategic investments that reduce risk and increase resilience.

Participants and Responsibilities

In developing this *2022 Plan Update*, SPU followed state guidelines and requirements, including engaging several different parties, or stakeholders, from government, the community, and the private sector. This section describes each of these group's roles in collaborating with SPU on the *2022 Plan Update*.

Government

- **SPU** is responsible for creating, executing, and funding all City of Seattle solid waste programs and projects. SPU is also responsible for developing and maintaining the *2022 Plan Update*, as described below.
- **Office of the Mayor** sets direction for all City departments, including SPU.
- **Seattle City Council** is the City's legislative body and adopts the *2022 Plan Update* by resolution.
- **Ecology** reviews and approves the *2022 Plan Update*. As described further below, Ecology also confers with SPU regarding future updates to maintain the plan.
- **Partner agencies**, such as King County's Solid Waste Division, Public Health–Seattle and King County (PHSKC), and the Hazardous Waste Management Program in King County, provided input on solid waste industry trends, issues, and proposed solutions.

Community and Private Sector

- **SPU's Seattle Solid Waste Advisory Committee (SWAC)** is an advisory body mandated by state law to provide recommendations and informed advice to the Solid Waste Utility regarding solid waste management issues. The SWAC provided policy advice and was involved throughout the planning process. Appendix H, *Seattle Solid Waste Advisory Committee (SWAC) Participation in Planning*, documents their involvement. SWAC will continue to be involved in future implementation of the *2022 Plan Update*.
- **Community Connections** is a program of SPU that funds multi-year partnerships with trusted organizations that serve a variety of ethnic and language groups to gather community input and to adapt and deliver in-language presentations and activities. Community Connections partners provided input and recommendations for how customers who are people of color, low-income, immigrants, and refugees participate in the decision-making and policy development process to improve service delivery, provide for culturally relevant education and outreach programs, and provide input to future development of waste prevention activities and product stewardship legislation.

- **Industry stakeholders**, such as collectors, processors, and waste and environmental interest groups, provided input on solid waste industry trends, issues, and proposed solutions.
- **General public** includes residents and businesses, solid waste industry representatives, and interest groups. The public's role was played out via the *2022 Plan Update's* public involvement process, with support from Community Connections Partners. Appendix D, *Stakeholder Engagement Summary*, describes the public involvement process.

Each of these parties has their own perspective on the *2022 Plan Update*, which is meant to serve as a resource to all of them. For example, regulators are interested in ensuring the *2022 Plan Update* meets legal requirements; SPU will use the *2022 Plan Update* to guide solid waste work in the coming years; and the public is interested in their critical role in achieving the goals identified in this *2022 Plan Update*. SPU offered opportunities for community and private sector stakeholders to provide input that informed recommendations included in the *2022 Plan Update*.

Recommendations Development

With input from its stakeholders, SPU developed recommendations in the *2022 Plan Update* through a process that gathered ideas for different alternatives from SPU staff and evaluated them against Seattle's overarching solid waste management goal areas, such as risk and resiliency, described in Goal Areas for Solid Waste Management, above. In developing the alternatives, SPU considered options for new programs and policies as well as opportunities to expand or enhance current programs.

To evaluate the alternatives, SPU took a slightly different approach than in past plans. In past plans, SPU modeled many different scenarios and selected the most cost-effective scenario that produced the largest recycling rate. The process for recommending programs in the *2022 Plan Update* was instead based on an innovative multicriteria decision analysis that considered both social and environmental impacts of the recommended actions.

For this plan, SPU evaluated and ranked programs based on the seven goal areas of the *2022 Plan Update* to decide which programs should be implemented. For example, environmental impacts were included by considering the solid waste management hierarchy—where a recommended action that addressed waste prevention was considered “very positive,” one that addressed recycling was considered “positive,” and recommended actions that did not affect any materials were considered “neutral.”

For a subset of alternatives, SPU also estimated quantitative impacts by modeling the alternatives in SPU's **Recycling Potential Assessment (RPA) model**. The RPA model estimates potential impacts of alternatives on tons generated and diverted and financial costs and

savings. SPU also uses a separate model to estimate the environmental benefits from diverting more tons. Appendix E, *Recycling Potential Assessment Model and Environmental Benefits Analysis*, presents the methodology and results of the RPA and environmental benefits model, including the projected recycling rates based on the programs recommended in the *2022 Plan Update*. Recycling rate projections were included to provide continuity with past solid waste plans in which the recommendations were driven primarily by their impact on the recycling rate.

Social and Environmental Impacts of Recommendations

In addition to recycling rate projections, the recommendations in the *2022 Plan Update* are expected to produce other improvements, such as more equitable, affordable, resilient, and safe services. By emphasizing waste prevention, SPU will help reduce greenhouse gas emissions associated with goods consumed in Seattle and will be responsive to the leadership and interest that diverse Seattle communities have demonstrated.

After reviewing the qualitative and quantitative evaluations, SPU staff prioritized the alternatives into the following categories:

- Already budgeted for as of 2021 and/or already in progress
- Short-term priority (1-5 years)
- Long-term priority (6-20 years)
- Not a current priority for the Solid Waste Utility

SPU has included recommendations for programs and policies in each chapter according to relevant topical area. Throughout each chapter, the *2022 Plan Update* recommends many new or expanded strategies for reducing waste, increasing recycling, and managing the solid waste system. Full explanations of recommendations are contained in the relevant chapters.

Metrics and Targets

Seattle is a data-driven city. Over the last three decades, SPU has built one of the most extensive solid waste datasets in the United States. SPU analyzes these datasets to understand key metrics that indicate the performance of current solid waste facilities and services and to set data-driven targets for goals. SPU creates metrics and targets at two levels: 1) at the citywide level to track big-picture, system-wide goals around waste generation, recycling, and environmental impacts, and 2) at the service- or facility-level to measure the performance of

individual activities, services, or facilities. Recommendations in the *2022 Plan* address developing new metrics and targets at both levels.

Measuring Upstream Goals and Environmental Impacts

Developing tools and methodologies to accurately capture the change in focus and priorities further upstream described in this chapter will require innovative and groundbreaking work in the next two to three years. SPU will need to develop new performance metrics and targets to establish current baselines and track progress. A specific challenge will be to track how SPU makes progress in waste prevention, as it is difficult to measure waste that was not produced, and to measure environmental impacts of specific strategies.

To advance in our ability to measure the impacts of upstream strategies, the *2022 Plan* explores potential metrics and targets that are better aligned with an emphasis on waste prevention and reducing the environmental impacts of waste than the recycling rate is. Based on preliminary work by SPU and other leading municipalities, the *2022 Plan* outlines a list of potential new overarching waste reduction and waste prevention metrics, as well as some targets, to consider in Chapter 2, *Maximizing and Measuring Impact: Moving Upstream Beyond the Recycling Rate*.

Measuring Services and Activities

Additionally, the *2022 Plan Update* includes near-term recommendations for SPU to explore and expand the evaluation and measurement of its programs across all stages of the materials management life cycle. New metrics are needed to track activity and performance in priority areas for SPU such as equity, operational excellence, safety, and broader environmental impacts that are not adequately reflected in current measurements like the recycling rate. Key measurement areas include:

- **Waste prevention:** explore ways to capture attitudes and actions around this topic, quantify actions related to circular economy and resource sharing, and assess the potential to reduce the generation of specific materials
- **Collection and processing:** research, evaluate, and identify new performance metrics that also consider climate impacts of operations
- **Behavior change programs:** use available data to develop more strategic approaches and identify high-priority areas with the greatest potential for waste prevention and diversion
- **Overarching:** consider equity impacts of solid waste management activities and continually assess how access to services and the risks and benefits associated with SPU's activities are distributed throughout the community at large

More research and evaluation are needed to identify what best balances SPU's needs, costs of the measurement activities, and alignment to overall goals. As a result, the *2022 Plan Update*

does not recommend specific new metrics for goal areas such as environmental impact and equity. However, the *2022 Plan Update* documents areas that SPU can consider exploring in the future to assess progress against goals. In the next chapter, *Maximizing and Measuring Impact: Moving Upstream Beyond the Recycling Rate*, SPU provides background of Seattle's evolving solid waste goals and approaches, and how they have informed the development of new metrics and targets.

WASTE LESS IN SEATTLE

WELCOME TO THE SOUTH TRANSFER STATION

Did you know that **ONE MILLION POUNDS** of material comes through here each day?

Seattle sends more than **250,000 TONS** of garbage to a landfill each year!

Let's find out how together we can **REDUCE** our waste to protect Seattle and our Planet Earth.

Seattle
Public
Utilities

Providing efficient and forward-looking utility services that keep Seattle the best place to live.



2

Maximizing and Measuring Impact: Moving Upstream, Beyond the Recycling Rate

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Chapter 2 Maximizing and Measuring Impact: Moving Upstream, Beyond the Recycling Rate

Overview

To reduce the environmental and health impacts of waste, Seattle Public Utilities (SPU) increasingly focuses on waste prevention. To show potential benefits from waste prevention, SPU worked with a consultant to calculate environmental impact scores of food packaging for two hypothetical Seattle consumers: “Avid Recycler” and “Reuse Champion.” Each consumer diverts 60% of their food packaging waste, but Avid Recycler generates 300 pounds of food packaging waste per year, while Reuse Champion generates only 75 pounds. Considering greenhouse gas (GHG) emissions, public health, and ecosystem toxicity, Reuse Champion has a much smaller environmental footprint by preventing waste through reusing materials.

Figure 2.1 Environmental Impact of Food Packaging for an Avid Recycler versus a Reuse Champion



Source: Seattle Public Utilities and Cascadia Consulting Group, 2019.¹

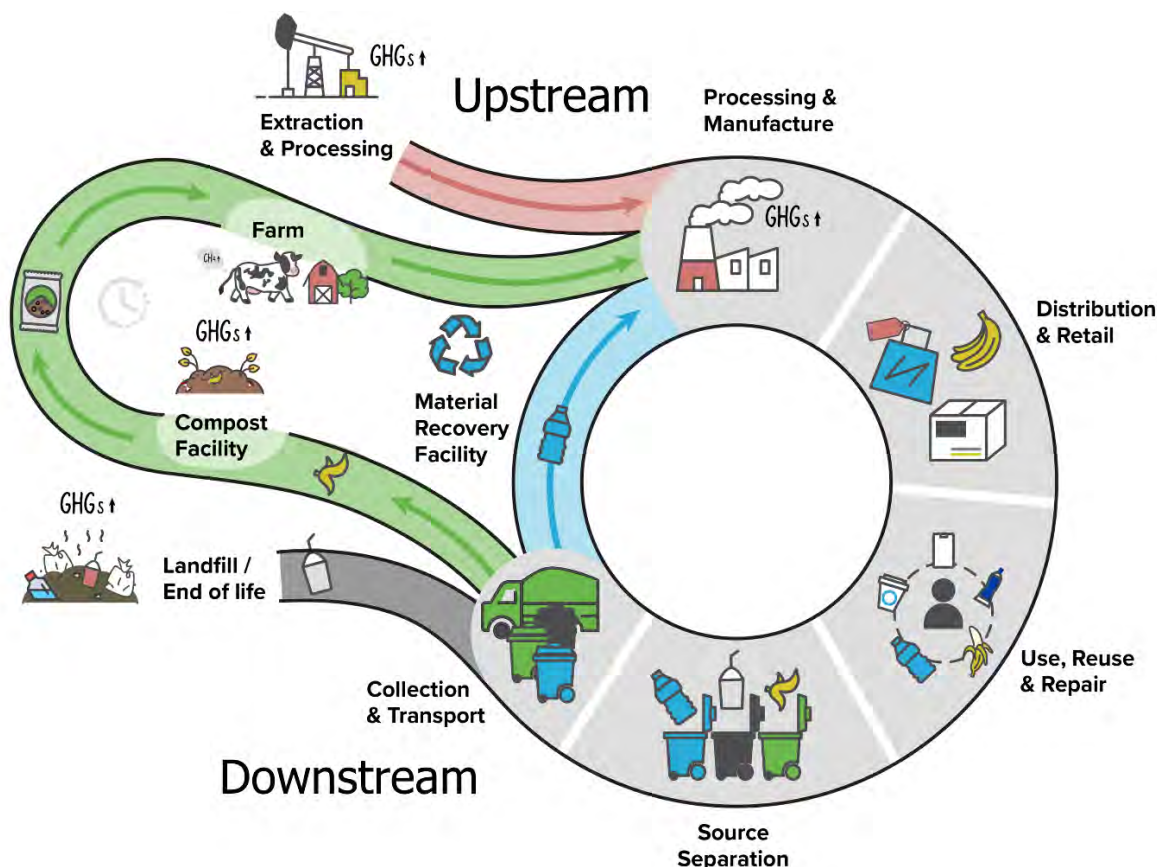
¹ The numbers associated with the footprints of food packaging for the Avid Recycler and the Reuse Champion are Environmental Impact Scores. These scores were calculated using life cycle assessment methods and consumer expenditure purchasing data to measure the impact that consumer choices have on (1) climate change, (2) public health, and (3) ecosystem toxicity.

Expanding to a full life cycle view of materials, starting upstream with extraction and processing of raw materials, helps demonstrate why preventing waste in the first place has a much bigger environmental impact than recycling (Figure 2.2 on page 2.5). Consistent with this life cycle view, SPU is moving away from using the recycling rate to measure the success of Seattle's solid waste program to using metrics better suited to waste prevention goals. To better understand the evolution of SPU's solid waste management further upstream in the materials life cycle, this chapter discusses:

- The history of SPU's data-driven approach to solid waste planning and target-setting for overarching solid waste goals
- The origins, progress toward, and changes to Seattle's recycling rate goals
- Seattle's current waste disposal goals
- The limitations of the recycling rate on measuring the impacts of solid waste diversion and prevention programs
- Alternative metrics to measure upstream goals and the impact of SPU's services

This historical information provides context for the development of new overarching metrics and targets in Seattle's *2022 Solid Waste Plan Update (2022 Plan Update)* to measure the progress of SPU's work "upstream" in waste prevention and reuse and the environmental impacts of solid waste. The chapter includes two recommendations that will boost SPU's work on waste prevention and discusses options to measure upstream impacts and environmental impacts. Chapters on waste prevention (Chapter 4, *Waste Prevention and Reuse*) and outreach and education (Chapter 9, *Outreach, Education, Enforcement, and Compliance Support*) discussion metrics and targets to measure the performance of specific activities related to those issues.

Figure 2.2 Life Cycle of Materials and Products



Source: Seattle Public Utilities and Cascadia Consulting Group.

A Data-Driven Approach to Planning

Seattle's current waste management system was shaped by a crisis. When the last two Seattle-owned landfills closed in 1987, the City's disposal costs increased as it began to send garbage to a regional landfill. To find a cost-effective solution, the City adapted a four-step methodology used by Seattle's electric utility into a new data-driven approach for solid waste planning to:

- 1 Forecast future solid waste generation:** Seattle built an analytical model called the *Recycling Potential Assessment (RPA)* to estimate future waste generation. The RPA projections are based on forecasts for factors, such as population, employment, income, and number of households as well as on historic data for these factors compared to historic tons of waste generated. See Appendix E, *Recycling Potential Assessment and Environmental Benefits Analysis*, for a description of the RPA and results of the RPA analysis for many of the recommendations in the 2022 Plan Update.

- 2 Model the cost and recycling rates in different waste management scenarios:** The RPA models results for different combinations of recycling programs (for example, curbside recycling, disposal bans) and disposal options (for example, near or far landfilling, mixed-solid-waste processing, or a waste-to-energy plant). The RPA assesses the costs of disposal, program implementation, as well as avoided costs (for example, when materials are recycled instead of being sent to the landfill). The RPA also assesses the recycling rate, tonnages recycled, and tonnages disposed by material type for each scenario.
- 3 Estimate environmental and social impacts of each scenario:** A separate model, the *Measuring Environmental Benefits Calculator*, or MEBCalc, described in Appendix E, *Recycling Potential Assessment and Environmental Benefits Analysis*. MEBCalc was developed by a consultant to estimate the cost of pollution on human health and other environmental indicators for tonnages disposed and recycled estimated by the RPA.
- 4 Evaluate the results to select the “best” option:** The cost, tonnage, and impact modeling results are combined with a qualitative assessment of the scenarios to select the “best” program options using criteria such as cost effectiveness, overall benefits, and feasibility.

This data-driven approach was a landmark achievement, a concrete example of resiliency planning, and the new cornerstone of Seattle's solid waste management planning. Modeling different waste management scenarios allowed Seattle to show unequivocally that recycling is cost-effective. This analysis, as well as stakeholder input, led Seattle to create a citywide curbside recycling and yard waste collection program in 1988.

A year later, Seattle adopted its first solid waste management plan independent of King County, the *1989 Integrated Solid Waste Management Plan, On the Road to Recovery*. Using the data-driven approach to evaluate different scenarios for managing solid waste, Seattle's plan concluded that recycling 60% of the generated waste and landfilling the remaining 40% was the most cost-effective of all the feasible waste management options. For a detailed overview of solid waste planning history in Seattle since 1989, see Appendix A, *Planning History and Progress on Prior Recommendations*.

Evolving Recycling Rate Goals for Commercial, Residential, and Self-Haul Waste

The approach used to develop the *1989 Plan* positioned the weight-based recycling rate as the primary metric to evaluate solid waste performance. At that time, Seattle focused on improving the low recycling rate of 24% in 1987. Seattle initially set a recycling rate target of 60% for commercial, residential, and self-haul waste by 1998. This ambitious target would require that 77% of Seattle residents and businesses to recycle 77% of all their waste.

By 1998, the recycling rate had grown to 46%, a tremendous increase, but still 14 percentage points short of the target. Subsequent solid waste management plans and resolutions reaffirmed the 60% goal, while incrementally delaying it to 2008, 2010, 2012, and 2015. Table 2.1 outlines how the 60% recycling rate target date has shifted over time and compares it with actual performance at each target year.

Table 2.1 60% Recycling Rate Target and Performance for Commercial, Residential, and Self-Haul Waste

TARGET-SETTING DOCUMENT	TARGET YEAR	PERFORMANCE AT TARGET YEAR
1989 Integrated Solid Waste Management Plan	1998	46%
1998 Solid Waste Management Plan	2008	54%
2004 Solid Waste Plan Amendment	2010	54%
2007 Zero Waste Resolution (#30990)	2012	56%
2011 Solid Waste Plan Revision	2015	58%

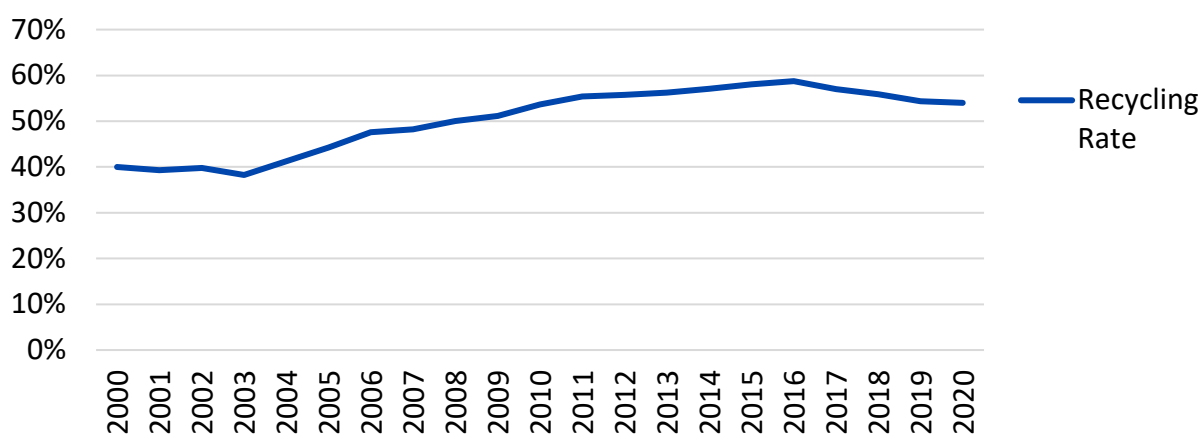
While delaying the 60% recycling rate target, Seattle's City Council introduced an even more ambitious recycling rate target of 70% in the [2007 Zero Waste Resolution](#).² The *Zero Waste Resolution* initially set 2025 as target year to reach a 70% recycling rate, and the *2011 Solid Waste Plan Revision* (2011 Plan Revision) accelerated it to 2022 (Table 2.2) for reasons discussed further below.

²<http://www.seattle.gov/documents/Departments/SPU/Documents/SolidWastePlanApdxBZWResolution30990.pdf>

Table 2.2 70% Recycling Rate Target for Commercial, Residential, and Self-Haul Waste

TARGET-SETTING DOCUMENT	METRIC	TARGET	TARGET YEAR
2007 Zero Waste Resolution (#30990)	Recycling rate for commercial, residential, and self-haul waste	70%	2025
2011 Solid Waste Plan Revision	Recycling rate for commercial, residential, and self-haul waste	70%	2022

Driven by these aggressive recycling rate targets, Seattle has made significant progress, particularly considering the staggering rate of population growth in the period 2010-2020.³ The recycling rate has steadily increased throughout the last three decades until 2016, when it reached an all-time high of nearly 59% (Figure 2.3). Further discussion of recycling rate trends and some of the key factors that influence recycling rates occurs in Chapter 3, *Seattle Waste Data and Trends*.

Figure 2.3 Seattle Overall Recycling Rate for Commercial, Residential, and Self-Haul Waste

Source: Seattle Public Utilities, "2020 Annual Waste Prevention & Recycling Report."

³ Gene Balk / FYI Guy. " Surprise! Seattle was the fastest-growing big U.S. city in 2020." Seattle Times, 27 May 2021, <https://www.seattletimes.com/seattle-news/data/surprise-seattle-was-the-fastest-growing-big-u-s-city-in-2020>.

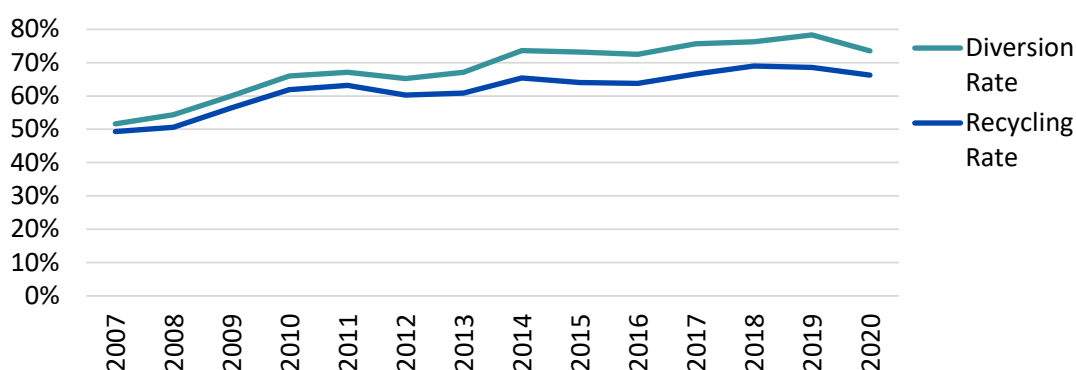
Seattle's Annual Waste Prevention & Recycling Report

SPU has traditionally monitored achievement toward the weight-based recycling rate through Seattle's [Annual Waste Prevention & Recycling Report](#).⁴ With SPU's shift in emphasis upstream to waste prevention, the report has increasingly focused on waste generation and disposal trends over the past few years, including results for each customer sector.⁵ Consistent with historical practice, the report also includes weight-based recycling rate results. It also discusses service and program highlights for the prior year, as well as near-term actions planned for the following year.

Construction and Demolition Debris Recycling Rate Goals

The *2011 Plan Revision* also set goals for reducing tons disposed (see page 2.11) and recycling construction and demolition (C&D) debris. Based on RPA modeling, the *2011 Plan Revision* set a 70% recycling rate goal for C&D debris by 2020. Seattle has made significant progress by increasing the recycling rate for C&D debris from about 49% in 2007 to nearly 66% in 2020 (Figure 2.4). The 2020 diversion rate was 74% when considering C&D debris diverted to beneficial uses, such as wood waste used as industrial boiler fuel.

Figure 2.4 Seattle Recycling and Diversion Rates for Construction & Demolition Debris



Source: Seattle Public Utilities, "2020 Annual Waste Prevention & Recycling Report."

⁴ <http://www.seattle.gov/utilities/about/reports/solid-waste-reports#annual>

⁵ Seattle Public Utilities, "2020 Annual Waste Prevention & Recycling Report," October 2021, https://www.seattle.gov/Documents/Departments/SPU/Documents/Recycling_Rate_Report_2020.pdf.

2011 Plan Revision Recycling Rate Goals

In the *2011 Plan Revision*, Seattle used its data-driven approach to assess options for achieving the 70% recycling rate goals of the *Zero Waste Resolution*. Seattle examined the benefits and costs of over 30 different scenarios to find the most cost-effective approach, ultimately choosing a scenario that contained 116 individual recommendations. At that time, the RPA model estimated that Seattle could reach a 70% recycling rate for commercial, residential, and self-haul waste by 2022—three years earlier than called for in the *Zero Waste Resolution*—and a 70% C&D recycling rate by 2020. Reaching these recycling targets would require all assumptions of the model to hold true over time. For example, reaching the targets meant that SPU would implement all 116 programs, that each program would perform exactly as anticipated in the modeling exercise, that materials such as packaging would remain the same over time, and that Seattle's waste would be generated exactly as anticipated.

Despite considerable success implementing this ambitious, best-case scenario (see Chapter 1, *Development of the 2022 Solid Waste Plan Update* for highlights as well as Appendix A, *Planning History and Progress on Prior Recommendations*, with progress on recommendations from the *2011 Plan Revision*), Seattle was not able to implement several of the programs recommended in the *2011 Plan Revision*, and some implemented programs have not performed as well as anticipated. Decisions to not implement individual programs recommended in the *2011 Plan Revision* were made incrementally based on a variety of factors, but together those decisions scaled back the scenario that was originally modeled and adopted. Such changes thus impacted the net benefits (and recycling rate) that Seattle could achieve.

While Seattle implemented most of the 116 programs in the *2011 Plan Revision*, several programs that were modeled to have substantial impacts on recycling or cost savings were either canceled, delayed, or studied but not fully implemented for reasons ranging from lack of markets or financial feasibility to equity concerns. For example, after identifying equity concerns during the 2012 pilot project, SPU decided not to change single-family garbage collection to every other week, which was projected to save millions of dollars to fund other recommendations, such as pet waste and diaper composting. Limited recycling markets delayed recommendations related to carpet, plastic film wrap, and textiles.

Additionally, SPU's experience managing Seattle's solid waste system for the past 10 years has demonstrated some limitations of the RPA model. Although powerful, the RPA model cannot predict every factor that may influence recycling rates, such as changes in consumer habits, new lighter-weight product packaging, or lack of markets for recyclable materials such as plastic film. As with any forecasting model, the RPA cannot predict all economic, environmental, and social factors that influence whether recommended programs are implemented. The model

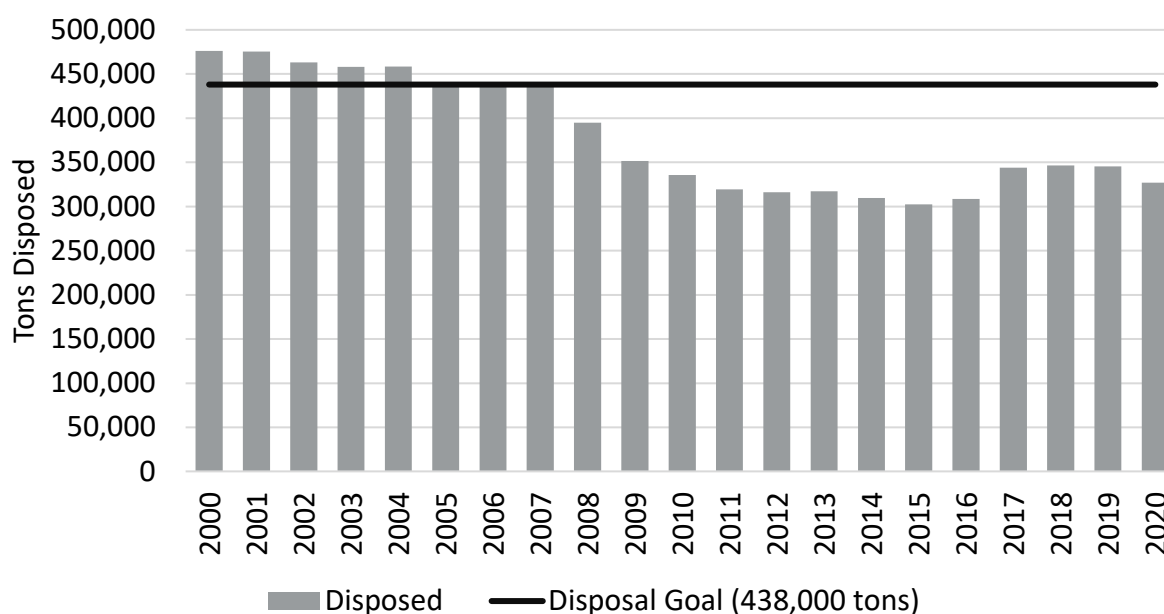
must rely on assumptions about factors such as program participation, efficiency, cost, and implementation timeline. While not perfect, RPA modeling results represent the best information available for Seattle's data-driven approach to solid waste planning.

Disposal Reduction Goals

Although Seattle's recycling rate goals typically receive the most attention, the City started looking beyond them to measure waste prevention by adopting a formal goal for disposal reduction in the *Zero Waste Resolution*. In addition to setting Seattle's recycling rate goals, the *Zero Waste Resolution* established waste reduction targets of keeping landfilled material below 438,000 tons per year, per the baseline year of 2006, and to reduce landfilled waste by 1% annually between the years 2008 and 2012.

According to the most recent data from 2020 (Figure 2.5), Seattle has kept landfill disposal of residential, commercial, and self-haul waste less than 438,000 tons per year since 2008, despite strong population and employment growth. During that time, newspapers declined, and plastic and other lightweight packaging proliferated. Additionally, Seattle reduced landfill tonnage by more than 1% annual on average between 2008 and 2012, meeting the target in the *Zero Waste Resolution*. A new target for landfill disposal reduction is discussed later in this chapter.

Figure 2.5 Seattle Commercial, Residential, and Self-Haul Waste Disposed



Source: Seattle Public Utilities, "2020 Annual Waste Prevention & Recycling Report."

Advantages and Limitations of the Recycling Rate

The weight-based recycling rate, the historic metric that SPU has used as its guiding beacon to drive and measure progress, has many advantages. For example, it is easy to communicate to the public and relatively easy to calculate, given that Seattle tracks disposed and recycled tons. Efforts to achieve recycling rate target drove Seattle's large advances in landfill diversion since the late 1980s (Figure 2.3, on page 2.8). The recycling rate is an important measurement that SPU uses to:

- Monitor progress of and adjust existing diversion-related services, programs, and policies
- Inform processing and disposal contracts
- Design and implement new diversion-related services, programs, and policies, especially as materials used for product packaging continue to change

Although using recycling rates goals to drive solid waste management suited the City when Seattle's recycling rate was low at 24%, over time, the solid waste management industry has come to understand the limitations of focusing solely on the recycling rate to measure success of solid waste management programs.

One of the main limitations of the weight-based recycling rate is that it does not fully measure the benefits of waste prevention activities. Consider the example of a waste prevention policy, such as a ban on phone book deliveries. The recycling rate does not measure the reduction in paper use from this ban nor its associated environmental impacts, such as greenhouse gas emissions avoided in the harvesting of trees for paper and in the manufacturing of phone books. The recycling rate not only misses key benefits of waste prevention activities, but it can also be undermined by them. The phone book ban example illustrates this point—reducing phone book deliveries also reduces the amount of paper available to be recycled, which is material weight that would have been counted toward the recycling rate goal.

Despite its limitations, the recycling rate remains a useful measurement and communications tool for solid waste programs. As a result, SPU will continue to track recycling rates for each waste sector, but SPU will not continue to use recycling rates as the primary driving metric going forward. With Seattle shifting toward a life cycle approach that emphasizes upstream waste prevention strategies, the recycling rate cannot continue to be the sole guiding consideration for program-related decision-making nor the primary data point by which Seattle measures success.

As SPU's solid waste management approach shifts upstream, SPU is adjusting its measures for success to examine reductions in waste generation as well as reductions in environmental impacts related to the production, transportation, and end-of-life management of materials. To better align goals, metrics, and targets with a greater focus on upstream strategies like waste prevention, SPU would like to focus less on hitting recycling rate targets and more on developing new measures of success for preventing waste and minimizing environmental impacts.

Recommendation

Consistent with a life cycle view of materials and SPU's increased focus on moving toward zero waste by emphasizing waste prevention, SPU recommends the following.

Rec 02. Keep developing overarching goals consistent with waste prevention and reduction activities instead of continuing to emphasize recycling rate goals focused on diversion

SPU should update metrics used to evaluate and improve SPU services. Objectives for these expanded efforts include:

- Researching, evaluating, and identifying performance metrics that consider life cycle environmental and climate impacts of waste (not just tons managed) to evaluate the overall impact of and prioritize SPU's solid waste activities.
- Researching, evaluating, modeling, and identifying performance metrics to recommend waste prevention goals and environmental impact goals or performance metrics.

To accomplish this recommendation, SPU has begun the work of developing metrics or proposing further research of metrics to measure system-wide upstream impacts and environmental impacts described in the following sections.



SPU is focused on moving toward zero waste by emphasizing waste prevention through actions such as reducing food waste and using reusable items (Source: SPU Image Library)

Measuring Upstream Goals

Recognizing that the main performance metric that SPU has used to track progress and make decisions about program implementation—the weight-based recycling rate—is not well-suited to measure upstream strategies like waste prevention, SPU organized a symposium in 2017—*Goals, Metrics, and More: Defining Success in Materials Management Symposium*. SPU held the symposium to discuss new ways to measure performance success in the solid waste industry and identify new metrics that better measure and communicate the success of Seattle's solid waste management system.⁶

The one-day symposium included regional and national stakeholders in education, environmental consulting, government, business (grocery, retail, reuse, and technology), waste haulers, and media. The symposium provided a collaborative forum for Seattle to:

- Start a dialogue with regional and national stakeholders from across the materials management life cycle about measuring success in materials management.
- Explore options for defining success in materials management beyond a weight-based recycling rate.
- Identify possible new metrics and targets to include in SPU's *2022 Plan Update* and annual *Waste Prevention & Recycling Report*.

Based on learnings from the 2017 Symposium, research conducted by other solid waste leaders, and guidance from the Department of Ecology, which moved away from focusing on the recycling rate in 2019, SPU is working to create goals consistent with a focus on upstream activities.⁷

⁶ Seattle Public Utilities, "Goals, Metrics, and More: Defining Success in Materials Management Symposium Summary Report," February 16, 2018, <http://www.seattle.gov/Documents/Departments/SPU/Documents/SPUMeasurementSymposium11022017Summary.pdf>.

⁷ Washington State Department of Ecology, "Changes in Washington's Statewide Solid Waste Metrics – FAQ," April 19, 2019, https://www.ezview.wa.gov/Portals/_1962/Documents/Water2Resources/SWAC19-05MetricsChangesFAQ.pdf.

Per Person Residential Waste Generation and Disposal

Following the *2011 Plan Revision* and reaffirmed in its *2021–2026 Strategic Business Plan*, SPU developed residential per-person generation and disposal targets described in Table 2.3.

Table 2.3 Metrics and Targets for Residential Per Person Waste Generation and Disposal 2021–2026

METRIC	TARGET
Reduce garbage, recyclables, and organics (food and yard waste) generated per resident per day (2019 baseline)	2.11 pounds (lbs.) per person per day
Minimize residential garbage tonnage transported to landfill for disposal (2019 baseline)	0.80 pounds (lbs.) per person per day

Potential Metrics and Targets

The following sections describe metrics and potential targets for further consideration as SPU attempts to better capture the success and environmental impacts of upstream activities. Every metric has advantages and disadvantages. Choosing the optimal subset of metrics will require additional analysis. More research and evaluation are needed to identify what metrics and targets best balances SPU's needs, costs of the measurement activities, and alignment to overall goals. The scenario selected in the *2022 Plan Update* was analyzed using the RPA model and can be used to propose potential targets for some of the metrics described below.

The following sections describe potential metrics, reasons to use them, limitations, and possible targets for:

- Landfill disposal and waste generation for commercial, residential, and self-haul waste (Table 2.4)
- Landfill disposal and waste generation for C&D debris (Table 2.5)
- Reductions in food waste (Table 2.6)
- Capture and contamination rates (Table 2.7)
- Environmental Impacts (no table)

In the second half of 2022, SPU plans to start a project to research, evaluate, and if appropriate, develop the solid waste metrics and targets proposed in the *2022 Plan Update*.

Commercial, Residential, and Self-Haul Waste

The metrics for commercial, residential, and self-haul waste proposed in Table 2.4 expand on the landfill tonnage and recycling rate metrics that Seattle has used in the past to present a fuller picture of Seattle's performance in preventing waste and increasing recycling. Many of the data for the proposed metrics for commercial, residential, and self-haul waste are already available. Note that although SPU developed per person residential waste generation and disposal goals as part of the *2021–2026 Strategic Business Plan*, SPU plans, starting in the second half of 2022, to reevaluate these measurements for their suitability in measuring Seattle's waste prevention and reduction progress.

Table 2.4 Potential Metrics and Targets for Commercial, Residential, and Self-Haul Waste

METRIC	REASONS TO USE	LIMITATIONS	POTENTIAL TARGETS
Total tons landfilled (update from <i>Zero Waste Resolution</i> goal of ≤438,000 tons per year)	May measure advances in both waste prevention, recycling, and composting efforts	Sensitive to economic variables and population growth	- Reduce 10% from 2018 levels by 2028 - Reduce 1% from the previous year
Per-employee or per \$1000 B&O tax commercial tons landfilled	Less sensitive than total landfill amount to economic factors and population growth; may measure advances in both waste prevention, recycling, and composting efforts	May produce unreliable outcomes when the economy grows or shrinks quickly	N/A (more analysis is needed to determine what is the best normalizing factor)

METRIC	REASONS TO USE	LIMITATIONS	POTENTIAL TARGETS
Per-capita or per household residential landfilled	Less sensitive than total landfill amount to economic factors and population growth; may measure advances in both waste prevention, recycling, and composting efforts	May produce unreliable outcomes when the economy grows or shrinks quickly	N/A (more analysis is needed to determine what is the best normalizing factor)
Total tons generated	May measure advances in waste prevention	Highly sensitive to economic and population growth; does not measure advances in recycling and composting	Less than 2.5% increase from previous year
Per-employee or per \$1000 B&O tax commercial generation	Less sensitive than total generation to economic factors and population growth; may capture waste prevention efforts	May produce unreliable outcomes when the economy grows or shrinks quickly; does not measure advances in recycling and composting	N/A (more analysis is needed to determine what is the best normalizing factor)
Per-capita or per household residential generation	Less sensitive than total generation to economic factors and population growth; may capture waste prevention efforts	May produce unreliable successful outcomes when the economy grows or shrinks quickly; does not measure advances in recycling and composting	N/A (more analysis is needed to determine what is the best normalizing factor)

C&D Debris

Expanding on the C&D debris recycling rate metric used in the past, the potential metric for C&D debris in Table 2.5 presents a fuller picture of Seattle's performance using total tons landfilled and generated. For C&D debris, scaling tonnages by the dollar value of construction and demolition permits can mitigate the effect of changes in construction activity on tonnage that make it hard to compare progress year-to-year. Generally, the data for the proposed C&D debris metrics are already available.

Table 2.5 Potential Metrics and Targets for C&D Debris

METRIC	REASONS TO USE	LIMITATIONS	POTENTIAL TARGETS
Total tons landfilled	May measure advances in both waste prevention, recycling efforts	Sensitive to economic variables and population growth	- Reduce 20% from 2018 levels by 2028 - Reduce 2% from the previous year
Total tons generated	May measure advances in waste prevention	Highly sensitive to economic and population growth; Does not measure advances in recycling	Less than 11% increase from previous year
Tons generated per permit and per dollar of permit value	Less sensitive than total generation to construction activity; may measure advances in waste prevention	May be affected by the many types of construction permits that vary widely in amounts of waste generated	N/A (more analysis is needed)

Reductions in Food Waste

As a signatory to the [Pacific Coast Food Waste Commitment](#), Seattle supports the regional commitment to reduce food waste 50% from 2015 levels by 2030.⁸ Seattle is also supportive of the statewide goals recently adopted for Washington under [RCW 70A.205.715](#) to “reduce by fifty percent the amount of food waste generated annually by 2030, relative to 2015 levels” and as part of the [Use Food Well Washington Plan](#) to “reduce at least half of edible food waste [disposed] by 2030, relative to 2015 levels.”^{9,10} As part of its efforts to support these state and regional goals, (Table 2.6), SPU must determine how to measure food waste, how to calculate the 2015 baseline and any changes over time, and whether to adopt specific targets related to food waste for Seattle. More on this voluntary commitment appears in Chapter 4, *Waste Prevention and Reuse*.

Table 2.6 Potential Metrics and Targets for Food Waste

METRIC	POTENTIAL TARGETS	TARGET YEARS	SOURCE
Food waste generated	Reduce food waste by 50% from 2015 levels	2030	Washington State, Pacific Coast Collaborative
Edible food waste disposed	Reduce edible food waste disposed by 50% from 2015 levels		

⁸ <https://pacificcoastcollaborative.org/food-waste/>

⁹ <https://app.leg.wa.gov/RCW/default.aspx?cite=70A.205.715>

¹⁰ <https://apps.ecology.wa.gov/publications/documents/2107027.pdf>

Capture Rates and Contamination Rates

In addition, two other potential metrics that measure how well Seattle is recycling deserve more study (Table 2.7). Where the recycling rate measures how much recyclable material is recycled compared to the total amount of waste generated, capture rates measure how much recyclable material is recycled compared to the total amount of recyclable waste generated. By measuring only recyclable materials, capture rates remove the impact of changes in the type of waste generated, such as changes in packaging, to focus on how well customers separate materials currently accepted for recycling from landfilled waste. When capture rates are calculated by material, such as cardboard, and by sector, such as multifamily residential, they can better show the effect of programs for individual sectors.

Capture rates help measure the success of recycling programs by stripping out variables such as light-weighting of recyclable products and packaging or changes in the non-recoverable portion of waste. For example, plastic bottles (already a relatively light material) have become even lighter over time, so the recycling rate may not change even when the capture rate for plastic bottles increases. In addition, the decrease in newspapers (a relatively heavy material) can decrease the recycling rate even if people are recycling newspapers at the same or a higher rate over time. Material-specific capture rate data can also help SPU prioritize educational efforts by identifying where people excel at recycling and opportunities for recovering more of certain materials with lower recovery rates.

Calculating Capture Rates

The capture rate is the percentage of recyclable materials sorted for recycling compared to the total amount of recyclable materials generated.

$$\text{Capture Rate} = \frac{400}{400 + 400}$$

For example, a household with 800 pounds of recyclable materials that puts 400 pounds in recycling and the other 400 pounds in garbage has a 50% capture rate.



A City-contracted collector picks up residential recycling (Source: SPU Image Library)

SPU designed the most recent study characterizing single-family residential waste to provide data to calculate capture rates for this sector. Data to calculate capture rates are harder to obtain for other sectors because nonresidential customers are not required to recycle using Seattle's collection contracts, from which Seattle obtains waste and recycling data.

While capture rates focus on whether customers separate accepted materials for recycling, contamination rates focus on whether customers are also placing unwanted materials in recycling containers, which increases the cost of recycling and can make some materials too dirty to recycle into new products. Residuals rates measure the amount of material collected for recycling that is ultimately landfilled. Residuals rates are affected by both contamination from customers and how effectively the recycling process properly sorts wanted recyclables. As with capture rates, data to calculate contamination and residuals rates are more available for the residential sector and harder to obtain for nonresidential sectors.

Table 2.7 Metrics for Capture and Contamination Rate

METRIC	BENEFITS	DRAWBACKS	POTENTIAL TARGETS
Capture rates by material and by sector	Provides quantitative information on specific materials that are landfilled; helpful in targeting materials for recovery	Hard to calculate as waste composition information of all three streams are needed; the definition can change with time if the list of accepted materials changes	N/A (more analysis is needed)
Contamination and residuals rates by stream and by sector	Focuses on quality of recyclables and recovered food and yard waste	May be difficult to obtain the data by sector	N/A (more analysis is needed)

Measuring Environmental Impacts

Measuring environmental impacts enables us to understand the broader impacts that Seattle's waste has on climate change, ecosystems, and human health. For 30 years, SPU has sought to examine benefits and costs that are external to its financial budget by considering greenhouse gas emissions reductions and other environmental and public health impacts when making decisions around solid waste management. For example, SPU has historically used information from life cycle assessments to prioritize which products or materials to focus on. Life cycle assessment is a technique used to quantitatively evaluate environmental impacts associated with some of (or ideally all) the stages of a product's life from raw material extraction through materials processing, manufacture, distribution, use, repair and maintenance, and disposal or recovery.

SPU's data-driven approach to planning includes modeling a wide range of environmental impacts associated with the programs SPU considers for implementation. See Appendix E, *Recycling and Environmental Benefits Analysis*, for an explanation of the models Seattle used to forecast the impacts of the recommendation in the 2022 Plan Update.

Seattle has not yet assessed environmental impacts after implementing recommendations to measure progress for several reasons. Estimating environmental impacts using this method requires the same data that are needed to calculate capture, contamination, and residuals rates. The overall level of effort to estimate environmental impacts using Seattle's method is relatively high compared to the range of uncertainty in the modeling results.

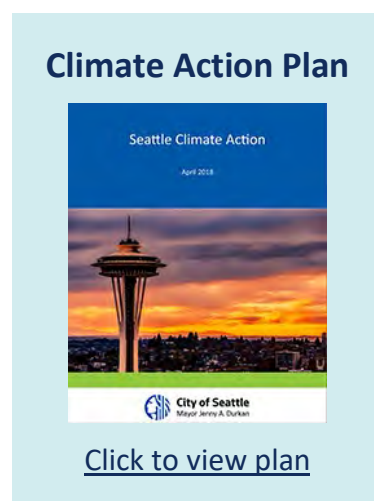
While a wide range of environmental impacts are important, Seattle and many jurisdictions have focused primarily on greenhouse gas emissions, because of their impact on climate change. The City established goals and metrics for reducing greenhouse gas emissions in the *2013 Climate Action Plan* and the *2018 Climate Action Strategy*. Citywide, the *2013 Climate Action Plan* established goals to:

- Reduce total core emissions 58% from 2008 levels by 2030
- Become carbon neutral by 2050 (based on the Paris Climate Agreement)

For solid waste, the *2013 Climate Action Plan* established goals to:

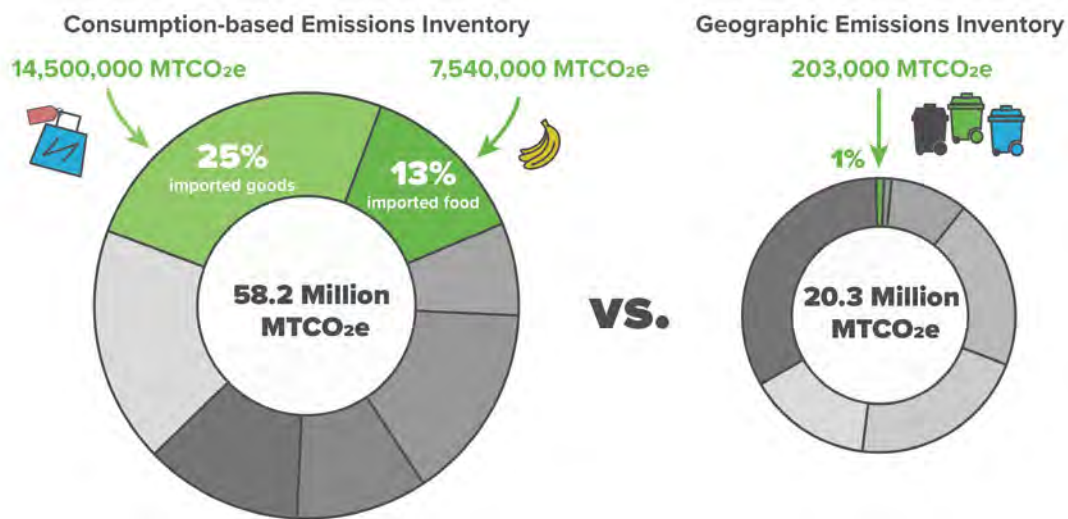
- Reduce methane emissions from landfill by 50% by 2020
- Recycle 70% commercial, residential, and self-haul waste by 2022 (based on the *Zero Waste Resolution*)

The City's current greenhouse gas emissions inventory estimates the contribution of waste from collection through disposal, focusing on end-of-life management. This inventory does not measure the full life cycle impacts of those materials during resource extraction, manufacturing, packaging, and transportation.



By contrast, conducting a greenhouse gas emissions inventory using a consumption-based methodology would better capture emissions associated with the whole life cycle of producing materials, including emissions from imported goods (see Figure 2.6). Measuring and tracking greenhouse gas emissions requires cooperation from many local agencies because such inventories require large-scale data sets. King County developed countywide consumption-based inventories in 2008 and 2015. Currently, Seattle is working with a team of local jurisdictions led by King County to develop a regional greenhouse gas emissions inventory that will also establish a consumption-based inventory specifically for Seattle. Such an inventory would be the first step in developing potential metrics and targets for solid waste in Seattle that measure impacts across the full life cycle of materials. Measuring the environmental life cycle impact of materials and operations could also include evaluating plastic pollution or energy use.

Figure 2.6 Consumption-Based vs Geographic Emissions Inventories



Source: Seattle Public Utilities and Cascadia Consulting Group.

Measuring the Impact of Activities and Services

In the Introduction (Chapter 1, *Development of the 2022 Solid Waste Plan Update*) SPU explained that the Solid Waste Utility plans to explore and expand the evaluation and measurement of its programs and services across all stages of the materials management supply chain. SPU will benefit from new metrics that align with the goals set in this *2022 Plan Update*. New research and future decision-making will be needed to identify, assess, and select these metrics.

Recommendation

Expanding data collection and analysis and developing future metrics will support Seattle's solid waste goals related to racial equity, safety, and affordability, so SPU makes the following recommendation:

Rec 03. Expand solid waste data analytics, metrics, and evaluation to improve assessment of services and operations

SPU should explore developing and tracking data related to:

- **Racial equity of service** such as demographic distribution of services provided and used, transfer station users, and missed collections by demographics, sector, and zip code. For example, in the multifamily sector, outreach distribution is evaluated every year to assess whether buildings of different sizes and in all geographic areas are being served. SPU evaluates whether residents living in the far north and south areas of the city are being served, as these areas have higher disadvantage in the Racial and Social Equity Index, the index used to map the city by race, English language proficiency, and socioeconomic and health disadvantages.¹¹ Adjustments are made to the next round of outreach based on the outcome of the evaluation.
- **Industry-standard safety metrics** to evaluate transfer station operations and contracted collectors, processors, transporters, and disposal.
- **Cost-related metrics**, including assessment of access and affordability of services and benchmarking of service costs.

¹¹ City of Seattle Office of Planning and Community Development, "Racial and Social Equity Index Map 2018," 2018 Accessed August 25, 2019, [Race and Social Equity Index Map 2018.pdf \(seattle.gov\)](#).



3

Solid Waste Data and Trends

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Chapter 3 Solid Waste Data and Trends

Overview

Seattle is a data-driven city. Over the last three decades, Seattle has built one of the most extensive solid waste datasets in the United States. SPU uses existing data to assess current solid waste facilities and services. As part of the solid waste planning process, SPU also uses its data to run sophisticated models that forecast future waste generation, diversion, and disposal and to project how different sets of services will perform. This chapter describes the data Seattle measures and how it analyzes them to inform design and development of solid waste facilities, policies, and services. The chapter covers:

- Types and sources of waste
- How SPU measures and models Seattle's waste
- Demographic, economic, and environmental factors that affect planning
- Waste generation trends and forecasts for commercial, residential, and self-haul waste
- Recycling and composting trends and forecasts for commercial, residential, and self-haul waste
- Capture rate estimates for commercial, residential, and self-haul waste
- Waste composition study results
- Trends and forecasts for construction and demolition (C&D) debris waste generation and recycling

Types and Sources of Waste

Solid waste includes all the garbage, recycling, organics (yard and food waste), and construction and demolition debris collected within Seattle and hauled to the City's recycling and disposal (transfer) stations. It includes waste generated by commercial, residential, and self-haul customers as well as waste from construction and demolition projects (called C&D debris) that

is managed separately from commercial, residential, and self-haul waste. Because C&D debris contains substantially different materials and is typically managed separately, Seattle has historically tracked and reported C&D debris separately from commercial, residential, and self-haul waste.¹ In some cases, commercial, residential, and self-haul waste includes some C&D materials, if disposed of at North and South Transfer Stations or placed in residential or business garbage containers.



Residential carts in front of a house are ready for collection (Source: SPU Image Library)

Seattle's waste is generated by five sectors:

- 1 Commercial includes nonresidential customers, such as businesses and nonprofit organizations. Typically, dumpsters are picked up as needed by the account that serves commercial buildings. For the past 21 years, the commercial sector has generated the most waste of any non-C&D debris sector, ranging from 40% to 52% of waste generated by commercial, residential, and self-haul customers.
- 2 Single-family residential includes waste from homes that have cans or carts picked up at the curb. These residences are typically single-family homes, up to and including fourplexes. The single-family sector generates the second most tons of non-C&D debris waste, around 26% to 33% in recent years.

¹ Previous versions of *Seattle's Solid Waste Plan* and annual *Waste Prevention and Recycling Reports* used the term "municipal solid waste (MSW)" to mean all commercial, residential, and self-haul waste. The *2022 Plan Update* no longer uses that term (except in selected appendices) in order to align with Washington State's legal definition of municipal solid waste as "a subset of solid waste which includes unsegregated garbage, refuse and similar solid waste material discarded from residential, commercial, institutional and industrial sources and community activities, including residue after recyclables have been separated" in Washington Administrative Code [\(WAC\) 173-350-100](#).

- 3 Self-haul includes residents and businesses who bring waste they create for drop-off at City-owned transfer stations. It also includes waste from nonresidential generators that do not use the City's solid waste contractors, including the Seattle Housing Authority, University of Washington, and military establishments. In recent years, self-haul waste has accounted for about 9% to 17% of non-C&D debris waste.
- 4 Multifamily residential includes waste picked up from residential buildings or complexes that have dumpster or detachable container service. Typically, these buildings have five or more housing units. This sector consistently generates the least waste of any non-C&D debris sector, with 9% to 12% of tons.
- 5 Construction and demolition (C&D) and landclearing debris includes wood waste, metals, asphalt roofing, gypsum, and other materials generated by construction, demolition, or landclearing activities that are not disposed of at City-owned transfer stations or mixed with commercial, residential, and self-haul waste. In 2020, C&D sector generated more tons overall than any other sector for the 10th straight year.

The Hazardous Waste Management Program in King County, which is a joint program supported and implemented by Seattle, King County, Public Health – Seattle and King County, and the Suburban Cities Association, manages **moderate risk waste**. **Moderate risk waste** includes household hazardous waste from residents and small quantity generator waste from businesses, which is discussed briefly in Chapter 6, *Solid Waste Handling Collection and Removal*.

Other categories of waste are not allowed in commercial, residential, and self-haul waste, such as biomedical, asbestos, biosolids, and dangerous wastes. These wastes require special handling and disposal due to regulatory requirements or other reasons such as toxicity or specific safe handling methods. Proper disposal options for these other wastes are discussed in Chapter 6, *Solid Waste Handling Collection and Removal*.

SPU uses sector-specific collection and disposal data to assess current and plan for future solid waste facilities and services. SPU's customer services, particularly those around outreach and education, are developed specifically around the four generating sectors or customer audiences. The following sections describe how Seattle gets data on sector-specific waste or discarded material. Measurement of prevented waste is discussed in Chapter 4, *Waste Prevention and Reuse*.

Measuring and Modeling Seattle's Waste

This section details how SPU collects sector-specific solid waste data and then uses those data to forecast service performance using sophisticated modeling. SPU uses a range of data and modeling tools to track recycling progress and analyze future services. Data sources include routine reports from SPU's contracted collectors and processors and yearly reports from recycling businesses. Seattle analyzes the data for many reasons, such as evaluating the efficacy of its services and policies, identifying service gaps or areas for improvement, supporting policy development, and identifying patterns and trends that inform customer outreach and education.

To further understand waste in Seattle, SPU conducts waste composition studies on roughly four- to six-year cycles by sector. These studies show what people are putting in the waste streams and help SPU assess the efficacy of its services and policies and identify opportunities to improve. SPU also gathers waste prevention data on a project-by-project basis, as noted in Chapter 2, *Maximizing and Measuring Impact: Moving Upstream Beyond the Recycling Rate*. This section concludes by describing the two key models SPU uses to analyze and forecast recycling performance:

- The Seattle Discards Model analyzes past recycling performance
- The Recycling Potential Assessment Model analyzes future services, including those recommended in the *2022 Solid Waste Plan Update (2022 Plan Update)*

Commercial Waste

Commercial waste includes garbage, recycling, and food and yard waste discarded by businesses, schools, and other institutions in Seattle that is collected in containers at those locations and not self-hauled by the generator to the transfer stations or a recycling site.

Data for commercial garbage come from reporting requirements built into collection contracts to assess contractor performance. SPU has data for each truck trip on a commercial collection route to the transfer stations. Weekly trip data provides SPU with the total tons of all materials collected under City contract as garbage, recycling, and food and yard waste.² SPU summarizes

² Note that few commercial customers have recycling and/or food and yard waste collected under the City's contract.

the data quarterly (showing monthly data) and posts the summaries on SPU's [Solid Waste Reports](#) webpage.³

Data on “open market” or non-contracted commercial and C&D recycling and commercial composting can be difficult to obtain and analyze but are important to help Seattle understand the citywide recycling rate. Per state law, businesses and nonprofit organizations can choose to use City-contracted recycling and food and yard waste haulers for commercial collection, or they can hire any hauler on the open market.

SPU obtains open market recycling data through the annual [City of Seattle Recycler License](#) requirement.⁴ Seattle requires recycling collectors and processors operating in the city to submit an annual report to maintain their City of Seattle Recycler License. They must report annual tons recycled, by material, and end-location or end-use of the material.

SPU analyzes the reports to minimize the double counting of tons (where the recycler who collected material and the processor who received it both report tons for that material). SPU relies on annual self-reporting of open market commercial and C&D recycling and commercial composting from recycling collectors and processors to estimate the commercial and C&D recycling rates each year.

In addition to the recyclers' reports, SPU receives detailed trip-level data for tons of recycling and food and yard waste collected from nonresidential customers under SPU's collection contracts to assess contractor performance. SPU combines these tons with the information from the recyclers' reports to report progress on reducing waste in the annual *Waste Prevention & Recycling Report*.⁵



SPU staff members inspect commercial garbage and recycling carts (Source: SPU Image Library)

³ <http://www.seattle.gov/utilities/about/reports/solid-waste-reports>

⁴ <http://www.seattle.gov/utilities/about/reports/solid-waste-reports/recycler-annual-reports>

⁵ Seattle Public Utilities, “2020 Annual Waste Prevention & Recycling Report,” October 2021, https://www.seattle.gov/Documents/Departments/SPU/Documents/Recycling_Rate_Report_2020.pdf.

Residential Waste

SPU's residential waste data come from reporting requirements built into collection contracts to assess contractor performance. SPU has data for each truck trip through a Seattle neighborhood to a processing center. Weekly trip data provides SPU with the total tons of all materials collected as garbage, recycling, and food and yard waste. SPU summarizes the data quarterly (showing monthly data) and posts the summaries on SPU's [Solid Waste Reports](#) webpage.⁶

To assess progress on food and yard waste recovery, SPU estimates the amount of food waste versus yard waste in residential food and yard waste collection using the Seattle Discards Model (described below). This statistical model uses historical data and current conditions to model waste generation, including projecting yard waste tons based on annual variations in weather.

SPU measures onsite (backyard) food and yard waste management as waste prevention because these materials never enter the collection system. In the past, Seattle has primarily relied on the Home Organics Survey to measure onsite or backyard management of food and yard waste.⁷ Historically, SPU has conducted this survey approximately every five years to update information on how many households compost at their homes and recycle their grass by leaving their mower clippings on the lawn (also called "grasscycling" or "mulch mowing").

Home Organics Survey data were combined with other data on average amounts of yard and food waste collected per household through the food and yard waste collection program. SPU uses all these data to estimate the number of tons of food and yard waste diverted from landfill. Since SPU conducts the Home Organics Survey roughly every five years, estimates for tons diverted through management at home remain constant until SPU has new data to re-estimate the tons diverted.

Self-Haul Waste

When self-haul customers enter and leave the City's transfer stations, they drive across a scale and interact with SPU staff at the scale house. SPU counts the number of customers (trips) and weighs the tons of garbage and yard waste they bring to understand waste generation for this sector.

⁶ <http://www.seattle.gov/utilities/about/reports/solid-waste-reports>

⁷ Seattle Public Utilities, prepared by FBLK Research, "2018 Home Organics Waste Management Survey Report," May 2018, www.seattle.gov/Documents/Departments/SPU/Documents/Home_Organics_Survey_2018.pdf.

SPU also has data on the amount of organic material hauled from the transfers stations to processing facilities. Having both sets of data serve as a check on the total tons of organic material. SPU reports food and yard waste tons quarterly (as monthly data) in the *Residential Organics Report*.

Recycling in the self-haul sector consists of self-haul yard waste (for composting) and a variety of other recyclable materials placed in drop boxes. For self-haul recycling, customers typically do not cross the scale to weigh their vehicles. Instead, SPU obtains outbound weight reports from the trucks that haul recyclables away from the transfer stations to processors.



Customers drive across a scale at the North Transfer Station (Source: SPU Image Library)

Construction and Demolition Debris

Seattle requires C&D debris recyclers and processors to submit annual facility reports to SPU and to document the facilities to which they sent material, along with the quantities of material diverted. C&D debris recyclers must also submit the same annual recycling and reuse report as commercial recyclers, as described above, to obtain a Recycler License. All Seattle Department of Construction and Inspection permit applicants for new construction, remodeling, and demolition through the must submit a Waste Diversion Report to SPU.

Waste Composition Studies

SPU conducts waste composition studies to measure the quantity and type of materials discarded in Seattle, sorting waste into dozens of categories. Seattle staggers its studies of

waste composition on four- to six-year cycles. Table 3.1 shows most recent years that Seattle conducted composition studies by sector and waste stream. Study reports are available on the [SPU's Solid Waste Reports webpage](#).⁸

Table 3.1 Most Recent Seattle Waste Composition Studies by Study Year

SECTOR	GARBAGE	RECYCLING	FOOD & YARD
Single-family residential	2020–2021	2020–2021	2016
Multifamily residential	2020–2021	2020–2021	2016
Commercial	2016	NA	2016
Self-haul	2017-2018	NA	NA
C&D debris	2013-14	NA	NA

Note: Years represent when data were collected, not when reports were published

The studies help Seattle measure progress toward waste prevention and recycling rate goals and identify opportunities to reduce or recycle more materials. They also provide key data for the Recycling Potential Assessment Model (described below and in Appendix E, *Recycling Potential Assessment and Environmental Benefits Analysis*, to evaluate and prioritize recommendations utilized in each solid waste plan update, including the *2022 Plan Update*. The most recent published composition data are presented in Waste Composition Study Results starting on page 3.34. Results from the 2020–2021 residential garbage and recycling study have not yet been published.

Seattle Discards Model

The Seattle Discard Model is not technically a data source, but an analytical tool that uses readily available data on commercial, residential, and self-haul waste to understand the effects of policy or program interventions on behavior. SPU uses the Seattle Discards Model to analyze recycling program performance. The Seattle Discards Model establishes a relationship between monthly collection quantities of garbage, recycling, and food and yard waste, as well as the factors that affect these discarded amounts. For instance, one calculation in the model estimates the effect of changes in household size or income on the amount of waste that households discard in the curbside recycling stream. Another part of the calculation estimates the impacts on residential garbage from similar changes. The Seattle Discards Model contains a

⁸ <http://www.seattle.gov/utilities/about/reports/solid-waste-reports>

set of calculations around expected garbage, recycling, and food and yard waste quantities, depending on factors such as:

- Unemployment rate
- Housing prices
- Household size
- Household income
- Average and marginal fees for collection
- Other factors such as temperature and precipitation

If a new factor, or a “shock to the system” emerges, such as the introduction of a disposal ban, the Seattle Discards Model can isolate the tonnage impact of the ban from the other factors that are also affecting waste tonnage. The Seattle Discards Model includes calculations for residential garbage, residential recycling, residential food and yard waste, self-haul garbage, and commercial garbage. Each calculation has its own set of factors, which explain the various garbage and recycling streams. Variables in the calculations have changed over time, but the overall methodology is the same. SPU continually works to refine and improve the model.

Recycling Potential Assessment Model

The Recycling Potential Assessment Model forecasts potential increases in recycling from a combination of programs, referred to as scenarios. The model starts with an econometric (mathematical economic) forecast of waste generation based on demographic and economic forecasts. It uses data from waste composition studies about what is left in the waste stream. The model estimates new recycling diversion based on assumptions about how effective each program could be for each affected material. Recycling Potential Assessment Model results include forecasted recycling rates through 2040, as well as the costs and avoided costs of each program and scenario.

The Recycling Potential Assessment Model also calculates estimated new or incremental costs associated with implementing and running each program. Examples of costs are new staff, customer education, and equipment and contractor payments. In addition, the model calculates the savings from each of the programs when the new tons recycled do not have to be collected, transferred, and disposed. This is called the “avoided cost,” or the financial benefit, to recycling. For a description of and details about the Recycling Potential Assessment Model analysis, as well as the Measuring Environmental Benefits Calculator, commonly known as MEBCalc, a second analysis SPU uses to calculate the economic value of environmental benefits associated with recycling, see Appendix E, *Recycling Potential Assessment and Environmental Benefits Analysis*.

Demographic, Economic, and Environmental Factors in Planning

Seattle considers a variety of demographic, economic, and environmental factors to understand, plan for, and forecast waste trends and to inform the design and implementation of customer services. For instance, Seattle looks at population and economic activity, including employment trends, to better understand and predict waste generation. Waste generation trends and forecasts play a key role in SPU's design of solid waste facilities, for example, where long-range tonnage forecasts help determine capacity, equipment, and staffing requirements. Changes in customer population including growth, changing demographics, and shifting of housing types, such as single-family to multifamily, affect the types and amounts of waste discarded by customers as well as awareness and ability to participate in diversion programs. SPU examines demographic data on race, housing trends, and language to better understand who its customers are and ensure its services are accessible to all.



An SPU staff member outside of a multifamily building in Seattle (Source: SPU Image Library)

Population

Population growth is a key factor that affects waste generation. In the past decade, Seattle grew at a staggering rate. During the so-called “Amazon Boom” of the past 11 years (2010-2020), Seattle grew by 25%, or 152,000 residents, from about 609,000 to 761,000 people. This represents more newcomers to the city than in the previous 30 years combined. Seattle ranked as the fastest-growing major city in 2020 and was the fastest-growing major city for the overall period from 2010 to 2020.⁹

Seattle's rapid growth was faster than forecasted, with the population in 2020 (761,000) nearly reaching earlier official projections for 2035 (765,000).¹⁰ Those official projections forecasted that in 2040 Seattle would have nearly 798,000 residents and 397,000 households. As of October 2021, updated forecasts are not available for Seattle, but regional forecasts for King, Pierce, Snohomish, and Kitsap counties project the population will grow by 37% and households will grow by 46% from 2020 to 2050.¹¹

Recent and projected population changes include continued anticipated growth in the multifamily sector and changing demographics, such as tech sector growth, increase in millennials, increase in housing density, changing immigrant populations, increase of retirees, and population turnover. Approaches used in the past may not be as effective or resonate with new audiences. For example, residents in apartment units may require more tailored tools for food scrap collection because the kitchen space available for a container may be limited.

With a total area of approximately 142 square miles, of which more than 40% are water, Seattle's current population density is approximately 9,500 people per square mile. As the population grows and density increases in the city, new collection challenges arise. For example:

- Increased density reduces the areas available for container setouts
- Types and sizes of new buildings require review of solid waste service options
- Curbside collection options can be impacted by competing uses for street space, such as bike lanes, tree areas, pedestrian ways, and parking

⁹ Gene Balk / FYI Guy, " Surprise! Seattle was the fastest-growing big U.S. city in 2020," Seattle Times, 27 May 2021, <https://www.seattletimes.com/seattle-news/data/surprise-seattle-was-the-fastest-growing-big-u-s-city-in-2020> Accessed 20 October 2021.

¹⁰ Puget Sound Regional Council, "Land Use Vision version 2 (LUV.2) Dataset," Accessed 12 August 2019, <https://www.psrc.org/projections-cities-and-other-places>.

¹¹ Puget Sound Regional Council, "2018 Regional Macroeconomic Forecast," Accessed 20 October 2021, <https://www.psrc.org/regional-macroeconomic-forecast>.

Maintaining good street access for staging containers and collection, particularly for dumpsters, presents many challenges. The new trend in building larger multifamily buildings as well as multi-use buildings, which combine residential and commercial spaces, will impact which solid waste service strategies and designs are effective. In addition, intermingling of mixed-use multifamily and single-family residences in historically single-family neighborhoods increases collection truck traffic, as different types of trucks are needed to service dumpsters versus curbside carts. City traffic slows collection overall, and heavy collection trucks cause wear and tear on streets and alleys that require ongoing maintenance.

Language

According to the most recent American Community Survey, 79% of Seattle's population speaks English only.¹² About 5% are a "limited English-speaking household," which is defined by the U.S. Census Bureau as "a household in which no person 14-years-old and over speaks only English, and no person 14-years-old and over who speaks a language other than English speaks English 'very well'."¹³ Seattle maintains a map that shows the percentage of the population that speaks a language other than English by census tract: *Race and Social Justice Initiative/Inclusive Outreach and Public Engagement Language Maps* ([RSJI/IOPE Language Maps](#)).¹⁴ Table 3.2 summarizes the categories of non-English spoken at home in Seattle. Understanding language use throughout the city enables SPU to provide culturally relevant communications to its diverse communities.

¹² U.S. Census Bureau, "American Community Survey, 2015-2019 American Community Survey 5-Year Estimates," Accessed March 2, 2021,

<https://data.census.gov/cedsci/table?q=ACSST5Y2017.S1601&g=1600000US5363000&tid=ACSST5Y2019.S1601>.

¹³ U.S. Census Bureau, "American Community Survey, 2015-2019 American Community Survey 5-Year Estimates," Accessed March 2, 2021.

<https://data.census.gov/cedsci/table?q=language&g=1600000US5363000&tid=ACSST5Y2019.S1602>

¹⁴ City of Seattle, "RSJI/IOPE Languages Spoken," Accessed August 23, 2019,

<http://seattlecitygis.maps.arcgis.com/apps/MapSeries/index.html?appid=d21c05ff5c9f41b98c2585497072586a>.

Table 3.2 Seattle Languages Spoken at Home

SPEAK A LANGUAGE OTHER THAN ENGLISH	% OF POPULATION
Speak a language other than English	21.3%
Spanish	4.1%
Other Indo-European language	4.2%
Asian and Pacific Island languages	10.2%
Other languages	2.8%

Source: 2019 American Community Survey Five-Year Estimates.

Race and Ethnicity

Table 3.3 presents Seattle demographics by race. Some respondents identify with two or more races in combination. Nearly 11% of Seattle's population identified as Hispanic or Latino in 2020.¹⁵ Understanding race and ethnicity throughout the city enables SPU to provide culturally relevant communications to its diverse communities.

Table 3.3 Seattle Racial Identity

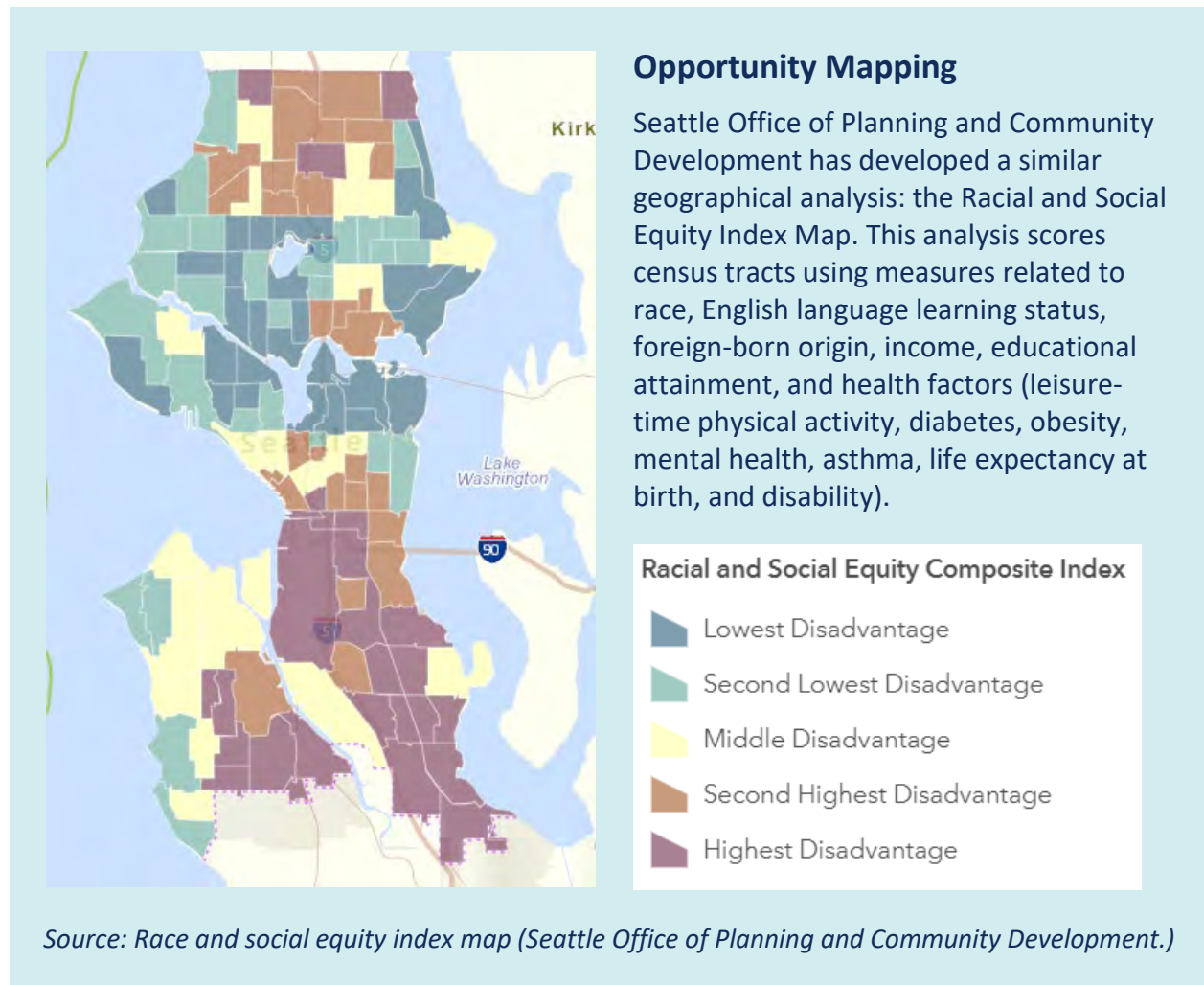
RACE	% OF POPULATION
White alone	55.5%
Asian alone	18.0%
Two or more races in combination	10.6%
Black or African American alone	8.8%
Some other race alone	5.3%
Native Hawaiian and other Pacific Islander alone	0.9%
American Indian and Alaska Native alone	0.8%

Source: 2020 Census Redistricting Data (Public Law 94-171.)

¹⁵ U.S. Census Bureau, "2020 Census Redistricting Data (Public Law 94-171)," Accessed October 5, 2021, <https://data.census.gov/cedsci/table?q=hispanic%20latino%20in%20seattle&tid=DECENNIALPL2020.P2&hidePreview=true>.

Opportunity

In 2018, Puget Sound Regional Council (PSRC) updated its Opportunity Mapping data, which uses several factors to assess opportunity by geography across PSRC's four-county region (King, Snohomish, Kitsap, and Pierce counties).¹⁶ PSRC uses indicators to assess opportunity, including level of education, economic health, neighborhood and housing quality, mobility and transportation, and public and environmental health to show where conditions and outcomes vary across a range of opportunity measures. SPU can use this analysis to inform its decision-making and assessments of service equity across the city. For example, by collecting zip code data during customer satisfaction surveys, SPU can assess whether levels of satisfaction vary geographically in a way that correlates with this map to identify potential equity issues.



¹⁶ Puget Sound Regional Council, "Opportunity Mapping Technical Addendum," July 2019, <https://www.psrc.org/sites/default/files/opportunitymapping.pdf>.

Employment

Waste generation directly correlates with economic cycles. For example, solid waste (garbage, recycling, and food and yard waste) generated by commercial, residential, and self-haul sources decreased with the recession after the economic high of 2007. Generation has risen again as the economy recovered and as population has increased, offset somewhat by the effects of waste prevention programs. Recently, waste generation has been in decline despite population growth. With the COVID-19 pandemic, generation reached its lowest point in many years, owing to the economic recession and restrictions on business activity.

Employment in Seattle grew by 23% over the past 20 years, from 502,000 employees in 2000 to 620,000 employees in 2019.¹⁷ Official forecasts conducted in 2017 show Seattle employment, an economic indicator, rising through the year 2040 (Table 3.4).¹⁸ The number of employees in each commercial sector factors into the volumes and types of waste generated from businesses. The finance, insurance, real estate, and services sector employs more than half of all workers in Seattle. Forecasts project that all employment sectors will rise except manufacturing, suggesting that waste generation will also increase. As of October 2021, updated forecasts were not available for Seattle. Regional forecasts for King, Pierce, Snohomish, and Kitsap counties project employment will grow by 44% from 2020 to 2050.¹⁹

Table 3.4 Forecasted Seattle Employment Trends by Sector through 2040

	2025	2030	2035	2040
Construction, Resources	20,505	20,320	21,039	22,316
Education	15,272	15,788	16,196	16,624
Finance, Insurance, Real Estate, Services	352,136	365,322	393,386	435,478
Government	80,225	79,130	77,634	77,222
Manufacturing, Wholesale, Trade, Utilities	64,726	61,706	61,774	63,572
Retail, Food Services	107,383	110,662	122,427	135,986
Total	640,247	652,928	692,456	751,198

Source: Puget Sound Regional Council Land Use Vision 2 Dataset, April 2017.

¹⁷ Washington State Employment Security Department, Quarterly Census of Employment and Wages, nd. Figures represent employment in industries covered by unemployment insurance.

¹⁸ Puget Sound Regional Council, "Land Use Vision version 2 (LUV.2) Dataset," 2017, <https://www.psrc.org/projections-cities-and-other-places>.

¹⁹ Puget Sound Regional Council, "2018 Regional Macroeconomic Forecast," Accessed 20 October 2021, <https://www.psrc.org/regional-macroeconomic-forecast>.

Consumption

Changes in customer population and consumption habits affects the type and quantity of material that residents and businesses set out for collection. Examples include continued shifts away from manufacturing businesses toward more service and office-type businesses, growth of the technology sector, population increases, in-migration from out-of-state, and aging of the baby boomer population. SPU frequently identifies and responds to changes in the waste stream as producers continually introduce new products and materials. One example is increased use of non-recyclable lightweight plastic bubble-wrap envelopes for shipping by online retailers instead of heavyweight, recyclable cardboard. By assessing possible future scenarios based on these trends, SPU is better positioned to provide resilient collection services and customer programs.

Building Permits

Trends in new construction and demolition activities affect generation of C&D debris as well as commercial, residential, and self-haul waste. Seattle's Office of Planning and Community Development tracks housing growth and demolition citywide and by neighborhood, providing this information in the online [Housing Growth Report](#).²⁰ Table 3.5 shows permitting data for residential units from 2016 through 2020.

Table 3.5 Building Construction Units by Year of Final Inspection 2016–2020

	2016	2017	2018	2019	2020
New residential construction	7,561	10,626	10,853	11,965	8,815
Residential demolition	610	1,553	666	650	484
Total	8,171	12,179	11,519	12,615	9,299

Source: Seattle Building Construction Permits from SDCI Permit Data Warehouse.

²⁰ Seattle Office of Planning & Community Development, "Housing Growth Report," Accessed August 23, 2019, <http://seattlecitygis.maps.arcgis.com/apps/opsdashboard/index.html#/1111d274c85e4ca48af719da4b26fe9f>.

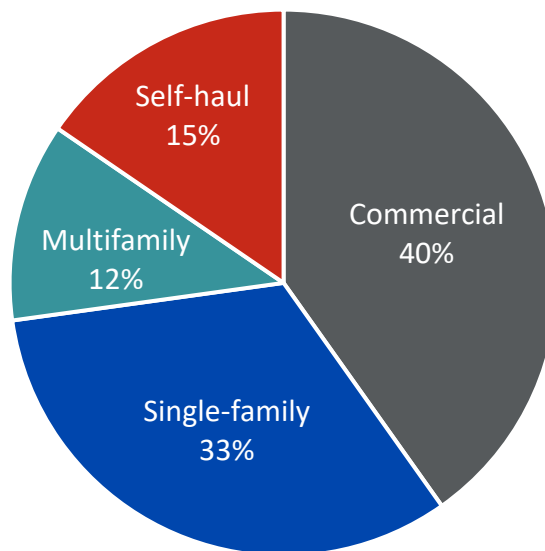
Commercial, Residential, and Self-Haul Waste Generation Trends and Forecasts

This section describes past trends in Seattle's generation and forecasts for waste generation through 2040. Understanding past trends and future forecasts helps Seattle understand which sectors are responsible for creating the most waste, evaluate drivers of waste generation, and identify which sectors may need expanded services in the future.

Total Generation Trends for Commercial, Residential, and Self-Haul Waste

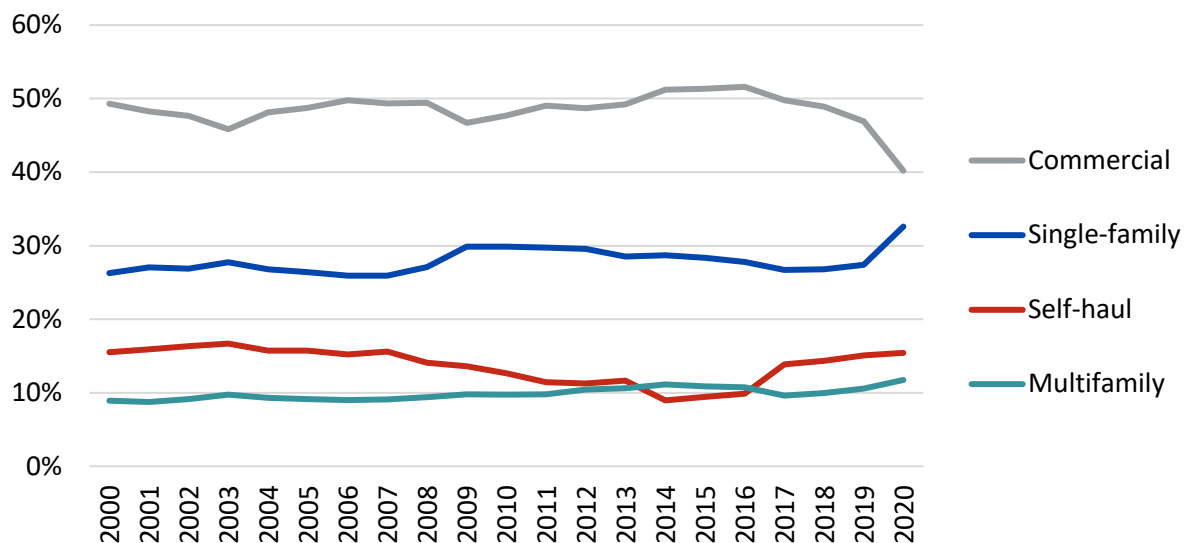
Overall generation of commercial, residential, and self-haul waste is the sum of each sector's share of all waste, which changes over time. Figure 3.1 shows the percentage of total commercial, residential, and self-haul waste generated by each sector in 2020, when the commercial sector discarded 40% of Seattle's non-C&D debris waste, single-family residents were responsible for approximately 33% of that waste while multifamily residents contributed 12%. Before the COVID-19 pandemic disruptions, the commercial sector generated a higher share of waste (47% in 2019). Residents and businesses that self-haul waste to Seattle's transfer stations generated 15% of total waste. Figure 3.2 shows the percentage of total commercial, residential, and self-haul waste generated by each sector from 2000 to 2020.

Figure 3.1 Estimated Share of Commercial, Residential, and Self-Haul Waste Generated by Sector in 2020



Source: SPU, "2020 Annual Waste Prevention & Recycling Report."

Figure 3.2 Estimated Share of Commercial, Residential, and Self-Haul Waste Generated by Sector 2000–2020



Source: SPU, "2020 Annual Waste Prevention & Recycling Report."

Commercial, residential, and self-haul tons of generated waste in Seattle have trended downward since 2018 (Table 3.6).

Table 3.6 Estimated Total Waste Generation for Commercial, Residential, and Self-Haul Waste 2000–2020

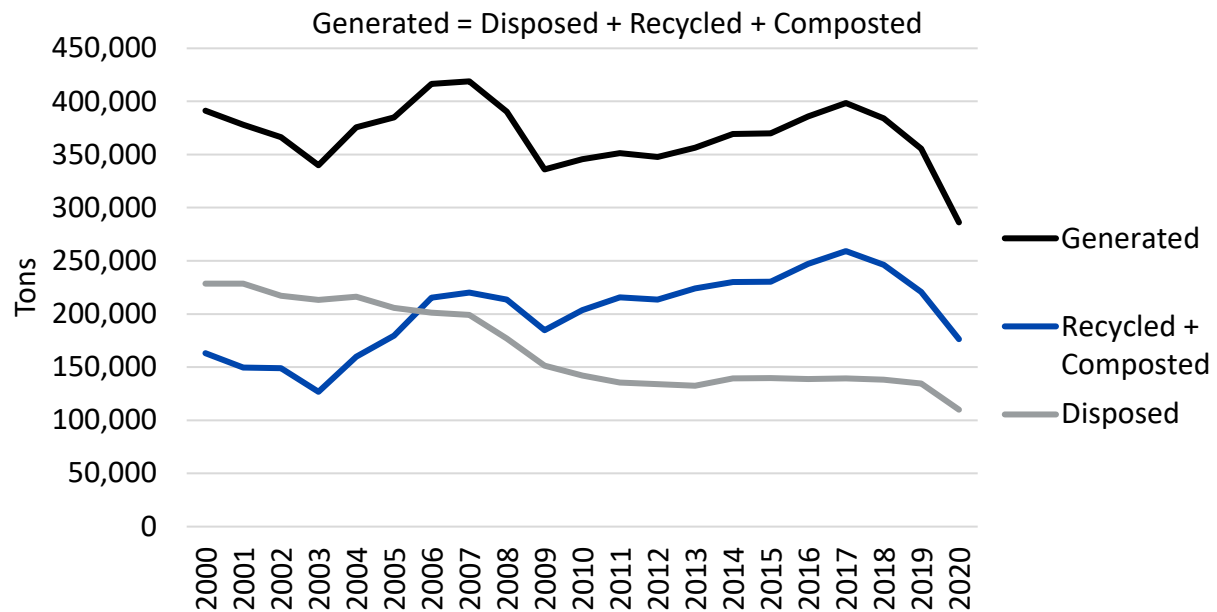
YEAR	COMMERCIAL TONS	SINGLE-FAMILY RESIDENTIAL TONS	SELF-HAUL TONS	MULTIFAMILY RESIDENTIAL TONS	OVERALL CITYWIDE TONS
2000	391,406	208,468	123,024	70,944	793,842
2001	377,927	211,982	124,453	68,611	782,974
2002	366,224	206,474	125,620	70,144	768,462
2003	339,844	205,748	123,597	72,149	741,337
2004	375,739	209,132	122,835	72,640	780,346
2005	385,093	208,675	124,364	72,325	790,456
2006	416,564	216,946	127,444	75,545	836,499
2007	418,979	220,128	132,545	77,108	848,759
2008	390,267	213,889	111,309	74,223	789,688
2009	335,992	215,015	97,893	70,524	719,424
2010	345,692	216,484	91,618	70,675	724,469
2011	351,214	212,861	81,776	70,145	715,996
2012	347,673	211,030	80,568	74,549	713,821
2013	356,480	206,603	84,341	76,960	724,385
2014	369,407	206,992	64,681	80,189	721,269
2015	370,037	204,397	67,993	78,278	720,705
2016	385,846	207,804	73,923	80,478	748,051
2017	398,422	213,709	111,098	77,150	800,380
2018	384,139	210,289	112,550	78,245	785,223
2019	355,453	207,538	114,234	80,241	757,466
2020	286,036	232,038	109,844	83,701	711,619

Source: SPU, "2020 Annual Waste Prevention & Recycling Report."

Commercial Waste Generation Trends

Figure 3.3 graphically shows estimated total tons of waste generated as well as tons of garbage, recycling, and food and yard waste from Seattle's commercial sector through 2020. With Washington State on lockdown for most of the year due to the COVID-19 pandemic, waste generation in the commercial sector decreased 20% from 2019 to 2020 levels. At just 286,000 tons, the sector produced the lowest number of tons in 21 years.

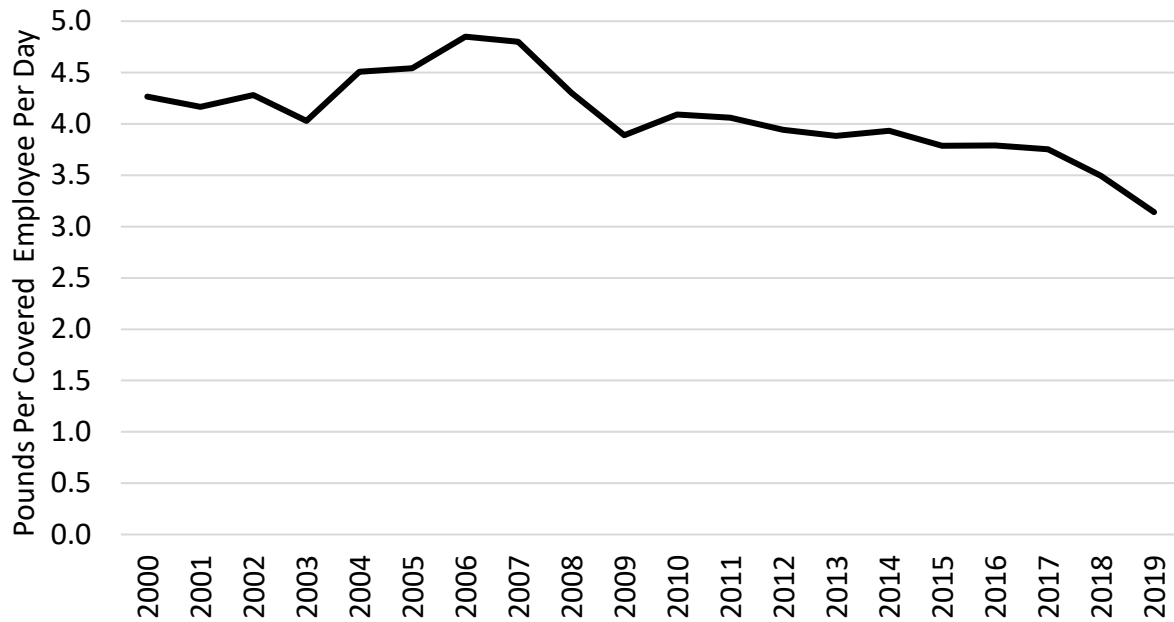
Figure 3.3 Estimated Commercial Waste Generation 2000–2020



Source: SPU, "2020 Annual Waste Prevention & Recycling Report."

While people working in Seattle increased by 23% between 2000 and 2019, commercial waste generation increased by only 10% because the amount of waste generated per employee decreased by 26%, from 4.27 pounds per employee per day to 3.14 pounds per covered employee per day (Figure 3.4).²¹

Figure 3.4 **Estimated Commercial Waste Generation per Covered Employee 2000–2019**



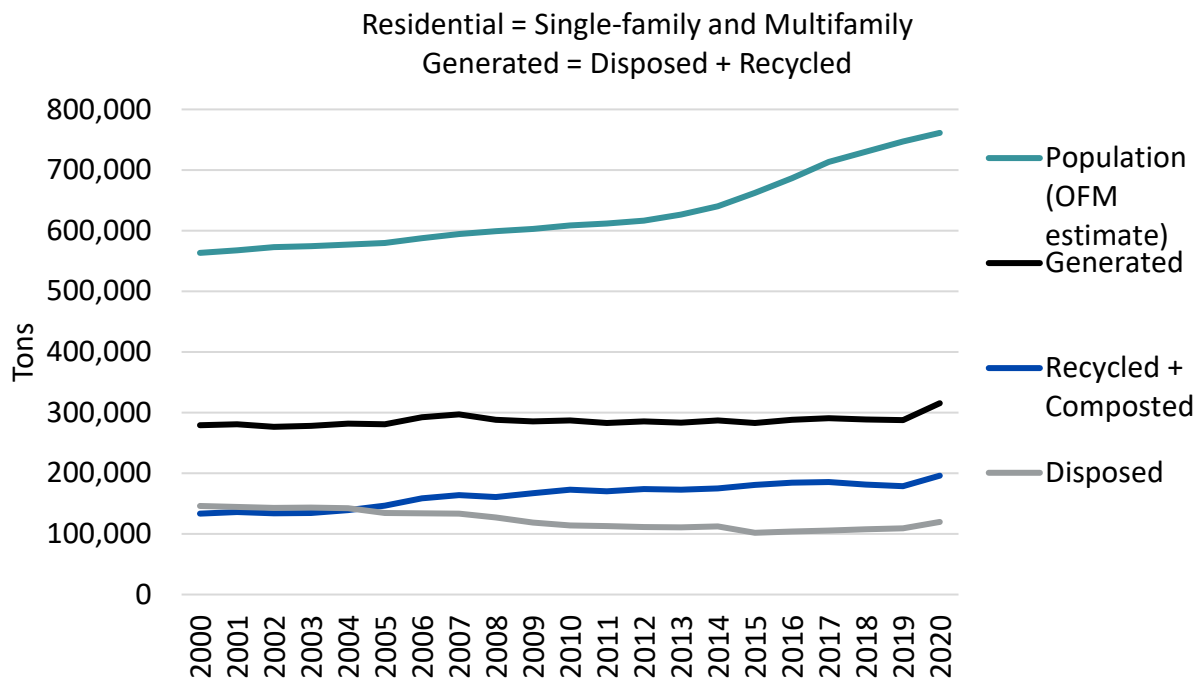
Source: SPU, Solid Waste Planning & Program Management Division unpublished data, 2020.

²¹ Covered Employment refers to positions covered by the Washington Unemployment Insurance Act. The Act exempts the self-employed, proprietors and corporate officers, military personnel, and railroad workers, so those categories are not included in the dataset. Covered Employment accounts for approximately 85% to 90% of all employment.

Residential Waste Generation Trends

Figure 3.5 graphically shows total tons of waste generated as well as tons of garbage, recycling, and food and yard waste from the residential sector (including both single-family and multifamily residents). While Seattle's residential population increased by 35% between 2000 and 2020, residential waste generation increased by 13%.

Figure 3.5 Residential Waste Generation 2000–2020

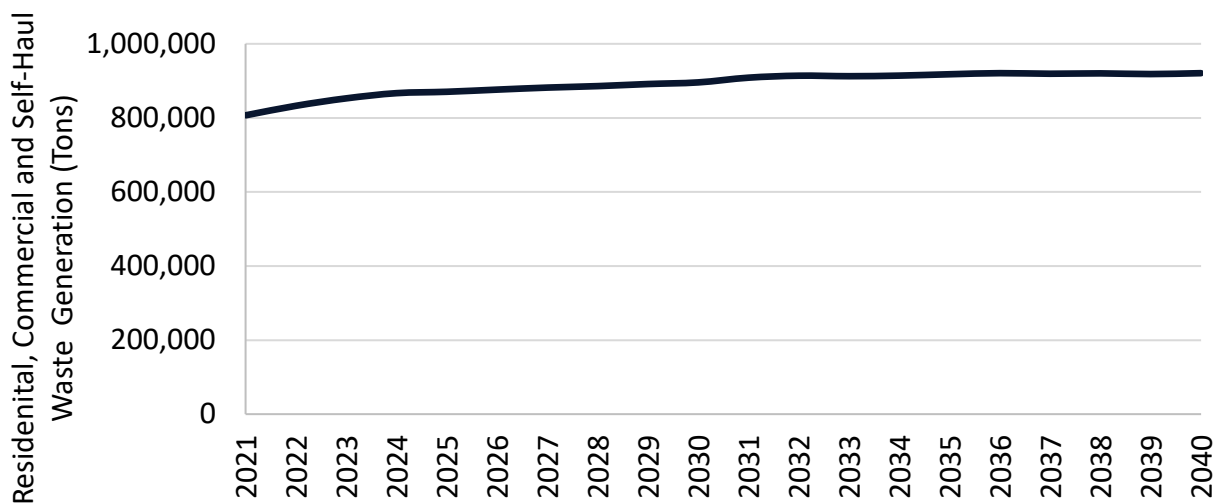


Source: SPU, "2020 Annual Waste Prevention & Recycling Report."

Waste Generation Forecasts for Commercial, Residential, and Self-Haul Waste

Following a dip in waste generation during the COVID-19 pandemic, SPU expects overall generation of commercial, residential, and self-haul waste to rebound and to steadily increase over the next roughly 20 years (Figure 3.6).

Figure 3.6 Forecast for Commercial, Residential, and Self-Haul Waste Generation through 2040



Source: SPU, Seattle's Solid Waste Forecasting Model, last updated December 2020, reviewed October 2021.

SPU forecasts waste generation using an econometric model that projects generation by sector. The projection for 2021—2040 is based model data from 2018, as well as some updates made in 2020. Note that the model does not incorporate 2020 Census data or COVID-19 pandemic impacts. Table 3.7 shows the commercial, residential, and self-haul waste generation forecast by sector and overall.

Table 3.7 Forecast for Commercial, Residential, and Self-Haul Waste Generation through 2040 by Sector

YEAR	COMMERCIAL TONS	SINGLE-FAMILY RESIDENTIAL TONS	SELF-HAUL TONS	MULTIFAMILY RESIDENTIAL TONS	OVERALL CITYWIDE TONS
2018 (actual)	384,139	210,289	112,550	78,245	785,223
2019 (actual)	355,453	207,538	114,234	80,241	757,466
2020 (actual)	286,036	232,038	109,844	83,701	711,619
2021	380,168	228,855	112,041	86,325	807,389
2022	403,983	226,371	112,900	89,768	833,022
2023	419,034	228,241	114,347	91,481	853,103
2024	426,920	229,132	115,411	95,638	867,100
2025	430,360	229,315	115,387	95,769	870,830
2026	433,858	231,032	115,825	95,935	876,650
2027	436,753	234,314	116,214	94,841	882,121
2028	438,823	234,414	117,054	95,806	886,097
2029	441,279	238,728	116,834	94,890	891,731
2030	442,993	236,962	117,075	99,124	896,154
2031	450,096	241,297	117,546	99,923	908,862
2032	452,048	239,937	117,965	104,257	914,207
2033	451,697	238,604	117,803	104,750	912,854
2034	451,936	236,607	117,865	108,015	914,423
2035	453,328	238,111	117,891	108,762	918,092
2036	454,048	239,889	118,134	108,969	921,039
2037	452,681	241,831	117,812	107,175	919,498
2038	452,664	241,899	117,715	108,212	920,490
2039	451,188	243,728	117,570	106,144	918,629
2040	451,644	241,343	117,656	110,411	921,053

Source: SPU, Seattle's Solid Waste Forecasting Model, last updated December 2020, reviewed October 2021.

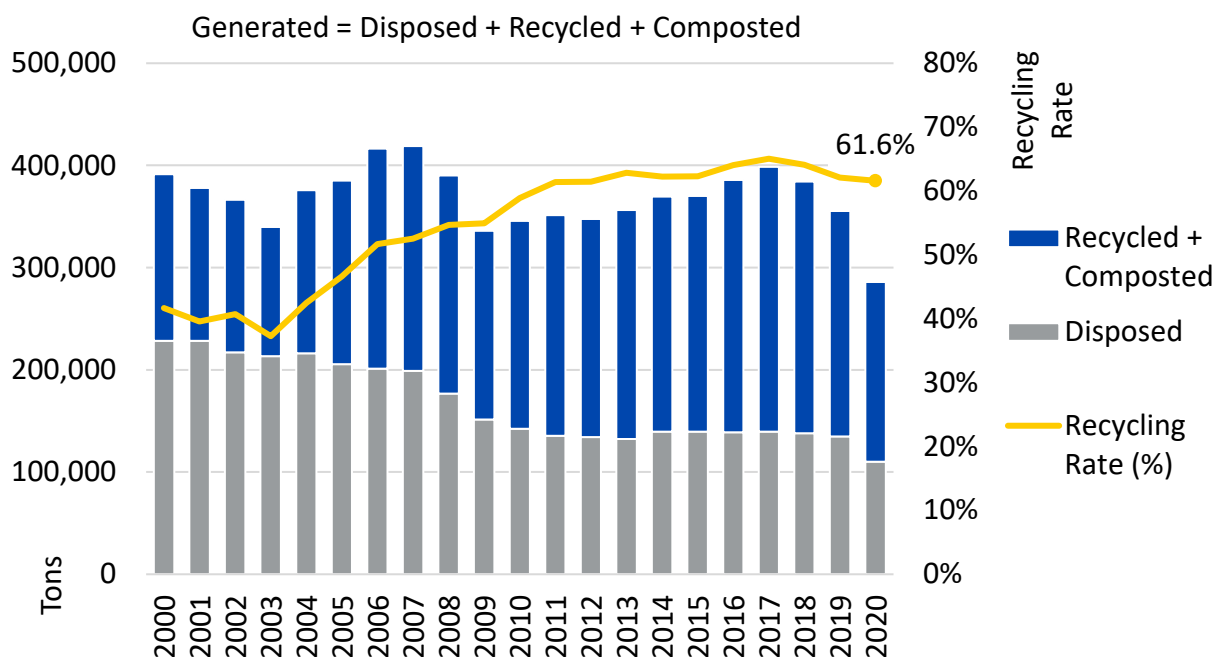
Commercial, Residential, and Self-Haul Waste Recycling and Composting Trends and Forecasts

Since 2000, Seattle has made substantial progress toward the weight-based recycling rate goals that the City Council set in the *2007 Zero Waste Resolution (#30990)* and revised in 2013. The citywide goal is to recycle 70% of commercial, residential, and self-haul waste through single-stream recycling or composting of food and yard waste by 2022. Within that overall goal, each sector had its own target and varying success toward reaching the target. SPU's annual *Waste Prevention & Recycling Report*, most recently published for 2020, provides additional detail on progress toward recycling rate goals.

Commercial

The estimated weight-based recycling rate for the commercial sector (40% of total generated waste in 2020) has increased since the *2011 Solid Waste Plan Revision (2011 Plan Revision)*, from 59% in 2010 to 62% in 2020 (Figure 3.7).

Figure 3.7 Estimated Commercial Waste Recycled and Disposed 2000–2020

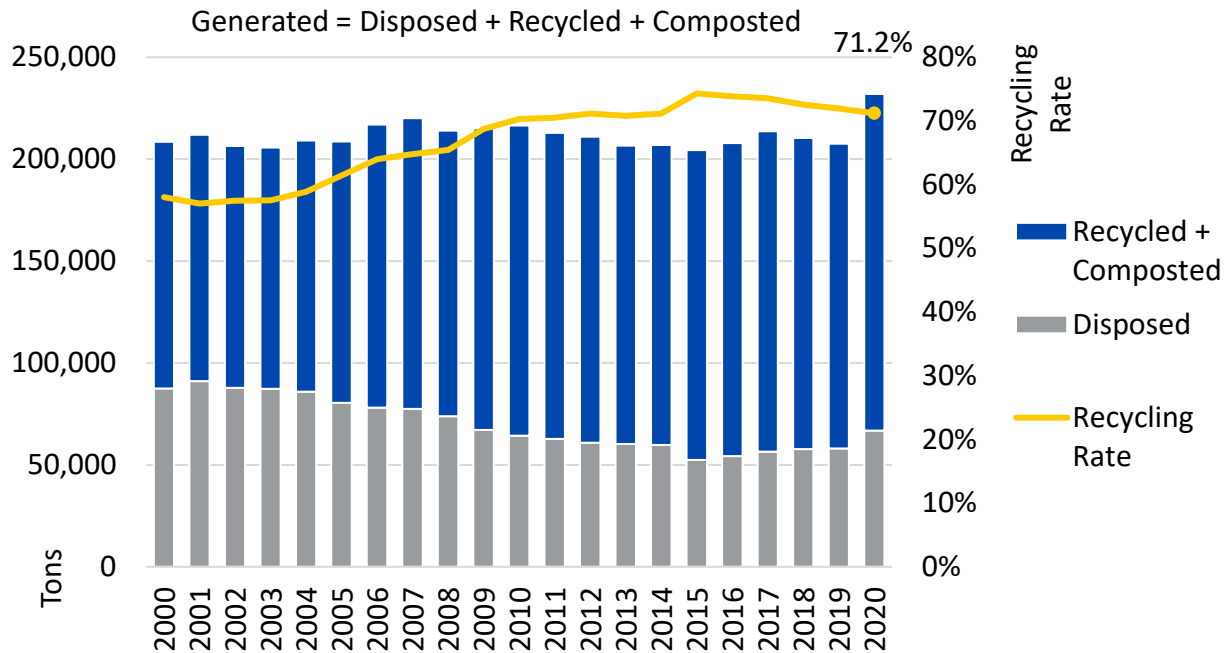


Source: SPU, "2020 Annual Waste Prevention & Recycling Report."

Single-Family Residential

The weight-based recycling rate for Seattle's single-family sector (33% of total generated waste in 2020) reached 71% in 2020 (Figure 3.8). The single-family weight-based recycling rate has held relatively steady since 2014.

Figure 3.8 Single-Family Waste Recycled and Disposed 2000–2020

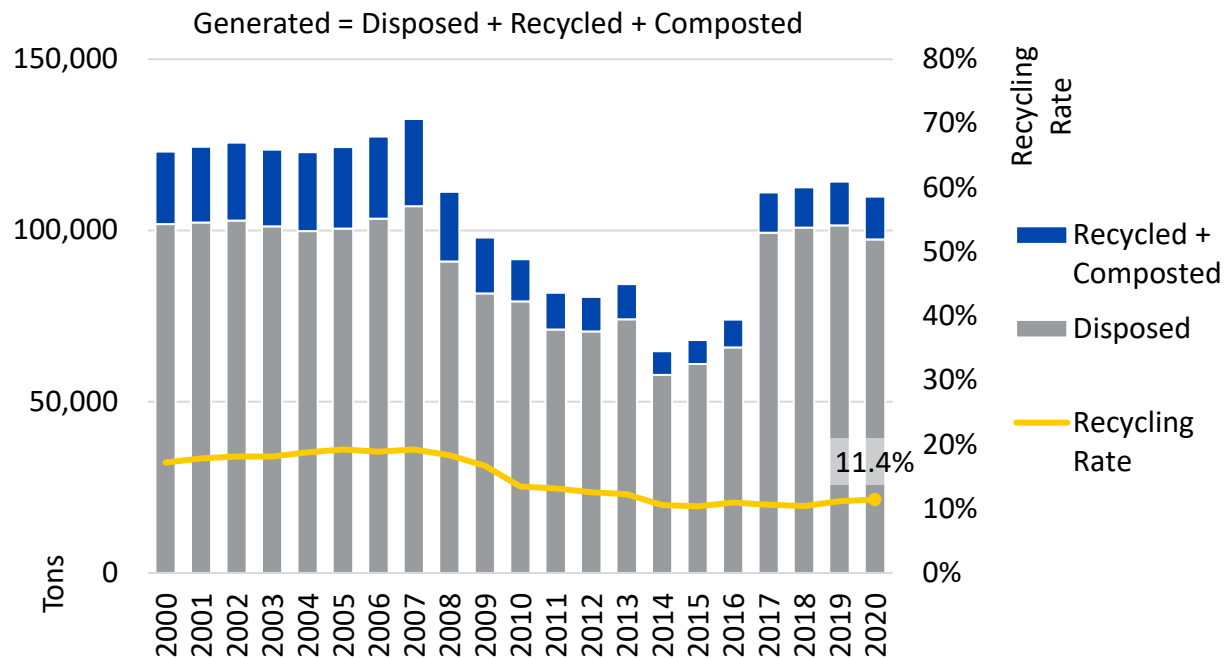


Source: SPU, "2020 Annual Waste Prevention & Recycling Report."

Self-Haul

Self-haul recycling (15% of total generated waste in 2020) has decreased since the *2011 Plan Revision*, from 14% in 2010 to 11% in 2020 (Figure 3.9).

Figure 3.9 Self-Haul Waste Recycled and Disposed 2000–2020

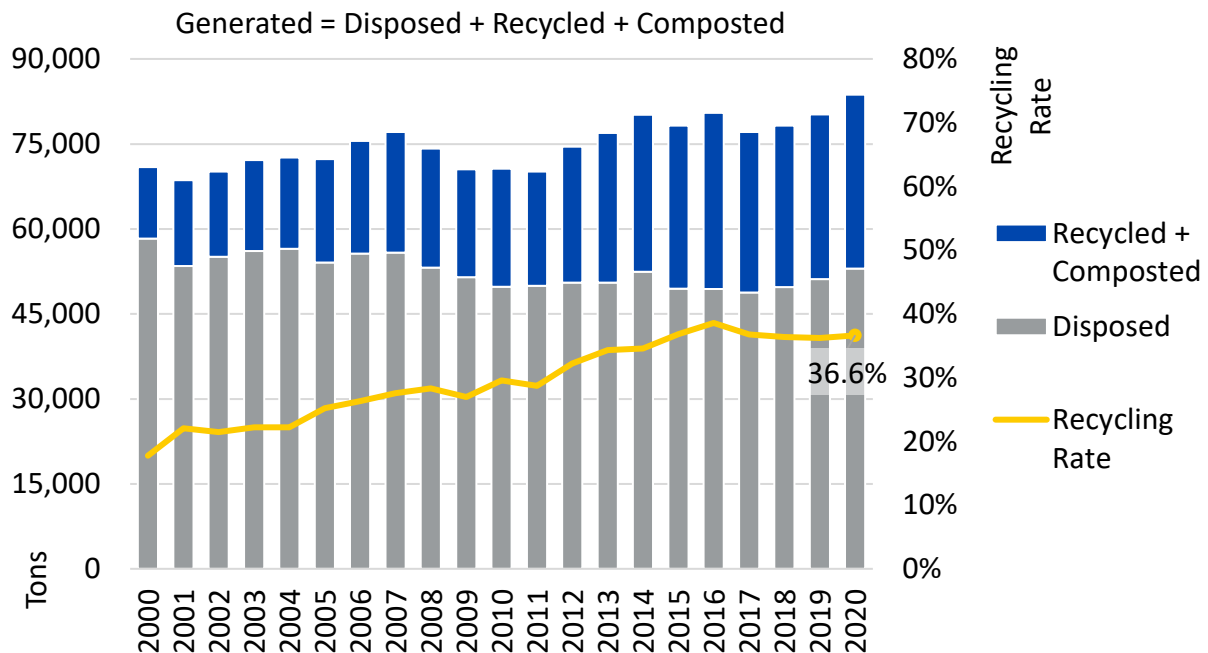


Source: SPU, "2020 Annual Waste Prevention & Recycling Report."

Multifamily Residential

The weight-based recycling rate for the multifamily sector (12% of total generated waste in 2020) has increased since the *2011 Plan Revision*, from 30% in 2010 to 37% in 2020 (Figure 3.10). The multifamily weight-based recycling rate has been relatively steady since 2015.

Figure 3.10 Multifamily Waste Recycled and Disposed 2000–2020



Source: SPU, "2020 Annual Waste Prevention & Recycling Report."

Commercial, Residential, and Self-Haul Waste Recycling Rate Forecasts

Table 3.8 shows the projected recycling rates through 2040 if the 39 recommendations in the 2022 Plan Update are implemented. The projections are based on the Recycling Potential Assessment, described briefly above and in detail in Appendix E, *Recycling Potential and Environmental Benefits Analysis*. The recommended programs have the potential to increase City of Seattle's recycling rate to 69% by 2040.

Table 3.8 Weight-Based Recycling Rate Projections by Sector After Implementing Recommended Programs

YEAR	COMMERCIAL	SINGLE-FAMILY RESIDENTIAL	SELF-HAUL	MULTIFAMILY RESIDENTIAL	OVERALL CITYWIDE
2018 (actual)	64.1%	72.5%	10.4%	36.4%	55.9%
2019 (actual)	62.1%	72.0%	11.1%	36.2%	54.4%
2020	65.9%	72.6%	10.6%	37.4%	57.3%
2025	72.9%	76.3%	12.6%	49.4%	63.3%
2030	76.7%	81.6%	15.1%	54.9%	67.7%
2035	78.0%	83.1%	17.2%	56.5%	68.9%
2040	78.0%	83.1%	17.2%	56.5%	69.0%
2022 Goal	75.0%	83.0%	46.0%	54.0%	70.0%

Source: SPU, *Recycling Potential Assessment Model*, August 2019.

Capture Rate Estimates for Commercial, Residential, and Self-Haul Waste

Where the recycling rate measures how much recyclable material is recycled compared to the total amount of waste generated, capture rates measure how much recyclable material is recycled compared to the total amount of recyclable waste generated (discussed in Chapter 2, *Maximizing and Measuring Impact: Moving Upstream, Beyond the Recycling Rate*). Capture rates are the percent of recoverable materials that are captured, meaning collected, for recovery out of the total amount of recoverable materials generated. Examining capture rates by material type using information from waste composition studies and the Seattle Discards

Model can identify where SPU has achieved success and where SPU may need to focus additional efforts. As part of forecasting using the Recycling Potential Assessment Model, SPU compiled available data from these sources to estimate capture rates (Table 3.9).

Table 3.9 Estimated Capture Rates (Overall Commercial, Residential, and Self-Haul Waste) for Select Material Types

MATERIAL	LANDFILLED TONS	RECYCLED OR COMPOSTED TONS	TOTAL WASTE TONS	CAPTURE RATE
Yard	4,931	114,537	119,467	96%
Newspaper	3,641	21,228	24,870	85%
Old Corrugated Cardboard and Kraft Paper	10,599	62,260	72,859	85%
Beverage Glass	4,357	23,746	28,103	84%
Mixed Scrap Paper	10,186	46,954	57,140	82%
Computer Office Paper	3,292	13,431	16,723	80%
Aluminum Beverage Cans	845	1,365	2,210	62%
Food Cans	1,259	1,658	2,918	57%
Food	69,584	88,049	157,633	56%
Other Container Glass	721	769	1,490	52%

Source: SPU, Recycling Potential Assessment Model, August 2019. ²²

SPU can identify continued opportunities for waste prevention, recycling, and composting by tracking priority material types and capture rates for these materials. For example, Seattle has a high capture rate for yard waste but substantial room to increase recovery of container glass, food waste, and food cans (Table 3.9). Seattle conducted residential waste characterization studies for garbage and recycling simultaneously in 2020-2021 specifically to measure capture rates by material.

²² Capture rate data based on SPU's modeling under the Recycling Potential Assessment for 2019, described in Appendix E, *Recycling Potential Assessment and Environmental Benefits Analysis*.

Waste Composition Study Results

SPU conducts waste composition studies to help highlight current recycling and disposal behaviors, prioritize specific materials for outreach and education programs, and inform SPU's annual *Waste Prevention & Recycling Report*. SPU could also use them to determine impacts of some waste prevention initiatives if the categories are specific enough, such as the plastic bag ban. SPU typically does waste composition studies on a four- to six-year cycle. Seattle staggers the studies for residential garbage (most recently in 2020–21), residential recycling (2020–2021), commercial garbage (2016), residential and commercial food and yard waste (planned to start in Q3 2021), self-haul garbage (2018), and C&D debris (2017). Results from the 2020–2021 studies are not yet finalized.

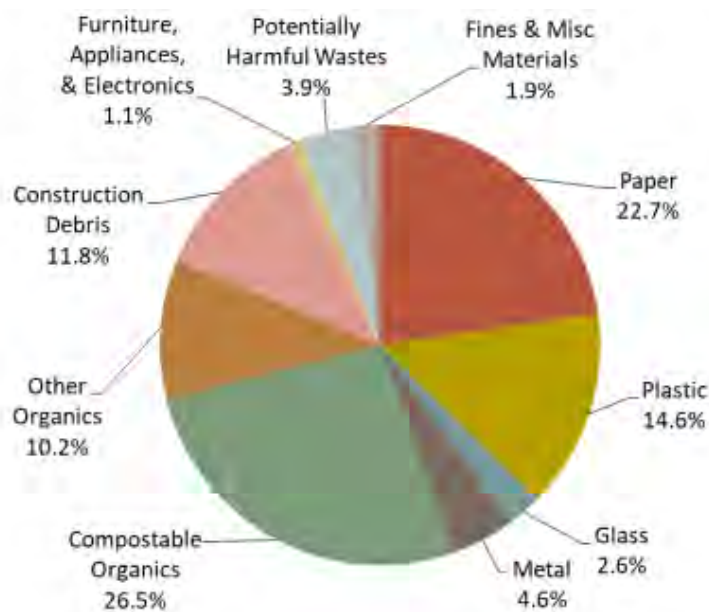
Examining the composition of garbage provides insights specifically into what recoverable materials sent to landfill could provide opportunities to increase recycling. The next sections provide data from the most recent garbage composition studies for the residential, commercial, self-haul, and C&D sectors. Data from these composition studies showed remaining opportunities to divert food from the garbage in the residential and commercial sectors and to divert clean wood in the C&D sector.

Commercial Waste

The most recent commercial waste study was completed in 2016, which documented the types and quantities of materials that businesses place in the garbage for pickup collection.²³ As shown in Figure 3.9, commercial garbage was approximately one-quarter (26.5%) compostable organics (mainly food and yard waste), one-fifth (22.7%) paper, and nearly 15% plastics by weight. Some but not all of this paper and plastic could have been recycled or composted.

²³ Seattle Public Utilities, prepared by Cascadia Consulting Group, "2016 Commercial Waste Stream Composition Study," 2017, <https://www.seattle.gov/Documents/Departments/SPU/Documents/2016CommercialWasteStreamCompositionStudy.pdf>.

Figure 3.11 Seattle Overall Commercial Waste Composition by Material Class 2016



Reprinted from: SPU 2016 Commercial Waste Stream Composition Study

Table 3.10 lists the 10 largest material components in commercial garbage by weight. Recoverable materials present in large quantities in the garbage included food, compostable/soiled paper, and plain old corrugated cardboard (OCC)/Kraft paper (including corrugated cardboard boxes and brown paper bags).

Table 3.10 Top 10 Materials by Weight, Seattle Overall Commercial Waste 2016

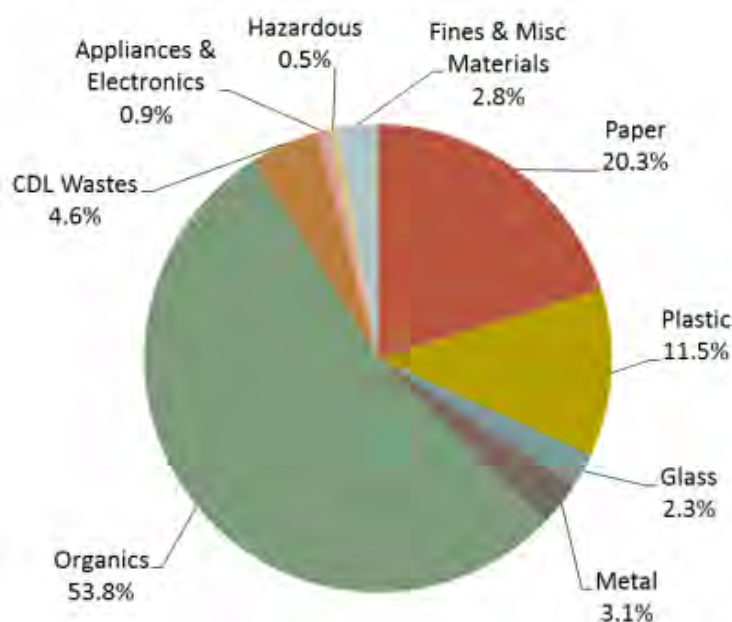
Class	Material	Est. Percent	Cum. Percent	Est. Tons
Compostable Organics	Food	24.5%	24.5%	29,935
Paper	Compostable/Soiled	8.1%	32.6%	9,879
Plastic	Other Film	6.5%	39.1%	7,877
Other Organics	Disposable Diapers	3.9%	43.0%	4,735
Paper	Plain OCC/Kraft	3.7%	46.7%	4,565
Potentially Harmful Wastes	Medical Wastes	3.5%	50.2%	4,253
Paper	Mixed Low-grade Paper	3.1%	53.3%	3,829
Other Organics	Textiles	2.2%	55.5%	2,652
Paper	Mixed/Other Paper	2.2%	57.7%	2,637
Other Organics	Animal By-products	2.1%	59.8%	2,621
Total		59.8%		72,982

Reprinted from: SPU 2016 Commercial Waste Stream Composition Study

Residential Waste

At the time of this writing, SPU is completing a report of findings on residential garbage and recycling composition studies conducted in 2020–2021. The most recent residential composition study with published data on garbage was completed in 2014.²⁴ This study documented the types and quantities of materials that Seattle single-family and multifamily residents placed in the garbage for collection at their homes. As shown in Figure 3.12, most material was recyclable or compostable, with organics making up over half (53.8%) of Seattle's residential garbage and paper making up one-fifth (20.3%). Most but not all of these organics and paper could have been composted or recycled.

Figure 3.12 Seattle Overall Residential Garbage Composition by Material Class 2014



Reprinted from: SPU 2014 Residential Waste Stream Composition Study

Table 3.11 lists the top 10 material components in residential garbage by weight. Recoverable materials present in large quantities included food and compostable/soiled paper.

²⁴ Seattle Public Utilities, prepared by Cascadia Consulting Group, "2014 Residential Waste Stream Composition Study," 2015, <https://www.seattle.gov/Documents/Departments/SPU/Documents/ResidentialWasteStreamCompositionStudy2014.pdf>.

Table 3.11 Top 10 Materials by Weight in Seattle Residential Garbage 2014

Material	Est. Percent	Cum. Percent	Est. Tons
Food	29.5%	29.5%	33,113
Animal By-products	10.7%	40.2%	12,054
Disposable Diapers	7.4%	47.6%	8,313
Compostable/Soiled Paper	6.4%	54.0%	7,169
Other Film	5.7%	59.7%	6,383
Mixed Low-grade Paper	4.3%	64.0%	4,806
Textiles/Clothing	2.9%	66.9%	3,207
Mixed/Other Paper	2.4%	69.3%	2,727
Newspaper	2.2%	71.5%	2,478
Miscellaneous Organics	1.7%	73.2%	1,899
Total	73.2%		82,147

Reprinted from: SPU 2014 Residential Waste Stream Composition Study

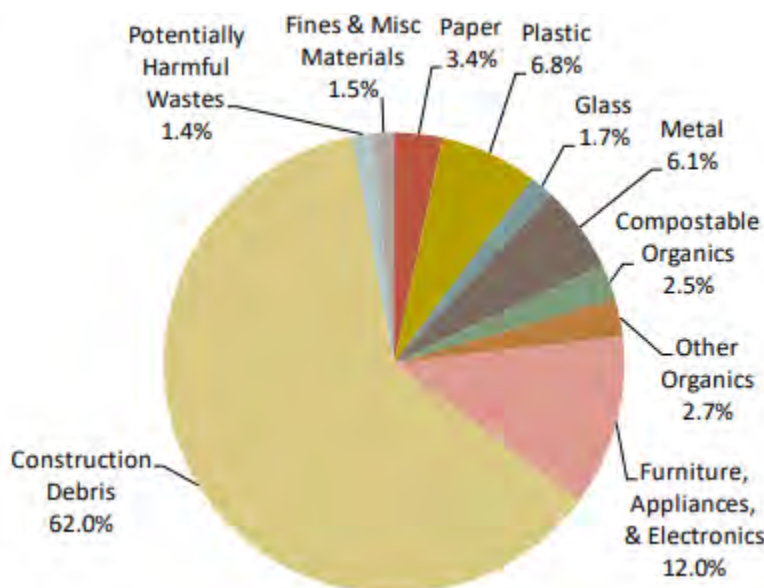


Residential food and yard waste sampling conducted in September 2021 (Photo by Luis Hillon)

Self-Haul Waste

The most recent composition study for the self-haul sector was completed in 2018.²⁵ Figure 3.13 shows the composition of material brought to Seattle-owned transfer stations by the residents or businesses for disposal, or self-haul waste, by material class. As shown, construction debris made up over three-fifths (62%) of the self-haul waste stream, adding up to about 60,000 tons.

Figure 3.13 Seattle Self-Haul Waste Composition by Material Class 2018



Reprinted from: SPU2017-2018 Self-haul Waste Stream Composition Study

The largest material components of self-haul waste by weight are presented in Table 3.12. Current and potentially recoverable materials present in large quantities included clean dimensional lumber, furniture, clean engineered wood, carpet, and mattresses. Nearly 13,000 tons of self-haul waste in 2018 consisted of materials covered by existing C&D disposal bans.²⁶ Capturing this material for recycling would increase the self-haul recycling rate, which lags in comparison to other sectors, and better support meeting the City's recycling rate goals.

²⁵ Seattle Public Utilities, prepared by Cascadia Consulting Group, "2017-2018 Self-Haul Waste Stream Composition Study," 2018, <https://www.seattle.gov/Documents/Departments/SPU/Documents/18%20Self-Haul%20Waste%20Stream%20Composition%20Study.pdf>.

²⁶ C&D materials currently banned for disposal include asphalt paving, bricks, concrete, metal, cardboard, new construction gypsum scrap, and unpainted and untreated wood. See <http://www.seattle.gov/utilities/businesses-and-key-accounts/construction/construction-waste/recycling-requirements>.

Table 3.12 Top 10 Materials by weight, Seattle Self-Haul Waste 2018

Material	Est. Percent	Cum. Percent	Est. Tons
Clean Dimension Lumber	9.7%	9.7%	9,525
New Painted Wood	9.1%	18.8%	8,883
Contaminated Wood	8.3%	27.1%	8,150
Furniture	7.6%	34.8%	7,480
Clean Engineered Wood	5.8%	40.6%	5,686
Carpet	5.2%	45.8%	5,100
Other Construction	4.1%	49.9%	4,007
Mixed Metals/Material	3.5%	53.3%	3,379
Mattresses	3.3%	56.7%	3,266
Other Treated Wood	3.3%	59.9%	3,194
Total	59.9%		58,669

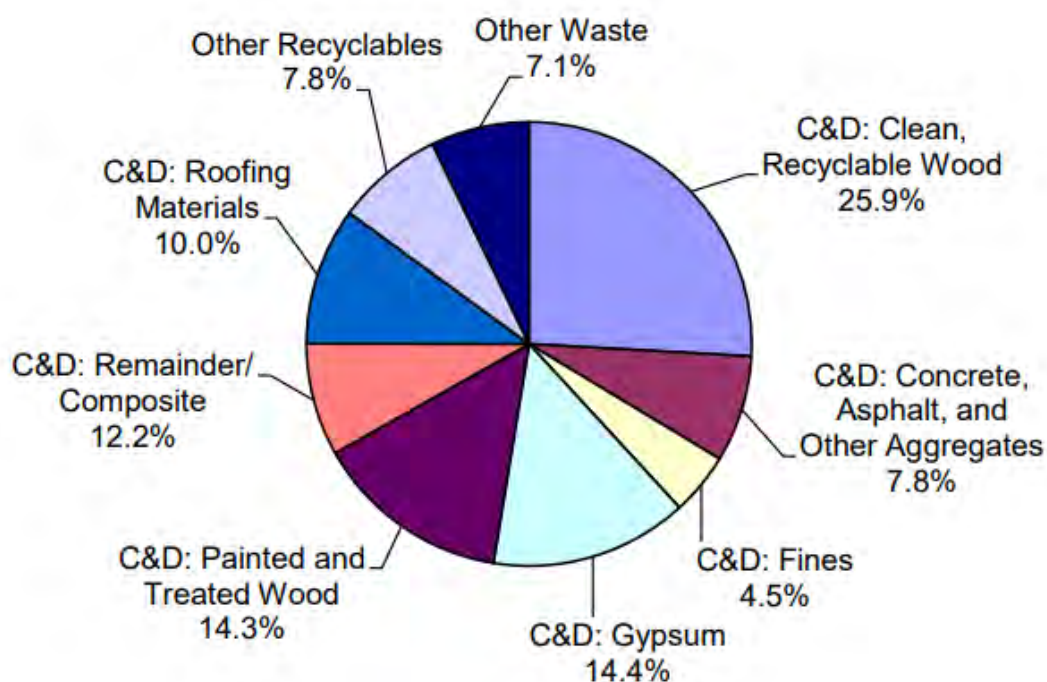
Reprinted from: SPU2017-2018 Self-haul Waste Stream Composition Study

Construction & Demolition Debris

SPU completed its last C&D waste composition study in 2013.²⁷ As shown in Figure 3.14, approximately one-quarter of the C&D waste stream was clean recyclable wood (25.9%). Clean recyclable wood could be diverted from disposal if managed appropriately and delivered to a certified recycling facility. Other materials making up a large portion of C&D waste in Seattle were gypsum (14.4%) and painted and treated wood (14.3%).

²⁷ Seattle Public Utilities, prepared by Cascadia Consulting Group, "2013 Construction & Demolition Composition Study," 2017, <https://www.seattle.gov/Documents/Departments/SPU/Documents/CDLWasteCompostitionStudy2017.pdf>.

Figure 3.14 Seattle Overall C&D Waste Composition by Material Class 2013



Reprinted from: SPU 2013 Construction & Demolition Waste Composition Study

Table 3.13 shows the top 10 individual materials in the C&D waste stream by weight. Recoverable materials present in large quantities included clean engineered wood, clean dimensional lumber, other recyclable wood, pallets and crates, and clean gypsum board.

Table 3.13 Top 10 Materials by Weight, Seattle Overall C&D Waste 2013

Component	Mean	Cum. %	Tons
Painted/Stained Wood	13.1%	13.1%	11,993
Painted/Demolition Gypsum Board	9.9%	23.0%	9,073
Clean Engineered Wood	7.7%	30.7%	7,024
Remainder/Composite Building Materials	7.3%	38.0%	6,677
Clean Dimensional Lumber	6.8%	44.8%	6,185
Composition Roofing	6.7%	51.5%	6,135
Other Recyclable Wood	6.5%	57.9%	5,908
Pallets and Crates	5.0%	62.9%	4,561
Clean Gypsum Board	4.5%	67.4%	4,076
Dirt and Sand	3.9%	71.2%	3,536
Total	71.2%		65,167

Reprinted as-is from: SPU 2013 Construction & Demolition Waste Composition Study

Construction and Demolition Debris Trends and Forecasts

Total Generation Trends

The amount of C&D debris generated annually has varied widely as construction activity increases and decreases. Generation of C&D material increased over the last decade since its low point in 2009 (288,551 tons). In 2020, C&D projects in Seattle generated an estimated 559,575 tons – an increase since the economic recession that started in December 2007 (Table 3.14).

Tonnages in 2020 are higher than in previous years, likely partially the result of Seattle's improved enforcement of and compliance with annual requirements to self-report recycling quantities. Seattle requires recycling collectors and processors to report their recycling activities to obtain a [Recycler License](#) that allows them to operate in the city.²⁸

In 2020, an estimated 64% of all C&D materials were managed for recycling and beneficial use at certified, private mixed C&D processing facilities. About 23% of C&D materials were disposed of at private facilities as C&D debris. In 2020, an estimated 13% of C&D materials were disposed of with commercial, residential, and self-haul garbage. In 2010, before Seattle implemented new regulations that mandated the disposal and recycling of C&D material through certified facilities, about 21% of all C&D debris was disposed of in commercial, residential, and self-haul

Table 3.14 Total Waste Generation for C&D Debris

YEAR	C&D DEBRIS TONS
2007	415,801
2008	397,052
2009	288,551
2010	288,957
2011	359,390
2012	371,962
2013	386,200
2014	485,242
2015	437,883
2016	532,126
2017	514,858
2018	476,433
2019	507,793
2020*	559,575

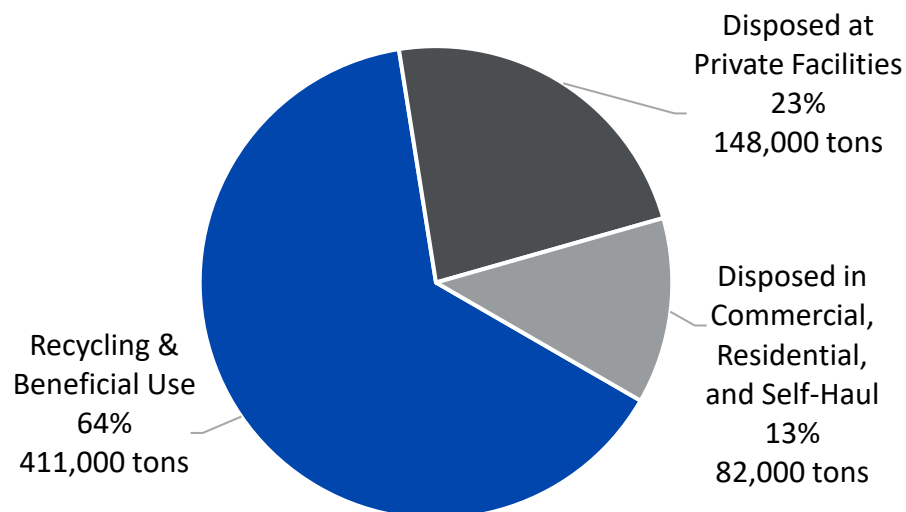
Source: SPU, "2020 Annual Waste Prevention & Recycling Report,"

Notes: Tons include concrete and exclude C&D material types disposed of in residential, commercial, and self-haul garbage.

²⁸ <http://www.seattle.gov/utilities/about/reports/solid-waste-reports/recycler-annual-reports>

waste. C&D materials handled in commercial, residential, and self-haul waste reduces those sector's recycling rate. The reduction particularly affects the self-haul sector (Figure 3.15 on page 3.40) because the self-haul sector does not have the ability to separate out commingled C&D debris.

Figure 3.15 Estimated Share of C&D Debris by Management Method in 2020

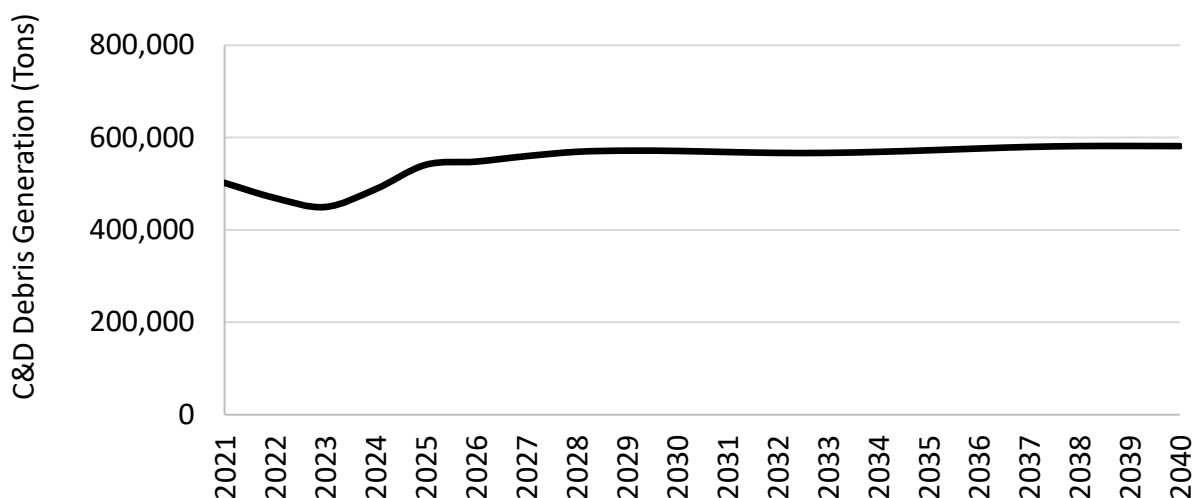


Sources: Seattle Public Utilities, "2020 Annual Waste Prevention & Recycling Report" and "2017-18 Self-Haul Waste Stream Composition Study."

Total Generation Forecast

Based on forecasts conducted pre-pandemic in 2019, SPU expects overall C&D debris generation over the next 20 years to fluctuate in the near-term (2021 through 2025), then stay relatively steady or increase slightly through 2040. (Figure 3.16). A table of forecasted tons is not presented because C&D debris generation has historically varied substantially, making exact forecasts unreliable.

Figure 3.16 Forecast for C&D Debris Generation through 2040



Source: SPU, *Seattle's Solid Waste Forecasting Model*, August 2019.

Recycling Rate Trends

Seattle's goal in the *2007 Zero Waste Resolution #30990* is to recycle 70% of C&D debris by 2022 (Table 3.15). In 2020, an estimated 66% of C&D debris was recycled, including concrete.²⁹ When including beneficial use, which means waste materials that are not recycled nor reused but are used for some other purpose like industrial boiler fuel, SPU estimates over 73% of C&D debris from Seattle was diverted from landfill (Table 3.15 and Figure 3.17).³⁰ Seattle's C&D debris recycling rate increased after Seattle implemented disposal bans for specific C&D materials. C&D disposal bans are described in Chapter 8, *Construction and Demolition Debris*.

²⁹ Seattle Public Utilities, "2020 Annual Waste Prevention & Recycling Report," October 2021, https://www.seattle.gov/Documents/Departments/SPU/Documents/Recycling_Rate_Report_2020.pdf.

³⁰ C&D diversion includes recycling and beneficial use. SPU estimates diversion for the C&D stream.

**Table 3.15 Estimated Waste Generation for Construction and Demolition Debris
2007-2020**

Year	Generated Tons	Disposed Tons*	Recycled Tons**	Beneficially Used Tons	Recycling Rate	Diversion Rate***
2007	415,801	201,156	204,907	9,738	49.3%	51.6%
2008	397,052	181,241	200,851	14,961	50.6%	54.4%
2009	288,551	115,446	162,742	10,362	56.4%	60.0%
2010	288,957	98,309	178,794	11,854	61.9%	66.0%
2011	359,390	118,216	227,049	14,125	63.2%	67.1%
2012	371,962	129,383	224,060	18,519	60.2%	65.2%
2013	386,200	127,040	234,982	24,178	60.8%	67.1%
2014	485,242	128,024	317,331	39,887	65.4%	73.6%
2015	437,883	117,343	280,205	40,336	64.0%	73.2%
2016	532,126	146,139	339,478	46,509	63.8%	72.5%
2017	514,858	125,074	342,755	47,029	66.6%	75.7%
2018	476,433	112,900	328,568	34,965	69.0%	76.3%
2019	507,793	110,275	348,032	49,486	68.5%	78.3%
2020	559,575	148,209	370,942	40,424	66.3%	73.5%
				2022 Goal	70%	NA

Source: SPU, "2020 Annual Waste Prevention & Recycling Report."

Notes:

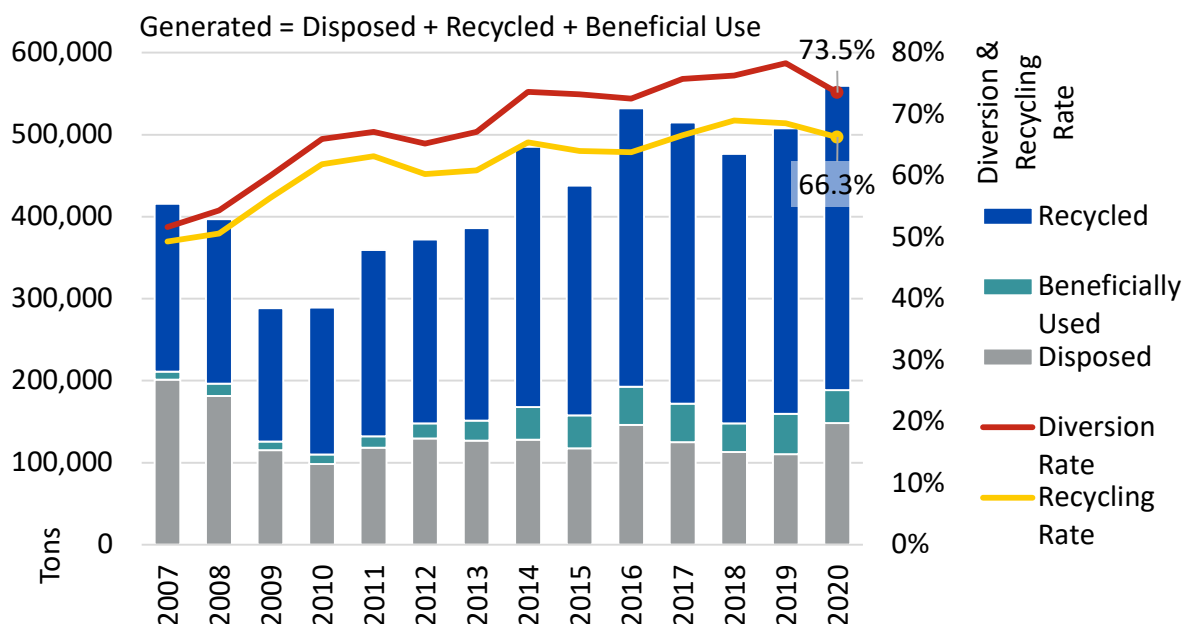
* C&D disposal and beneficial use tons were estimated based on an analysis comparing self-reporting of C&D companies in the Qualified Facilities Monthly Reports and in the annual recycling reports.

** C&D recycled tons are estimates based on self-reporting of recycling collectors and processors. They include concrete.

*** The diversion rate includes both recycled and beneficial use tons.

In 2020, SPU updated disposal estimates for 2018 and 2019 following additional data quality control and assurance activities and review of other disposal data.

Figure 3.17 Estimated C&D Debris Diverted and Disposed 2007–2020



Source: SPU, "2020 Annual Waste Prevention & Recycling Report."

A significant portion of recycled C&D material by weight in Seattle is concrete, which is easily recycled into gravel, new concrete, or other new structures. Without concrete recycling, the C&D debris weight-based recycling rate would be significantly lower. Table 3.16 shows C&D debris generation, disposal, recycling, and beneficial use without concrete. Looking at the data this way allows SPU to focus on materials that are harder to recycle.

Table 3.16 Estimated Waste Generation for Construction and Demolition Debris Without Concrete 2015–2020

YEAR	TOTAL GENERATED TONS	LANDFILLED TONS	RECYCLED TONS	RECYCLING RATE	BENEFICIALLY USED TONS	DIVERSION RATE
2015	223,453	117,343	65,775	29.44%	40,336	47.49%
2016	252,392	146,139	59,744	23.67%	46,509	42.10%
2017	226,183	125,074	54,080	23.91%	47,029	44.70%
2018	243,731	112,900	95,866	39.33%	34,965	53.68%
2019	241,924	110,275	82,163	33.96%	49,486	54.42%
2020	305,724	148,209	117,091	38.30%	40,424	51.52%

Source: SPU, Solid Waste Planning & Program Management Division unpublished data, 2020.

Recycling Rate Forecast

Opportunities remain to increase Seattle's weight-based recycling rates for C&D debris. Recommendations in Chapter 8, *Construction and Demolition Debris*, include initiatives to increase recycling of C&D debris. Table 3.17 shows the projected recycling rate for C&D debris through 2040 if the recommended programs are implemented.

Table 3.17 Weight-Based Recycling Rate Projections for C&D Debris After Implementing Recommended Programs

YEAR	RECYCLING RATE INCLUDING CONCRETE
2018 (actual)	69.0%
2019 (actual)	68.5%
2020 (actual)	66.3%
2025	68.3%
2030	74.4%
2035	74.2%
2040	75.2%
2022 Goal	70.0%

Source: SPU, Recycling Potential Assessment Model, August 2019.



4

Waste Prevention and Reuse

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Chapter 4 Waste Prevention and Reuse

Overview

Waste prevention keeps waste from entering the waste stream in the first place, yielding the greatest environmental gains of any waste management strategy. For example, waste that is prevented—not generated in the first place—does not require downstream management, it cannot become litter, it does not affect the quality of collected materials or become a contaminant in recycling or compost, and it does not require an end market for recycled products.

Beyond reducing downstream waste, waste prevention reduces wastes and impacts that would have otherwise occurred “upstream” during resource extraction, manufacturing, and other life cycle stages before purchase. For most products and packaging, these upstream stages, particularly resource extraction and manufacturing, create the largest life cycle environmental and human health impacts.¹ By addressing waste at its source, waste prevention can:

- Enhance the resilience of the solid waste management system by reducing the amount of waste and toxics produced in the first place.
- Support other local environmental priorities like reducing litter, decreasing greenhouse gases and toxics, and preventing stormwater pollution.
- Minimize overall life cycle impacts of materials.

SPU encourages waste prevention by providing customers with useful, reliable, and easy-to-understand information that empowers people to become better informed consumers and promotes more efficient use of products and materials at home and in business and industrial settings. The goal is to change customers’ mindset so they see reducing all waste, including

¹ In addition to environmental and health benefits, waste prevention offers economic benefits, though SPU and other leaders in waste prevention are still in the early stages of determining how to identify and measure those benefits. See Chapter 2, *Maximizing and Measuring Impact: Moving Upstream Beyond the Recycling Rate*, for a discussion of measuring upstream benefits

recycling and food and yard waste, as important as reducing garbage. SPU's current waste prevention work focuses on:

- Supporting food rescue efforts that prevent waste by getting edible food to those that need it most
- Promoting informed purchasing and consumption by institutions, businesses, and individuals
- Eliminating unnecessary single-use items
- Funding organizations that emphasize waste prevention in their communities
- Promoting regenerative natural yard care practices that avoid the use of toxic fertilizers, pesticides, and herbicides



A North Transfer Station visitor's suggestion for things you can do to waste less. (Source: SPU Image Library)

This chapter begins with recommendations on prioritizing waste prevention by developing programs and policies rooted in research and data and creating outreach and education campaigns to promote waste prevention. The chapter then covers SPU's current waste prevention efforts, how they are measured, and recommendations for action in the future. The chapter is organized by subject as follows:

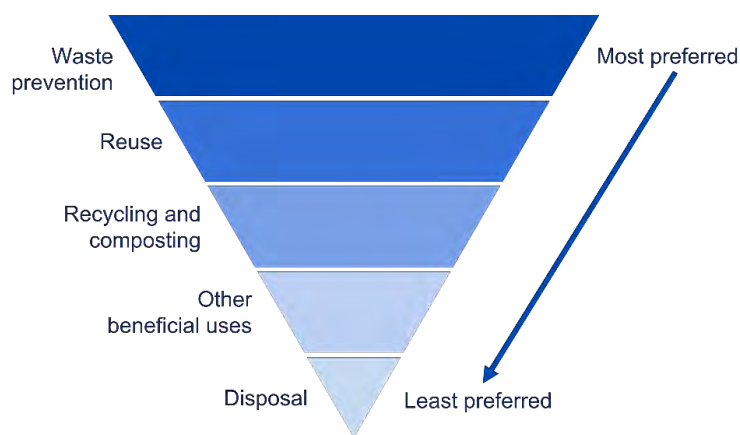
- Prioritizing waste prevention
- Food waste prevention and food rescue
- Product-related waste prevention (excluding extended producer responsibility, or EPR)
- Waste-Free Communities Matching Grant
- Natural yard care
- Green purchasing
- Reuse and repair

For a discussion of EPR, which touches many elements of the material life cycle, see Chapter 5, *Recycling and Composting Policy and Markets*. For a discussion on waste prevention related to construction and demolition debris, including reuse of salvaged building materials, see Chapter 8, *Construction and Demolition Debris*.

Prioritizing Waste Prevention

SPU is increasingly aligning its priorities and programs with waste prevention, which sits at the top of the waste management hierarchy used by both the US Environmental Protection Agency (EPA) and Washington State (Figure 4.1). Reuse falls next on the hierarchy, which involves finding a new user or use for a product that is no longer wanted by the original user for its original use, such as donating unwanted clothing to a thrift shop. While reuse is better than disposal, eliminating clothing waste in the first place provides more environmental benefits.

Figure 4.1 Solid Waste Management Hierarchy



Source: Cascadia Consulting Group for Seattle Public Utilities, aligned with Ecology and EPA hierarchies.

Recommendations

To identify, prioritize, and support implementation of waste prevention-focused programs and policies, SPU should invest in new research and analysis.

Rec 04. Prioritize and support waste prevention with program research, data analysis, and metrics

SPU should conduct new research and analysis to shape and inform new areas of focus, new programs, and new methods and metrics to evaluate program success that incorporate environmental benefits.

In support of this recommendation, SPU is developing a *Waste Prevention Strategic Plan* in 2022–24. SPU's *Waste Prevention Strategic Plan* will continue the work started with the 2022 *Solid Waste Plan Update* to define metrics and targets that can track progress of specific waste prevention efforts and measure triple-bottom-line improvements for the environment, the economy, and society. This effort may involve or recommend:

- Developing and implementing surveys to assess Seattle residents' and businesses' current attitudes and actions around waste prevention, particularly for materials with high environmental impacts as identified through waste composition studies and life cycle assessments
- Identifying and regularly monitoring the emergence of products that are hard to recycle or that could have large environmental impacts if not appropriately managed; developing waste prevention strategies to address these products
- Expanding analyses around circular economy, such as the potential environmental and economic impact of sharing, reuse, and repair of durable items if used more broadly citywide
- Considering how to better embed considerations around waste prevention, life cycle environmental impacts, and other Solid Waste Utility goals into future development of new solid waste projects or policies
- Exploring strategies to promote sustainable consumption, such as researching effective framing and message development with a diverse cross-section of Seattle's community
- Identifying and collaborating with potential partners that work on environmental and economic issues in other City departments, including the Office of Economic Development and Office of Sustainability & Environment, and other public agencies, such as King County
- Considering additional changes to waste composition study methodologies to better measure waste prevention; for example, SPU's 2020–2021 residential waste composition study separated edible from non-edible food waste

- Developing a companion tool for SPU's Recycling Potential Assessment model that assesses the potential impacts of waste prevention
- Developing methods to measure citywide participation in waste prevention activities, either overall or broken down by zip code, business sector, or demographic information
- Developing a mechanism to measure and track food waste associated with Seattle's support for the regional commitment to reduce food waste by 50% by 2030 from a 2015 baseline
- Develop citywide methods to quantify the current level of rescued food and the progress made toward increasing the volume and improving the quality needed to address food insecurity
- Developing reliable and robust ways to measure (1) current reuse and repair in its many forms, (2) reuse and repair potential, and (3) the economic, social, and environmental impacts of reuse and repair

SPU anticipates publishing the Waste Prevention Strategic Plan in 2024. Concurrent with this effort, SPU will continue to track and analyze available solid waste data and key trends. See Chapter 3, *Seattle Data and Trends*, for a detailed discussion of the solid waste data sources and historical trends that SPU uses to inform solid waste planning and facilities in Seattle. SPU's prioritization and support for waste prevention programs, while important, will not result in the needed environmental, social, and economic benefits if Seattle residents and businesses are not aware of and motivated to use them. The next recommendation outlines efforts to increase community awareness of waste prevention through coordinated campaigns.

Rec 05. Increase community awareness of waste prevention through coordinated outreach

A key component of building a waste prevention ethic in Seattle will be increasing community awareness about the importance of waste prevention and specific actions people can take to prevent waste. Specifically, SPU should:

- Develop and implement waste prevention campaigns to build awareness about the importance of prevention and specific actions people can take to prevent waste. These campaigns may be specific to topics mentioned in this chapter, such as food waste prevention, textiles, or repair. SPU may also implement campaigns with more broadly focused waste prevention messaging, helping the community understand why prevention is important.
- Create shared citywide and potentially regionwide messaging and branding to help customers make the connection between different waste prevention efforts.
- Where feasible, incorporate waste prevention into existing recycling education to further SPU's commitment to leading with prevention.

- SPU will continue to collaborate with agencies, businesses, and community organizations to expand its reach on waste prevention, engaging with:
 - **Industry groups** on promoting the role of waste prevention—in addition to recycling and discards management—in meeting the region's environmental, economic, and social equity goals
 - **Local zero waste organizations, reuse and repair businesses and nonprofit organizations, and charities** that provide and can expand services, repair electronics and other products, accept donations for resale, and participate in product stewardship programs
 - **Circular economy and environmental groups** that promote waste prevention within communities, such as “Buy Nothing” Facebook groups, tool libraries, repair and reuse organizations, and nonprofit groups like Zero Waste Washington
 - **Community-based equity organizations** and organizations serving diverse populations
 - **Other community-based organizations (CBOs)**, such as faith-based, healthcare, and hunger-relief groups

More information on waste prevention outreach and education-related efforts appears in the recommendations for Outreach, Education, and Enforcement in Chapter 9, *Outreach, Education, Enforcement, and Compliance*.

Food Waste Prevention and Food Rescue

Food is the single largest component found in Seattle's residential (29.5%) and commercial (24.5%) garbage waste streams and has a disproportionately large environmental impact.²³ And while Seattle is recognized as a leader for requiring food and yard waste collection across all sectors, composting does not reduce the estimated \$408 billion spent each year in the U.S. to grow, process, transport, store, and dispose of food that is never eaten.⁴ Beyond economic impacts, the production, transportation, and disposal of food waste is estimated to generate between 4% to 10% of the world's greenhouse gas emissions.⁵⁶ The social impacts of food waste are also significant.

² Seattle Public Utilities, “Residential Waste Stream Composition Study Final Report,” 2014, www.seattle.gov/documents/Departments/SPU/Documents/ResidentialWasteStreamCompositionStudy2014.pdf.

³ Seattle Public Utilities, “Commercial Waste Stream Composition Study Final Report,” 2016, www.seattle.gov/documents/Departments/SPU/Documents/2016CommercialWasteStreamCompositionStudy.pdf.

⁴ ReFED, “Roadmap to 2030: Reducing U.S. Food Waste by 50% and the ReFED Insights Engine: At-A-Glance,” 2021, refed.com/uploads/refed_roadmap2030-FINAL.pdf.

⁵ Ibid.,.

⁶ Word Wildlife Fund, “Driven to Waste: Global Food Loss on Farms Report Summary,” July 2021, https://wwfint.awsassets.panda.org/downloads/driven_to_waste_summary.pdf.

From the United Nations to more locally in our state, governments and businesses have committed to halving food waste by 2030. To address food waste in Washington, the 2019 Washington State Legislature passed House Bill (HB) 1114, now codified as [RCW 70A.205.715](https://app.leg.wa.gov/rcw/default.aspx?cite=70A.205.715).⁷ The law established statewide food waste reduction goals, relative to 2015 levels, including reductions in the amount of edible food wasted. The law also required the Washington State Department of Ecology (Ecology) to develop and adopt a statewide food waste reduction plan, establish food waste baseline data, and annually track progress toward statewide goals. In December 2021, after consultation with the Washington State Department of Agriculture, Washington State Department of Health, stakeholder advisory panels, and the public, Ecology released its plan, [Use Food Well Washington](https://ecology.wa.gov/Waste-Toxics/Reducing-recycling-waste/Waste-reduction-programs/Organic-materials/Food-waste-prevention/Use-Food-Well-Washington-Plan).⁸



Love Food, Stop Waste outreach at High Point Health Fair on 2019 (source: ECOSS)

In support of the state's commitment to reduce food waste by 50% by 2030, Seattle is working to reduce food waste across the city, described in detail in the sections that follow:

- **Residential food waste prevention** that happens at home
- **Commercial food waste prevention** that occurs at businesses and nonprofit organizations such as grocery stores, large commercial kitchens, and food service enterprises
- **Commercial food rescue** of surplus food that businesses or nonprofit organizations donate to food banks and other hunger relief organizations instead of wasting
- **School food rescue** of surplus food from lunchrooms and cafeterias at public schools

In 2022, Washington's legislature also passed HB 1799 to help Washington achieve its 2030 goal to cut landfill-disposed organic material by 75%, compared to 2015. The HB 1799 requires diversion of organic materials away from landfill disposal and towards food rescue programs and organics management facilities. As the requirements of HB 1799 become clearer, SPU will assess its impacts on Seattle's services and costs.

⁷ <https://app.leg.wa.gov/rcw/default.aspx?cite=70A.205.715>

⁸ <https://ecology.wa.gov/Waste-Toxics/Reducing-recycling-waste/Waste-reduction-programs/Organic-materials/Food-waste-prevention/Use-Food-Well-Washington-Plan>

Love Food, Stop Waste (Residential Campaign)

A significant portion of food waste in Seattle comes from the residential sector. As such, residential food waste prevention is one of the key strategies Seattle will use to support the statewide commitment to reduce food waste by 50% by 2030. In 2012, EPA Region 10 and the West Coast Climate and Materials Management Forum published a report to provide guidance on developing community food waste prevention programs. They developed this report in partnership with Western cities and states, including Seattle.



In 2013, SPU conducted a study to find how much of the food waste in Seattle's residential waste stream is edible and preventable. In the study, 119 households separated and weighed their edible and inedible food waste for 13 weeks. Inedible food waste includes bones, shells, peels, and pits. Study results showed that 32% of the food waste was edible, which equates to more than 10,000 tons of edible, and thus preventable, food waste in Seattle's residential waste stream, if extrapolated citywide.⁹

In 2014, SPU received a Coordinated Prevention Grant from Ecology to fund a food waste prevention pilot project. SPU began by conducting a survey of 445 households to establish a baseline understanding of food waste prevention awareness, knowledge, behaviors, barriers, receptiveness, and opportunities in Seattle. Informed by survey results, SPU developed and piloted its messaging, materials, and engagement strategies.

SPU used lessons learned from the pilot to develop the current *Love Food, Stop Waste* program, which continues to provide information and resources to help Seattle's residents waste less food. SPU is working to ensure equitable engagement in the program through transcreating content and partnering with community organizations to provide in-language, culturally relevant, and effective engagement. Where translation simply changes words into another language, transcreation ensures the meaning is clear and relevant in another culture. Figure 4.2 shows a transcreated Spanish-language residential food storage guide created through this program.

⁹ University of Washington Center for Public Health Nutrition, "Food Waste Prevention and Recovery Assessment 2015 Report," prepared for Seattle Public Utilities and City of Seattle's Office of Sustainability and Environment, 2015, www.seattle.gov/Documents/Departments/OSE/Food%20Waste%20Report_FINAL_121815.pdf.

Figure 4.2 Residential Food Storage Guide (Spanish)

Guía de almacenamiento de alimentos

Spanish Español

¡Guarda tu comida y ahorra dinero!

Recuerda cambiar el agua cada dos días cuando pongas las verduras en agua

Guarda la fruta en trozos y las verduras en el refrigerador.

La leche, huevos y mantequilla se deben guardar en un estante en la parte de atrás del refrigerador – la parte del refrigerador es muy caliente para ellos.

No guardes las cebollas con las papas, ya que estas hacen que maduren más rápido.

Los plátanos maduros producen un gas que hace que las frutas a su alrededor maduren más rápido, así que recuerda guardarlos por separado.

Guarda las carnes en la parte más fría del refrigerador, que generalmente es el estante de abajo o el cajón para la carne.

Para que el pan dure más tiempo, guárdalo en el congelador. Ponilo en el refrigerador hasta que se endurezca más rápido.

Antes de guardar las verduras, quítales las **ligas y ataduras**.

Antes de guardarlas, quítales las **hojas** a las zanahorias, batatas y nabos, dejándoles un tallo de aproximadamente una pulgada de largo.

No desperdices tus comidas caseras, mejor aprovéchalas de la siguiente manera:

1. Deja los restos de comida enfriar completamente.
2. Pon los restos de comida en contenedores herméticos para guardarlos en el refrigerador.
3. Comparte comida con tus amigos, familia y vecinos.
4. Planea una cena semanal con los restos de comida.

Cuando prepares mucha comida, congela los restos y guárdalos dentro de contenedores herméticos en el congelador. Cuando estés listo para comerlos de nuevo, descongela en el refrigerador durante el día y vuelve a calentarlos en la estufa, horno o microondas para una cena fácil!

Para aprender más sobre cómo aprovechar tu comida, visita seattle.gov/utilities/stopfoodwaste (sitio web en inglés)

¿Qué significan las fechas en las etiquetas de los alimentos?

Los fabricantes le ponen etiquetas con fechas a los alimentos para indicar cuándo la comida está en su mejor punto y no para decir que la comida no se pueda comer. A excepción de la fórmula infantil, las etiquetas con fecha no son requeridas por la regulación federal.

Sell By (fecha límite de venta): Recomienda a los comerciantes la fecha límite de venta, para que la comida dure cuando la compres. Los alimentos todavía se puedan comer después de esta fecha.

Best Before/Best By (fecha de consumo preferente): Indica que la comida presentará su mejor sabor y calidad antes de esa fecha. No significa que la comida ya no se puede comer.

Use By (fecha de caducidad): Indica que la comida puede empezar a perder calidad después de esa fecha. No significa que la comida ya no se pueda comer. La fórmula infantil es la única excepción y no debe ser utilizada después de la fecha en la etiqueta.

Source: www.seattle.gov/utilities/protecting-our-environment/sustainability-tips/waste-prevention/at-home/stop-food-waste/food-storage.

Commercial Food Waste Prevention

In 2016, Rethink Food Waste through Economics and Data ([ReFED](#)) published a comprehensive analysis of U.S. food waste and solutions, estimating that consumer-facing businesses, such as grocery retailers, restaurants, institutions, and food service businesses, generate approximately 40% of all food waste.¹⁰¹¹ Consequently, food waste prevention represents the greatest potential for cost savings and environmental benefits for food-related businesses.

Then in 2017, a study by the [World Resources Institute](#) across nearly 700 companies and 17 countries found that for every \$1 companies invested in reducing food loss and waste, they saved \$14 in operating costs.¹²¹³ In the United Kingdom, industry-supported voluntary agreements under Courtauld Commitment 3 led to over £100 million in business savings from 2013 to 2015.¹⁴ These same agreements led to a reduction of 555,000 tons of carbon dioxide emissions. Changes in manufacturing, packaging, retailing, food service, and date labeling all offer potential to prevent food waste.

Achieving significant food waste prevention across Seattle food businesses and their suppliers will take collective partnership beyond city limits. One way Seattle is leveraging large scale partnerships is through the [Pacific Coast Collaborative](#) (PCC).¹⁵ The PCC is a coalition of governments focused on reducing greenhouse gas emissions and creating a vibrant, low carbon economy along the West Coast. PCC jurisdiction partners include British Columbia, Washington, Oregon, California; the cities of Vancouver, Seattle, Portland, San Francisco, Oakland, and Los Angeles; and King and Alameda counties.



¹⁰ ReFED, "A Roadmap to Reduce U.S. Food Waste by 20 Percent," 2016, refed.com/downloads/ReFED_Report_2016.pdf.

¹¹ <https://refed.org/>

¹² Hanson and Mitchell, "The Business Case for Reducing Food Loss and Waste," 2017, champions123.org/sites/default/files/2020-08/business-case-for-reducing-food-loss-and-waste.pdf.

¹³ <https://www.wri.org/>

¹⁴ WRAP, "Courtauld Commitment 3: Delivering Action on Waste (Final Report)," 2017, www.wrap.org.uk/content/courtauld-commitment-3-delivering-action-waste.

¹⁵ <https://pacificcoastcollaborative.org/food-waste/>

The PCC's [Pacific Coast Food Waste Commitment](#) calls upon food retailers, manufacturers, and their supply chains to commit to reducing and preventing regional (West Coast) food waste by at least 50% by 2030. By signing onto this agreement, signatories:¹⁶

- Support the regional commitment to reduce food waste by 50% by 2030
- Annually measure and report food waste reduction data for ongoing analysis
- Take actions to reduce food waste, with an emphasis on prevention-related solutions

Along with these other West Coast city, county, and state jurisdictions, Seattle is helping fund the expertise to achieve these ambitious goals. This project brings national and international expertise from [ReFED](#), [World Wildlife Fund](#), and the Waste and Resources Action Program ([WRAP](#)).¹⁷¹⁸¹⁹ It will mirror the approach taken in the United Kingdom, where WRAP effectively cut the UK's food waste by 19% over five years.

So far, Albertsons Companies West Coast divisions, includes Albertsons, Safeway, Vons, and Pavilions; the Kroger Company, encompassing QFC and Fred Meyer; PCC Community Markets; New Seasons Market; Raley's; Sprouts Farmers Markets; Walmart; Sodexo, Organically Grown, Lamb Weston, Food Northwest; and Bob's Red Mill have signed on to this commitment and are beginning to take early actions, such as uploading their data through ReFED's Food Loss and Waste Calculator tool. These signatories represent 65% of the grocery market share in Washington and 51% across the West Coast. Over time, recruitment will expand to bring in more retailers, manufacturers, hospitality, and other food-related businesses.



Apples from City Fruit, a Seattle-based organization that harvests urban fruit and reduces food waste (Source: SPU Image Library)

¹⁶ <https://pacificcoastcollaborative.org/food-waste/>

¹⁷ <https://refed.org>

¹⁸ <https://www.worldwildlife.org/>

¹⁹ <https://wrap.org.uk/>

In the past, SPU has contracted with organizations, such as [Leanpath](#), to work directly with businesses to reduce waste and measure the results in the commercial sector.²⁰ SPU will work with retail food businesses under the PCC agreement and develop new methods to measure and aggregate results from this regional approach to prevention. Work is underway to establish a mechanism to measure and track food waste to support the regional commitment under the PCC to reduce food waste by 50% by 2030 from a 2015 baseline.

Food Rescue

SPU is also actively involved in facilitating the rescue of edible food. Food rescue is the process of collecting nutritious, surplus food from retail establishments and donating it to organizations, such as food banks, meal programs, that serve people who need it the most. Rescuing and redistributing volumes of food is complex and expensive: it requires trucks, drivers, cold storage, kitchens, and staff to sort, stock, de-package, and prepare into meals or pantry items.

In 2015, SPU and the Office of Sustainability and Environment provided funding to the [University of Washington Center for Public Health Nutrition](#) to conduct in-depth interviews with hunger relief agencies, nonprofits, local governments, and food-generating businesses to identify current challenges and opportunities in commercial food waste prevention and rescue in Seattle.²¹ Research recommendations included:

- Taking an integrated systems approach to identifying solutions
- Developing a forum for collaboration with diverse stakeholders
- Exploring opportunities to leverage funding across agencies
- Increasing food donation infrastructure and capacity to receive and store more perishable food

Seattle's 2016 and 2017 waste composition studies indicated that surplus food is available to address local food insecurity. According to these studies, food makes up 43% of all commercial garbage and food and yard waste tons. Although the composition study data do not show how much of this food would have been safe and edible to consume, they suggest that more surplus food is available to address food insecurity.

²⁰ <https://www.leanpath.com/>

²¹ <https://www.washington.edu/research/research-centers/center-for-public-health-nutrition/>



Grant-supported project led by City Fruit to rescue fruit from private property fruit trees and donate to local hunger relief agencies, 2018 (Source: Seattle Image Library)

[Feeding America](#) estimated before the COVID-19 pandemic that nearly one-quarter of a million King County residents were food insecure, of which over 15% are children.^{22,23} Hunger relief organizations report especially needing nutrient-dense, perishable foods, such as fresh protein, fruits and vegetables, and dairy. At the same time, ReFED estimates that nearly 80% of food wasted nationally comes from perishable foods.²⁴ Local hunger relief organizations consistently inform SPU that they have insufficient equipment, such as trucks and cold storage, and staffing to rescue enough food to meet the demand.

Beginning in 2018, SPU and [Mary's Place](#), a local nonprofit organization that provides shelter and services to support women, children, and families, convened cross-sector events, called Food Rescue Innovation Labs, to identify gaps and opportunities in Seattle's food rescue infrastructure and to also understand the human impact of hunger in the community.²⁵ Stakeholders identified chronic challenges in transportation, cold storage, communications, and donor-recipient relationships. Figure 4.3 presents a graphic summary of topics discussed at the

²² Feeding America, "Map the Meal Gap 2019: Overall and Child Food Insecurity by County in 2017," Accessed August 25, 2019, public.tableau.com/profile/feeding.america.research#!/vizhome/2017StateWorkbook-Public_15568266651950/CountyDetailDataPublic.

²³ <https://www.feedingamerica.org/>

²⁴ ReFED, "A Roadmap to Reduce U.S. Food Waste by 20 Percent," 2016, refed.com/downloads/ReFED_Report_2016.pdf.

²⁵ <https://www.marysplaceseattle.org/>

first lab. Based on feedback from the Labs, SPU and Mary's Place also convened three roundtable discussions with transportation and logistics professionals from local hunger relief organizations to explore transportation solutions that might increase food rescue efficiencies. As an outgrowth of the roundtables, SPU funded research by the [University of Washington Supply Chain Transportation Logistics Center](https://www.supply-chain-transportation.uw.edu/), which showed that barriers in communication and shared data make it even more difficult to fill infrastructure gaps.²⁶

The COVID-19 pandemic, which began to impact the local economy and food rescue infrastructure in March 2020, has further fragmented food rescue operations and reduced nonprofit capacities to try new approaches. At the same time, the number of people experiencing food insecurity continues to grow. In 2021, SPU is working with grocery retailers and their grocery rescue partners to assess rescue operations and identify recommendations such as how to standardize grocery rescue practices across donor employees and hunger relief organization volunteers, increase the reliability of donation pickups, and better measure grocery rescue results, all in service of reducing food waste.

Figure 4.3 Graphic Notes from the 2018 Food Rescue Innovation Lab



Source: Maketa Wilborn, "Sketch Notes" from the Food Rescue Innovation Lab 2018.

School Food Share

Anyone who has visited a school cafeteria knows that a tremendous amount of edible food is wasted daily. In 2017, SPU helped launch *School Food Share*, a pilot program with Seattle Public Schools (SPS) to collect uneaten, unopened, safe food from lunchrooms and donate it to local hunger relief organizations. Building on successful food rescue programs in other local area

²⁶ <https://www.supply-chain-transportation.uw.edu/>

school districts, the pilot sought to explore operational barriers, understand how to prevent uneaten food, and determine how to scale up food rescue if the results were positive.

A local nonprofit, [EarthGen](https://earthgenwa.org) (formerly Washington Green Schools), helped coordinate SPS, SPU, and hunger relief organizations who collect and redistributed the food to individuals and families in need.²⁷ Three elementary, one middle, and one high school in West Seattle participated in the pilot program. While the pilot was logistically complex, the schools succeeded in donating over seven tons of uneaten, unopened edible food over the two-year period. EarthGen continues to work with SPS to prevent food waste on a larger scale, by leveraging lessons learned from the pilot:

- Having a designated site contact at the school to coordinate with volunteers to pick up the donated food and deliver it to the site where the food will be redistributed
- Creating a clear donation area in the lunchroom with ice packs to keep the food cold if needed
- Providing clear instructions about what foods are accepted for donation
- Providing consistent communication with the site coordinator, food redistributing organizations, and lunchroom staff to manage issues and keep the process running smoothly

Recommendations

SPU makes two recommendations to continue to expand food waste prevention efforts and to boost food rescue efforts.

Rec 06. Expand food waste prevention to reduce food waste

For the commercial sector, SPU should leverage Seattle's participation in the PCC to engage food retailers, brand manufacturers, and supply chains, and work to secure industry-wide agreements to measure and reduce food waste. As part of the PCC, participating jurisdictions will have support from "Resource Partners" (contracted nongovernmental organizations) who will provide technical expertise to recruit businesses, establish individual food waste baselines, align measurement and reporting protocols, define business working groups, and lead technical support. This work has potential to expand beyond food retailers and manufacturers to other large food generating sectors like the hospitality sector, schools, and hospitals.

²⁷ <https://earthgenwa.org>

For residents, SPU should expand existing Seattle-specific, consumer-facing outreach and education programs, similar to the *Love Food, Stop Waste* campaign, to prevent residential food waste. While one-on-one engagement is an effective tool for behavior change, there is still a need to more broadly market the campaign to raise awareness about food waste, why it matters, and what residents can do to waste less.

SPU should consider how recommendations from Ecology's *Use Food Well Washington* plan might support food waste prevention across both sectors.

Rec 07. Expand efforts to rescue safe, edible food from the waste stream by getting it to those that need it most

SPU should support collaboration among (1) surplus food generators such as retailers and distributors, (2) hunger relief organizations, (3) community partners that can connect food rescue with community well-being such as healthcare providers and faith-based organizations, (4) those experiencing food insecurity, and (5) other public agencies with shared goals such as Ecology and the Washington State Department of Health.

Collaborative efforts across these players could:

- Foster donor-recipient practices that increase communication, employee education, quality of donated food, and/or efficiencies of donation logistics
- Measure the amount of food that is successfully distributed to the ultimate consumer (individuals/families experiencing food insecurity) and identifying reasons for loss
- Test equipment such as colored carts and signage that standardize donation procedures and help reduce the need for frequent employee education
- Test methods to extend the life of surplus food when it cannot be immediately redistributed
- Pool resources across the donor-recipient system to share storage, transportation, staff, and knowledge

The next section describes SPU's efforts to promote and facilitate waste prevention for other products through policy solutions and industry engagement.

Product-Related Waste Prevention (Excluding EPR)

This section describes regulations and voluntary programs that Seattle has implemented to promote waste prevention for specific products. These programs and regulations cover materials such as plastic bags and other single-use packaging and products. Seattle designed these programs to address areas with high potential to reduce litter and waste, address ongoing challenges such as recycling or food and yard waste contamination, and promote diversion. In addition to programs and regulations to manage specific product types, SPU also engages with manufacturers and producers upstream to support waste prevention and diversion goals. For information on programs and regulations specific to EPR, see Chapter 5, *Recycling and Composting Policy and Markets*.

Reducing Consumption of Single-Use Items

The impacts of overconsumption of single-use items, particularly single-use plastics, have gained local, national, and international attention. Items like single-use plastics persist in the environment, but these materials are used to serve food and drinks that are consumed in a short period of time. Single-use plastic products represent a design mismatch of a long-lasting material being used temporarily, often for just minutes, before being disposed. In addition, some single-use plastic food service containers, such as polyethylene terephthalate (PET) or polypropylene (PP) folding “clamshell” containers commonly used for take-out food, are made of low value, difficult-to-recycle plastics that typically have been baled with other low-value mixed plastics and exported to Asia for sorting and recycling. Although they are currently accepted for recycling if cleaned of food waste, these materials potentially create



Display focused on reducing single-use items at the SPU South Transfer Station (Source: SPU Image Library)

social harm and pollution overseas where environmental, health, and safety protections to manage materials may be limited. Food contamination of single-use products that are recycled degrades or ruins the recycling. At the same time, that food waste is lost to the compost system, where it would be productively used.

While substituting single-use plastic with compostable materials can partly address these issues, compostable items also have associated costs, environmental impacts, and specific end-of-life management requirements. The environmentally preferable approach is to prevent and reduce waste by eliminating the use of single-use items made from any type of material whenever possible. That is why SPU seeks to eliminate unnecessary single-use products by replacing them with refillable, reusable, and durable options. SPU advocates for and communicates the following messages for waste prevention of single-use products for each of the following audiences.

- **Residents:** Bring your own durable bags, water bottles, travel mugs, straws, utensils, and food containers
- **Food service businesses:**
 - Encourage customers to use reusables, such as by offering discounts for customers who bring their own mugs or by participating in reusable cup and take-out container programs when available
 - Provide durable plates, glasses, utensils, and straws for dine-in customers
 - Provide single-use straws, utensils, and condiments only on request, through self-serve stations or dispensers

The below sections provide further information on SPU's activities to curb use of single-use products and packaging through ordinances and other programs.

Single-Use Food Service Packaging Ordinances

Seattle's food service packaging and other packaging-related efforts have multiple purposes. In addition to waste prevention and diversion, single-use food service packaging ordinances support measures to improve the quality of the recycling and food and yard waste streams and to reduce litter, which benefits stormwater quality. The primary elements of several single-use packaging ordinances are described below.

Expanded Polystyrene Food Service Packaging and Products

By enacting [Ordinance 122751](#), Seattle City Council prohibited food service businesses from selling or providing food, for consumption on or off premises, in expanded polystyrene (EPS)

food service products, commonly called “Styrofoam,” in 2008, effective January 1, 2009.²⁸ The ban applies to EPS foam food containers, plates, clamshells, hot and cold beverage cups, meat and vegetable trays, egg cartons, and other products made of EPS foam and used for selling or providing food for consumption on or off the premises. Beginning July 1, 2021, the ban also applied to packaging for raw meat and raw seafood. This ban applies to items packaged or filled at the food service business and does not apply to products packaged off premises or to supplies purchased by customers, such as packets of EPS foam cups purchased for use at home.

While compliance with the ordinance has been high, some Seattle food service businesses have been confused because restaurant supply stores within Seattle are allowed to sell these items to businesses who are located outside of Seattle. State legislation, Senate Bill (SB) 5022, passed in the 2021 legislative session and will ban statewide the sale of many EPS food service products, which will minimize this problem in the future. Beginning June 1, 2024, the sale and distribution of the following EPS foam products will be prohibited in the state: food containers, plates, clamshell-style containers, and hot and cold beverage cups. Seattle’s ban on additional EPS food serviceware remains in place. In addition, SB 5022 bans the sale of EPS loose-fill packaging products (also referred to as packing peanuts) as of June 1, 2023, and bans some portable cold storage containers beginning June 1, 2024.

What is food serviceware?

Food serviceware includes containers, plates, "clamshells," serving trays, meat and vegetable trays, hot and cold beverage cups, wrappers, straws, and utensils.

Disposable Food Service Packaging Prohibited

Seattle’s Ordinance 122751 also prohibited food service businesses from selling or providing food, for consumption on or off premises, in or with disposable plastic food serviceware, effective July 1, 2010. Acceptable alternatives must be compostable or recyclable. The City Council refined these requirements in 2010, enacting [Ordinance 123307](#). Revisions included changing the definition of disposable food serviceware to apply to all forms of non-compostable and non-recyclable food serviceware meant for one-time use and providing a process for the Director of SPU to establish rules providing for temporary one-year waivers. These temporary waivers are reviewed annually and expire if not extended through a revised [SPU Director’s Rule](#).²⁹ By ordinance, SPU can provide temporary one-year waivers under two circumstances:

²⁸ <http://clerk.seattle.gov/search/ordinances/122751>

²⁹ SPU is governed by ordinances in Title 21 and Title 22 of the Seattle Municipal Code. The General Manager/CEO of SPU further adopts policies and rules, also called "Director's Rules," that can include temporary waivers for ordinances under certain circumstances. <http://www.seattle.gov/utilities/about/policies>

- 1 Where commonly used recycling and composting technology cannot process the food serviceware
- 2 Where suitable alternative products that meet performance and food health and safety standards are not available

Straws and utensils, as well as a small number of other types of food service packaging such as metal-faced paper wrap, previously received annual temporary waivers from this ordinance requirement. The temporary waivers for straws and utensils expired in July 2018, making Seattle the first major city in the U.S. to ban non-compostable plastic straws. As a result, food service businesses can no longer provide non-compostable straws and utensils. A waiver remains for non-compostable bendable plastic straws on request if needed by customers due to physical or medical conditions. SPU promotes and encourages businesses to keep a supply of bendable plastic straws in stock to meet the needs of their customers with disabilities. Figure 4.4 shows an example of SPU educational materials sent to Seattle businesses about Seattle's straw and utensil requirements.

Figure 4.4 Information on Straw and Utensil Requirements Sent to Seattle Businesses



Source: Seattle Public Utilities.

Based on these ordinances, single-use food service packaging, when provided for dine-in consumption, must be compostable.³⁰ Food-contaminated packaging is not recyclable and—as customers have no reasonable means to separate food from single-use packaging when dining—

³⁰ <http://www.seattle.gov/utilities/about/policies>

in—any single-use packaging must be compostable, not recyclable. This helps capture leftover food for composting instead of disposal and works to reduce food-contaminated materials in the recycling stream. In addition, compostable packaging can be managed locally, unlike the low-value, hard-to-recycle plastic packaging that has been historically shipped overseas for sorting and processing.

Since Seattle enacted these ordinances in 2010, the number of compostable products available to restaurants and other food service businesses on the market has increased significantly. Promoting, facilitating, and educating food service businesses and the public about these changes has helped food service businesses shift from disposable serviceware to recyclable, or especially, compostable serviceware. However, these ordinances alone do not do enough to prevent waste, and there continues to be confusion about what items are compostable, due to “look-alike” non-compostable plastic serviceware.

To help address this, SPU advocated for passage of HB 1569 in the 2019 Washington State legislative session. Enacted into law as [RCW 70A.455](#), HB 1569 established requirements for certifying, labeling, and tinting compostable products (including compostable bags) and took effective July 1, 2021.³¹ HB 1569 also banned the use of confusing terms on any products such as “biodegradable.” The purpose of the law was to enable businesses and residents to better distinguish truly compostable products from non-compostable products whose producers engage in “greenwashing.”

Manufacturers who violate the requirements are subject to civil penalties. The Washington State Attorney General’s office and cities and counties have concurrent authority to enforce the requirements. SPU and the Washington State Attorney General’s office are discussing enforcement coordination. Passage of HB 1569 has spurred the [Biodegradable Products Institute](#), which certifies compostable packaging, to convene stakeholders nationally, including SPU, to develop industry standards for tinting and labeling of compostable packaging.³²

Tracking compostable or recyclable single-use food service packaging can be challenging, as it is difficult to obtain data from food service businesses on the types of food packaging used. SPU conducts inspections and tracks outreach visits to estimate progress. It is also challenging to identify the effects of outreach related to food packaging regulation in the commercial sector. The amount of diverted packaging material is not separately measured but appears in aggregated reports from collectors and the City’s compost processor covering all composted materials.

³¹ <https://app.leg.wa.gov/rcw/default.aspx?cite=70A.455>

³² <https://bpiworld.org/>

In 2019, SPU worked with a team from University of Washington's Evans School of Public Policy & Governance to conduct a survey to assess the level of compliance of food service businesses with the requirement that straws and utensils must be durable or compostable and cannot be made of single-use plastic. The survey of 70 food service businesses found that 78% were fully compliant for straws and 68% were fully compliant for utensils.³³ This survey provided a "spot-check" and potential baseline. SPU will monitor progress through ongoing surveying.

While Seattle's ordinances have been effective at reducing disposable packaging and shifting to recyclable or compostable packaging, many food service businesses still provide single-use items to customers, regardless of whether they want or need those items. To address this problem, Seattle advocated for SB 5022, which passed the Washington State Legislature in the 2021 legislative session. SB 5022 requires, beginning January 1, 2022, that food service businesses only provide customers with single-use straws, utensils, condiment packaging, and beverage cup lids if the customer affirms they want those items, with some exceptions. This state law complements Seattle's current requirements. SPU will include these state requirements in its ongoing outreach and coordinate with Ecology to implement the state law locally.

Plastic Carryout Bag Ordinance and Legislation

The use of single-use bags in Seattle creates costs and impacts, including waste, litter, marine debris, and greenhouse gas emissions. To reduce these costs and impacts, the Seattle City Council passed [Ordinance 123775](#), which went into effect in 2012.³⁴ This ordinance bans retailers from providing single-use plastic and biodegradable carryout bags and places a fee on paper carryout bags. Bags used for take-out food, thicker reusable plastic bags (at least 2.25 millimeters thick), plastic and compostable bags for non-retail and selected retail purposes (such as newspapers, dry cleaning, and prescription medications) are exempt from the ordinance.

Under the ordinance, large paper carryout bags must contain at least 40% post-consumer recycled content and retailers must collect a pass-through charge of \$0.05 per bag. The retailer keeps the \$0.05 charge to offset the cost of the bags. Retail establishments may not collect a pass-through charge from anyone with a voucher or an electronic benefits card issued under the City's Women, Infants and Children (WIC) or Temporary Assistance to Needy Families

³³ Abe Smith-Groening, Beth Lemon, Lauren Ballinger, and Liesl Olson, "Assessing Seattle's Progress toward Reducing Single-Use Plastic Straw and Utensil Consumption," prepared for Seattle Public Utilities, 2019, www.seattle.gov/Documents/Departments/SPU/Documents/Plastic_Straw_Utensil_Consumption_2019.pdf.

³⁴ https://library.municode.com/wa/seattle/ordinances/municipal_code?nodeId=520374

(TANF) programs; the Washington State Food Assistance Program; or the federal Supplemental Nutrition Assistance Program (SNAP, also known as Basic Food).

In 2016, the Seattle City Council approved [Ordinance 125165](#), making several revisions to Seattle's bag regulations.³⁵ Revisions included requiring that compostable bags be labeled and tinted either green or brown, disallowing the distribution of non-compostable plastic bags that are tinted green or brown, and requiring an annual report on the bag ordinances to City Council. The ordinance also banned the use of confusing descriptions on bags such as "biodegradable," "degradable," "decomposable," or other labels that imply that the bag will break down, fragment, biodegrade, or decompose in a landfill or other environments. These ordinances are codified in [Seattle Municipal Code 21.36.100](#).³⁶

Seattle's plastic bag ordinance has successfully reduced the number of plastic carryout bags distributed in the city. An estimated 85% of Seattle retailers complied with the ordinance in 2018, based on surveys of retailers. These surveys showed a lower compliance rate among international grocery and produce stores, estimated at 60% in 2018. SPU found that lack of awareness of the ordinance and language barriers pose the top two challenges to compliance.

Bag ordinance outreach materials are now available in 18 languages: English, Amharic, Arabic, Chinese, Hindi, Indonesian, Japanese, Korean, Khmer, Laotian, Oromo, Russian, Somali, Spanish, Tagalog, Thai, Tigrinya, and Vietnamese. This information is also available in transcreated form in Chinese, Spanish and Vietnamese. Figure 4.5 shows an example of a transcreated flyer where SPU adapted both the words and format.

³⁵ https://library.municode.com/wa/seattle/ordinances/municipal_code?nodeId=795352

³⁶ https://library.municode.com/wa/seattle/codes/municipal_code?nodeId=TIT21UT_SUBTITLE_IIISOWA_CH21.36S_OWACO_SUBCHAPTER_IISOWACO_21.36.100SIEPLREPACABA

Figure 4.5 Examples of Transcreated Flyers



Source: Seattle Public Utilities.

Despite successes, plastic bags continue to be a leading contaminant at compost facilities. Plastic bags also pose problems at material recovery facilities for recycling, where they become entangled in equipment, leading to incorrect sorting of recyclable materials, contamination, equipment malfunctions, increased expenses, and dangerous conditions for workers who must cut entangled plastic bags from recycling equipment by hand.



Recycling facility workers cut plastic wrap and bags from sorting screens (Source: SPU 2019 Report on Seattle Bag Ban Compliance)

Since the plastic bag ban went into effect in 2012, plastic bags have primarily entered Seattle's waste stream in three ways: from Seattle restaurants exempt from the ban, non-compliant retailers in Seattle, and businesses outside the City that Seattle residents visit.

Seattle's plastic bag ordinance has served as a model for other cities, and many of its requirements have influenced state legislation. In the 2020 legislative session, the Washington State Legislature passed SB 5323, enacting a statewide ban on thin carryout plastic bags and other requirements that became effective October 1, 2021. The law, codified as [RCW 70A.530](https://app.leg.wa.gov/RCW/default.aspx?cite=70A.530), preempts and makes many improvements to Seattle's ordinance and addresses the three primary ways plastic carryout bags have continued to enter Seattle's waste stream:³⁷

- 1 Restaurants are not exempt and may no longer provide thin single-use plastic carryout bags
- 2 Businesses outside of Seattle may no longer distribute thin single-use plastics carryout bags
- 3 As these bags are prohibited statewide, suppliers and distributors will understand not to sell them within the state, which could reduce non-compliance among Seattle businesses

³⁷ <https://app.leg.wa.gov/RCW/default.aspx?cite=70A.530>

Additional improvements include:

- Certified compostable bags are allowed and must be tinted green or brown
- Bag fee increased to \$0.08 and also applies to thicker 2.25-millimeter plastic bags
- Thicker plastic bags must have 20% post-consumer recycled content

SPU has coordinated with Ecology and other stakeholders to create outreach materials like Seattle's existing materials that are updated for the state law and can be used in Seattle and throughout the state. These materials have been translated into 17 languages. SPU will continue to conduct outreach and coordinate with Ecology to implement the state law locally.

Reducing Single-Use Items with Businesses

SPU recognizes policies such as packaging requirements can increase costs to businesses and their customers, particularly small and minority-owned businesses that have less ability to absorb additional costs. Because of this, SPU provides businesses with technical assistance, including recommendations for cost savings, such as providing compostable food service packaging, straws, and condiments only on request. SPU works with food service businesses in the following ways to provide ongoing outreach and engagement on product-specific waste prevention requirements and to promote the use of durable, reusable food serviceware instead of single-use options:

- Concerned individuals call the green business hotline when they encounter businesses that are not in compliance with the bag ban or the single-use food service packaging ordinances. A member of the inspection team or the outreach team will then visit the business to provide education and support the switch to compliant packaging.
- SPU provides sector-specific education to businesses affected by packaging ordinances, such as proactive outreach to the retail and grocery sectors on single-use plastic bag requirements.
- SPU provides tailored in-language outreach and assistance to food service businesses to support compliance with local requirements.
- Outreach staff attend events throughout the year to provide education to businesses about local requirements.

Upstream Industry Engagement

In addition to using ordinances and customer education, SPU engages with manufacturers, product suppliers, and industry groups on non-legislative product and packaging initiatives that prevent waste or enhance recyclability or compostability of products. These engagements have various purposes and include:

- Informing and improving SPU programs, outreach, and policies
- Sharing lessons learned in Seattle with product designers, manufacturers, distributors, industry groups, and others to assist them in making improvements that benefit local systems
- Evaluating compliance of the manufacturer or supplier's products with Seattle ordinances and providing information on the steps, if needed, to become compliant
- Advocating that these manufacturers and product suppliers engage in waste prevention strategies for their products; provide reusable options; improve labeling; and make their products easy and safe to reuse, recycle, or compost
- Developing a shared understanding of effective voluntary actions and informing the need for legislative actions when appropriate, such as for product stewardship and extended producer responsibility

Examples of SPU engagement to date include discussions with Seattle-based companies Amazon and Starbucks to reduce and reuse packaging, minimize environmental impacts of packaging, and increase use of post-consumer recycled content. SPU also engages with compostable product manufacturers.

U.S. Plastics Pact

SPU is a Founding Activator and active participant in the [U.S. Plastics Pact](#). The first of four targets of the U.S. Plastics Pact is to “define a list of packaging that is to be designated as problematic or unnecessary by 2021 and take measures to eliminate them by 2025.” Other Pact targets address the reusability of packaging. In 2019, SPU also became a partner to develop and pilot standards for reuse systems for reusable cups, take-out containers, and other packaging. SPU also participates in the [National Reuse Network](#) and [Government Reuse Forum](#), both hosted by the NGO [Upstream Solutions](#). Our active participation in these initiatives benefits our work on single-use packaging, as well as other areas of prevention and reuse.

In addition to engaging local companies, SPU engages producers and suppliers who are based outside of Seattle and sell goods to customers operating in the city. SPU also engages on non-packaging-related products, such as with [Call2Recycle](https://www.call2recycle.org/) on its voluntary stewardship program for rechargeable batteries.³⁸ In addition, engagement with industry groups such as the [Sustainable Packaging Coalition](https://sustainablepackaging.org/) and organizations such as the [New Plastics Economy Initiative](https://www.newplasticseconomy.org/), [Ocean Plastics Leadership Network](https://oceanplasticsleadershipnetwork.org/), and the National Reuse Network, provides exceptional opportunities to collaborate on a national and international scale and to advocate for reuse and international brand packaging improvements.³⁹⁴⁰⁴¹

Actions by the City and other jurisdictions, along with consumer demand, can catalyze significant actions by brand owners and manufacturers. For example, to eliminate plastic straws from its stores, Starbucks has shifted to a new “sippy cup” lid design that is both easier to recycle than straws and eliminates the need for a single-use plastic straw, which should reduce plastic straw litter from Starbucks’ beverages. This program represents an important step in enhancing the recyclability of single-use products. However, SPU will continue to advocate for the use of durable travel mugs and coffee cups for in-store consumption, and returnable or reusable cups and takeout containers as a means of preventing waste and reducing the associated upstream environmental impacts by food service businesses.

Recommendation

SPU recommends continuing efforts to switch from single-use products in favor of durable and reusable alternatives.

Rec 08. Reduce single-use items and promote durable or reusable alternatives

SPU should continue implementing policies, programs, and collaborative efforts to reduce the use of single-use items, focusing on single-use food serviceware and other single-use plastics. In parallel, SPU should expand regional approaches for waste prevention education, such as “BYO” (bring your own) campaigns, promotion of durables, and reduction of plastic packaging and plastics pollution from single-use plastics. Example approaches include:

³⁸ <https://www.call2recycle.org/>

³⁹ <https://sustainablepackaging.org/>

⁴⁰ <https://www.newplasticseconomy.org/>

⁴¹ <https://opln.org/>

- Considering an ordinance to require restaurants to serve dine-in food with durable (instead of single-use) plates, cups, and cutlery. The ordinance could also require the food service establishment to charge a fee on single-use cups. A similar ordinance went into effect in early 2019 in the City of Berkeley, California, which includes a \$0.25 fee on every single-use cup.⁴²
- Expanding and collaborating on education campaigns to promote the use of durable and reusable products and discourage the use of single-use products. Promote BYO campaigns such as BYO bags (including for take-out food), coffee mugs, other drink cups, and water bottles. For waste prevention messages focused on buying sturdier and better-made consumer goods with longer useful lives, SPU should consider that these products typically cost more and may not be accessible to residents with lower incomes.
- Researching and addressing regulatory barriers to using refillable containers and bottles at food service businesses.
- Promoting and encouraging new business models and community-based programs that provide systems that support the use of refillable or durable cups and containers as an alternative to single-use food and beverage packaging and serviceware. Examples include:
 - Returnable, reusable, and refillable take-out container systems, including all system elements such as standardized cups and containers, collection systems, commercial wash facilities, and transport systems for redistribution to participating retailers
 - Reusable and returnable bottle and beverage container programs
 - Implementation of and access to water refill stations
- Exploring partnerships with the retail sector to encourage reuse, sharing, and zero waste consumer packaging alternatives.
- Exploring methods to address reduction of other single-use and plastic packaging products through both producer and consumer engagement.

In addition to engaging with industry, SPU also funds community-initiated and community-led projects that promote and facilitate waste prevention, described in the next section.

⁴² City of Berkeley, "Berkeley Single Use Foodware and Litter Reduction Ordinance," Accessed September 25, 2019, www.cityofberkeley.info/Public_Works/Zero_Waste/Berkeley_Single_Use_Foodware_and_Litter_Reduction_Ordinance.aspx.

Waste-Free Communities Matching Grant

In 2008, SPU established the Waste Prevention and Recycling Matching Grant to fund community-initiated and community-led projects that prevent waste generation and increase reuse, recycling, and composting. Supporting community-driven waste prevention efforts strongly aligns with SPU's equity goals. Matching grants increase customer value by leveraging community funding to achieve larger results. Grants focused on waste prevention can also increase affordability by helping the community save money and providing access to free and low-cost resources.

In 2008–2009, SPU awarded \$200,000 to 17 projects focused on food rescue, school composting and recycling, commercial waste prevention, materials reuse, multifamily composting and recycling, and onsite composting. The grant projects engaged nearly 10,000 residents and businesses and diverted over 1,900 tons of waste.

In 2010–2013, grant funds were refocused to help K-12 schools in Seattle comply with new food waste requirements. SPU awarded funds to implement food waste collection programs in 27 public and 14 private schools, reaching more than 10,000 students. The compost programs divert more than 200 tons of food waste from the garbage annually.

When the program relaunched in 2018 after a four-year dormancy period, SPU changed the name to the Waste-Free Communities Matching Grant program and refocused the program specifically on waste prevention. This grant program is an effective method for SPU to fund community-driven programs that help the community and promote a waste prevention culture. Projects receiving grant funding must meet one of the following requirements in addition to preventing waste:

- **Be innovative:** test or expand on new approaches or technologies, such as developing apps or bringing repair workshops to Seattle
- **Engage one or more of the following communities:** communities of color, immigrants, refugees, low-income, people with disabilities, seniors, young adults, youth, children, and/or small businesses
- **Help communities in need:** for example, increase affordability by providing free or low-cost resources or job training to low-income communities or individuals experiencing homelessness

SPU uses a variety of strategies to increase equitable access, participation, and outcomes in the grant program. These efforts include collecting community feedback on grant program design,

conducting in-language promotion of the grant program, encouraging in-language and video applications, and including community members on the grant review committee.

In 2018–2021, SPU awarded \$313,419 to 25 projects focused on single-use plastics reduction, food rescue, onsite anaerobic digestion, repair workshops, upcycling textiles, youth education, reducing diaper waste, school waste prevention, the sharing economy, and building deconstruction. In addition to promoting sustainability, many of the funded projects focused on providing community benefits such as helping low-income, immigrant, and refugee community members, building job skills, and strengthening youth leadership.

SPU measures the performance of the grant program on a project-by-project basis. Some projects, including food rescue and onsite anaerobic digestion, track tons of food diverted from the waste stream. Other projects track number of items repaired or reused. Education-focused projects track number of people engaged. SPU also collects information from projects on community benefits, such as number of jobs created.

Waste-Free Communities Grantee Spotlight: Refuge Artisan Initiative (RAI)



2019 grantee RAI works to transform the lives of refugee and immigrant women by providing sustainable employment. RAI provides its artisans with free training and equipment to upcycle donated fabric waste into store-quality home goods. With support from SPU's Waste-Free Communities Matching Grant, RAI began selling its upcycled products in local stores.

Recommendation

To maximize opportunities for waste prevention, SPU should consider how to build up the many community-driven waste prevention efforts already occurring across the city.

Rec 09. Expand support for community organizations working to prevent waste

Tapping into and strengthening these existing community leadership efforts will create a stronger foundation for building a waste prevention ethic in Seattle. In addition to continuing the Waste-Free Communities Matching Grant program, Seattle could make a significant impact by:

- Increasing grant funds to \$200,000 a year to fund additional efforts
- Identifying ways to increase the sustainability of community efforts beyond initial grant funds, such as program marketing and promotion, free grant writing workshops, free business analyst consultations, and gap funding

In addition to offering grants, this recommendation would also seek opportunities to expand partnerships with community organizations, nongovernmental organizations, businesses, industry groups, and other agencies working in the area of waste prevention to establish waste prevention models, pilots, businesses, and opportunities in the city. The process would begin cataloging existing entities in the city and convening a “waste prevention summit” to gather input and discuss opportunities.

The next section describes SPU's efforts to promote waste prevention to landscapers, residents, and businesses by managing food and yard waste onsite and using natural yard care practices.

Natural Yard Care

Food and yard waste make up a significant portion of the overall waste stream. However, when these wastes are disposed of in the landfill, they decompose anaerobically and produce methane gas. Conversely, when food and yard waste are composted or used directly onsite (typically as mulch), they often become powerful tools to improve soil health, sequester carbon in the soil, and increase soil water storage. Compost and mulch can help us both fight climate change and be more resilient to it.

SPU currently encourages residents to manage their food and yard waste in three ways: 1) deposit materials in the food and yard waste cart for offsite composting, 2) compost onsite,

such as backyard composting, and 3) use the materials in place, such as placing fallen leaves on garden beds as mulch and leaving grass clippings to decompose on the lawn after mulch mowing. These last two items are the primary examples of waste prevention activities related to natural yard care.

Waste prevention includes reducing not solely the quantity of waste but also the impact it has on the environment. To reduce the environmental impacts of landscaping, SPU promotes natural yard care methods, including using alternatives to chemical fertilizers and pesticides. Natural yard care practices including backyard composting, grasscycling by leaving grass clippings to decompose on the lawn after mulch mowing, and mulching of yard waste have both financial and environmental benefits. Natural yard care reduces resident and business costs for landscaping inputs such as pesticides, fertilizers, mulch, soil amendments, and water for irrigation.

Composting and compost use also have global environmental benefits including reducing greenhouse gas emissions, reducing the production and use of synthetic fertilizers made from petroleum products, and increasing carbon capture and sequestration in soils. Finally, compost use has local environmental benefits through improving soil and plant health, reducing irrigation water demand during the peak summer period, and reducing stormwater runoff by soaking up rain onsite.

A 2008 evaluation of SPU's natural yard care programs found significant economic, social, and environmental benefits.⁴³ SPU now primarily supports grasscycling and other natural yard care practices through its Garden Hotline, the Master Composter Sustainability Steward volunteer outreach program, and web- and print-based resources and information for landscape professionals. Despite reduced spending and modest outreach in recent years, SPU anticipates that residents using natural yard care techniques will continue to reduce household yard and hazardous wastes. SPU can generate estimates for backyard composting, mulching, and grasscycling from data on the number of participating households. SPU conducts a survey every five years on how residents manage their food and yard waste at home. The most recent survey was completed in 2018.⁴⁴ The sections below describe Seattle's education for landscape professionals, outreach to residents and businesses, and support for backyard composting.

⁴³ Morris and Bagby, "Measuring Environmental Value for Natural Lawn and Garden Care Practices," *The International Journal of Life Cycle Assessment*, May 2008, Volume 13, Issue 3, pp 226–234. (link.springer.com/article/10.1065%2FJca2007.07.350)

⁴⁴ Seattle Public Utilities, "2018 Home Organics Waste Management Survey Report," 2018, www.seattle.gov/Documents/Departments/SPU/Documents/Home_Organics_Survey_2018.pdf.

What is Soil Carbon Sequestration?

Soil carbon sequestration is the process of removing carbon dioxide from the atmosphere and storing it in terrestrial ecosystems. Agriculture and deforestation, particularly in the last several decades, have depleted soil carbon stocks. Conserving and restoring degraded soils help return carbon to soil, thereby reducing greenhouse gas concentrations in the atmosphere. Conversely, landfilling food and yard waste produces methane and nitrous oxides, greenhouse gases that have approximately 23 and 300 times the warming potential of carbon dioxide (CO₂) respectively. Emissions associated with composting food and yard waste are significantly lower than landfilling them.

Using compost and natural yard care practices help sequester carbon and decrease greenhouse gasses in four primary ways:

- 1 Compost use and natural yard care techniques create healthy soil, which helps plants grow bigger and faster, which pulls more CO₂ from the atmosphere and puts it into the soil
- 2 Natural yard care avoids the use of chemical fertilizers, which require a lot of energy to produce
- 3 Composting food and yard waste avoids the methane and nitrous oxide emissions associated with landfilling these materials
- 4 Using compost adds carbon directly to the soil, where the carbon can be stored instead of released into the atmosphere

Sustainable Landscaping Professional Education

Beginning in 1994, SPU led the Green Gardening program to educate landscape professionals on pesticide reduction, onsite yard waste management, composting, and other resource conservation practices. The Hazardous Waste Management Program in King County primarily funded this program. Although the Hazardous Waste Management Program refocused efforts and defunded the program in 2017, SPU continues to collaborate with other departments and agencies to provide professional education with multi-resource benefits such as yard waste prevention, pesticide and fertilizer reduction, potable water conservation, and improved soil health and surface water quality. For instance, SPU co-leads an annual professional education seminar with Seattle Parks and Recreation and works with King County Noxious Weed Program and SPU's Water and Drainage lines of business to promote landscape management practices that protect the environment and human health.

SPU also maintains extensive multilingual, web-based training resources on sustainable landscaping through its Sustainable Landscaping Professional Development program. This program offers training and resources to help landscape professionals create landscapes that produce less solid and hazardous waste, reuse yard wastes onsite, conserve water, reduce runoff and pollution, and enhance public health. As part of the Sustainable Landscaping Professional Development program, SPU actively collaborates on the national [Sustainable Sites](https://www.sustainablesites.org/) (SITES®) standards and project certification program (the site and landscape equivalent of LEED green building), as well as the Washington [ecoPRO Certified Sustainable Landscape Professional](https://ecoprocertified.org/) program for landscape professionals to certify and promote sustainable landscape installations and practices amongst a professional audience.⁴⁵⁴⁶

Garden Hotline and Master Composter/Sustainability Stewards

Since 1986, SPU has taught and promoted food and yard waste reduction and recycling practices through the Garden Hotline, Master Composter/Sustainability Steward volunteers, and various natural yard care outreach and events. These efforts reach approximately 16,000 members of the public every year and shift resident and businesses practices toward food and yard waste reuse in landscapes through grasscycling, mulching, and composting. Reusing food and yard waste through grasscycling, mulching, and compost application plays a critical role in building soil health for climate-resilient urban landscapes, stormwater management, water conservation, and sustainable regional agriculture.

The Garden Hotline and the Master Composter/Sustainability Stewards Volunteer Program also provide education on safer alternatives to toxic landscape chemicals, a form of waste prevention related to reducing toxics in products. These multilingual, community-based programs have achieved notable success in collaboration and partnership with other local community-based organizations and multiple jurisdictions and agencies, locally, regionally, and nationally.

SPU manages both the Garden Hotline and the Master Composter/Sustainability Stewards volunteer program, which are staffed through a contract with the community-based organization [Tilth Alliance](https://tilthalliance.org/). Because some of these projects help pollution prevention in

⁴⁵ <https://www.sustainablesites.org/>

⁴⁶ <https://ecoprocertified.org/>

addition to promoting reuse and composting, the Hazardous Waste Management Program in King County partly funds them.⁴⁷

The Garden Hotline responds to calls and email from residents about yard care and landscaping, as well as teaches classes and holds events. In addition, SPU offers natural yard care videos, publications, and hands-on training for home gardeners and landscape professionals.

The Master Composter/Sustainability Stewards is a volunteer training program with a community outreach requirement. Each Master Composter/Sustainability Steward participates in 30 hours of classroom learning (online in 2020 and 2021, combined with outdoor hands-on learning) followed by 35 hours of volunteer outreach, which could include projects such as giving composting classes at schools and civic associations, helping schools and community gardens set up a compost system, and teaching Seattle residents about waste prevention at in-person and online events.



Master Composter Sustainability Steward program volunteers help residents build worm bins, recycle food and yard waste, build healthy urban soils, and support thriving landscapes, 2019 (Source: David McDonald)

SPU will continue to collect and track participation, such as the number of calls to the Garden Hotline and the number of volunteers and professionals that SPU has provided training to on natural yard care.

⁴⁷ <http://www.tilthalliance.org/>

Backyard Composting

Backyard composting and compost use education, which are focus areas of the Master Composter/Sustainability Steward and Garden Hotline programs, help residents understand the importance of keeping contaminants, or non-compostable material, out of the curbside food and yard waste cart, and the value of compost to nourish soils.

Backyard composting is the process by which community members compost their food and yard waste on their own, thereby keeping these materials out of the commercially collected food and yard waste stream. This practice is generally called backyard composting but can and does occur at locations beyond backyards such as community gardens, schools, places of worship, and various businesses. Backyard composting by Seattle households peaked between 2000 and 2005 and then began declining when Seattle began collecting food waste in residential yard waste carts starting in 2005. In March 2009, as part of the rollout of new collection contracts, SPU expanded the program to require all single-family accounts to have food and yard waste carts. At the same time, SPU added meat and dairy products to the list of products allowed in curbside food and yard waste carts.



A young boy sits atop a school garden compost heap in the Fremont neighborhood, 2021 (Source: Kate Kurtz)

SPU further encouraged residential use of curbside food waste collection service to meet Seattle's 60% recycling goal. As a result of these changes, the number of households participating in backyard composting continued to decline, and SPU ended subsidized sales of backyard compost bins in 2011.

In 2010, 30% of households surveyed reported participating in backyard composting. Backyard composting decreased to 23% in 2018 according to the [2018 Home Organics Survey](#). The next survey on residential waste prevention, which will gauge current backyard composting practices in addition to other waste prevention practices, is planned for 2022.

Green Purchasing

SPU engages in some efforts to promote waste prevention in the City's own operations through participation in and support for City green purchasing initiatives. Green purchasing approaches reduce the environmental impacts of products and materials purchased by the City. City procurement policies incorporate requirements based on Seattle Municipal Code to buy products that contain recycled content, are less toxic, and are reusable or recyclable. Green purchasing policies and ordinances are available [online](#).⁴⁸ The Department of Finance and Administrative Services (FAS) administers these policies with input from other City departments, including SPU.

Environmentally Preferable Purchasing

FAS worked with a cross-departmental citywide team to update the City green purchasing policy, which is slated to be completed in 2022. SPU's Solid Waste Utility staff position to advise on green purchasing was eliminated in 2015, but SPU continues to participate in the Department of Finance and Administrative Services-led efforts to update the environmentally preferable purchasing policy and ordinance.

Green purchasing policies, particularly those that promote waste prevention, support SPU's strategic approach of solving problems at the source and leading by example in its operations. Waste prevention procurement policies include using bulk purchasing and other packaging reduction methods, minimizing use of office paper, and discouraging the use of bottled water at City meetings and events.

Where waste cannot be prevented, green purchasing policies focus on selecting products that are durable, reusable, recyclable, compostable, or include recycled content, with additional elements to support market development. The market development elements of green purchasing, such as post-consumer recycled-content requirements, are increasingly important with changes in global recycling market conditions. Buying products made with recycled content helps close the recycling loop by building market demand for materials that SPU collects in its recycling stream. Examples of key products where requiring post-consumer

⁴⁸ <http://www.seattle.gov/purchasing-and-contracting/purchasing/green-purchasing>

recycled content would support local recycling markets or create demand for key recyclable materials include:

- Paper products
- Landscape products, such as compost, on City projects and landscaped areas
- Plastic bags purchased by City agencies and programs such as Parks and Recreation and SPU's Clear Alleys Program
- Plastic garbage, recycling, and food and yard waste collection carts

SPU currently offers input for related policies but does not administer, monitor, or measure the City's green purchasing activities.

E-Stewards Digital Equity Partner Commitment

In 2017, FAS, with input from Seattle Information Technology (IT) and SPU, signed the e-Stewards Enterprise Agreement. Under this agreement, Seattle IT committed to engaging its Digital Equity program to source refurbished equipment from e-Stewards certified recyclers and refurbishers wherever practical and to deploy this equipment through an organized training program, which includes training on the responsible use and end-of-life management of the equipment. This program has not been able to launch successfully due to insufficient donations of appropriate equipment from participating businesses. The e-Stewards program is in the process of continuing to develop necessary business partners.

Recommendation

This recommendation expands waste prevention within the City's own operations, throughout all departments.

Rec 10. Expand support of the City's sustainable and green purchasing policies

SPU should support efforts to update and implement the green purchasing policy within City of Seattle offices and operations. Specifically, SPU should:

- Provide advisory input to FAS as it updates the green purchasing ordinance and related procurement activities with regards to waste prevention, recycled content, compost, toxics reduction, and other topics
- Encourage City procurement that supports developing markets for materials recycled locally, such as recycled content paper and compost/mulch to promote a more circular economy
- Develop guidelines for food service packaging and products purchased for City meetings and events and promote the use of durable and reusable products where possible
- Promote the existing Executive Order that disallows use of bottled water at City meetings and events
- Encourage FAS to reestablish an advisory "green team" and then allocate Solid Waste Utility staff to participate on the team
- Determine additional internal City policies and strategies to prevent waste, such as development of an Executive Order to reduce single-use plastics use in City offices and facilities
- Engage other City departments to incorporate waste prevention into their related work on economic growth, human health connection, procurement, and sustainability
- Continue to coordinate with FAS, Seattle IT, and e-Stewards through e-Stewards Enterprise License Agreement to ensure City electronics are responsibly reused and recycled
- Participate in e-Stewards Digital Equity program to deploy used equipment through a responsible training program that incorporates responsible end-of-life management of equipment

The next section describes SPU's efforts to promote and facilitate reuse and repair to keep products out of the solid waste system.

Reuse and Repair

Reuse is the second most preferred action within the waste hierarchy, after waste prevention and before recycling (discussed next in Chapter 5, *Recycling and Composting Policy and Markets*). Reuse is generally defined as the “use of a product more than once in its same form for the same or similar purpose.”⁴⁹ The Reuse Institute has expanded the definition of reuse to mean “to extend the life of a product, package, or resource by either using it more than once with little to no processing (same or new function), repairing it so it can be used longer, and/or sharing, renting, selling, or donating it to/with another party.”⁵⁰ Extending the life of a consumer product through these methods also avoids or slows the replacement of that product; reduces the need to purchase new items; and reduces the associated cost of waste disposed through curbside collection and bulky item pickups.

Reuse can reduce environmental impacts across a product's life cycle. SPU promotes and facilitates reuse in several ways, both directly and indirectly. The next sections briefly describe SPU's activities around clothing reuse, recycling and reuse at Seattle's transfer stations, and measuring reuse and repair.

Threadcycle (Reusing and Recycling Clothes)

Textile production, distribution, and consumption is a growing contributor to solid waste streams and a major contributor to global greenhouse gas emissions. Textile waste includes apparel (such as clothing and footwear) and non-apparel items (such as home and hospitality linens and healthcare and industrial textiles). Apparel is one of the largest categories in U.S. textile waste at 13 million tons in 2018.⁵¹ The rise of “fast fashion,” a term used to describe the fashion industry's ever-accelerating pace of releasing new styles at low cost, is a driver of increased clothing waste. According to the Ellen MacArthur Foundation, “half of fast fashion produced is disposed of in less than a year. In the U.S., clothes are only worn for around a quarter of the global average.”⁵² McKinsey & Company found that the average consumer

⁴⁹ CalRecycle, “Glossary of Waste Prevention Terms,” Accessed September 25, 2019, www.calrecycle.ca.gov/reducewaste/define#Reuse.

⁵⁰ Reuse International, “Resources,” Accessed September 25, 2019, www.reuseinstitute.org/resources.

⁵¹ U.S. EPA, “Advancing Sustainable Materials Management: 2018 Tables and Figures,” 2020, www.epa.gov/sites/default/files/2021-01/documents/2018_tables_and_figures_dec_2020_fnl_508.pdf.

⁵² Ellen MacArthur Foundation, “A New Textile Economy,” 2017, www.ellenmacarthurfoundation.org/assets/downloads/publications/A-New-Textiles-Economy_Full-Report.pdf.

bought 60% more items of clothing in 2014 than in 2000 but kept each garment half as long.⁵³ Waste prevention for textiles is important not only because of the proliferation of “fast fashion” trends and resulting impacts, but also because true recycling of textiles is still in the early stages of development. Currently, most recycled textiles are downcycled into lower value uses such as industrial wiping rags or shredded textile insulation. As little as 1% of recycled textiles may be turned into new garments.⁵⁴



Repairing holes in sock to extend their life and prevent waste (Source: Adobe Stock Inc.)

In response to these trends, from 2015 through 2017, Seattle and King County created *Threadcycle*, a public information campaign to reduce local textile waste. Many consumers already knew they could extend the life of their unwanted clothes by donating them to thrift stores. *Threadcycle* encouraged consumers to also donate damaged textiles so that they could be recycled into industrial products instead of going to the landfill. “Threadcycling” started to become a local term for keeping clothing and textiles in use. However, while thrift store partners reported successes, the growing public awareness alone did not appear to reduce the volumes of textiles going into the garbage in King County. The success of this strategy also relied on strong global export markets to accept used U.S. textiles that were not already available domestically. The consumer campaign also did not address increasing over-production, consumer purchasing habits, rapid disposal, and accelerating climate impacts.

Textiles have a large carbon footprint. According to the 2020 “Fashion on Climate” report, the global fashion industry produced around 2.1 billion metric tons of greenhouse gas (GHG)

⁵³ McKinsey & Company, “Style That’s Sustainable: A New Fast-Fashion Formula,” 2016, www.mckinsey.com/business-functions/sustainability/our-insights/style-thats-sustainable-a-new-fast-fashion-formula.

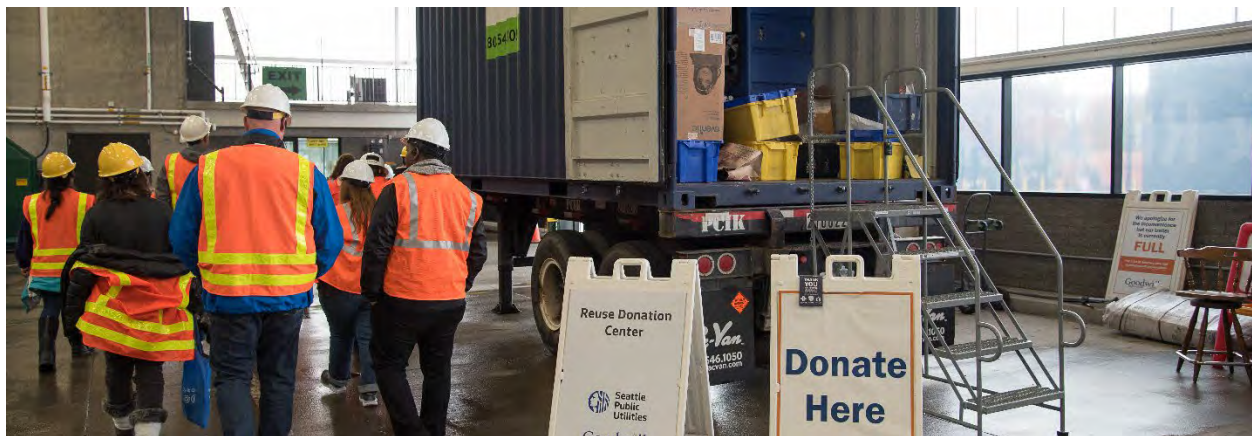
⁵⁴ Ellen MacArthur Foundation, “A New Textile Economy,” 2017, www.ellenmacarthurfoundation.org/assets/downloads/publications/A-New-Textiles-Economy-Full-Report.pdf.

emissions in 2018, equaling 4% of the global total. And according to the report's authors, "If no further action is taken over the next decade beyond measures already in place, the industry's GHG emissions will likely rise to around 2.7 billion [metric tons] a year by 2030, reflecting an annual volume growth rate of 2.7%."⁵⁵

Given these issues, Seattle and King County decided to shift focus upstream to identify opportunities for manufacturers, retailers, and the public sector instead of relying solely on consumer behaviors to reduce textile waste. Adding to the Seattle/King County research, organizations such as the Ellen MacArthur Foundation, Global Fashion Agenda, and others have called for the introduction of circular business models to minimize pre- and post-consumer waste, consumer education, policies to encourage sustainable consumption, and multi-stakeholder collaboration.

Reuse at Transfer Stations

In 2017, SPU opened the Recycling and Reuse Building at its remodeled North Transfer Station. SPU currently contracts with Seattle Goodwill to collect reusable items in this building. They accept items in good condition such as clothing and linens, electronics, small furniture, and household goods for resale at Goodwill retail locations. Waste reduction activities related to charity thrift shops like Goodwill both keep items from the landfill and can provide job training and other support services for low-income individuals and families. SPU collects diversion data from the companies collecting useable household goods from the vehicles entering the North Transfer Station.



Goodwill donation site as pictured during facility tour, 2018 (Source: SPU Image Library)

⁵⁵ McKinsey & Company and Global Fashion Agenda, "Fashion on Climate," 2020, www.mckinsey.com/industries/retail/our-insights/fashion-on-climate.

Since 2011, SPU also offers bicycle collection for reuse at both the North and South Transfer Stations through a partnership program between Recology, one of Seattle's solid waste collection contractors, and Bike Works, a local nonprofit that promotes bicycles as a vehicle for change to empower youth and build resilient communities. Since 2011, transfer station customers have been bringing old bicycles to a dedicated collection container. Bike Works volunteers then sort and repair collected bikes for reuse, resale, or donation. SPU collects data on the number of bicycles collected at both the North and South Transfer Stations. So far, the program has collected over 288 tons, or roughly 29,000 bicycles.

Recommendations

SPU recommends exploring and expanding market opportunities for reuse and repair and boosting textile waste prevention.

Rec 11. Explore and expand market opportunities for reused material and repair services

To achieve a measurable drop in per-capita consumption, in this strategy SPU should expand its role in promoting and facilitating reuse and repair options for Seattle residents. Example strategies for exploring and expanding market opportunities for reused material and repair services include:

- Connecting SPU programming to other City departmental initiatives (such as use of durable food serveware, electronics reuse and repair, waste prevention campaigns, and waste-free grants) and developing information resources that promote awareness of and easy access to reuse and repair services.
- Strengthening existing partnerships and building new ones to maximize reuse opportunities in the city. Examples include:
 - Promoting existing reuse businesses, charities, programs, and community-based efforts.
 - Working with existing reuse businesses to understand barriers and opportunities for creating a stronger network of reuse opportunities.
 - Engaging with community-based organizations that are already fostering a reuse and repair ethic and support consumer actions to reuse and repair goods. Determine how best to support and expand this work.
 - Fostering engagement over time with customers that would focus SPU's work on the local consumer experience and how to provide benefits that increase human connection and prosperity.

- Working with economic development agencies, community-based organizations, and national nongovernmental organizations (NGO) and foundations to identify new local economic opportunities related to reuse and repair, including job training development opportunities.
- Developing policies that enable reuse. Work with repair industry groups to support Right to Repair legislation to ensure product manufacturers do not hinder the ability for others to repair products.
- Identifying impacts on consumption, disposal, larger environmental issues, and human prosperity. Determine which indicators can be useful metrics and how to measure progress.

Rec 12. Promote and support waste prevention for textiles and monitor emerging textiles recycling technologies

SPU should promote and support waste prevention strategies for textiles in while continuing to monitor emerging technologies for textiles recycling. Example strategies for textiles waste prevention include:

- Expanding beyond current thrift collaboration to support sharing, repairing, reusing, and refashioning textiles with more stakeholders such as public agencies, nonprofits, academia, brands, retailers, and businesses that are directly engaged in extending the useful life of apparel. Collaboration could include expanding overall awareness of the issues and potential solutions, creating shared language and credible metrics, investigating policies that enable reuse, supporting business models to keep clothes in use.
- Monitoring national and international proposals for taxes, extended producer responsibility plans (described in more detail in Chapter 5, *Recycling and Composting Policy and Markets*), sustainability action plans, and incentives to reuse, repair, and recycle used clothing.
- Developing and running a consumer campaign in collaboration with other partners to raise awareness about the costs of wasted clothing and the opportunities to extend the life of clothes.
- Monitoring national and international progress on textile recycling technologies that do not downcycle clothing by turning used clothing into wiping rags or insulation, for example.
- Exploring how true textile recycling, or recycling used clothing into another clothing product, could be implemented in the Puget Sound region as available technology progresses.
- Looking for economic development and job creation opportunities for textile repair and upcycling.



5

Recycling and Composting Policy and Markets

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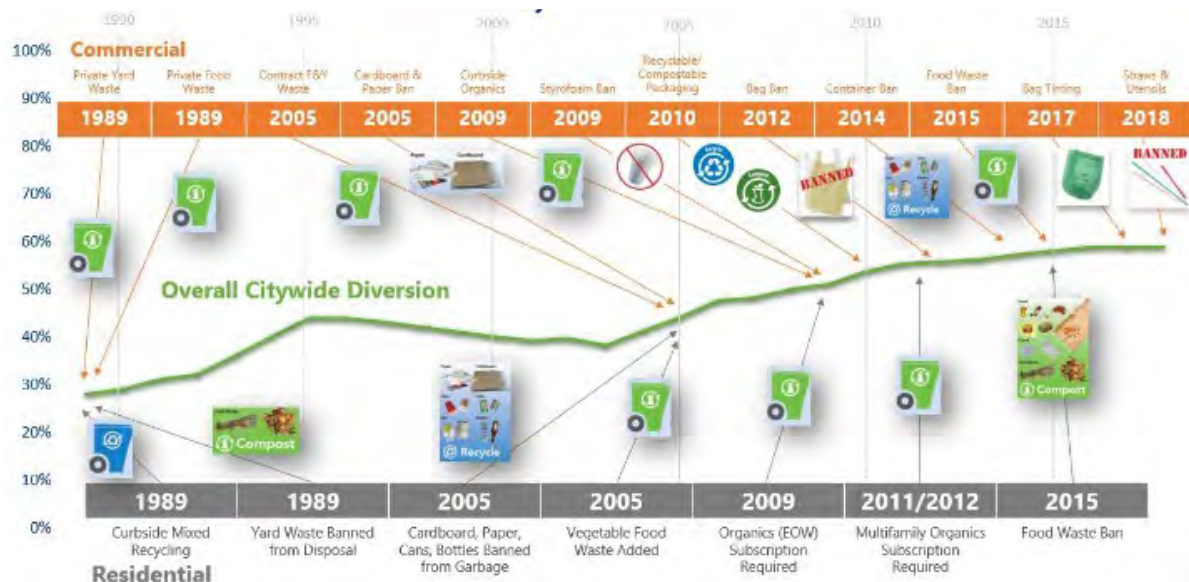
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Chapter 5 Recycling and Composting Policy and Markets

Overview

After waste prevention and reuse, the next best option for dealing with discards is to recycle or compost them. Seattle’s current rate structure for solid waste services, often referred to as a “pay-as-you-throw” (PAYT) system, promotes recycling and food and yard waste composting by charging less for these services than for garbage. The more materials customers divert into recycle or compost, the lower their cost for overall solid waste services. Recycling and composting preserves natural resources, reduces the amount of waste sent to landfill, decreases greenhouse gas emissions, and saves money. Appendix F, *Economics of Residential Recycling in Seattle*, demonstrates how Seattle’s residential recycle and compost programs have decreased household disposal rates, saved ratepayers money, and reduced potential human illnesses and other environmental pollution impacts.



Seattle’s commercial and residential services and policies increase diversion and have many other benefits (Source: SPU)

This chapter describes recycling and composting in Seattle within the context of recent international events that have prompted SPU and its partners to take a more holistic view of diversion to minimize its impact and to build more responsible circular recycling and composting systems locally. Strategies highlighted in this chapter, include:

- Improving recycling quality
- Building local recycling and composting markets and infrastructure
- Advocating for voluntary product stewardship measures
- Advancing extended producer responsibility legislation

To explain how Seattle Public Utilities (SPU) approaches recycling today, the next sections describe what is accepted for recycling in Seattle—and how commodity markets near and far make it possible for the City to offer one of the nation's most extensive recycling programs.

Benefits and costs of Recycling and Composting

For more information on the economic, environmental, and social benefits and costs of recycling and composting to Seattle, please read Appendix E, *Economics of Residential Recycling in Seattle* or read the following articles:

[Recycling: A Triple Win¹](#)

[Composting: Seattle's Winning Strategy for Managing Organics²](#)

Related Topics in Other Chapters Include:

- Physical collection, processing infrastructure, and the accompanying contracting mechanisms for disposal, recycling, and composting in Chapter 6, *Solid Waste Handling and Collection and Removal*
- Education, behavior change, and enforcement activities that support implementation of programs, policies, and regulations in Chapter 9, *Outreach, Education, Enforcement, and Compliance*
- Financing, such as rate structures, that supports all solid waste management activities in Chapter 10, *Administration and Financing of the Solid Waste System*
- Seattle's Contamination Reduction and Outreach Plan (CROP), detailing Seattle's efforts to improve recycling quality, appears in Appendix F, *Economics of Residential Recycling in Seattle*

¹ <https://resource-recycling.com/recycling/2020/05/14/a-triple-win>

² <https://www.biocycle.net/seattles-winning-strategy-managing-organics>

What's Recyclable

State law requires local solid waste management plans to designate which recyclable materials the City collects. In urban areas like Seattle, designated recyclables must be collected from single-family and multifamily residences. Seattle's collection programs designate materials as recyclable through contract negotiations with the processor that sorts materials collected for recycling. When negotiating and designating recyclable materials, Seattle considers factors like processing costs, commodity markets, customer interests, quantities generated, and alternative recycling options. The recycling processing contract prohibits disposal of designated materials. SPU continues to expect all contracted materials to be shipped to processing markets for recycling, regardless of market conditions.

Seattle Municipal Code prohibits the disposal of recyclables in residential (SMC [21.36.083](#)) and commercial (SMC [21.36.082](#)) garbage.³ Recyclables are all materials accepted for collection as listed in the recycling guidelines. SPU's website provides the latest information on [currently recyclable materials](#).⁴ SPU's current processing contract will continue to 2024 or 2027, at SPU's discretion. If SPU changes designated materials for recycling, it will consult the Seattle Solid Waste Advisory Committee and notify the Washington State Department of Ecology. Table 5.1 presents the current list of designated recyclable materials.



A resident empties materials into recycling carts (Source: SPU Image Library)

³https://library.municode.com/wa/seattle/codes/municipal_code?nodeId=TIT21UT_SUBTITLE_IIISOWA_CH21.36S_OWACO_SUBCHAPTER_IISOWACO_21.36.082CORERE

⁴<http://www.seattle.gov/utilities/your-services/collection-and-disposal/recycling>

Table 5.1 Designated Recyclables

CATEGORY	INCLUDES
Glass	Glass bottles and jars
Metal	Tin cans, aluminum cans, pots, pans, foil, and scrap metal larger than 3 inches but smaller than two feet in any direction and less than 35 pounds
Organics	Food waste (including food-soiled paper, napkins, and waxed paper), yard waste, wood waste, approved compostable bags, approved single-use compostable food serviceware
Paper	Mixed-waste paper, cardboard, newspaper, poly-coated paper, and aseptic packaging
Plastic	Plastic bottles, jars, tubs, cups, and food containers (excluding expanded polystyrene or Styrofoam), rigid plastics #1-7, lids larger than 3 inches, planter pots, and five-gallon buckets
Other materials (collected separately)	Foam, batteries, CFLs (compact fluorescent lamps), small and large electronics, used motor and cooking oil

Until 2020, plastic bags were accepted in curbside recycling if they were bagged together. The City had been working with the American Chemistry Council, The Recycling Partnership, Sustainable Packaging Coalition, and Association of Plastic Recyclers on an industry-led effort to increase retail drop-off locations to provide an alternative and convenient option for recycling this material, but this work ended during the COVID-19 pandemic.

Recycling Markets

Recyclables can be a resource used to create new products and packaging. SPU relies on both domestic and global commodity markets to purchase and reprocess Seattle's recyclable material. Seattle's status as an international port and connection to major transportation infrastructure facilitates the sale and transport of its recyclables locally, throughout the U.S., and across the Pacific Ocean for reprocessing into new products and packaging.

When contracting for processing services, SPU specifies end markets for individual commodities to support the highest and best use of these discards. For example, the current processing services contract requires at least 50% of glass collected from recycling streams to be processed back into glass cullet (used to make new glass containers). The contract also requires the processor to create bales of high-grade paper or plastics for regional markets. SPU tracks

average monthly market prices for commercial and residential recycled materials. These data date back to 1988 and can be found on SPU's website with [other regular solid waste reports](#).⁵ Table 5.2 shows current end markets for contracted recyclables. SPU receives commodity revenues for 100% of the market value of recyclables from Seattle services.

Table 5.2 SPU Recycling Tonnages and End Markets (based on facility reporting)

MATERIAL	2020 TONS	2020 MARKETS
Cardboard	15,500	85% Washington, Oregon, and Idaho mills and 15% Asian ports
Glass	24,700	100% Seattle
Metals	2,400	100% Seattle or Washington, Oregon, and Idaho
Non-recyclable	9,900	Landfill
Papers	37,300	70% Washington, Oregon, and Idaho mills and 30% Asian ports
Plastics	4,700	75% United States or Canadian processors
Total	94,900	80% in United States or Canada

Source: Republic Services, Quarterly Recycling Reports to SPU.

New Restrictions Improve Quality Standards and Expose Unintended Consequences of Recycling

Commodity market conditions are a known risk in long-term solid waste planning. That is because both supply and demand for individual commodities can vary for many reasons. These reasons can relate directly to markets or to factors ranging as widely as weather patterns, changing consumer behaviors, or the effects of national policy. SPU attempts to buffer some of this risk by sharing it with the recycling processing contractor, but recent events have highlighted that no one dependent on exporting recyclables is immune to the impacts of seismic shifts in global commodity markets.

⁵ <http://www.seattle.gov/utilities/about/reports/solid-waste-reports>



Bales of crushed aluminum cans (Source: Republic Services)

For years, Seattle's recycling programs have relied on Asian export markets, particularly China, to purchase and process lower quality recyclable materials, especially mixed paper and mixed plastics. But in 2013, China started to implement progressively more restrictive environmental and anti-corruption policies to reduce the amount of waste imported into the country. Such policies included decreasing the amount of non-recyclable material or contaminants allowed in recycling,⁶ accompanied by customs inspections, import limits, and eventually, an import ban.

Enforcement of the import ban, called "National Sword" (2017), began in January 2018, upending the global markets for mixed paper and plastics (#3-#7) as other nations in Southeast Asia adopted import and contamination policies like China's. The implementation and enforcement of these policies significantly restricted the end markets available to both SPU and the rest of the world with established recycling programs. Although Seattle was well-positioned to weather such a dramatic shift in markets, many other municipal programs have had to pause or cancel their recycling programs.

Though immensely disruptive, China's import ban has generally resulted in higher quality standards, meaning lower overall thresholds for contamination or garbage in the recycling. The new statewide requirement for each county or city with solid waste management authority to develop a Contamination Reduction and Outreach Plan (Appendix B, *Contamination Reduction & Outreach Plan*) reflects recent emphasis on improving recycling quality.

Simultaneously, the potential for recyclables to become contaminated has increased, with new materials on the market that are not currently accepted in Seattle's recycling. These confusing

⁶ Contamination is any material that is different than main material in a bale. Said material must be removed before the main bale material can be recycled. Plastic mixed into a paper bale would be considered a contaminant.

materials include new flexible plastic packaging and some mixed-material packaging that combines several material types, such as foam, plastic, and metal. With packaging design constantly evolving and often complicating recycling efforts, SPU works with both its recycling and organics processing contractors to:

- Monitor contamination rates
- Enhance product labeling for accuracy and clarity around recyclability
- Engage upstream manufacturers about their products
- Educate customers on proper sorting to mitigate contamination issues
- Maintain strong product quality in the face of more challenging market conditions

Along with spurring stricter quality standards, China's policies have increased awareness of the environmental and human toll on recycling exports to poorer nations with fewer environmental, health, and human rights protections. For instance, contamination from garbage or food and yard waste in recycling may end up as garbage, pollution, or litter if sent overseas for processing in countries with fewer environmental protections than the United States.



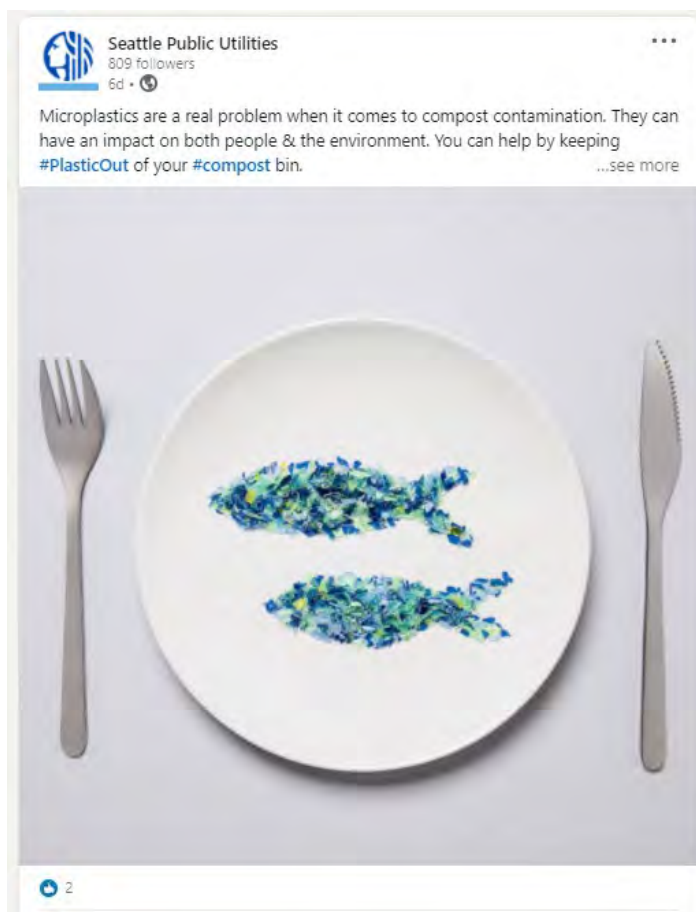
SPU staff talk with customers about how different materials should be sorted (Source: SPU Image Library)

Managing Low-Grade Mixed Plastics

The fallout from China's policies has helped highlight challenges surrounding recycling of low-value mixed plastics. The lack of markets for low-grade mixed plastics, increased instances of plastics contamination in other recyclable or compostable material, and the introduction of hard-to-recycle packaging materials has challenged the viability of Seattle's recycling programs.

At the same time, increasing concerns are emerging about plastic pollution and litter, including air and water pollution and its impact on communities. Concerns include the persistence of plastic waste in the environment, the toxicity of plastics, plastic waste and microplastics pollution in the ocean, and ingestion of plastic waste by wildlife. SPU continues to consider how to address plastics recycling and end-of-life management. One option for Seattle may be to eliminate materials such as low-grade, low-value, single-use plastic packaging from the recycling stream altogether and replace them with reusable or compostable packaging.

In response to growing environmental management concerns, Southeast Asian countries, including Malaysia, Thailand, and Vietnam, have restricted or entirely stopped importing mixed plastics, following China's lead. In May 2019, 187 countries ratified new international treaty restrictions on mixed and low-grade waste plastics under the Basel Convention. This framework aims to enhance transparency and increase regulation of global trade of plastic waste.



*Social media post from SPU on plastics in the compost
(Source: SPU's LinkedIn account)*

Basel Convention Restrictions on the Transboundary Movement of Mixed and Low-Grade Waste Plastics

A global waste treaty, the Basel Convention limits global trade in hazardous wastes between developed and developing countries. It has been ratified by 187 countries, excluding the U.S. The U.S. is a signatory to the Basel Convention but has not ratified the treaty.

Since 1997, the Seattle-based nonprofit organization, Basel Action Network (BAN) has promoted the Basel Convention's toxic waste trade solutions by using interrelated policy, market solutions, and public engagement strategies.

On May 10, 2019, the 187 countries that have ratified the Basel Convention approved applying the treaty to mixed plastic wastes due to the significant social and environmental impacts of global "trade" in these plastics. This action serves as an indicator of the level of concern for the impacts of mixed plastics exports on human health and the environment in receiving countries.

Responsible Recycling Task Force

King County's Solid Waste Advisory Committee and Metropolitan Solid Waste Management Advisory Committee formed the Responsible Recycling Task Force (RRTF) in April 2018 to respond to recycling market disruption caused by the implementation of China National Sword, which shed light on how materials collected for recycling in the United States were causing harm abroad. The disruption began with China's implementation of increasingly stringent environmental policies to halt the flow of waste materials into the country. Such policies included contamination standards for recycling (limits on the amounts of non-recyclables in the recycling), import limits, and eventually, an import ban on certain recyclable material that severely affected global markets for mixed paper and mixed plastics.

Seattle participated on the RRTF along with representatives from King County, other cities in King County, solid waste haulers, and other stakeholders. The RRTF's goals were to (1) address the short-term and long-term impacts of the global recycling market disruption, (2) learn about the problem, (3) understand policies, programs, and activities that are being implemented elsewhere, and (4) identify opportunities for change. Developing a responsible recycling system is a commitment to ensuring that the recyclable materials collected, transported, and processed do not cause harm to the environment and human health or create social inequities

in the United States and other countries that might have less stringent regulations for safeguarding human health and the environment.

To minimize the impact of the unintended consequences of recycling now and in the future, Seattle and its partners in King County adopted a “responsible recycling” philosophy as an approach to minimize those impacts. Responsible recycling places a premium on recycling practices that avoid harming planet and people.

Responsible Recycling

“Responsible Recycling is a philosophy that ensures we take responsibility for the waste and recyclables we generate so that they are sorted, processed, and if necessary, disposed in a responsible manner. It ensures that our recycled materials do not cause harm here or elsewhere, including other countries. It also motivates producers and consumers to reduce wasteful packaging and products and increase the use of recycled and recyclable materials. Responsible Recycling is not going to be easy. It is not going to be free. It will require significant changes in our recycling systems and infrastructure. However, it is the right thing to do to conserve valuable resources, minimize impacts from global warming, and secure a sustainable future.”⁷

The RRTF took a coordinated, collaborative approach to providing guidance on (1) establishing goals to improve recycling systems in King County, (2) recommendations for how to accomplish those goals, and (3) action items to bring back to County and City advisory committees and decision makers. The RRTF identified several challenges to address. In the short term, reduced markets for mixed paper and mixed plastics due to China’s import restrictions hindered recycling in King County. Long term challenges included contamination, vulnerable market conditions, and the cost of recycling, which residents and customers often perceive as free.

To address these challenges, the RRTF developed the six goals listed below along with 23 specific action items.⁸ The Seattle Solid Waste Advisory Committee reviewed and endorsed the identified actions in March 2019 for the RRTF to implement in 2019 and beyond.

- Goal 1: Establish responsible recycling policies
- Goal 2: Develop local recycling infrastructure
- Goal 3: Harmonize recycling program and messaging

⁷ King County Responsible Recycling Task Force. Recommendations to Achieve a Responsible Recycling System. January 2019, <https://kingcounty.gov/~media/depts/dnrp/solid-waste/about/planning/documents/task-force-final-recommendations.ashx?la=en>.

⁸ Ibid.

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- Goal 4: Increase demand for recyclable materials
- Goal 5: Create clean and marketable feedstocks
- Goal 6: Improve upstream design

As of this writing, the Responsible Recycling Task Force has taken action on each of these goals. A list of action item deliverables is available on the [Responsible Recycling Task Force website](https://kingcounty.gov/depts/dnrp/solid-waste/about/advisory-committees/recycling-task-force.aspx).⁹ Recommendations in Seattle's 2022 *Solid Waste Plan Update (2022 Plan Update)* incorporate many of the 23 uncompleted action items identified by the RRTF and SPU continues to apply the "responsible recycling" philosophy to its work.



Commingled recycling at a material recovery facility in Seattle (Source: SPU Image Library)

⁹ <https://kingcounty.gov/depts/dnrp/solid-waste/about/advisory-committees/recycling-task-force.aspx>

Recommendations

SPU developed two recommendations to improve the quality of and reduce environmental and social impacts of materials that Seattle customers divert to recycling and composting.

Rec 13. Advocate for responsible recycling policies recommended by the Responsible Recycling Task Force

SPU should work to protect the quality and recyclability of collected materials and monitor how the materials are recycled to ensure they are not creating environmental or social harm. In support of the RRTF recommendations, SPU can support responsible recycling in solid waste management processing and disposal contracts by:

- Including requirements in future contracts that protect against creating environmental or social harm from SPU's recycling practices, such as requiring sorting of mixed plastics to resin type before exporting
- Working with King County and others to develop a methodology or practices for documenting the chain of custody from sorting facilities to end markets to monitor adherence to recognized environmental and human health and safety standards
- Exploring opportunities to prioritize domestic processing in contracts
- Supporting monitoring of recycling quality by exploring ways to track and document landfilled residuals from material recovery facilities that sort recyclables, contamination in baled materials, and material characterization study data for material recovery facilities

Rec 14. Continue and expand efforts to reduce the amount of contamination, or non-recyclable material, in the recycling and food and yard waste

SPU should explore, evaluate, and implement expanded strategies to address and reduce contamination in recycling and food and yard waste (composting), such as through education and enforcement approaches and new sorting technology. Specific measures to consider include the following:

- Continue to increase monitoring of materials, tagging contaminated loads, and providing public messaging to waste generators in Seattle
- Continue to promote and participate in regional collaborations to expand contamination reduction efforts
- Continue to participate in and help provide consultant support for King County's RRTF, the King County Organics Recycling Work Group, and similar county-wide, regional programs

- Continue to collaborate through the Washington Organic Recycling Council with statewide industry and government efforts to reduce and manage contamination in organics separated for composting

In support of responsible recycling, SPU should also consider tracking contamination rates in recycling, including in marketed bales produced by recycling sortation processors. SPU may also consider enhancing the transparency of reporting on where Seattle-generated recyclable materials end up, establishing a means to collect data on end markets for recycling (past the first material broker). For detailed information on SPU's specific strategies to improve recycling quality, see Seattle's *Contamination Reduction and Outreach Plan*, which appears in Appendix F, *Economics of Residential Recycling in Seattle*.

Developing Local Recycling Markets

The development of local end markets for materials, recycled content requirements, and advanced technology and facilities will help support responsible recycling and help Seattle build a more circular economy locally. The current recycling market landscape requires development of regional recycling infrastructure and markets. Mixed paper and mixed plastics collected in Seattle have been shipped predominately to Asia for further sorting and processing, but those countries are restricting imports of mixed paper and plastics. Because of these factors, King County's RRTF selected development of local recycling infrastructure as a key goal and identified several actions to support local recycling infrastructure.¹⁰

"Our region should support the development of our local recycling infrastructure to build resiliency, create local jobs, minimize greenhouse gases from transportation and production, and increase the ability to document and measure real recycling."¹¹

¹⁰ King County's Responsible Recycling Task Force, "Recommendations to Achieve a Responsible Recycling System," January 10, 2019, <https://kingcounty.gov/~media/depts/dnrp/solid-waste/about/planning/documents/task-force-final-recommendations.ashx?la=en>.

¹¹ Ibid.

SPU is partnering with King County to implement relevant action items from the RRTF recommendations report, including to:

- Conduct pilot projects and support information sharing to encourage the development of domestic recycling infrastructure and secondary markets for recycled materials
- Create action plans and grant programs to support the development of markets for compost, recycled paper and plastic, and salvaged wood
- Update City and County recycling contracts and codes to prioritize domestic sorting and processing and require documentation of the chain of custody from sorting facilities to legitimate end markets

The next sections describe local efforts to grow the local recycling economy through LinkUp and the Recycling Development Center.



A tour of Seattle's North Transfer Station (Source: SPU Image Library)

LinkUp

SPU coordinates and partners with local governments, regional sorting facilities, national processors, product representatives, and packaging specialists to facilitate innovation in local recycling and composting processing and markets. For example, SPU collaborates with King

County on the [LinkUp](#) program to support market and infrastructure development.¹² LinkUp works to expand markets for selected recyclable and reusable materials through research, stakeholder engagement, and policy development. Program goals of LinkUp include:

- **Goal 1.** Enhance and expand markets for recyclable and reusable materials to achieve a sustainable materials management system
- **Goal 2.** Advocate and support development of regional recycling and reuse infrastructure and policy approaches

Examples of recent collaborations include:

- **Responsible management of mixed plastics.** In 2018, SPU and King County convened a one-day *Domestic Processing of Mixed Plastics Summit* through LinkUp to determine current management practices for mixed plastics and the necessary steps to ensure plastics are sorted by resin type prior to export overseas. This summit contributed to local material recovery facilities conducting additional sorting of mixed plastics in regional facilities, increased discussions on the need for a Seattle area plastic recovery facility and/or secondary material recovery facility, and the formation of the RRTF.
- **Support and development of the use of post-consumer recycled (PCR) paper in regionally produced paper products.** SPU and King County co-funded a report titled *Puget Sound's Paper Trail: Seattle & King County Paper Market Assessment*.¹³ The report summarizes information for King County and Seattle on existing PCR paper supply, research, and outreach to paper manufacturers and other industry professionals. It characterizes existing paper market demand and conditions and potential approaches for expanding end markets available for PCR paper.
- **Organics market development.** SPU has contributed staff time in King County's Regional Organics Stakeholder process and development of a study that assessed trends and market conditions for food and yard waste and recommended actions to strengthen markets for products made from these recovered materials.¹⁴
- **Recycling Development Center grants.** SPU has contributed staff time to work funded by Recycling Development Center grants for King County to map processing infrastructure throughout the state and conduct research on establishing a platform to coordinate efforts around equitable business assistance and support for secondary material end markets.

¹² <https://kingcounty.gov/depts/dnrp/solid-waste/programs/linkup.aspx>

¹³ King County LinkUp, "Puget Sound's Paper Trail: Seattle & King County Market Assessment," November 2020, <https://kingcounty.gov/~media/depts/dnrp/solid-waste/linkup/documents/paper-market-assessment-2020.ashx?la=en>.

¹⁴ King County LinkUp, "Organic Materials Management in King County," August 2019, <https://kingcounty.gov/~media/depts/dnrp/solid-waste/linkup/documents/organics-materials-market-assessment.ashx?la=en>.

Recycling Development Center

SPU also advocates for legislation that supports end market development. SPU advocated for legislation in the 2019 legislative session (House Bill 1543) that established the state [Recycling Development Center](#). The purpose of the Center is to provide or facilitate basic and applied research and development, marketing, and policy analysis to further the development of markets and processing infrastructure for recycled commodities and products.

The initial priority products addressed by the Recycling Development Center are mixed paper and plastics. SPU has participated on the initial Advisory Board and in related activities to develop the Center's initial work plan, review grants applications to the Center, and look for opportunities to amplify or supplement local market development work undertaken in collaboration with King County.

Recommendation

Because the recyclable material that Seattle customers put out for collection is truly recycled only when it becomes a new product, SPU developed the following recommendation related to recycling end markets.

Rec 15. Support market and infrastructure development for recycling

Developing local markets and improving processing infrastructure for post-consumer recyclables supports SPU's goal to decrease its dependency on foreign recycling markets and promote environmentally and socially responsible practices. This strategy addresses barriers that prevent recycled materials from being marketable. Specific activities that support market development include:

- Advancing efforts to establish post-consumer recycled-content legislation that requires manufacturers to make certain products with a designated amount of recycled material
- Supporting research and pilots for new technology, technical assistance, networking, engagement of stakeholders at all stages of the supply chain, education and training, strategy development, and pilot tests
- Creating partnerships with businesses, agencies, and other organizations in the Puget Sound area to help increase the collection and processing of recyclable materials, use of recycled materials in manufacturing and production, and purchase of recycled-content products

SPU may also increase its focus on broad market development for plastics, paper, and organics, such as through supporting the Association of Plastic Recyclers' Recycling Demand Champions program. This program encourages businesses to procure items made with recycled plastics such as pallets and garbage cans. These market development actions are aligned with recommendations in King County's RRTF report to increase demand for recycled material. SPU prioritizes market development efforts for post-consumer recycled content.

Partnering for Change

SPU participates in regional collaboration and stakeholder engagement to accomplish its waste reduction and diversion goals. Partnerships play a central role in growing local recycling markets and infrastructure, improving the recyclability and compostability of products and packaging within municipal solid waste systems, and advancing product stewardship approaches that incentivize producers to design more sustainable, less toxic materials.

Industry Organizations

SPU engages in dialogue and collaboration with many trade and industry organizations to improve the recycling or composting of products. While SPU collaborates with a wide range of organizations, the following three examples are particularly notable:

- **The Packaging Consortium (PAC)** has a goal to help the packaging industry transition toward “a world without packaging waste.” SPU advises and assesses new packaging design and supports development of reports and fact sheets that highlight new packaging innovation as part of its participation in PAC's Packaging Innovation Gateway project. The project's goal is to find practical solutions to packaging recycling and composting challenges.
- **The Sustainable Packaging Coalition (SPC)** works with industry to make packaging more sustainable and aims to catalyze actionable improvements to packaging systems. SPC members are predominately packaging brands and businesses, but government agencies, including SPU, are active participants. SPU has advised on and benefited from many SPC projects, including the How-to-Recycle and How-to-Compost label systems, the Design for Recycled Content Guide, The Essentials of Sustainable Packaging training, Applying Systems Thinking to Recycling (ASTRX), and the Composting Collaborative. One of the action items identified by the RRTF in 2018 is to “engage with the Sustainable Packaging Coalition and their How2Recycle programs to help educate brands and packaging designers on

recyclability of packaging, the use of recycled materials in packaging, and designing packaging that is less toxic and more recyclable (e.g., no PVC plastic).”¹⁵

- **The Biodegradable Products Institute (BPI)** verifies that compostable products and packaging will break down in professionally managed facilities without negative impacts on the quality of compost. BPI provides a certification for products that meet compostability standards. SPU frequently communicates with BPI on compostable products and policy.

SPU also participates in various industry leadership committees, such as those studying end-of-life solutions for multi-laminate flexible packaging, such as chip bags, which are a flexible combination of plastic and metal. Most recently, Seattle became a founding Activator and active participant of the US Plastics Pact (The Pact). The Pact aims to unify diverse public-private stakeholders across the plastics value chain to rethink the way plastics are designed, used, and reused to create a circular economy for plastic in the United States. The Pact has created a road map for addressing problematic plastics and creating policies that will help reduce contamination, including extended producer responsibility.

The **U.S. Plastics Pact** is a collaborative, solutions-driven consortium to unify diverse public-private stakeholders across the plastics value chain to create a path forward for a circular economy for plastic in the United States. The road map for action on plastics addresses four targets:

- 1 Define a list of packaging that is to be designated as problematic or unnecessary by 2021 and take measures to eliminate them by 2025
- 2 100% of plastic packaging will be reusable, recyclable, or compostable by 2025
- 3 Undertake ambitious actions to effectively recycle or compost 50% of plastic packaging by 2025
- 4 By 2025, the average recycled content or responsibly sourced bio-based content in plastic packaging will be 30%¹⁶

Product Stewardship Organizations

SPU also partners with organizations on product stewardship and extended producer responsibility (EPR) programs. SPU is a founding member and active participant of the Product Stewardship Institute (PSI). PSI membership includes agencies from 47 states and over 200 local governments, as well as over 100 partners from industry and non-governmental organizations.

¹⁵ King County's Responsible Recycling Task Force, "Recommendations to Achieve a Responsible Recycling System," January 10, 2019, <https://kingcounty.gov/~media/depts/dnrrp/solid-waste/about/planning/documents/task-force-final-recommendations.ashx?la=en>.

¹⁶ U.S. Plastics Pact, "Take Action," accessed October 2021, <https://usplasticspact.org/take-action>.

PSI works to develop and promote legislation and voluntary initiatives establishing producer responsibility systems.

SPU is also a partner of the Northwest Product Stewardship Council (NWPSC), a coalition of government organizations in Washington and Oregon. NWPSC consists of a 15-member Steering Committee that works with Associate Members to promote product stewardship programs and policies. NWPSC sets regional goals for managing materials through product stewardship approaches. Seattle serves on the NWPSC steering committee. NWPSC activities include:

- Supporting passage of legislation to manage packaging, plastics, and other materials that are toxic, hard-to-handle, or prevalent and would be more effectively and equitably managed through stewardship programs
- Developing educational materials to inform other agencies and stakeholders about product stewardship
- Supporting and participating in local, regional, or national dialogues with producers seeking product stewardship programs for select materials
- Supporting program pilots, launches, and growth of existing product stewardship and take-back programs, which are described in more detail in the next sections

The next section expands on how SPU works with its partners to advance product stewardship and extended producer responsibility.

Voluntary Product Stewardship

Product stewardship strategies often include elements of waste prevention, reuse, and recycling. Product stewardship, which may take the form of either a legislated or voluntary approach, engages producers of packaging and products to reduce waste and toxicity of their products by improving design and labeling and by taking responsibility for the end-of-life management of their products. A prominent example of a voluntary product stewardship program is Call2Recycle, which collects and processes cell phones and rechargeable batteries. Voluntary product stewardship in Seattle includes retailer take-back of plastic bags, batteries, and other items as well as the Take it Back Network.

The Take it Back Network is a partnership between local government agencies (including SPU and the King County Solid Waste Division), retailers, repair shops, charitable organizations, and recyclers to provide safe and cost-effective recycle options for certain electronic



products not yet covered by, or interim to, EPR systems.¹⁷ Currently, the regional Take It Back Network includes recyclers that typically charge a fee to accept and responsibly recycle certain electronics not yet covered by stewardship legislation. Take It Back Network recyclers accept electronics such as computer and television peripherals and other consumer electronics.

Extended Producer Responsibility

The legislated form of product stewardship is called extended producer responsibility, or EPR. The Organisation for Economic Co-operation and Development (OECD) explains that EPR “is a concept where manufacturers and importers of products should bear a significant degree of responsibility for the environmental impacts of their products throughout the product life-cycle, including upstream impacts inherent in the selection of materials for the products, impacts from manufacturers’ production process itself, and downstream impacts from the use and disposal of the products.”¹⁸

In an EPR system, producers become responsible for the costs to manage end-of-life recycling of their products. When the external costs of end-of-life management are internalized, they become part of the costs of doing business, just like research, development, administration, marketing, and other costs that are reflected in the price of a product. Through their EPR programs, producers can incorporate efficiencies into their product design and production systems to reduce these costs while providing effective collection and proper end-of-life product management.

Depending on the product, EPR can offer recycling options beyond what SPU can provide. For instance, a state-wide EPR system can offer wide-spread and convenient drop-off options for paint and pharmaceuticals at retail and pharmacy locations, which would be very difficult for SPU to establish and finance. Seattle often supports local and state efforts to implement and expand EPR programs.

EPR programs typically include requirements for producers to promote the collection program and provide education regarding proper handling of materials covered by a given program. EPR programs support recycling and proper disposal of covered products by removing end-of-life costs for the consumer and providing reasonably convenient collection locations and services. These types of programs aim to place responsibility for life cycle environmental impacts on

¹⁷ King County, “Take it Back Network,” Accessed October 2021, <https://kingcounty.gov/depts/dnrm/solid-waste/programs/take-it-back.aspx>.

¹⁸ Organisation for Economic Co-operation and Development, “Fact Sheet: Extended Producer Responsibility,” Accessed November 2021, <https://www.oecd.org/env/waste/factsheetextendedproducerresponsibility.htm>.

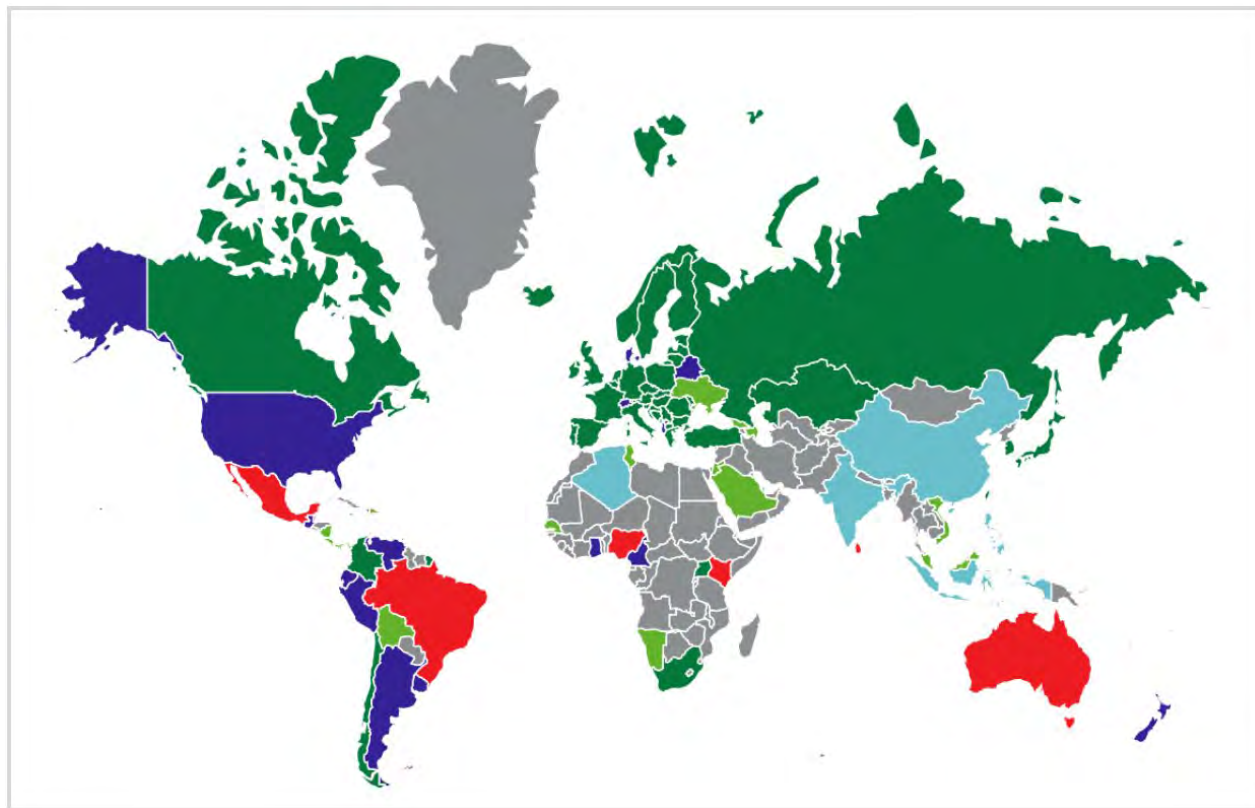
designers, producers, marketers, and retailers of products. In this way, EPR supports the resiliency of the recycling system for covered products by providing a dedicated and sustainable funding source to provide convenient access to end-of-life management options that small towns and rural areas might otherwise lack.

EPR legislation is the key tool that requires producers to fund and manage products at the end of a product's useful life. For products incompatible with curbside recycling, drop-off locations are provided. For some products, such as packaging, EPR collection includes a combination of curbside collection with drop-off or depot collection for materials that are problematic in commingled curbside and processing programs.

The role of EPR, or product stewardship systems, continues to expand in Washington State and worldwide. Outside of the United States, EPR is widely used to address packaging and paper products (Figure 5.1). Within the United States, over 120 producer responsibility laws have been enacted to cover a wide range of toxic, hard to handle, or problematic products (Figure 5.2). Recycling market challenges and increasing consumer awareness of the environmental impacts of plastics has increased public interest in and legislative proposals for packaging and paper product EPR.

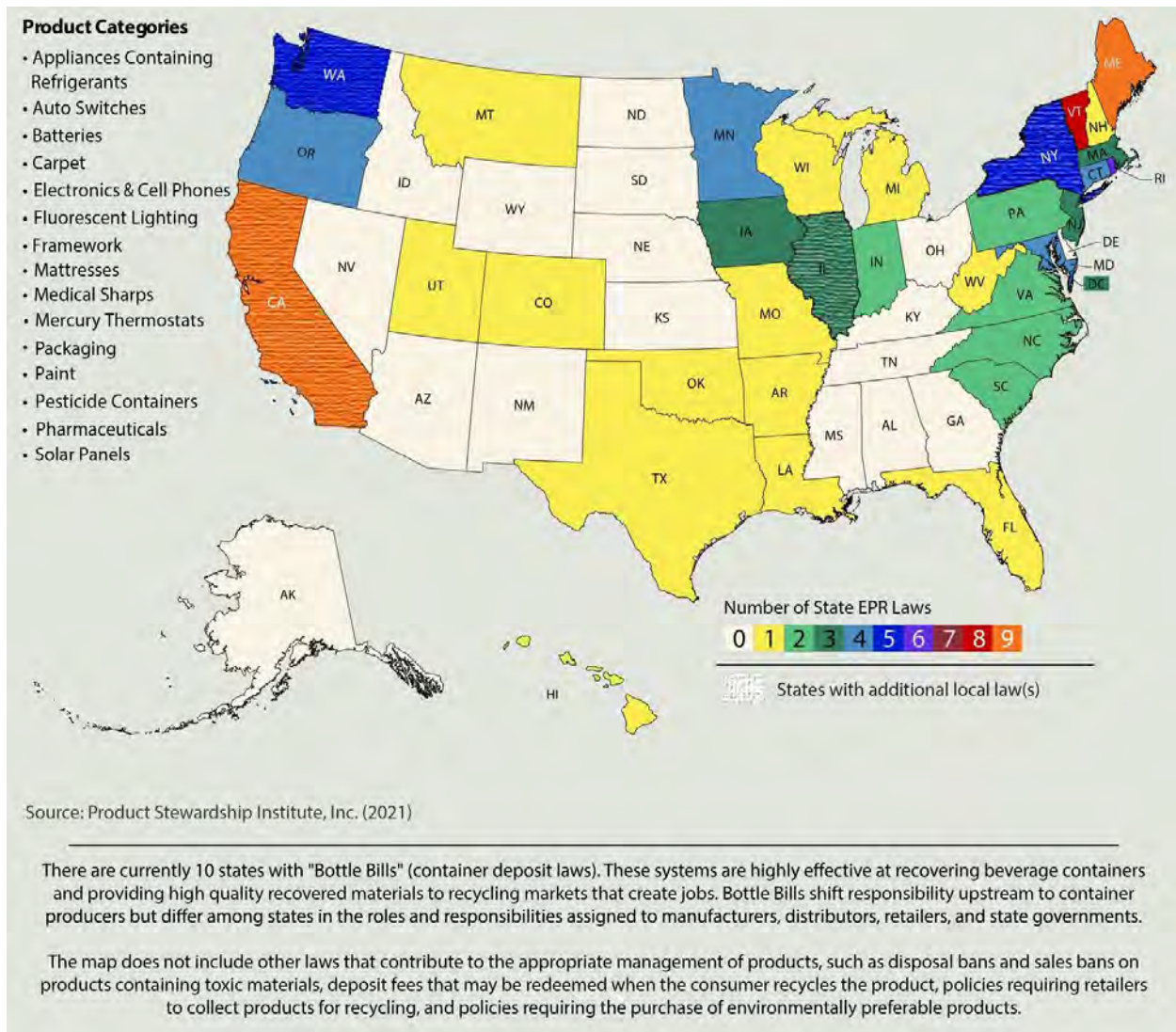
Locally, Washington has statewide EPR programs that cover certain electronics (E-Cycle Washington), lights containing mercury (LightRecycle), pharmaceuticals (Safe Med Project), and paint (PaintCare). Washington has also passed EPR legislation for solar panels. In 2019, the state legislature passed a bill to study (but not yet implement) EPR for plastic packaging. In 2020, SPU contributed to policy approaches included in the federal *Break Free from Plastics Act*. More recently, SPU advocated for legislation to establish a comprehensive producer responsibility system for all plastic packaging (House Bill 1118/Senate Bill 5022). State or national EPR legislation would coordinate materials collected at a state, regional, or national scale, while helping to minimize contamination and maximize reuse and responsible recycling.

Figure 5.1 Countries with Packaging EPR in 2021



Source: <https://www.loraxcompliance.com/> (used with permission)

Figure 5.2 U.S. States with EPR Laws



Source: Product Stewardship Institute,
[www.productstewardship.us/page/State EPR Laws Map](http://www.productstewardship.us/page/State_EPR_Laws_Map) (used with permission)

Following are descriptions of current and planned EPR programs that cover material generated by Seattle residents and businesses.

Computers, Monitors, Laptops, and TVs

E-Cycle Washington is an extended producer responsibility program. The statewide [E-Cycle Washington](#) program began in 2009 following passage of legislation in 2006.¹⁹ The program provides free recycling of computers and laptops, monitors, tablets, e-readers, portable DVD players, and televisions from the following groups:

residents, small businesses, small government agencies, schools, and school districts. There are over 30 drop-off sites available to residents and small businesses in Seattle alone. Recycling with E-Cycle



Washington is free, but the program does not accept as many items for recycling as some Take It Back Network electronics recyclers.

Approximately 1,718 tons of electronics were collected within Seattle in 2019 for recycling, and many additional tons were salvaged by E-Cycle Washington collectors for refurbishment, resale, and reuse.²⁰ Between 2009 and 2020, the stewardship program spent about 16.4 million dollars to collect and manage electronics in Seattle. Without the E-Cycle Washington program, residents and small businesses of Seattle would have had to pay directly to ensure safe and environmentally sound management of these electronics.

Mercury-Containing Lights

LightRecycle Washington, a legislated stewardship program, provides collection sites throughout Washington where the public can drop off for free their unwanted



mercury-containing lights, including compact fluorescents lights (CFLs) and high-intensity discharge (HID) lamps. Over 40 of these sites advertise collection of mercury-containing lights within Seattle, including Second Use Building Materials, hardware and lighting stores, and the City's two household hazardous waste collection facilities. Eight other private sites participate in the program but do not advertise that they accept mercury lights. In 2019, the program estimates that Seattle sites collected nearly 133,000 lights, totaling about 31 tons.²¹

LightRecycle Washington receives its funding from an environmental handling charge that is added to the purchase price of every mercury-containing light sold at retail in Washington

¹⁹ <https://ecology.wa.gov/Waste-Toxics/Reducing-recycling-waste/Our-recycling-programs/Electronics-E-Cycle>

²⁰ SPU, "2019 Waste Prevention & Recycling Report," October 2020, http://www.seattle.gov/Documents/Departments/SPU/Documents/Recycling_Rate_Report_2019.pdf.

²¹ Ibid.

State. This funding mechanism is not sustainable due to the rapid replacement of CFLs by new lighting technology; however, CFLs will continue to need proper management and funding to cover those costs for many years in the future. An EPR program applied to all lighting products would alleviate system finance instabilities created when technology changes, such as when lighting manufacturers shifted to LED lighting from fluorescent lighting.

Medication

Safe Medication Return is a unified, statewide EPR program that gives Washington residents free, convenient, and environmentally responsible options to dispose of unwanted medication. [RCW 69.48](#) established Washington's Safe Medication Return program (also known as the Drug Take-Back program) in 2020.²² Drug manufacturers fund the program at no cost to consumers. The program accepts prescription medications, over-the-counter medications, controlled substances, and pet medications.

[MED-Project](#), the state's approved program operator, manages the Safe Medication Return Program.²³ The Department of Health oversees the establishment of the program, monitors on-going operations, manages enforcement when compliance issues arise, and evaluates program effectiveness.

Because of this program, Seattle residents can safely and at no cost dispose of medicines they no longer need at approximately 39 drop-off collection locations throughout the city. The program also provides a mail-back option, which increases accessibility of safe disposal of medication for those who are home-bound or otherwise unable to use drop-off locations.

Oil and Latex Paint

SPU joined with other local governments, non-governmental organizations, and industry to introduce and support passage of House Bill 1652 Concerning Paint Stewardship in 2019. With House Bill 1652, codified as [RCW 70A.515](#), the Washington State Legislature enacted a statewide EPR program for architectural paint (both latex and oil-based) that began April 2021.²⁴

The program, administered by PaintCare, establishes free and convenient [paint drop-off collection sites statewide](#) for both residents and businesses.²⁵ The legislation requires drop-off

²² <https://app.leg.wa.gov/RCW/default.aspx?cite=69.48>

²³ <https://med-project.org/>

²⁴ <https://app.leg.wa.gov/RCW/default.aspx?cite=70A.515&full=true>

²⁵ <https://www.paintcare.org/states/washington/>

locations for every 30,000 in population in urban areas that are “distributed to provide convenient and reasonably equitable access for residents in each area.” Based on this requirement, Seattle expects to receive at least 25 sites and King County expects to receive a total of about 50 sites, although PaintCare has typically established far more sites than the required minimums in other states with legislation like Washington’s. When PaintCare launched April 1, 2021, it had 12 sites in Seattle and was in the process of opening eight more.

Solar Panels

In 2017, SPU and Seattle City Light worked for passage of the nation’s first producer responsibility law for photovoltaic modules (commonly known as solar panels), which the Washington State Legislature passed (House Bill 5939) and codified as [Revised Code of Washington 70A.510](#).²⁶ This law requires solar panel manufacturers to fund and establish a stewardship program for the take-back and proper management of solar panels that were produced after July 2017 and used in Washington. They must provide collection locations in all regions of the state.

In 2019, Seattle City Light helped develop a proposal to expand the legislation to cover modules in large “solar farms,” which were inadvertently excluded from the 2017 law. Subsequent legislation has delayed full implementation of the program to 2025. The program will provide free, convenient, and environmentally responsible solar panel recycling options for the public.

Laying the Groundwork for Statewide Packaging EPR and a Container Deposit System

As of June 2019, the U.S. is the only member country of the OECD that currently does not have industry-funded EPR for packaging.²⁷ EPR programs have been a primary tool in Europe and Canada for addressing packaging waste, including programs in France, Germany, Belgium, British Columbia, and Ontario. Studying these programs provides insight into how Washington State might implement a similar program. Together with its partners, SPU has worked over the past few years to better understand how to advance, design, and implement a comprehensive, statewide stewardship policy approach in Washington. The following sections describe recent

²⁶ <https://app.leg.wa.gov/RCW/default.aspx?cite=70A.510&full=true>

²⁷ Product Stewardship Institute, “Letter to Washington Senate Committee on Environment, Energy, & Technology,” Dated January 31, 2019, <http://productstewardship.net/sites/default/files/Docs/packaging/support-plastic-packaging-stewardship-psi-2019-01-31.pdf>.

studies examining packaging EPR and beverage container stewardship policies, or Container Deposit Systems.

Plastic Packaging Study

In 2019, the Washington State Legislature passed a law advocated by SPU and others requiring the Department of Ecology to hire an independent contractor to assess current disposal and management of plastics packaging, evaluate industry-led or product stewardship options for managing this material, and provide recommendations to the for managing plastic packaging in the state.²⁸ The [Plastic Packaging Study](#) included extensive research and stakeholder consultation and resulted in five reports and 10 recommendations provided to the Washington State Legislature in autumn 2020.²⁹ The recommendations were intended to meet the goals set in the law of reducing plastic packaging and achieving 100% reusable, recyclable, or compostable packaging in all goods sold in Washington, with at least 25% post-consumer recycled content, by January 1, 2025. The recommendations appear under the four categories below.

Primary Recommendations

- 1 Extended producer responsibility policy framework for all consumer packaging and paper
- 2 Deposit return system (DRS) for all beverage containers
- 3 Recycled content requirements for all plastic packaging

Interim Recommendations

- 4 Producer registry and packaging reporting
- 5 Recycled content requirements for plastic beverage containers

Complementary Recommendations

- 6 Recycled content requirements for trash bags
- 7 Ban on problematic and unnecessary plastic packaging
- 8 Standard for customer opt-in for foodservice packaging and accessories

Recommendations for Agency Action

- 9 Strengthen data collection on final destinations of materials sent for reprocessing
- 10 Support development and adoption of reusable packaging systems

²⁸ RCW Chapter 70A.520 <https://app.leg.wa.gov/RCW/default.aspx?cite=70A.520>.

²⁹ <https://ecology.wa.gov/Waste-Toxics/Reducing-recycling-waste/Waste-reduction-programs/Plastics/Plastics-study>

In 2021, the Department of Ecology consulted with stakeholders such as SPU about the recommendations and worked on developing legislative proposals for the 2022 session to advance on the state's ambitious goals for plastic packaging.

Extended Producer Responsibility Policy Framework and Implementation Model

As a follow-up to recommendations made by King County's RRTF, SPU, and King County conducted a study of EPR systems for packaging called the "Extended Producer Responsibility Policy Framework and Implementation Model: Residential Recycling of Packaging and Paper Products in Washington State" (EPR Policy Framework and Implementation Model). Published March 2020, the EPR Policy Framework and Implementation Model explores an "EPR Policy Framework" that would be required in state law to support the implementation of a statewide EPR system for packaging and paper products from residents.³⁰ The study presents a conceptual model of how an EPR policy framework could be implemented across Washington State that would:

- Establish a sustainable financing source
- Create a harmonized list of materials that are collected and recycled
- Create a harmonized outreach and messaging program
- Result in reduced contamination
- Provide access to packaging and product designers to help facilitate the recycling of products and packaging
- Provide opportunities for research and development of new or enhanced domestic markets for the recyclable commodities collected in Washington State

³⁰ King County Responsible Recycling Task Force, "Extended Producer Responsibility Policy Framework and Implementation Model: Residential Recycling of Packaging and Paper Products in Washington State," March 2020, <https://kingcounty.gov/~media/depts/dnrp/solid-waste/about/planning/documents/task-force-EPR-policy-framework.ashx?la=en>.

The main elements of the EPR Policy Framework are described below.

EPR Policy Framework Elements³¹

A mandated EPR policy should consider these elements, at a minimum:

- Producers of packaging and paper products are required to fund and coordinate the recycling of materials from the residential sector, including collection, transportation, sorting, and marketing.
- Producers are authorized to form a “Producer Responsibility Organization” (PRO) to manage the responsibilities established in the policy.
- Stewardship plans are developed with mandatory public consultation.
- Eco-modulated fees are used to drive changes in packaging design.
- A statewide uniform list of materials must be collected/recycled.
- Residents across the state must have convenient, equitable access to recycling collection service.
- Producers must achieve material-specific recycling rate requirements by specific timelines.
- Producers must use post-consumer recycled materials in products/ packaging to stimulate demand for materials.
- Required documentation and verified end markets for materials.
- A legislated “regulatory authority” that has authority to monitor compliance and enforce legal requirements.

Building on the work done to develop the EPR Policy Framework and Implementation Model, the NWPSC, of which SPU is a member, formed a packaging policy committee in 2020 to further refine a policy framework for EPR for packaging and paper products in Washington that meets the needs of local governments and advances best practices in effective EPR policies for packaging and products.

³¹ King County Responsible Recycling Task Force, “Extended Producer Responsibility Policy Framework and Implementation Model: Residential Recycling of Packaging and Paper Products in Washington State,” March 2020, <https://kingcounty.gov/~media/depts/dnrp/solid-waste/about/planning/documents/task-force-EPR-policy-framework.ashx?la=en>.

Container Deposit Study

Published in phases throughout 2020, the Container Deposit Study built upon the EPR framework and model developed in the EPR Policy Framework and Implementation Model report.³² Together, these studies were designed to understand how the program and policy elements could be applied to EPR in Washington State to address issues of sustainable financing, consistency of programming and messaging, economies of scale, and contamination reduction.

Container deposit systems, also commonly referred to as DRS, have proven to be very effective at achieving high redemption rates for the aluminum, glass, and plastic containers covered in the system. DRS can be a system for beverage container stewardship separate from, complimentary to, or included within an EPR system.



Beverage container flow through a DRS System (Source: King County Solid Waste Division)³³

The Container Deposit Study assessed the effects of implementing a DRS for beverage containers in Washington State as well as the impacts of an EPR system for packaging and

³² King County Solid Waste Division, "Container Deposit Study: Executive Summary" December 2020, <https://kingcounty.gov/~media/depts/dnrp/solid-waste/about/planning/documents/task-force-container-study-executive.ashx?la=en>.

King County Solid Waste Division, "Deposit Study: Phase I: Inventory of Existing Container Programs," December 2020, <https://kingcounty.gov/~media/depts/dnrp/solid-waste/about/planning/documents/task-force-container-study-phase-1.ashx?la=en>.

King County Solid Waste Division, "Deposit Study: Phase II: A Beverage Container Deposit System for Washington - Qualitative Research and Recommendations," December 2020, <https://kingcounty.gov/~media/depts/dnrp/solid-waste/about/planning/documents/task-force-container-study-phase-2.ashx?la=en>.

King County Solid Waste Division, "Container Deposit Study: Phase III: Costs and Benefits of Residential Packaging and Paper Product Recycling in Washington State," December 2020, <https://kingcounty.gov/~media/depts/dnrp/solid-waste/about/planning/documents/task-force-container-study-phase-3.ashx?la=en>.

³³ King County Solid Waste Division, "Executive Summary – Container Deposit Study: Analysis of Residential Packaging and Paper Product Recycling in Washington State," December 2020, <https://kingcounty.gov/~media/depts/dnrp/solid-waste/about/planning/documents/task-force-container-study-executive.ashx?la=en>.

paper products. It includes an overview of future system scenarios, including EPR, DRS, and EPR combined with DRS modeled against the current system. Key findings include:

- All future systems modeled with EPR and DRS, separately or together, result in better net benefits than the current system, including contributions to the local economy and the social costs of carbon emissions due to climate change impacts.
- All systems result in an increase in the amount of material captured and recycled at no additional cost to the ratepayer.
- EPR in Washington would save between \$90 to \$121 per household per year, create between 1,650 and 2,600 new, local jobs in the state, and reduce the amount of packaging and paper products going to landfill by 20%.
- This additional recycling would reduce greenhouse gas emissions by between 565,000 and 650,000 tons of CO₂ equivalent, equal to removing between 120,000 to 138,000 vehicles from the road each year.

The results of analysis in the Container Deposit Study demonstrated that a policy for EPR for packaging and paper products, whether including a container DRS or not, would lead to better outcomes and higher net benefits compared to the current system of residential recycling in the state. And like the findings of the EPR Policy Framework and Implementation Model, results of the Container Deposit Study have informed the work of the Northwest Product Stewardship Council packaging policy committee.

Extended Producer Responsibility for Packaging and Paper Products

SPU and King County also reviewed and provided input on “Extended Producer Responsibility for Packaging and Paper Products: Policies, Practices, and Performance,” published in 2020 by the Product Stewardship Institute.³⁴ The Product Stewardship Institute’s report outlines how EPR programs in four Canadian provinces have increased packaging recovery and recycling, reduced contamination, and developed markets for difficult to recycle materials. It includes a detailed case study of the packaging EPR program in British Columbia.

³⁴ Product Stewardship Institute, “Extended Producer Responsibility for Packaging and Paper Products: Policies, Practices, and Performance,” March 2020, https://cdn.ymaws.com/www.productstewardship.us/resource/resmgr/1/PSI_EPR_for_PPP.pdf.

Seattle's 2022 Solid Waste Plan Update

Chapter 5 – Recycling and Composting Policy and Markets

	BASELINE Current System	FUTURE SYSTEM 1 Current System + DRS	FUTURE SYSTEM 2 EPR + Enhanced Collection and Coverage	FUTURE SYSTEM 3 EPR + Aligned Universal Collection Option 1	FUTURE SYSTEM 4 EPR + Aligned Universal Collection Option 2	FUTURE SYSTEM 5 EPR + Enhanced Collection + DRS	FUTURE SYSTEM 6 EPR + Aligned Universal Collection Option 1 + DRS	FUTURE SYSTEM 7 EPR + Aligned Universal Collection Option 2 + DRS
Cost per Ton Recycled (USD)	\$471	\$523	\$454	\$503	\$529	\$532	\$442 ★	\$542
Total Cost of System (Millions, USD)	\$247M ★	\$308M	\$334M	\$379M	\$406M	\$419M	\$346M	\$436M
PPP Disposal Cost Savings (Millions, USD)	\$0	\$7.3M	\$25.9M	\$27.9M	\$27.9M	\$31.4M	\$30.7M	\$31.9M ★
Material Value (Millions, USD)	\$21.5M	\$50.7M	\$37.4M	\$36.9M	\$44.9M	\$64.3M	\$64.6M	\$71.4M ★
GVA (Millions USD) (Direct, Indirect, Induced)	-\$497M	-\$646M	-\$705M	-\$694M	-\$834M	-\$1,050M	-\$928M	-\$1,132M ★
Social Cost of Carbon (Millions, USD)	-\$105M	-\$112M	-\$147M	-\$148M	-\$154M	-\$148M	-\$152M	-\$157M ★
Net Benefit per Ton Recycled (USD)	-\$542	-\$998	-\$643	-\$558	-\$704	-\$939	-\$886	-\$1,012 ★

★ = Best Performer in Category

Overview of environmental and social benefits of alternative systems to manage packaging
(Source: King County Solid Waste Division)³⁵

This study adds to the growing research available to inform the development of EPR systems in Washington and around the world.

Draft Proposal for Extended Producer Responsibility for Packaging and Paper Products

The findings from each of the studies presented in this section have helped inform a draft policy proposal for EPR for packaging and paper products developed by the NWPSC, including representations from SPU. This draft proposal was incorporated into two bills introduced in the 2021 Legislative Session, House Bill 1118 and Senate Bill 5022. An amended version of Senate Bill 5022, also called the 2021 Plastics Law, was adopted without the EPR element, and it is anticipated that House Bill 1118 will be reintroduced in the 2022 legislative session or replaced with a new revised bill that includes EPR for packaging and paper products.

³⁵ King County Solid Waste Division, "Executive Summary – Container Deposit Study: Analysis of Residential Packaging and Paper Product Recycling in Washington State," December 2020, <https://kingcounty.gov/~media/depts/dnrp/solid-waste/about/planning/documents/task-force-container-study-executive.ashx?la=en>.

Recommendations

SPU developed two recommendations to expand producer involvement in recycling waste from the products they manufacture and sell to Seattle consumers.

Rec 16. Continue to explore and implement product stewardship policies and programs that require producers, manufacturers, and/or retailers to take back and recycle the products they sell

SPU should evaluate, propose, and support opportunities to establish producer involvement in end-of-life materials management through product stewardship. SPU will continue to monitor emerging problematic products and identify stewardship strategies to address them. Problematic products include those associated with broader environmental issues, such as plastic pollution and toxics. In proposed product stewardship programs and legislation, SPU will advocate for equity such as through strong convenience standards that consider all community members.

Expanded EPR policies considered in this recommendation include statewide programs for:

- **All packaging materials**, based on findings and recommendations from a dedicated study.
- **Plastic packaging only**, modeled after House Bill 1204 of the 2019 legislative session. This bill did not pass, but its companion bill in the Senate, Senate Bill 5397 (codified as [RCW 70A.520](#)), passed as a study bill. Results of the study and recommendations were submitted to the Legislature in autumn 2020. The primary policy recommendation was to implement EPR for all packaging, not just plastic. As a result of the study and recommendations, it is likely that EPR for all packaging materials, not just plastics, is the more effective and viable approach to support in Washington.
- **Batteries**, specifically single-use and rechargeable batteries weighing up to five kilograms (11 pounds) each. Addressing larger rechargeable batteries used for solar and electric vehicles should be considered.
- **Carpet** from residential and commercial generators.
- **Beverage containers**, through a container deposit system that could be considered in conjunction with, or as an alternative to, stewardship options for all packaging.
- **Electronic peripherals**, such as cell phones, keyboards, or computer mice, added to the existing E-cycle Washington program. The current program covers only televisions, computers, laptops, monitors, tablets, and e-readers.
- **Mattresses**, which have existing EPR programs in other states.

Other future potential stewardship programs to consider include the following: all household hazardous waste, all lighting products, cigarettes and vaping devices, furniture, gas cylinders, textiles, sharps, smoke and fire alarms, fishing and aquaculture gear, and other products.

SPU may also consider and evaluate a *local* EPR program for plastic wrap and bags under three conditions: (1) voluntary, industry-led efforts to address this material are inadequate to meet SPU's goals; (2) plastic wrap and bag management is found to benefit from regulation; or (3) state-level EPR for plastic packaging or all packaging are not successfully implemented. For a local EPR program for plastic wrap and bags, SPU should consider all non-compostable plastic bags and product wrap made of two types of plastics (LDPE or HDPE), including materials used for e-commerce, retail sales, or packaging. Producers of products packaged in plastic wrap or bags and companies that provide plastic wrap and bags to customers in Seattle would be required to finance and provide responsible collection and recycling system for those materials within the city, from all sectors. SPU should consider requirements for retail take-back for plastic wrap and bags, if implemented.

Rec 17. Continue to support and expand industry-led, voluntary retail take-back of plastic wrap and bags

This recommendation is intended to improve, expand, and promote voluntary retail take-back of plastic wrap and bags through industry-led collaboration. In January 2020, SPU removed plastic wrap and bags from the list of materials accepted for residential recycling. Work to develop a take-back-to-retail collection system was delayed due to the COVID-19 pandemic. Though the State's ban on single-use plastic bags will eliminate many single-use carryout plastic bags, it allows for the use of plastic carryout bags that are 2.25 millimeters or more thick and many other plastic bags that could be recycled if not reused. In addition, retail take-back programs take many other forms of plastic wrap, such as product overwrap for toilet paper. The industry-led collaboration would establish markets, collection and transportation infrastructure, incentives, and responsible recycling. This voluntary program would be in place only until plastic bags and wrap are included in an EPR system for all packaging.

In this strategy, SPU should provide outreach and education to the commercial sector (specifically brand retailers, brand grocers, and local grocers) to support industry-led collection and retail take-back for plastic wrap and bags. Existing SPU commercial outreach and education will promote various collection options.

Composting

In Seattle, composting is the predominant method of recycling organics to divert food and yard waste from landfills. Composting organic materials, such as yard and food waste, recycles them into a beneficial soil amendment and imitates the natural processes of decay and regeneration. Composted organic materials are critical for long-term resiliency in this region because of their many environmental benefits.

Seattle's 2022 Solid Waste Plan Update
Chapter 5 – Recycling and Composting Policy and Markets

Diverting organic material from landfills to composting reduces environmental impacts associated with landfilling this material, and it creates compost, a powerful tool for regenerating depleted soils. The emissions reduction potential of diverting Washington's food scraps from landfills through composting for just one year is equal to approximately 1.8% of Washington's 2050 greenhouse gas emissions reduction goal.³⁶



Two individuals deposit food waste into a food and yard waste cart (Source: SPU Image Library)

The end-product from composting has significant environmental benefits. Compost supports restoration of soil health, stormwater management, biofiltration, erosion control, water conservation, and soil carbon sequestration. Moreover, compost supports healthy plant growth in urban landscapes and agricultural sites alike. One other benefit of using recovered organic products like compost is greenhouse gas reduction and climate adaptation through soil carbon sequestration, which is the process of removing carbon dioxide from the atmosphere and restoring it to depleted soil reserves.

³⁶ McKenna Morigan, "Reducing Greenhouse Gas Emission Emissions through Recycling and Composting in California, Oregon, and Washington," The Evans School Review Vol 1, Num 1, Spring 2011, <https://depts.washington.edu/esreview/wordpress/wp-content/uploads/2012/12/ESR-2011-Research-Reducing-Greenhouse-Gas-Emissions-Through-Recycling-and-Composting.pdf>.

Activities such as agriculture and other development have degraded the quality of soil and the amount of carbon stored in soil. Applying compost and other carbon-based soil amendments while adopting soil conservation practices can restore carbon to soil, helping to reduce greenhouse gas emissions, support mitigation of climate change, and promote resiliency of the environment including drought and erosion resistance. To gain these broader environmental benefits, it is critical to ensure compost is good quality, free of chemical or physical contaminants, and widely used. Seattle promotes efforts to compost organic waste and create programs that encourage the use of compost.

What's Compostable

SPU has encouraged composting for more than three decades. Since 2012, food and yard waste service has been required for all residential buildings with one to four units, and since 2015, one can no longer put food and compostable paper, including food-soiled pizza boxes, paper napkins, and paper towels, in the garbage. Yard debris such as leaves, grass, and plant trimmings have not been allowed in the garbage since 1988.³⁷

Food and yard waste (or compost) collection service is required for nearly every home and business in Seattle. It is an important part of sorting waste that helps the environment and cuts down on costs. Appendix F, *Economics of Residential Recycling in Seattle*, provides detailed discussion of how Seattle's residential compost programs have decreased household disposal rates, saved ratepayers money, and reduced potential human illnesses and other environmental pollution impacts.

Yard waste may include leaves, branches, plants, and approved compostable food packaging. The most common food-related items for composting in the food and yard waste carts are meat, fish, poultry, and bones; dairy products, such as yogurt, cottage cheese; vegetable and fruit trimmings; eggshells, bread, pasta, and coffee grounds; and food-soiled paper and cardboard like pizza boxes, paper coffee filters napkins, paper towels, brown paper bags and paper plates.

³⁷ Seattle Municipal Code prohibits the disposal of food scraps, compostable paper, yard waste, and recyclables in residential (SMC [21.36.083](#)) and commercial (SMC [21.36.082](#)) garbage.



Food waste discarded into compost cart (Source: SPU Image Library)

Businesses that generate food waste or compostable paper must subscribe to a composting service or self-haul their food waste to a [transfer station](#) for processing. For sector-specific details about compost collection, including limited free collection offered by Seattle's contracted waste haulers, see Chapter 6, *Solid Waste Handling Collection and Removal*.

To encourage the use of compost made from locally processed food scraps and yard waste, Seattle offers free Compost Giveaway Events. In 2021, SPU held eight events, distributing 364 cubic yards of compost for use in gardens and vegetable patches. At these free events, customers bring a container and shovel to receive up to a half yard of bulk compost, helping complete the loop from compost cart to garden and promoting the benefits of using compost.

Recommendations

SPU developed four recommendations related to organics. Two recommendations focus on increasing food waste and compostable paper collected for composting while one focuses on expanding the market for finished compost products to close the loop. The final recommendation in this chapter examines options to divert materials that are currently unrecoverable.

Rec 18. Require all single-use food service packaging to be compostable and harmonize acceptance standards for compostable products

Seattle Municipal Code (SMC) currently requires food service businesses to use recyclable or compostable materials for single-use food service packaging. However, single-use food service packaging that is recyclable in theory is often not recycled in practice because it is soiled with food, not clean enough for the recycling system, difficult to sort at the processing facility, or low in market value. Switching to all compostable food service products could reduce contamination in both organics and recycling streams and ensure a pathway for diversion for single-use food service products.

SPU could revise SMC 21.36.086 to require food service businesses to provide only compostable food service packaging. Potential benefits of this approach include:

- Capturing food service packaging and related food waste for diversion through composting
- Simplifying packaging options to reduce confusion among food service businesses and customers on which products are approved for distribution and accepted for composting
- Reducing contamination in materials collected for recycling and for composting since confusion is reduced
- Minimizing the generation of (1) recyclable plastic food service packaging, which has limited recyclability in practice, (2) material that is contaminated, and (3) material that may contain food waste that is not properly diverted

To be successful, this strategy requires updating and harmonizing lists of single-use compostable products that are accepted and can be processed by contracted organics processors and further reducing customer confusion about which container they should use to dispose of food service products.

Rec 19. Continue to refine and develop strategies to keep more food waste and compostable paper out of the garbage

SPU should continue to refine and develop strategies focused on recovering food waste and compostable paper (both through edible food rescue and increasing diversion of compostable material from the landfill), particularly from sectors where capture rates are lagging.

Rec 20. Continue to support market development for compost products

As municipal organics recycling (primarily composting) expands throughout Washington, local composting facilities require growing markets for finished products to close the loop. SPU can support compost market development by promoting compost uses for stormwater management, soil-building after land development, sustainable agriculture, and climate mitigation and adaptation uses. SPU could support these end uses for compost by:

- Conducting research on soil carbon sequestration and soil health impacts of compost and end products from anaerobic digestion and other organics processing technologies. Research could include quantifying potential greenhouse gas reduction benefits from use of compost and other organics processing products to the geography covered by the Pacific Coast Collaborative, described in Chapter 4, *Waste Prevention and Reuse*. This effort is aligned with commitments made through Seattle's membership in the Pacific Coast Collaborative. Outcomes from this research could drive new investments and support soil health initiatives, local and state policy development, and composting and other organics recovery technologies.
- Promoting the use of [SITES®](#) or other sustainable landscaping standards around the region and requiring them for City projects. Sustainable site and landscape design, construction, and maintenance practices yield multiple benefits, including onsite organics reuse (source reduction through mulching and grasscycling or mulch mowing), increased organics diversion to offsite composting, water conservation, or stormwater management, and public health benefits from increased green space and reduced climate impacts.
- Continuing partnerships with other government agencies and professional groups. Opportunities include expanding professional education on topics like compost use for stormwater applications and identifying partnerships to support compost use on both public and private property. SPU can work collaboratively throughout King County and Washington State to expand compost use in sustainable agriculture for soil health, and climate mitigation and resiliency purposes. Key collaborators would be King County Department of Natural Resources, the King Conservation District, Washington State University, University of Washington, Washington State Department of Agriculture, and Washington State Conservation Commission.

Rec 21. Assess options for diaper and pet waste recovery

In the future, SPU should assess next steps for diaper and pet waste diversion from landfill. Diaper and pet waste composting was a recommendation included in the *2011 Solid Waste Plan Revision*, although implementation (previously recommended for 2020) has been postponed. For the *2022 Plan Update*, this strategy is recommended for the long-term (more than five years from now), unless conditions warrant implementing it sooner. SPU is considering two approaches for diaper and pet waste recovery:

- **Large commercial generators only.** One option for diaper and pet waste recovery is to focus on large commercial generators first, such as childcare facilities, adult care and nursing facilities, dog parks, and daycare and boarding for pets. In this option, SPU should consider introducing onsite collection for the largest generators of diapers and pet waste.
- **Residential collection.** In this option, SPU should identify and evaluate options that would allow for safe collection of pet waste and diapers.



6

Solid Waste Handling, Collection, and Removal

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Chapter 6 Solid Waste Handling, Collection, and Removal

Overview

Managed collection and proper handling of solid waste from residents and businesses protect the health of Seattle residents and the surrounding environment. Diverting recoverable recyclable materials from landfill into new products helps conserve natural resources and minimizes pollution associated with production, while recycling food and yard waste into compost helps reduce the production of methane gas, a powerful greenhouse gas. Furthermore, keeping hazardous materials out of landfills helps prevent toxic leaching into the surrounding soil, groundwater, and air.

To help protect human health and the environment and keep Seattle beautiful, SPU manages citywide collection of solid waste and some other wastes at the curb, onsite, and at its two transfer stations. SPU also provides litter collection and illegal dumping removal in the public right-of-way; collects waste from unsheltered encampments and from recreational vehicles; operates two hazardous waste collection facilities; and provides customer education on how to properly and safely dispose or recycle most materials. This chapter is organized according to how SPU handles and manages collection or removal of different types of wastes from homes, workplaces, and the public right-of-way:

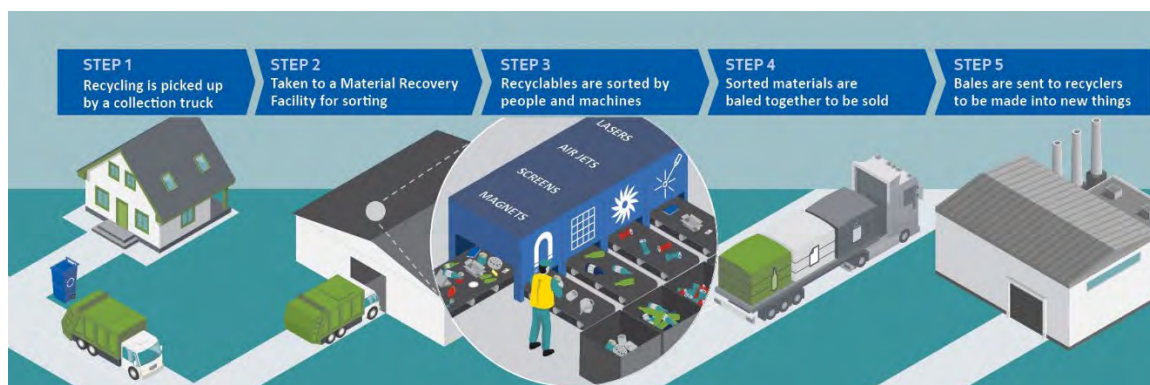
- **Curbside or onsite collection where people live and work:** waste collectors pick up recycling, food and yard waste, garbage, and some additional items discarded from Seattle's homes and workplaces. Customers can also choose to self-haul their waste to a City-operated transfer station.
- **Litter and illegal dumping removal from the public right-of-way:** Contracted collectors and vendors and/or volunteers collect litter and illegal dumping discarded in the public right-of-way, in encampments, and by residents living in recreational vehicles.
- **Hazardous waste drop-off for certain materials prohibited from the garbage:** As part of the Hazardous Waste Management Program in King County, SPU operates two hazardous waste

drop-off facilities and provides at-home collection of hazardous waste for elderly and disabled King County residents.

- **Proper handling of other waste:** SPU collects some “other” wastes at the transfer stations that require special handling. For “other” waste that it does not manage, SPU provides guidance on proper handling and disposal.

Collection at Home and Work

Within city limits, Seattle Municipal Code limits the hauling of (1) residential garbage, recycling, and food and yard waste, (2) commercial garbage, and (3) construction and demolition debris destined for disposal to designated contractors selected by SPU. SPU designs collection services according to the goals and the needs of each sector. Service areas and routes are planned for efficient use of collection vehicles. Services are designed to create an even, predictable flow of material collected each day to help transfer and processing facilities avoid stockpiling incoming materials.



SPU's Recycling Process (Source: SPU)

SPU uses a competitive bidding process to select contractors. Where possible, SPU requires collection contractors to reduce environmental impacts of solid waste management operations. For example, SPU requires collection contractors to use clean fuel types to power collection vehicles and to purchase specific types and quantities of new battery-electric vehicles. Other environmental fleet specifications relate to new clean burning engines, low-impact brake pads, and idle shut-off systems.

Seattle contracts require collection service providers to also deliver education and outreach to customers, including culturally appropriate and in-language outreach. Currently, SPU contracts with two companies, Waste Management and Recology. These contracts began on April 1, 2019, and continue through March 31, 2029.

Generally, for home collection of solid waste, SPU's contractors take recycling, food and yard waste, garbage, and some miscellaneous items discarded by residential customers living in single-family or multifamily homes. Residential customers also have the option of hauling their waste directly to Seattle's transfer stations for recycling or disposal, a practice referred to as "self-hauling."

Commercial customers, which include entities such as businesses, nonprofit organizations, and institutions, have the option of hauling their own waste to Seattle's transfer stations for recycling or disposal, but most (approximately 8,000 customers) rely on Seattle's contracted commercial garbage collector for garbage collection services. A few commercial customers are exempt from using City-contracted garbage collection service and may use a third-party garbage hauler.

For recycling and food and yard waste collection service, most commercial customers choose to use a third-party private hauler, though they may obtain limited recycling and a full range of food and yard waste collection services from City-contracted collectors.¹ Table 6.1 summarizes service provider options by sector and waste stream.

Table 6.1 City-Contracted and Private Collection Services

SECTOR	MATERIAL GARBAGE	RECYCLING	FOOD AND YARD
SINGLE-FAMILY	City contracted	City contracted	City contracted
MULTIFAMILY	City contracted	City contracted	City contracted
COMMERCIAL	City contracted or (rarely) private haulers	City contracted or private haulers	City contracted or private haulers

SPU has divided the city into four areas for City-contracted collection. Figure 6.1 shows the collection areas served by Seattle's two collection contractors as of 2019.

¹ Under Seattle's contracts, commercial customers can get up to two 96-gallon recycling carts for every-other-week collection at no cost and can subscribe to a wide range of food and yard waste collection for a fee.

Figure 6.1 Commercial and Residential Collection Service Areas 2019



Source: Seattle Public Utilities.

Single-Family Residential Collection

Seattle's single-family sector includes approximately 170,000 individual households. Single-family residences are those with one to four dwelling units. Single-family residences are required to subscribe to collection services for garbage and food and yard waste; garbage service includes the cost of recycling collection. To receive service, customers must set out their carts or cans at the curb or in the alley on their collection day. All three waste streams (garbage, recycling, and food and yard waste) are collected on the same day to provide efficient and effective services and to decrease customer confusion.

Residents may choose from several sizes of garbage containers, and service costs increase with the garbage container size to encourage diversion of recoverable materials to the recycling cart and the food and yard waste cart. Food and yard waste service costs less than garbage. SPU also offers "backyard service" for customers unable to bring their containers to the curb. Backyard service is available for a fee for all customers and is free for qualified customers (usually for customers with disabilities). Extra garbage and yard waste may be set out for a fee if properly contained.

Single-family customers are automatically signed up for recycling when they request garbage collection. Recycling is collected every other week in either a 65- or 96-gallon wheeled cart. Customers can request one additional recycle cart free of charge. Since 2009, Seattle's recycling has been collected "single-stream," in which all recyclables are collected together in one container. Extra recycling, when properly contained, may be set out for free.

All single-family customers must subscribe to food and yard waste collection service. Customers choose from three sizes of wheeled carts (13-, 32-, or 96-gallon), and the price increases with size. Additional yard waste (but no extra food waste) may be set out for a fee if it is properly contained.

Multifamily Residential Collection

Seattle's multifamily sector includes approximately 180,000 households and 7,000 buildings with five or more units. The type and size of multifamily buildings range widely, including large garden-style properties (typically one to three stories with shared outdoor space), mid-size condominiums, mixed-use high-rises, and small efficiency units.



Recycling at a multifamily property using a dumpster (Source: Seattle Image Library)

Seattle's contracted collectors pick up garbage from multifamily buildings at least once a week. Various sizes of compactors, roll-off containers, dumpsters, and some wheeled carts are available to multifamily customers. Collection frequency and dumpster size depend on the needs and space constraints of the building. The cost of service increases with garbage container size and pickup frequency to help to encourage diversion. Multifamily buildings are required to subscribe to garbage service and to provide their residents with recycling and food and yard waste collection service. Most compostable waste from multifamily customers consists of food waste, so this section uses the term "compost" to describe food and yard waste collection.

Recycling service is included in the cost of garbage service for multifamily buildings. SPU assesses each property to determine the appropriate container type, size, and collection frequency. Various sizes of compactors, dumpsters, and 96-gallon wheeled carts are available to multifamily customers. About 60% of apartment buildings and condominiums have recycling collection every other week, while the remaining properties have their recycling collected more often. SPU recommends that multifamily buildings subscribe to the equal volumes of trash and recycling; guidelines are presented in Table 6.2.

Table 6.2 Recommended Multifamily Service Levels per Dwelling Unit

STANDARIZED CAPACITY (PER WEEK, PER UNIT)		
Stream	Gallons	Cubic Yards
Garbage	30	0.15
Recycle	30	0.15
Compost	2	0.01

Compost collection service became a requirement for the multifamily sector in September 2011. Building needs and number of dwelling units determine service levels. Various sizes of wheeled carts are available to multifamily customers. Compost carts are normally collected once a week. Multifamily buildings can subscribe to “onsite” service or “curb/alley” service. At properties with curb/alley service, property managers or other property staff move collection carts from the building to the curb or alley on designated collection days. For properties that do not have staff who can routinely move carts to the curb, SPU offers onsite service where the contracted collector transports carts from the building to the curb for collection. Onsite service is more expensive than curb/alley service.

Multifamily compost carts that are used mainly for food waste collection include a compostable bag or liner that the contracted collector installs after emptying the containers. The liners are provided at no additional cost, and they help improve the cleanliness of the cart. Buildings that have a commercial kitchen or produce very large volumes of food waste are encouraged to use a compost dumpster, which is available from private companies.

Solid waste collection in the multifamily sector, the fastest-growing housing type in Seattle, presents unique challenges. Collecting waste from multifamily building containers is more difficult than collecting from single-family carts because multifamily buildings all have different layouts and container types and configurations, including multiple collection points at some properties.

Additionally, research suggests that inadequate solid waste infrastructure is one of the main barriers to resident participation in diversion programs.² While single-family residents normally have co-located containers that are easily accessible, multifamily residents often lack convenient access to solid waste containers, which is especially true for recycling and compost. Buildings may have space constraints for common solid waste containers and residents may have limited space available inside their units for multiple receptacles to allow for sorting and

² Based on SPU’s surveys, focus groups, and data collected at hundreds of Seattle buildings.

separation of recycling and food waste. Other factors that affect convenience, access, and use of multifamily collection services include:

- Property owners and/or managers—not tenants—subscribe to and pay for solid waste services. Residents in multifamily buildings with shared containers often do not directly pay more for disposal if they produce more waste, losing the economic incentive to reduce waste or recycle more.
- Reaching tenants directly requires extra effort by SPU because building operators are the subscribing customer.

Beyond the Cart Residential Services

This section describes SPU’s “[Beyond the Cart](#)” recycling, compost, and garbage services available to all Seattle residential customers in addition to curbside or onsite solid waste collection where they live.³ Both single-family and multifamily customers may set out certain recyclable materials that are not accepted in their carts, listed in Table 6.3. Single-family customers must schedule a pickup for these items with their designated collector. Multifamily residents must arrange for these services with building management because only the bill payer, who is usually the property manager, can request and schedule pickup of these additional items.

³ <http://www.seattle.gov/utilities/your-services/collection-and-disposal/recycling/beyond-the-cart>

Table 6.3 “Beyond the Cart” Items Collected Curbside

ITEMS	COLLECTION REQUIREMENT	FEE
CFLs (compact fluorescent lights)		\$
Household batteries		\$
Electronics		\$
Large items, such as appliances and furniture		\$
Motor and cooking oil (used)		×
Small gas canisters		\$
Styrofoam blocks		×
 Must be scheduled  Must be properly contained  Fee  No Fee		

Customers must usually pay a fee to have large items like appliances and furniture removed from their property. However, enrolled [Utility Discount Program](#) customers are eligible to receive one of the following options for access to large item collection: ^{4 5}

- Two large item pick ups
- Two transfer station vouchers
- One transfer station voucher and one large item pick up



Beyond the cart collection of block foam at a single-family residence (Source: Pat Kaufman)

⁴ The Utility Discount Program provides bill assistance for seniors, persons with disabilities, and low-income homeowners and renters.

⁵ <https://www.seattle.gov/utilities/your-services/discounts-and-incentives/utility-discount-program>

SPU also partners with its collection contractors to host six community collection events per year to provide residential customers with convenient drop-off options to recycle items and reusable materials. Both single-family and multifamily residential customers can bring items for recycling and reuse that cannot go in their home recycle cart or dumpster. Events are free. See Table 6.4 for accepted items and required condition.

Table 6.4 Items Accepted at Residential Recycling and Reuse Collection Events

ACCPETED ITEM	CONDITION AND REQUIREMENTS
Clothing and linens	Any condition, must be clean and dry
Florescent tubes and bulbs	Limit: tubes must be no longer than 4 feet; no broken bulbs
Household batteries	Not damaged
Paper for shredding	Limit: 4 boxes of paper
Small appliances	Non-freon
Small electronics	Size and quantity limits apply
Small furniture and household goods	In good condition
Styrofoam	Size and quantity limits apply

Compost Giveaway events are held four to six times per year, where residents can receive up to half a yard of free bulk compost made from food and yard waste. These popular events offer an opportunity to educate customers on the importance of closing the loop in composting, composting all their food and yard waste, and keeping non-compostable material out of the compost stream.

Commercial Collection

Commercial customers can self-haul their garbage to a City-owned transfer station or to a designated privately-owned transfer station within Seattle city limits if they choose not to subscribe to City-contracted garbage collection service. Garbage is collected from the commercial sector similarly to the multifamily sector.

City contractors collect garbage from compactors, dumpsters, or carts of various sizes at least weekly in most parts of Seattle. To encourage recycling, the monthly garbage fee depends on and increases with, container size and pickup frequency. In areas served by the [Clear Alleys](#)

Program (CAP), City contractors collect garbage more often than weekly using prepaid bags.⁶ City contractors deliver garbage to one of Seattle's two transfer stations.

Commercial customers must separate their recyclables from their garbage. The commercial sector has many recycling collection options. For businesses that need a limited amount of recycling service, Seattle's collection contract includes a small business recycling service of up to two carts collected every other week at no additional charge.⁷ However, most commercial customers require more service than this and therefore contract with a third-party hauler for recycling collection service.



Food waste, recycle, and garbage collection containers for restaurant customers (Source: Pat Kaufman)

If commercial customers do not use SPU's small business recycling service, they may contract with any third-party private recycling hauler on the open market for recycling collection. These haulers collect materials in a wide variety of dumpster and compactor sizes. Collectors sometimes take source-separated materials, such as baled cardboard from large grocery retailers, directly to recycling sorting facilities or specific recycling brokers.

⁶ <https://www.seattle.gov/utilities/protecting-our-environment/safe-and-clean-seattle/clear-alleys>

⁷ Seattle businesses can sign up for collection of recycling (up to two 90-gallon carts collected every other week) or food and yard waste (up to two 90-gallon carts collected weekly).

Commercial customers have several options for food and yard waste collection. They may use the same collector that provides garbage or recycling collection service to their business or another private food and yard waste hauler. Typically, the collected food and yard waste go straight to the compost facility and not to a City-owned transfer facility. Seattle offers a small business food waste service of two curbside carts, serviced weekly, at the same cost as the multifamily food and yard waste cart.

Clear Alleys Program

Many public alleys downtown and in neighborhood business districts serve as storage spaces for solid waste dumpsters due to building space and/or access constraints. Having dumpsters in high-traffic public right-of-way alleys poses many problems, such as providing cover for uncivil and illegal behaviors, impeding pedestrian and vehicular traffic use, restricting access required by the Americans with Disabilities Act (ADA), and attracting illegal dumping.

As replacement for dumpsters in public alleys, Seattle's Clear Alley Program (CAP) offers a prepaid bag system for businesses, apartments, and condominiums in designated business districts that do not have storage space in their buildings for carts. All businesses in Business Improvement Areas (BIAs) must use CAP services, if designated by BIA vote. CAP services are currently in place in five Seattle BIAs. CAP services are also available for subscription throughout Seattle for customers that require them due to space constraints.

Seattle's two collection contractors provide CAP service to all commercial and multifamily customers in CAP-designated areas. Bags are used for garbage and recycling and are collected more often than carts. Recycling bags are used for plastic, paper, aluminum, and limited amounts of glass. If the customer produces a high volume of glass, they can choose to use a cart for recycling even in CAP-designated areas. Customers use carts for food and yard waste collection in CAP-designated areas. Customers in BIAs are also able to self-haul garbage to Seattle's transfer stations.

Customers can subscribe to commercial food and yard waste collection service in CAP areas, which comes in the form of 96-gallon green carts from Seattle's collection contractors. Locking lid service is strongly advised and may sometimes be required by a City solid waste inspector, depending on whether the property has problems with contamination, such as garbage deposited by passersby in areas with high foot traffic.

SPU and collection contractor staff regularly provide education, outreach, and enforcement activities in CAP areas to address illegal dumping and other issues.

Performance of City-Contracted Collection Services

SPU measures the performance of contracted collection service based on missed collections, timely container delivery, customer satisfaction, and service equity. The following sections describe current monitoring and metrics that SPU uses to track its collection programs. To ensure reliable collection, SPU measures missed collections and on-time container delivery rates.

Collection reliability metrics are currently presented together for all container types; however, differences in collection infrastructure for these sectors (for example, compactors and dumpsters for multifamily versus carts for single-family) can affect the performance of the collection system. As multifamily housing and multi-use buildings grow in number, measuring reliability separately may help SPU ensure that equitable services are available across residential sectors.



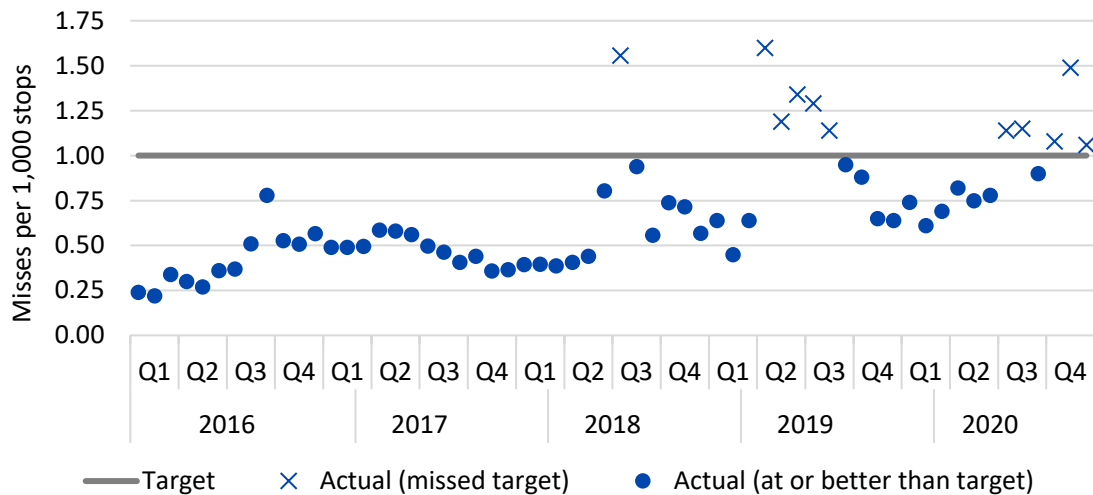
A city-contracted collection truck on a residential street (Source: SPU Image Library)

Missed Collection

SPU tracks two key metrics to measure collection reliability for City-contracted collections: missed collections and subsequent pickup of missed containers within 24 hours. Reliability is measured across all container types (carts, cans, and dumpsters) and all waste streams (recycling, food and yard waste, and garbage). SPU's goal is to miss fewer than one collection per 1,000 stops (<0.1%).

Figure 6.2 shows missed collections rates for all residential container types and waste streams from 2016 to 2020. SPU met its goal in all but one month during 2016–2018. SPU's contracted collectors missed this goal five times in 2019 and five times in 2020.

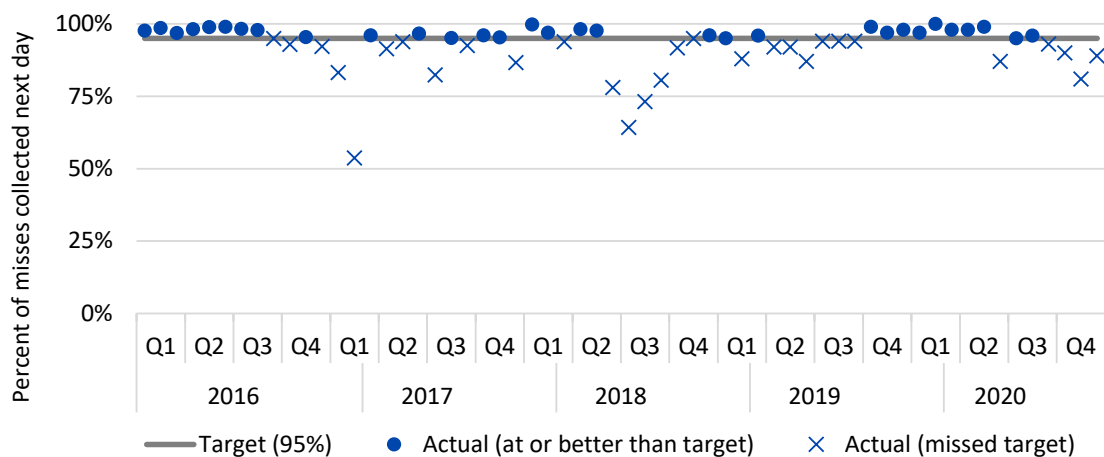
Figure 6.2 Misses for All Residential Container Types and Waste Streams



Source: City-contracted collector reports provided to SPU.

SPU also tracks whether collectors promptly pick up reported missed collection, with a goal to pick up 95% of them within 24 hours. Figure 6.3 shows missed collections picked up the next day. In 2016–2020, collectors met the goal approximately half of the time.

Figure 6.3 Percent Misses Picked Up within 24 Hours for All Container Types and Waste Streams



Source: City-contracted collector reports provided to SPU

To evaluate equity of collection services across Seattle, several years ago SPU conducted a statistical study to identify any relationship between missed single-family solid waste

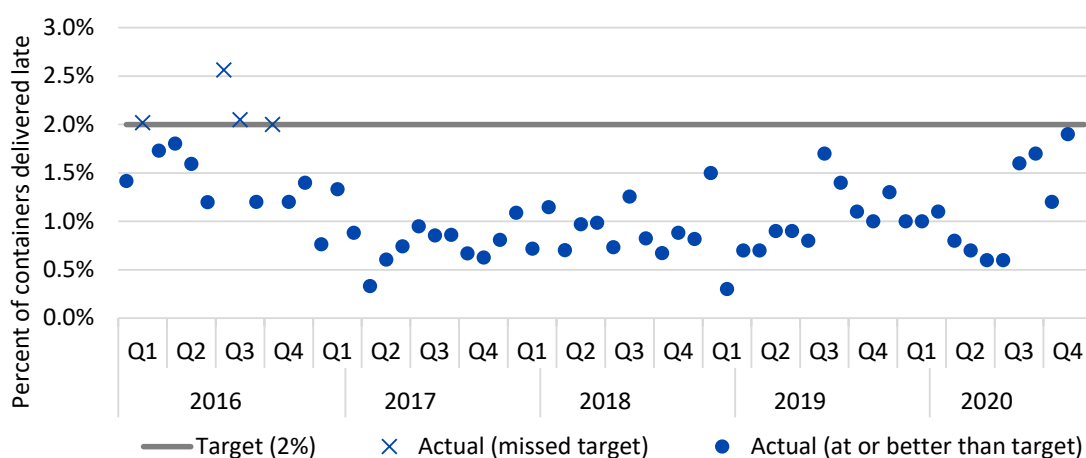
collections and the percentage of people of color in a neighborhood. SPU found that the collection miss rate was driven by three key factors: customer density, frequency of special services including backyard collection, and the ratio of multifamily to single-family residents. After controlling for these factors, SPU found no statistically significant relationship between missed collections and percentage of people of color in a neighborhood.

SPU has used the findings from this study to inform collection contracts from 2009 through 2019. SPU now has a more comprehensive set of performance incentives and reviews some performance data by neighborhood or demographics. For example, SPU has begun mapping missed collections and “Oops” tag (described in Chapter 9, *Outreach, Education, Enforcement, and Compliance*) distribution by zip code. In addition, current collection contracts require collection service providers to offer culturally competent and in-language outreach to customers.

Container Delivery

Figure 6.4 shows the percentage of containers delivered late, meaning the delivery did not arrive within five business days. SPU’s goal is to not exceed 2% late deliveries (that is, to deliver containers within five days at least 98% of the time). In 2016–2020, the container delivery goal was met 93% of time, missing the target only four times in 2016.

Figure 6.4 Percent of Containers Delivered Late for All Container Types and Waste Streams



Source: City-contracted collector reports provided to SPU.

Overall Customer Satisfaction

SPU periodically surveys customer on their satisfaction with garbage, recycling, and food and yard waste collection services. Table 6.5 shows overall satisfaction from the most recent published surveys. SPU's goal is to score no lower than a "5" on a 1 to 7 scale. The most recent residential survey was 2015.⁸ The most recent published results for commercial customers are from 2011.⁹ SPU exceeded its goal for both surveys. SPU plans to conduct a new residential customer satisfaction survey in 2022.

Table 6.5 Customer Satisfaction with Collection Services

SATISFACTION LEVEL†	
Residential – 2015 Survey	
Garbage Pickup	6.04
Recycling Services	6.00
Yard and Food Waste Pickup	6.02
Commercial – 2011 Survey	
Garbage Pickup	5.67
Recycling Services*	5.69
Yard and Food Waste Pickup	5.45

Source: Seattle Public Utilities, "2015 Residential Customer Survey" and "2011 Commercial Garbage Customer Survey."

*Mix of City-contractor and private service

† Scale = 1 (not satisfied) to 7 (very satisfied)

Self-Haul to City Transfer Stations

As an alternative to curbside collection service, commercial customers may haul their own garbage, clean yard and wood waste, and recyclables to either of the two City-owned transfer stations, a practice referred to as "self-hauling." Businesses and nonprofit organizations may also self-haul garbage to designated private transfer stations in Seattle. They may also take recyclables or yard waste to various recycling or food and yard waste processors. For some

⁸ Seattle Public Utilities, prepared with FBK Research, "2015 Residential Customer Survey," April 2016.

⁹ Seattle Public Utilities, prepared by PRR, Inc., "2011 Commercial Customer Survey," 2016, Results from a commercial customer satisfaction survey conducted in 2021 were not available at the time of writing.

businesses, self-hauling all their waste rather than subscribing to garbage service offers the greatest convenience. For instance, mobile businesses, such as landscapers, roofers, remodelers, and food trucks, often have waste as a by-product of their work. SPU provides solid waste services to these customers at the transfer stations.

When residential customers have large quantities of materials or have materials unsuitable for curbside collection, they also may self-haul them to City-owned recycling and disposal stations. For example, home remodelers frequently self-haul construction waste to Seattle's transfer stations. However, SPU encourages these customers to use regular and special curb services whenever possible to minimize transfer station traffic. Curb services are often the most affordable for the customer.

SPU accepts the following materials for recycling at the transfer stations: scrap metal, metal cans, plastic and glass bottles and jars, paper, and cardboard. At the North Transfer Station, SPU partners with the nonprofit organization Goodwill to collect certain reusable goods. A Goodwill representative inspects all items for donation onsite before accepting them. Items not accepted for donation can be disposed of (for a fee) at the transfer station. Items accepted for reuse at the North Transfer Station include:

- Bicycles
- Clothing and linens in good condition or worn out, but no wet items
- Electronics, including televisions, computers, monitors, and small electronics
- Household items in good condition, such as dishware, books, and games
- Small furniture in good condition, but no large furniture

SPU also accepts some other wastes that require special handling, many of which are banned from the garbage. These other items are noted in Table 6.6.

Table 6.6 Other Wastes Requiring Special Handling Collected at the Transfer Stations

MATERIAL	ACCEPTANCE REQUIREMENTS	FEE
Appliances	Appliances include old refrigerators, freezers, and air conditioners. Up to 2 items per trip.	\$
Automotive motor oil	Up to 5 gallons and oil filters per trip.	×
Car batteries		×
Household batteries	Rechargeable and lithium batteries	×
Cell phones		×
Contaminated soils	Large quantities can be accepted, if accompanied by a Waste Clearance form from Public Health — Seattle & King County. Call (206) 263-8528.	\$
Large furniture and household goods		\$
Mattresses		\$
Sharps, syringes, and lancets	Must be in puncture-proof containers.	×
Tires	Up to 4 tires per trip.	\$
\$ Fee × No Fee		

Seattle's transfer station employees monitor for items prohibited from the garbage to keep them from entering the facilities (described in Chapter 7, *Solid Waste Transfer Processing Disposal and Emergency*). Signage at the scale houses and throughout the stations informs users of prohibited wastes. Workers visually observe all loads and refuse access to vehicles carrying prohibited wastes. If a prohibited material does enter the facility, employees remove it from the tipping areas (if they can do so safely) or ensure the material is appropriately managed.



Self-haulers bring items to the SPU scale house (Source: SPU Image Library)

SPU provides up-to-date information to its customers on where and how to properly dispose of wastes that require special handling or not accepted at transfer stations on the [SPU website](#) and on its [“Where Does It Go?” webpages](#).^{10 11} King County provides up-to-date information on its [“What Do I Do With..?” webpages](#), which SPU customers can use.¹² Chapter 5, *Recycling and Composting Policy and Markets*, describes collection options for items collected by extended producer responsibility and voluntary product stewardship programs. Public Health–Seattle & King County regulates biomedical waste collectors.

¹⁰ <http://www.seattle.gov/utilities/your-services/collection-and-disposal/garbage/hazardous-waste-items>

¹¹ <https://www.seattle.gov/utilities/your-services/collection-and-disposal/where-does-it-go#/a-z>

¹² <https://info.kingcounty.gov/services/recycling-garbage/solid-waste/what-do-i-do-with/>

Recommendations

Seattle plans to continue its current collection services and makes four recommendations to improve collection services and access.

Rec 22. Conduct research to inform future collection, processing, and disposal contracts

SPU will continue to conduct research to inform future contracts to support Seattle's waste-related goals and metrics. Research should include new methods, technologies, or other elements to consider including in future collection contracts for residential and commercial sectors. SPU should conduct similar research to inform processing and disposal contracts. This type of research is an ongoing practice and priority for SPU, and results inform future rate reviews. Rate structures are discussed in Chapter 10, *Administration and Financing of the Solid Waste System*.

Rec 23. Adopt collection infrastructure incentives or requirements in multifamily construction to ensure tenants have sufficient solid waste services and convenient access to solid waste containers

SPU will continue efforts to update the land use code to make collection more convenient and ensure adequate infrastructure for recycling in new multifamily construction. Increasing access and convenience to collection increases diversion of recyclable materials, food waste, and some yard waste.

Specifically, SPU will consider requirements to pair garbage, recycling, and food and yard waste collection (co-located collection) and provide incentives for or require multifamily buildings to have on-floor collection options for garbage, recycling, and food and yard waste. On-floor collection could be implemented through chute collection (one chute per collection stream), designated space on every floor for collection containers, or a combination of chutes and containers.

Having co-located, on-floor solid waste collection increases equity for multifamily residents by increasing access and convenience, similar to that of single-family residents. If successfully implemented, new buildings are likely to save money through reducing solid waste costs (more recycling, more composting, and less garbage).

Rec 24. Explore collection infrastructure requirements for new construction of townhomes and live-work units

SPU should explore requirements to improve future collection infrastructure, access, and service levels for recycling and food and yard waste in other types of new construction that are mix residential and commercial uses or are otherwise not defined as multifamily properties. This program includes evaluating storage and collection methods for future townhomes, such as shared containers, and live-work units (spaces where a person both lives and works).



Recycling, food and yard waste, and garbage collection in a residential alley (Source: SPU Image Library)

Rec 25. Improve alley and public right-of-way access for collection vehicles

SPU should work with other City departments to ensure alley and right-of-way access for collection vehicles to enhance the safety of collection activities and improve street access and street use. This work would require interagency assistance from both Seattle Department of Transportation (SDOT) and Seattle Department of Construction & Inspections (SDCI), specifically:

- **Assistance from SDOT to address non-compliance identified by SPU's Solid Waste Inspections & Compliance team.** The Solid Waste Inspections & Compliance team documents infractions where alleys and roadways are not in compliance with collection requirements; however, addressing non-compliance would be the responsibility of SDOT.
- **Ongoing coordination with SDCI and SDOT** in permitting and reviewing new development to ensure solid waste services meet all code requirements for all agencies and reduce the impact of solid waste collection on alleys and in the right-of-way.

Litter and Illegal Dumping Mitigation in the Public Right-of-Way

This section focuses on “Clean City” programs that mitigate litter, illegal dumping, and other pollution from accumulating in the public right-of-way. The public right-of-way includes roadsides, open streets, and paved alleys. Clean City programs are located within the Clean City Division of SPU’s People, Culture, and Community Branch. Clean City programs are supported by the City’s General Fund and are managed separately from solid waste functions in the Solid Waste Utility.

The Clean City programs are driven by service requests. People report junk, garbage, or debris dumped illegally in the public right-of-way. Illegal dumping can be reported by calling SPU’s hotline at (206) 684-7587, or using the [Find It, Fix It mobile app](#).¹³ Illegal dumping inspectors respond to reports of illegally dumped materials in the public right-of-way and coordinate cleanup with contractors. Litter and dumped junk, garbage, or debris are by collected by vendors contracted by the Clean City programs.¹⁴

Events such as the COVID-19 pandemic, growth in the unsheltered population, and the opioid epidemic have contributed to a noticeable increase in the number of service request received about litter, illegal dumping, and sharps such as syringes, needles, and lancets. Consequently, Seattle launched the “[Clean City Initiative](#)” in December 2020 that invests \$3 million into new and existing programs to clean up litter and garbage across the City.¹⁵ The Clean City Initiative pulls together and expands efforts from SPU, Seattle Parks and Recreation, Office of Economic Development, and Seattle Department of Transportation to respond to a maintenance backlog and to address growing community concerns and associated public health and safety risks. Clean City programs central to the Clean City Initiative include:

- Public place litter and recycling
- Litter abatement
- Encampment trash and recreational vehicle garbage remediation
- Medical sharps or needle collection

¹³ <http://www.seattle.gov/customer-service-bureau/find-it-fix-it-mobile-app>

¹⁴ Note that response to and management of waste accumulation and junk storage on private property is handled by the Seattle Department of Construction & Inspections.

¹⁵ <https://www.seattle.gov/parks/about-us/special-initiatives-and-programs/clean-city-initiative>

The performance of Clean City programs for trash and litter remediation is measured based on metrics, including:

- Quantity of material collected, such as pounds of litter, sharps, or large items collected
- Number of service requests
- Response time to addressing service requests
- Percentage of illegal dumping removed within 10 business days from public property

Each of the Clean City waste-related programs is detailed in the sections that follow, along with the City's community-led cleanup programs, Adopt-a-Street and Spring Clean.

Public Place Litter and Recycling

The Public Place Litter and Recycling program provides collection and disposal of garbage and recycling from containers located along public streets in commercial areas and communities with high pedestrian traffic. Roughly half of all public place litter cans are paired with a recycling can. The program includes about 1,000 collection cans for garbage and recycling. Program staff track and report instances of illegal dumping, trash overflow, and graffiti on or around cans. Seattle's contracted commercial garbage collectors collect waste from the public place litter and recycling receptacles on a [regular schedule](#).¹⁶



City public place recycling can (Source: Pat Kaufman)

Litter Abatement Program

An analysis of community feedback and solid waste service data showed that some communities in Seattle experience significant issues with litter. SPU implemented a Litter Abatement Pilot to test Seattle's litter abatement services, tools, and service levels, and determine the best way to reduce litter.

Since July 2016, SPU has provided additional litter services to International District/Chinatown, Little Saigon, Ballard, University District, Licton Springs, Central District, South of Downtown (SODO), Rainer Beach, Hillman City, Othello, and South Park through the litter abatement pilot in response to community concerns.

¹⁶ <https://www.seattle.gov/Documents/Departments/SPU/EnvironmentConservation/LitterCanPickup2019.pdf>

Litter Abatement Program activities include litter cleanup on streets and sidewalks, collection and disposal of sharps, increased cleanup of illegal dumping from the neighborhood core and sidewalk area, and educational and outreach activities to community groups and BIAs.

In 2020, the Litter Abatement Pilot became a full-fledged program. Under the Clean City Initiative, SPU added 10 new litter routes to the existing eight community litter routes, more than doubling efforts to collect litter and illegally dumped trash throughout the city. Each litter route covers about 50 blocks and is serviced twice a week. Maps of the [Litter Abatement Program routes](https://www.seattle.gov/Documents/Departments/ParksAndRecreation/AboutUs/SPU%20Litter%20Abatement%20Program%20Expansion%20Map.pdf) can be accessed online.¹⁷

Under the Clean City Initiative, SPU continues to service 18 litters routes and will work with other city partners to identify and service areas experiencing significant challenges regarding litter, illegal dumping, and trash remediation on a weekly basis.



Litter abatement team removing discarded carpet abandoned on city sidewalk (Source: SPU Image Library)

¹⁷<https://www.seattle.gov/Documents/Departments/ParksAndRecreation/AboutUs/SPU%20Litter%20Abatement%20Program%20Expansion%20Map.pdf>

Encampment Trash Removal

SPU developed an encampment trash removal pilot program in 2016 to test service options and effectiveness for garbage collection near unsanctioned homeless encampments. As part of this pilot, SPU provided preventive weekly and on-call garbage service in designated areas near the encampments to address growing community concerns and associated public health risks from trash accumulation and improperly disposed needles. SPU also tested the use of authorized purple bags for garbage collection and tracked participation rates and compliance.



Purple garbage bags used for encampment trash removal (Source: Dave Hare)

In 2017, the pilot engaged with a variety of community outreach partners including the Union Gospel Mission and the Seattle Police Department's Community Police Teams to help distribute bags on a weekly basis. Today, the Encampment Trash Program provides proactive and preventive weekly and on-call garbage service to 30 selected unsanctioned homeless encampments. SPU provides purple garbage bags for encampment residents to use to collect garbage surrounding unsanctioned homeless encampments. In service of people living

unhoused, Seattle Parks and Recreation, SDOT, and SPU will continue to collect trash from encampments across the city through this expanded Encampment Trash Program and through onsite garbage collection under the Clean City Initiative.

Recreational Vehicle Remediation

Launched in 2018, the Recreational Vehicle (RV) Remediation program partners with the Seattle Police Department, Seattle Parks and Recreation, SDOT, Seattle Finance and Administrative Services, and Seattle's Office of the Mayor to address issues with RVs parked illegally. The program focuses on removing trash and structurally unsound RVs from the public right-of-way.

Sharps Collection Program

Seattle's [sharps collection program](http://www.seattle.gov/utilities/protecting-our-environment/safe-and-clean-seattle/sharps-collection) began in 2016 to provide safe disposal of sharps (including syringes, needles, and lancets).¹⁸ The program includes services to remove and collect sharps.

¹⁸ <http://www.seattle.gov/utilities/protecting-our-environment/safe-and-clean-seattle/sharps-collection>

The program removes sharps from the public right-of-way within 24 hours of receiving a service request. SPU receives these service requests through the Find It, Fix It mobile app and the Sharps Hotline (via an online form or phone number). SPU responds to service requests seven days per week.

Seattle has installed secure sharps disposal boxes in several locations throughout Seattle, including in the public right-of-way and City-owned parks. As of the time of writing, Seattle has five small boxes that accept single sharps and 19 large boxes that accept containers up to two liters each. Boxes are currently serviced weekly. SPU provides trainings on safe collection and handling of sharps to community groups, City departments, and individuals. The litter abatement, encampment trash removal, and RV remediation programs include needle collection.

Community-Led Cleanups

SPU provides several community-centered programs designed to offer Seattleites options to reduce litter and illegal dumping in their communities.

Adopt-a-Street

Seattle's [Adopt-a-Street](http://www.seattle.gov/utilities/protecting-our-environment/volunteer/adopt-a-street) program provides residents, businesses, and community groups with supplies to remove litter and debris from Seattle's streets.¹⁹ Services includes free removal of solid waste cleaned up from sidewalks year-around. Volunteers can conduct a one-time cleanup or agree to adopt one mile or more for a minimum of two years. Seattle provides street signs that recognize two-year adopters. Program staff track and report the number of Adopt-a-Street volunteers and volunteer hours dedicated to ground litter collection.

¹⁹ <http://www.seattle.gov/utilities/protecting-our-environment/volunteer/adopt-a-street>



Adopt-A-Street volunteers pose for a photo during litter cleanup (Source: SPU Image Library)

Spring Clean

Spring Clean is an annual program (April through May) that supports community-developed projects in the public right-of-way and on other City-owned properties.²⁰ SPU provides supplies (including trash bags, safety vests, and gloves) and solid waste disposal. Program staff track and report the total number of projects, number of volunteer hours dedicated to cleanup, and estimated number of pounds of materials collected. Spring Clean has been on hold since March 2020 due to the COVID-19 pandemic.

²⁰ <http://www.seattle.gov/utilities/protecting-our-environment/volunteer/spring-clean>

Recommendation

Because expansion of Clean City programs depends on funding from the City's General Fund or other outside sources, SPU recommends this action for the long-term, meaning five or more years from now. If additional funding becomes available sooner, SPU could implement this enhancement to the Clean City programs during the current planning period.

Rec 26. Expand the Clean City education campaign to increase awareness of the City's litter and cleanup programs

This strategy involves expanding ongoing education about Clean City programs to support program goals, increase awareness about services, and assess community satisfaction and expectations. As part of expanded education, SPU should consider the following actions:

- Research and consider implementing an anti-litter education campaign
- Provide in-language customer education on how to use tools like Find It, Fix It app and explore whether the app itself can be offered in languages other than English
- Expand surveys of customer expectations and satisfaction with an analysis of survey findings by respondent demographics to identify racial disparities

Hazardous Waste Drop-off

As a partner in the regional [Hazardous Waste Management Program in King County](#), SPU operates two household hazardous waste collection facilities to handle and safely dispose of household hazardous waste (HHW) and moderate risk waste (MRW) from residents and small quantity generators.^{21 22} One site is co-located at the South Transfer Station and the other operates as a stand-alone location near Aurora Avenue North and North 125th Street.

Table 6.7 City-Owned Permitted Moderate Risk Waste Facilities

FACILITY	LOCATION
North Household Hazardous Waste Facility	12550 Stone Way N
South Household Hazardous Waste Facility	8105 2nd Ave S

²¹ A small quantity generator is a business that produces less than 220 pounds of hazardous waste per month, produces less than 2.2 pounds of extremely or acutely hazardous waste per month, and stores less than 2,200 pounds of hazardous waste at any time.

²² <https://kingcountyhazwastewa.gov/en/about-us>



The South Household Hazardous Waste Facility drop-off (Source: Hazardous Waste Management Program)

Moderate risk waste is hazardous waste generated by residents and in small quantities by businesses and institutions, further defined in Washington State's Hazardous Waste Management Act ([Revised Code of Washington 70A.300.010](#)).²³

Moderate risk waste includes many common materials used in cleaning, yard care, and automotive repair and maintenance that contain toxic, flammable, reactive, or corrosive ingredients. [Seattle Municipal Code 21.36.026](#) prohibits disposing of moderate risk waste in garbage as these products can pose a threat to human health and the environment when disposed of improperly.²⁴ Though the amount of hazardous waste coming from a single house or business may be small, the total amount from 2.2 million residents and more than 75,000 businesses in King County can harm public health and the environment if not properly managed.

The Hazardous Waste Management Program operates two additional household hazardous waste collection sites that Seattle residents and small quantity generators may use: the Factoria Household Hazardous Waste Facility and the Auburn Wastemobile. SPU staff working on the

²³ <https://apps.leg.wa.gov/rcw/default.aspx?cite=70A.300.010>

²⁴ https://library.municode.com/wa/seattle/codes/municipal_code?nodeId=TIT21UT_SUBTITLE_IIISOWA_CH21.36S_OWACO_SUBCHAPTER_IISOWACO_21.36.060GACAAI

Hazardous Waste Management Program provide countywide at-home collection of hazardous waste for elderly or disabled individuals who are unable to drop off hazardous materials. Reusable products with a low potential for environmental harm and low toxicity are donated to nonprofit organizations and community groups.

The Hazardous Waste Management Program manages hazardous waste for jurisdictions throughout King County, which includes Seattle, seven other cities, two tribes, and unincorporated areas.²⁵ Partnering local governments work in multi-agency teams, drawing on their strengths and expertise to protect public health and the environment from harmful toxics. The Hazardous Waste Management Program's mission is to protect and enhance public health and environmental quality in King County by reducing the threat posed by the production, use, storage, and disposal of hazardous materials.

The King County Board of Health authorizes the Hazardous Waste Management Program and sets the program's annual fees used to fund the program ([BOH Code 11.04](#)).²⁶ The Hazardous Waste Management Program has an annual budget of approximately \$22 million and is funded through local hazardous waste fees, which include surcharges applied to Seattle's solid waste collection customers and Seattle's waste transfer station customers. The Hazardous Waste Management Program provides comprehensive hazardous waste management planning for the region. As of this writing, the Washington State Department of Ecology has approved the [latest draft management plan](#).²⁷

²⁵ Seattle Municipal Code [10.76.010](#) approved

²⁶ <https://kingcounty.gov/depts/health/board-of-health/~media/depts/health/board-of-health/documents/code/BOH-Code-Title-11.ashx>

²⁷ <https://www.kingcountyhazwastewa.gov/en/about-us/about-us-library?class=PROGRAM-PLANS,&doc-search=2021%20Hazardous%20Waste%20Management%20Plan>



Notice

We DO NOT Accept

-  Radioactive and Hazardous Waste (and Containers)
-  Household Chemicals
-  Fluorescent Lights
-  Asbestos
-  Ammo, Firearms, Fireworks, Flares, Explosives
-  Sewage
-  Sealed Drums, Fuel or Oil Tanks, Compressed Gas Cylinders
-  TVs or Monitors (CRTs)

7

Solid Waste Transfer, Processing, Disposal, and Emergency Management

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Chapter 7 Solid Waste Transfer, Processing, Disposal, and Emergency Management

Overview

After collecting solid waste from commercial, residential, and self-haul customers, Seattle Public Utilities (SPU) manages the complex operations of or contracts with a network of facilities for the transfer, processing, and disposal of this waste. These post-collection services and operations represent the final steps in ensuring all City-collected waste—recoverable recyclables, compostable food and yard waste, landfilled materials, and hazardous materials—are handled properly and end up at their appropriate destination.

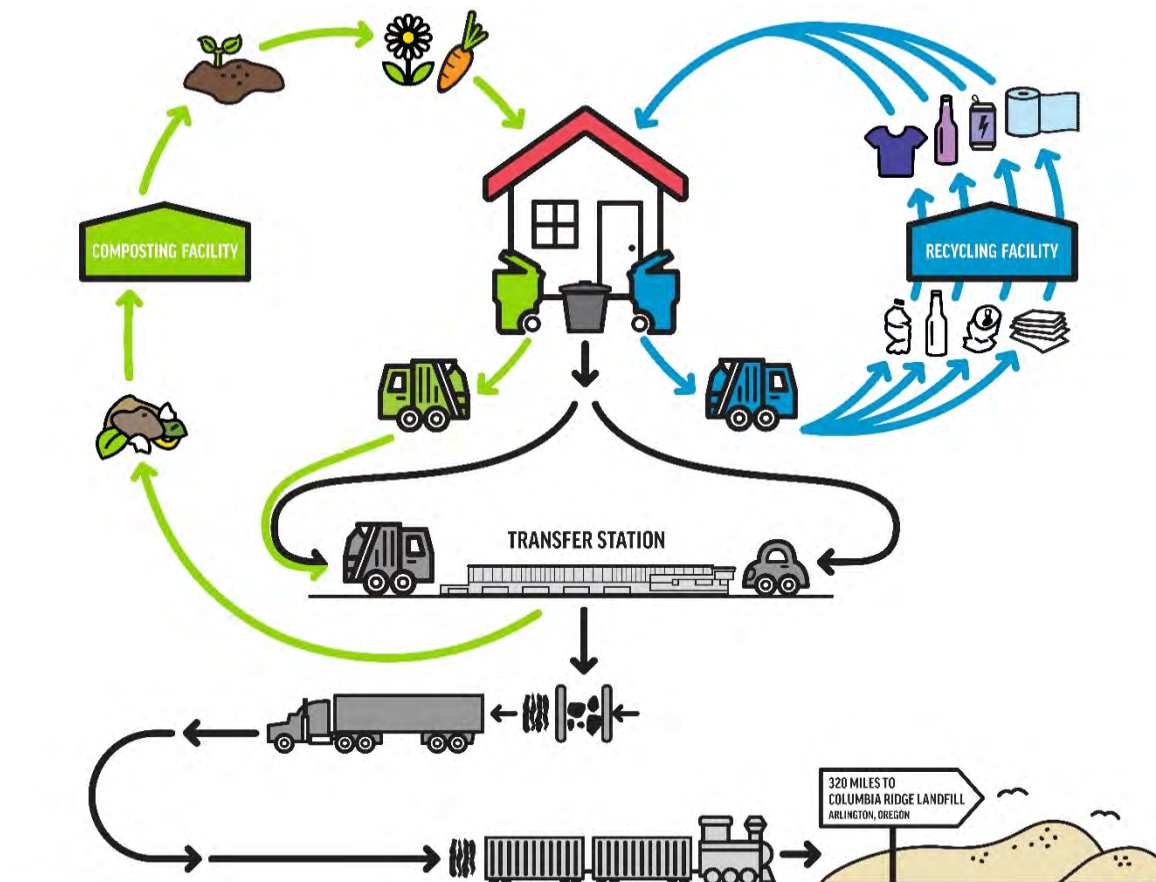
This chapter covers post-collection operations and facilities related to the **transfer, processing, and disposal** of Seattle’s solid waste. It also describes Seattle’s **emergency management** planning to ensure solid waste services continue even in times of crisis. Major components of solid waste handling operations discussed in this chapter include:

- **Transfer.** Seattle owns and operates two transfer stations, which consolidate collected solid waste before transporting materials to their next destination, such as to processors or a landfill.
- **Processing.** At this stage, recycling processors sort collected recyclables at the material recovery facility, and organics processors compost food and yard waste. Processors send materials to brokers and markets.
- **Disposal.** Materials collected as garbage and residual materials from processing that cannot be recycled or composted are disposed. Once garbage is consolidated at the transfer stations in shipping containers, those shipping containers are transported via trailer trucks to the rail head where they are loaded onto rail cars for transport to landfill. Although Seattle disposes garbage out of state, SPU maintains historic City-owned landfills that are inactive disposal sites.

- **Emergency management.** SPU has developed emergency management plans to continue to provide collection, transfer, and disposal of disaster debris and other waste in case natural disasters, civil disturbances, or other unexpected events occur that disrupt normal solid waste operations.

Figure 7.1 shows the solid waste system, including collection, from the perspective of residential customers.

Figure 7.1 Seattle Solid Waste System



Source: Seattle Public Utilities

A network of public and private service providers and facilities transfer, process, and landfill waste generated in Seattle. Table 7.1 lists the facilities in Seattle's solid waste system that handle residential, commercial, and self-haul waste. Facilities that handle construction and demolition (C&D) debris for salvage and reuse, source-separated recycling, mixed recycling, and transfer are listed in Chapter 8, *Construction and Demolition Debris*.

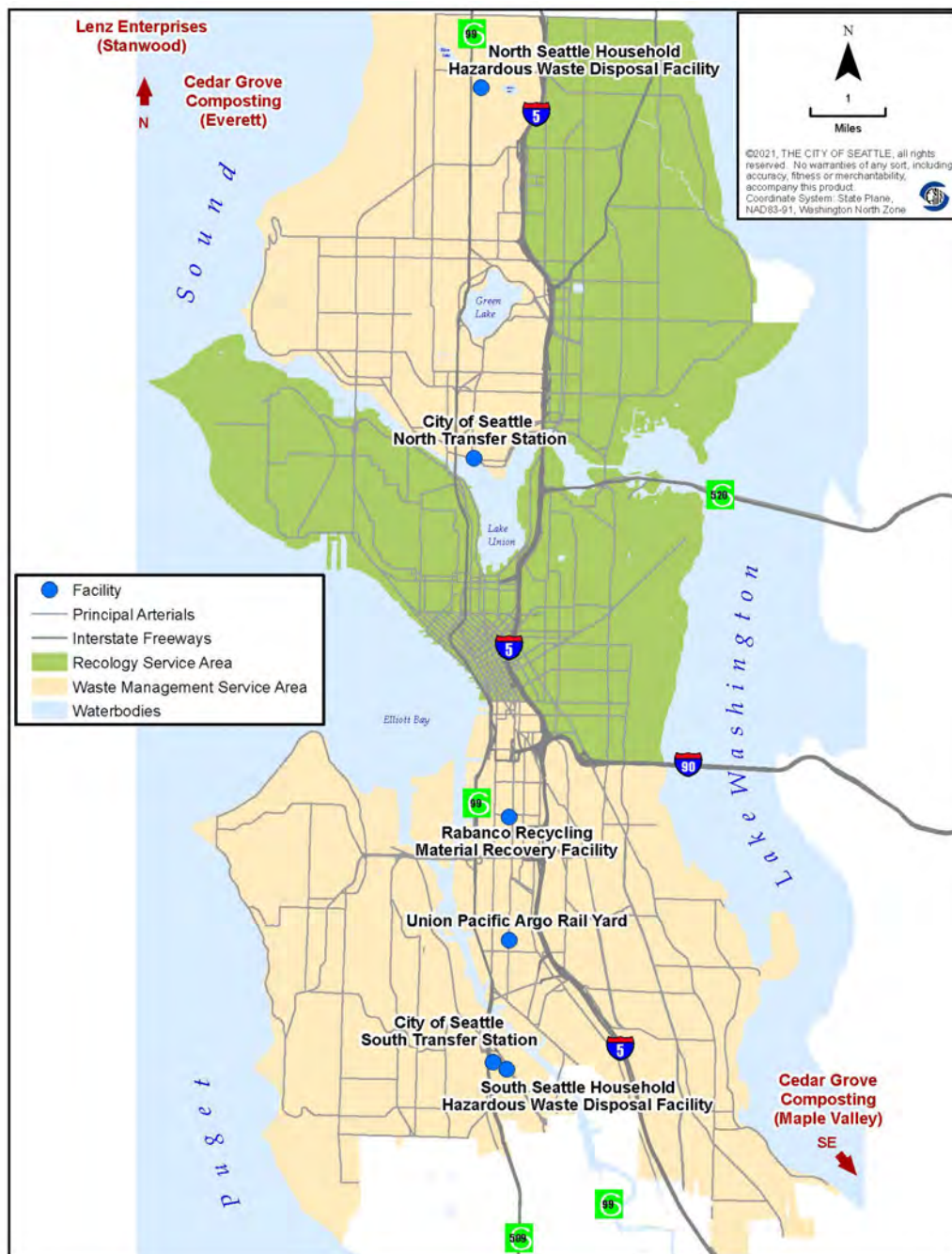
Table 7.1 Solid Waste Transfer, Processing, and Disposal Facilities Serving Seattle

OPERATOR	FACILITY/LOCATION	TYPE
City-Owned Permitted Facilities in Seattle		
SPU	North Transfer Station 1350 N 34th St	- City-contracted residential garbage and food and yard waste collection transfer - City-contracted commercial garbage and food and yard collection transfer - Self-haul garbage, yard and wood waste, recycling, and reuse
SPU	South Transfer Station 130 S Kenyon St	- City-contracted residential garbage and food and yard waste collection transfer - City-contracted commercial garbage and food and yard waste collection transfer - Self-haul garbage, yard and wood waste, and recycling
Privately-Owned Permitted Facilities in Seattle		
Recology	Materials Recovery Facility 4401 E Marginal Way S	Recycling processing
Republic Services	Rabanco Recycling Material Recovery Facility 2733 3rd Ave S	- Recycling processing - Intermodal transfer of C&D debris to long-haul disposal
Seadrunar	Seadrunar Recycling 28 S Brandon St	Recycling processing
Waste Connections	Northwest Container Services Intermodal Facility 635 S Edmunds St	Intermodal transfer of C&D debris to long-haul disposal
Waste Management, Inc.	Alaska Reload Facility 70 S Alaska St	Contaminated soil transfer

OPERATOR	FACILITY/LOCATION	TYPE
Waste Management, Inc.	Eastmont Transfer Station 7201 W Marginal Way	- Some garbage transfer - Some food and yard waste transfer - C&D debris transfer
Waste Management, Inc.	Biomedical Waste Facility 149 SW Kenyon St	Biomedical treatment
Union Pacific Railroad (used by Waste Management, Inc.)	Argo Rail Yard 402 S Dawson St	Intermodal transfer of garbage and C&D debris to long-haul disposal
Privately-Owned Permitted Facilities Outside Seattle		
Cedar Grove	Cedar Grove Everett 3620 36th PI NE Everett, WA Cedar Grove Maple Valley 7825 Cedar Grove Rd SE Maple Valley, WA	Food and yard waste composting
Lenz Enterprises	Compost Facility 5210 WA-532 Stanwood, WA	Food and yard waste composting
Waste Connections	Finley Buttes Landfill 73221 Bombing Range Rd Boardman, OR	C&D landfill disposal
Waste Management, Inc.	Columbia Ridge Regional Landfill 18177 Cedar Springs Lane Arlington, OR	Landfill disposal
Republic Services	Roosevelt Landfill 500 Roosevelt Grade Road Roosevelt, WA	C&D landfill disposal

The locations of the key Seattle-owned or -contracted facilities appear in Figure 7.2. Other facilities important to regional jurisdictions or privately-operated recycling handlers in the local area are not shown.

Figure 7.2 Seattle Solid Waste Facilities



Source: Seattle Public Utilities.

North and South Transfer Stations

City-contracted collectors take the garbage and food and yard waste that they collect to one of two City-owned transfer stations. They take residential recyclables to a City-contracted processor, where materials are sorted, separated, and prepared for sale. Occasionally, garbage and yard waste are transferred at contracted transfer facilities.

The recycling and transfer facilities consolidate collected solid waste materials and prepare them for transport to their next destination. The recycling and transfer stations were originally built in the 1960s when the Seattle started landfilling its waste outside city limits at the Kent Highlands and Midway landfills. Before that time, waste was disposed of in landfills within the city limits without requiring transfer. By the early 1960s, landfill space within Seattle ran out, indicating the need for a large out-of-town landfill. Collection trucks could not travel that far efficiently, so Seattle began to use transfer stations to consolidate garbage into larger loads for transport to the landfill. Seattle's transfer stations also provide drop-off services for self-haul customers.

Seattle's transfer stations were renamed "recycling and disposal stations" in the 1990s, reflecting a new emphasis on their role in recycling in addition to transferring waste for disposal. At that time, their names changed to the North Recycling and Disposal Station (NRDS) and the South Recycling and Disposal Station (SRDS), but they have since been renamed to North Transfer Station (NTS) and South Transfer Station (STS). See Figure 7.2 on page 7.7 for the locations of Seattle's solid waste facilities.

The original facilities have both been replaced and renamed since the *2011 Solid Waste Plan Revision*. Seattle completed the first phase of the SRDS-to-STS replacement in 2013. The NRDS-to-NTS replacement was completed in 2016. These replacement projects increased the capacity and material handling ability of each facility and incorporated plans to minimize customer wait time, enhance control of noise and air emissions, and expand recovery by providing recycling and reuse areas separate from disposal areas.

To provide comparable services at both facilities, the *2011 Solid Waste Plan Revision* included a second phase work on the SRDS-to-STS replacement, which was known as the South Recycling Center. The South Recycling Center phase has been postponed to allow for a more holistic evaluation of needs and opportunities in South Seattle. The current scope of the project (now called South Transfer Station 2 or STS2) is limited to the remediation of the South Park Landfill required under a consent decree with the Department of Ecology, minimal operational improvements, and a path along 5th Avenue to mitigate the street vacation at STS.



The South Transfer Station (Source: SPU Image Library)

Distributing transfer station capacity between the north and south ends of Seattle improves collection efficiency and creates convenient access for self-haul customers. While the two-station system helps spread solid waste transfer activity across geographic areas, balancing neighborhood impacts, such as noise and increased traffic, and comparable levels of service between two facilities remains an ongoing planning issue.

Station Operations

Seattle's transfer stations have performed the same basic functions since they were first built: receive waste, consolidate them into loads, and send them to their next destination. SPU staff keep materials moving through to processing or disposal by performing the following jobs:

- **Scale operators** weigh vehicles as appropriate and collect payment from self-haul customers. To the extent possible, they also screen incoming loads for unacceptable materials and compliance with Washington State secured load laws (detailed below).
- **Floor staff** direct vehicles and keep operational areas clean and safe. They also watch for unacceptable materials.
- **Equipment operators** handle material movement on the floor and into compactors for loading.

- **Maintenance laborers** operate compactors to load solid waste into intermodal containers and prepare trailers for shipment.
- **Administrative employees** ensure personnel and other resources are allocated appropriately. They also generally ensure that other staff have what they need to safely do their jobs.

Seattle's transfer stations are open and available 362 days per year from 8 a.m. to 5:30 p.m. to self-haul and commercial customers. Transfer stations serve a wide variety of vehicles and customers, and they receive a variety of garbage, recyclables, and food and yard waste. All garbage and food and yard waste are loaded into containers during each workday and hauled to their next destination. Garbage is compacted and loaded into shipping containers. Food and yard waste are loaded into open-top trailers.



North Transfer Station entrance (Source: SPU Image Library)

In addition to consolidating waste from Seattle's contracted collectors (discussed in Chapter 6, *Solid Waste, Handling, Collection, and Removal*), transfer stations also accept materials unsuitable for curbside collection. Residents with large items or excess quantities of waste can bring these materials to the stations for recycling or disposal. The stations also serve businesses that choose to self-haul their waste and recyclable materials.

Self-haul accounts for a relatively small portion of the approximately 420,000 tons handled at the transfer stations each year. Collection trucks made up 16% of the trips to the transfer

stations and drop-off 75% of the tonnage due to their large vehicle size. Table 7.2 (contracted collectors) and Table 7.3 show the number of trips (single visits) and tons of material transferred through NTS and STS.

Table 7.2 Transfer Services for Garbage and Food and Yard Waste from City-Contracted Collectors at NTS and STS in 2020

	NTS		STS		TOTAL	
Waste Type	Trips	Tons	Trips	Tons	Trips	Tons
Garbage	8,044	47,623	31,734	166,454	39,778	214,077
Food and yard waste	1,990	14,604	11,831	86,873	13,821	101,477
Totals	10,034	62,227	43,565	253,327	53,599	315,554

Table 7.3 Self-Haul Service Provided by NTS and STS in 2020

SELF-HAUL	NTS		STS		TOTAL	
Waste Type	Trips	Tons	Trips	Tons	Trips	Tons
Garbage	105,739	37,198	120,890	57,900	226,629	95,098
Yard waste	10,042	2,060	16,968	4,691	27,010	6,751
Wood waste	633	201	671	405	1,304	606
Other recycling	4,057	1441	13,837	1015	17,894	2,456
Totals	120,471	40,900	152,366	64,011	272,837	104,911

One of the primary challenges at the transfer stations is managing the number of self-haul customers. Individual self-haul trips require more staff resources per trip for scale transactions and assistance on the tipping floor, and these customers take longer to unload than commercial trucks. Although handling a high volume of customers with small loads is relatively costly, providing convenient self-haul services for residents and commercial customers is an important SPU objective.

One challenge to optimizing transfer station operations is gathering data on (1) who is using transfer stations, (2) why they use the transfer stations, and (3) what they need from these facilities to better serve them. Lack of customer data limits SPU's ability to evaluate both the equity of services provided to customers across Seattle and the quality of service overall. Transfer station operations are informed by waste characterization study data (see Chapter 3, *Seattle Waste Data and Trends*, for more information), but these types of studies provide limited insight into behavior and attitudes around transfer station use.

Prohibited Materials

To keep unacceptable wastes out of the garbage and recycling streams, Seattle's transfer station employees monitor loads for prohibited wastes. These include wastes that are “hazardous,” “dangerous,” or otherwise require special handling for safe and efficient disposal. Signage at the scale houses and throughout the stations informs customers of prohibited wastes. Workers monitor all loads and deny access to vehicles carrying prohibited wastes. If a prohibited material does enter the facility, employees ensure the material is appropriately managed. Seattle's transfer stations collect many of these waste that are prohibited from disposal, such as used oil, lead-acid batteries, tires, and large metal appliances, for recycling. Materials accepted and prohibited at City-owned transfer stations are listed in Chapter 6, *Solid Waste Handling Collection and Removal*. The process for designating materials for recycling is described in Chapter 5, *Recycling and Composting Policy and Markets*.

Secure Load Requirement

SPU also enforces secure load requirements at the transfer stations. Roughly 40% of the litter on Washington State highways comes from unsecured loads or from vehicle loads that are not tied, covered, or properly confined.¹ In addition to creating litter issues, road debris causes about 400 accidents on Washington State highways every year. To reduce litter and road debris, State and City laws require vehicle operators to secure loads to prevent spillage while the vehicle is moving ([Revised Code of Washington § 46.61.655](#) and [Seattle Municipal Code 21.36.450](#)).²³ All SPU and private transfer stations charge vehicle operators an additional fee for unsecured loads.



¹ Washington Department of Ecology, “Litter Laws,” Accessed August 25, 2019, <https://ecology.wa.gov/Waste-Toxics/Solid-waste-litter/Litter/Litter-laws>

² <https://app.leg.wa.gov/rcw/default.aspx?cite=46.61.655>

³ https://library.municode.com/wa/seattle/codes/municipal_code/226077?nodeId=TIT21UT_SUBTITLE_IIISOWA_C_H21.36SOWACO

Transfer Operations

All materials received by Seattle's two transfer stations are loaded into transfer containers and hauled to their next destination. SPU owns and operates a fleet of trucks and trailers to haul

materials away from its two transfer stations. SPU loads garbage into sealed 40-foot intermodal containers (owned by Waste Management, Inc.) and transports them by truck to the Union Pacific Argo Rail Yard. From there, full containers are placed on a train and an empty container is returned to the transfer station. SPU transports food and yard waste and compostable materials by truck to contracted processors (Cedar Grove and Lenz Enterprises, as of 2021). Other materials are also transported by truck to recycling facilities in the local area.



*Compactor and signage at the North Transfer Station
(Source: SPU Image Library)*

Station and Transfer Performance

SPU regularly monitors the performance of transfer stations operations, including compliance with applicable health and safety regulations. SPU tracks the following information to keep transfer station operations running efficiently and safely:

- **Customer turnaround time.** Turnaround time measures the number of minutes elapsed from the time collection trucks cross the inbound scales to the time they cross the outbound scales. To keep the flow of traffic in and out of the transfer stations moving efficiently, SPU has a goal to keep the turnaround time per vehicle at or below 15 minutes.
- **Removing all waste from facilities each day.** Waste sitting in tipping areas overnight can release odors into surrounding neighborhoods, especially in summer. SPU strives to empty the tipping areas at the end of each day, at least 90% of the time.
- **Satisfactory inspections by public health inspectors.** As the regulatory agency for solid waste handling facilities, Public Health—Seattle & King County regularly inspects City-owned transfer stations. SPU strives for 100% satisfactory ratings 100% of the time.

As discussed in the recommendations in Chapter 2, *Maximizing and Measuring Impact: Moving Upstream Beyond the Recycling Rate*, SPU may also consider additional metrics and performance measures in support of key goal areas of operational excellence, safety, cost-effectiveness, and environmental impact, such as those related to:

- Industry-standard safety metrics for workers and the public
- Environmental and neighborhood impacts of transfer station activity
- Equitable access to and use of transfer station services

Recycling and Compost Processing

After collection and transfer, recoverable materials are processed as the first step to becoming new products. In this chapter, processing refers to sorting recyclables at a material recovery facility (commonly called a “MRF”) into individual material types and composting yard and food waste into a soil amendment. After materials are processed, they go to private enterprises for additional processing or to commodity markets. Seattle contracts with three processors for materials collected by the City’s contracted collectors from primarily residential customers:

- 1 Rabanco Recycling Material Recovery Facility in Seattle, Washington processes all recyclables collected through Seattle’s collection contracts
- 2 Lenz Enterprises in Stanwood, Washington processes about 70% of food and yard waste collected through Seattle’s collection contracts
- 3 Cedar Grove in Everett, Washington processes about 30% of food and yard waste collected through Seattle’s collection contracts

This section details what happens to recyclable and compostable materials after they are collected from customers across the city. For now, SPU plans to continue its current processing approach. SPU regularly reviews customer rates and researches new methods, technologies, reporting requirements, or other elements that could improve processing in the future.

Recyclables Collected by City-Contracted Collectors

Seattle currently contracts with Republic Services to sort and bale recyclables collected under City collection contracts representing all residential recycling and a small amount of commercial recycling at the Rabanco Recycling Material Recovery Facility. The current contract began June 29, 2015, and is guaranteed through March 2024. Seattle has the option of extending the

[contract](#) to 2027.⁴ SPU will review future processing alternatives before those deadlines, with enough time to pursue the chosen contracting approach.

The contractor is responsible for processing and marketing all recyclables collected under City contracts with provisions related to:

- Hours open to City-contracted collection trucks
- Collection truck in-and-out (turnaround) time
- Capacity to receive, process, and store a week's worth of materials for one week
- Limits on residuals, which is garbage that remains after recyclables are sorted
- Transportation of material to markets
- Reporting requirements
- Recycling market risk sharing
- Backup recycling facility in the event of a temporary shut down
- Conditions for employees, such as permanent jobs, living wages, benefits

More than 40 people work at the 80,000-square-foot material recovery facility. Seattle's processing contract requires prevailing and living wages and benefits for all staff and positions supporting Seattle's contracted services. This means that processing and disposal contractors must ensure that all recycling sort staff are full-time employees with living wages and full benefits. All new contract procurement efforts include a review of worker wages and benefits.

Seattle's recycling processing contract with Republic Services also has performance standards and penalties for non-performance. SPU monitors Republic Services' reporting for accuracy, assesses penalties as needed, and maintains open communication with contractors to identify problems early and work out solutions. At the same time, the current contracts lack reporting requirements for key information that could support responsible recycling: contamination rates in recycling delivered to Republic Services, quality of outgoing bales of recyclable materials, and final-end markets (past the first material broker) for baled recyclables from Seattle.

The recycling collected by Seattle's contractors becomes their property upon collection. Recyclables generated by Seattle customers then become the processor's property when the collectors deliver it to the City-contracted processing facility. SPU pays its contracted recycling processor monthly, at a set price per ton, to process the materials. The actual amount paid to the processor each month depends on tonnage volume and commodities prices for the processed materials. The contract sets a base price for the various commodities, and SPU bears 100% of the risk (positive or negative) of market price changes for recyclables. If market prices

⁴ <https://www.seattle.gov/Documents/Departments/SPU/Documents/SPUAWRecyclingProcessingContract.pdf>

are higher, SPU receives a "credit" (savings) on the processing bill. If market prices are lower, the processing bill increases (an extra cost paid to the processor).



Recology collection truck delivering recyclables to the Recology Materials Recovery Facility (Source: Pat Kaufman)

Seattle's processing contract does not allow the processor to dispose of recyclable materials without SPU's explicit permission. Even during the 2008 recession when commodities prices dipped significantly, all of Seattle's recyclable materials went to market, meaning none were landfilled. Seattle's recyclables also continued to go to market after China restricted imports of mixed plastics (resin numbers 3-7) and mixed paper starting at the end of 2018. Other jurisdictions in the region were not as well-positioned as Seattle to weather the impacts of China National Sword, with some cities temporarily authorizing landfill disposal of mixed paper that could not be placed on the market. Seattle continues to benefit from its access to both domestic and foreign markets, but the reduced tolerance of commodity markets for contamination poses challenges.

Seattle's capacity for processing recyclables is currently adequate, although growth in population and diversion programs may exceed capacity in the future. Local recycling capacity expanded in Seattle in 2014 when Recology built a material recovery facility south of downtown Seattle. Recology's facility processes some privately collected commercial recyclables from Seattle.

Privately Collected Recyclables

Most commercial customers contract with third-party or private haulers for recycling collection and processing. Per state and federal law, businesses and non-profits have multiple options for collection of their recycling and composting. They can choose whether to use Seattle's contracted commercial collectors or any third-party private hauler.

Private haulers collect both mixed and source-separated materials and deliver them to a variety of processors. Depending on the quantity and type of materials recycled, commercial customers may receive revenue, have free collection, or pay a fee for recycling. Recycling usually costs less than disposal.

Privately collected recyclables may include the materials accepted in SPU's recycling collection program as well as additional materials. To monitor open market commercial recycling, Seattle has required private recyclers to report annually on materials collected, material sources, and delivery destinations since 1997. Tracking weight-based recycling rates for the commercial sector provides one indicator of how well the private market is serving commercial waste generators.

The annual reporting and licensing requirement ([Seattle Municipal Code 6.250.080](#)) for private commercial and C&D recycling and reuse haulers requires these companies to report on all materials collected, processed, or hauled for recycling in Seattle.⁵⁶ SPU uses the data from the reports to calculate the recycling rates for commercial and C&D sectors. Calculating the recycling rates for these sectors based on recyclers' annual reports is complex because one material could be handled by several different companies between the generator and the final destination. To ensure it has reliable data for the annual *Waste Prevention & Recycling Report*, SPU spends a significant amount of time identifying and removing the resultant "double counting."

⁵ See [Annual Recycling and Reuse Report and Recycler License](#) for additional details.

⁶https://library.municode.com/wa/seattle/codes/municipal_code?nodeId=TIT6BURE_SUBTITLE_IVNELICO_CH6.25OCOPREMA

Food and Yard Waste Composting

The City [contracts for processing of food scraps and yard debris](#) with Lenz Enterprises in Stanwood and Cedar Grove Composting, Inc., in Everett and Maple Valley.⁷ With its processors located nearby in Western Washington, Seattle is compliant with the state's apple maggot quarantine (see Appendix I, *Washington State Department of Agriculture Compliance Letter*).⁸

Current organics processing under these contracts includes yard waste, food scraps, compostable paper, and other approved food packaging. The City's food and yard waste processing contracts require companies to process material delivered by Seattle's contracted collectors into a marketable product, such as soil amendments. Except for contaminants such as plastic bags, processors are prohibited from disposing material at a landfill or incinerator. Unlike with recyclables processing contracts, the organic contractors bear all responsibility, costs, profit (or loss), and risk for marketing end products. Other contract provisions relate to:

- Compliance with all applicable ordinances, zoning, and regulations (health and air)
- Hours open to City trucks and City collection contract trucks
- Handling and disposal of contaminated waste
- Pilot tests of new processing methods or services
- Education and informational materials on food waste for commercial customers
- Reporting
- Primary processing facilities and back-up facilities in the event of a temporary shutdown

As with the recycling processing contract, SPU's contracts for compost processing have performance standards and penalties for non-performance. SPU monitors the performance of food and yard waste processors by regularly reviewing contractor reports for accuracy and maintaining open communication with contractors and local regulators to identify problems early and create solutions.

Once delivered to the processing facilities, grinders shred the material and conveyors move it to areas specifically built for aerating the material in the first stage of composting. Blowers control air flow and manage odors while naturally occurring microbes break down the material. At later stages in the process, the material finishes composting in piles in a different area of the facility. At the end, the material is screened, tested, and blended into a mix for bags or bulk use.

⁷ <http://www.seattle.gov/utilities/about/contracts>

⁸ In its review of the preliminary draft of the *2022 Plan Update*, the Washington State Department of Agriculture did not find any conflicting compliance issues related to the state's apple maggot quarantine ([Washington Administrative Code, Chapter 16-470](#)).

Current contracted processors have been able to receive and process the quantity of material outlined in their contracts with Seattle. For the longer term, regional stakeholders recognize that the regional and local capacity for processing food and yard waste will need to expand to handle increased recovery. SPU will monitor processing capacity and market development activities.

Long-Haul and Disposal of Garbage

By law, the City of Seattle has authority to decide where and how to manage all of Seattle's solid waste that is not recycled or composted. This legal authority is commonly called “flow control.” Seattle has arranged for and committed to transporting disposed waste via train to landfill for burial. Seattle [contracts with Waste Management of Washington](#) (Waste Management, Inc.) to haul garbage by rail and dispose of it at Columbia Ridge Landfill in Gilliam County, Oregon, an arid region east of the Cascade Mountains.⁹

Seattle has had a contract for rail haul and disposal with Waste Management, Inc. since the Columbia Ridge Landfill opened. The City most recently amended the contract for the fourth time in 2017. The current contract expires in 2028 and includes a City opt-out option in 2024. The long-haul rail and disposal contract has clear performance standards and penalties for non-performance and contains provisions related to:

- A partnership incentive for transporting waste from other local jurisdictions on the same train as SPU waste
- Open hours for the rail yard hours to receive full containers
- Container storage capacity (two days)
- Truck turn-around time
- Container data and reporting (number of containers available, storage availability, location, and transfer station of origin)
- Truck scales and intermodal lift trucks
- Unacceptable containers (leaky, containing prohibited waste)
- Backup receiving facility (intermodal rail yard), which is Terminal 18 at the Port of Seattle on Harbor Island, Seattle
- Alternate rail lines
- Locomotives and double-stack rail cars
- Landfill design and operations that meets Washington and Oregon standards
- A screening program at the landfill for unacceptable wastes

⁹ <http://www.seattle.gov/utilities/about/contracts>

- Incremental landfill closure and post-closure care
- Management plan for wastes that require special handling, including asbestos, construction and demolition debris, and contaminated soils



Columbia Ridge Landfill (Source: Waste Management)

Once the City compacts material collected as garbage at the North and South Transfer Stations into shipping containers, it is then hauled to and loaded onto trains stationed at the Argo Rail Yard in the industrial area south of downtown Seattle. Trains leave Argo Rail Yard six times a week, stacked two-containers high. Trains hauling Seattle's waste unload the containers at an intermodal rail siding on the landfill site, and tractors haul the containers to the active landfill area to be emptied.

Columbia Ridge Landfill has a gas-to-electricity system that produces 12.8 MW of electricity—enough to power 12,500 homes—from captured landfill gas.¹⁰ Seattle has the right to purchase

¹⁰ Waste Management, Inc., "Columbia Ridge Landfill & Green Energy Plant," Accessed October 2021, <http://wmnorthwest.com/landfill/pdf/columbiaridge.pdf>.

energy produced by this system. The landfill site began operating in 1990 and is permitted and regulated by the Oregon Department of Environmental Quality.

Seattle's capacity for transport and disposal of garbage is adequate. The Columbia Ridge Landfill projects that it will be able to receive material beyond the current contract's guaranteed 2028 end date. As of this writing, the landfill has approximately 143 years of permitted capacity left: it receives about 2.7 million tons of waste per year and had approximately 329 million tons of remaining permitted air space.¹¹ Municipal solid waste landfills in Washington State also have remaining permitted capacity for disposal, if Seattle needs to use an alternative location. As of 2015, Ecology estimated that the 14 municipal solid waste landfills operating at that time had about 60 years of capacity remaining.¹² Rail haul capacity to transport material to the Columbia Ridge Landfill has not been an issue to date. The contract provides for alternative transportation if rail lines become temporarily unavailable.

Managing Historic Landfills

Until the 1960s, the City of Seattle disposed of its solid waste at various landfills within city limits (see Figure 7.3). Between 1966 and 1986, Seattle operated two major landfills south of Seattle: Midway and Kent Highlands. The Midway Landfill accepted garbage until October of 1983, and Kent Highlands Landfill accepted garbage through 1986.

Between 1986 and 1991, Seattle took its solid waste for disposal to King County's Cedar Hills Landfill. Since 1991, Seattle has shipped its solid waste by rail to Oregon's Columbia Ridge Landfill.

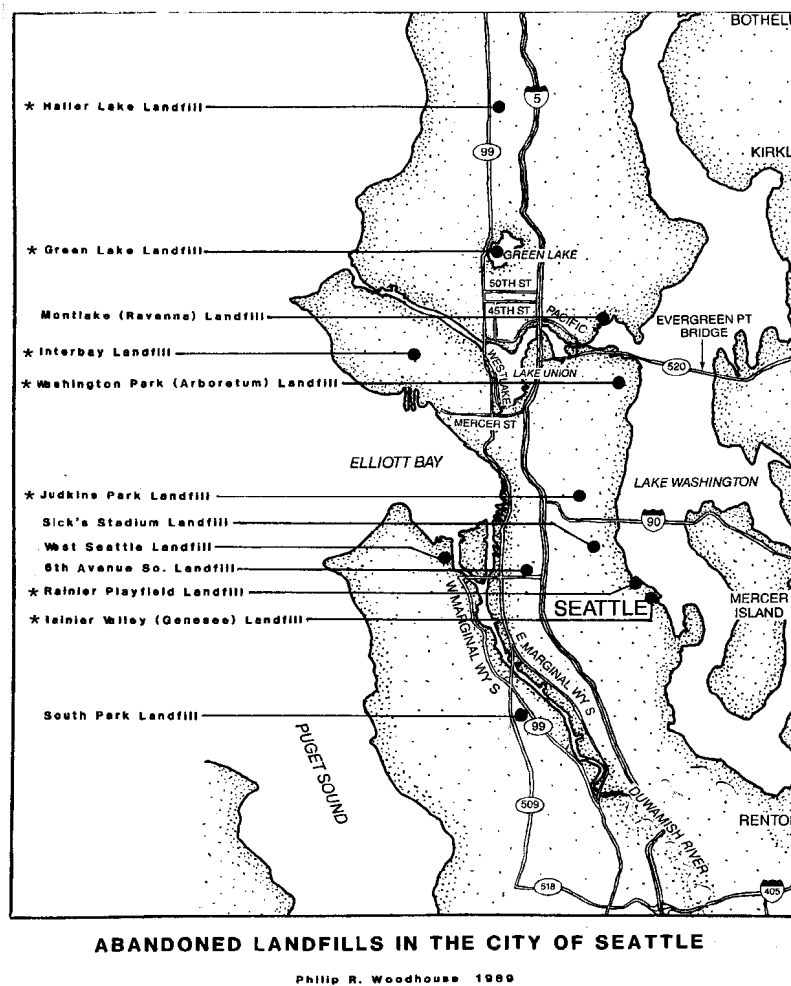
Once they stopped accepting waste, the Midway and Kent Highlands landfills went through the process of environmental closure. During the 1980s, Midway and Kent Highlands landfills were designated as Superfund sites by the EPA, with cleanup supervised by Ecology. A superfund site is land that has been contaminated by hazardous waste and is a candidate for cleanup because it poses a risk to human health and/or the environment. Seattle completed cleanup through legally binding agreements with Ecology at Midway in 1991 and at Kent Highlands in 1995. SPU continues to monitor these landfills per agreements with Ecology. In 2015, SPU sold surplus property adjacent to the Kent Highlands Landfill to a private developer.

¹¹ Waste Management, Inc., "Columbia Ridge Landfill & Green Energy Plant," Accessed October 2021, (<https://www.wmnorthwest.com/landfill/columbiaridge.htm>).

¹² Washington State Department of Ecology, "Solid Waste in Washington State – 24th Annual Status Report," 2017, <https://fortress.wa.gov/ecy/publications/documents/1707007.pdf>.

In addition to Midway and Kent Highlands, Seattle has 12 other historic landfills. An assessment in 1984 by Public Health—Seattle & King County concluded that no further action was needed at five of the historic landfills (Green Lake, Judkins Park, the Arboretum, Rainier Playfield, and Sick's Stadium). Actions recommended for seven other sites (Interbay, Genessee, Montlake, Haller Lake, West Seattle, South Park, and 6th Avenue South) have been implemented or are underway. In 2019, SPU signed a consent decree that details the cleanup elements required for the South Park Landfill.

Figure 7.3 Historic Landfill Sites in Seattle



Source: City of Seattle Archives

Monitoring Historic Landfills

Ecology formally tracks the performance of landfill closure programs for Midway, Kent Highlands, and the South Park landfills on a five-year review cycle. SPU conducts ongoing monitoring of these landfills related to:

- Compliance with landfill gas requirements, tracked quarterly at all three landfills
- Groundwater quality testing around the perimeter of each landfill

SPU staff monitor the Kent Highlands and Midway historic landfill sites and facilities in accordance with regulatory requirements and to the satisfaction of adjacent communities. Monitoring requirements include:

- Inspect the gas extraction and flare system to ensure proper operation cover and perimeter security are intact and perform general maintenance as needed
- Perform surface water quality testing
- Conduct groundwater sampling and reporting to ensure the test wells are functioning properly
- Ensure leachate discharge to the sanitary sewer meets permit limitations
- Perform pump maintenance for groundwater, surface water, and leachate



SPU staff conduct gas monitoring at Midway Landfill, 2015 (Source: Jeff Neuner)

At the Interbay and Genessee historic landfills, SPU crews operate and maintain gas control systems and monitor and evaluate methane levels along site perimeters. Public Health—Seattle & King County monitors performance at the other historic Seattle landfills. SPU responds to problems at historic in-city landfills on a case-by-case basis.

Consistent with the *2011 Solid Waste Plan Revision*, *Seattle's 2022 Solid Waste Plan Update* contains no proposal to locate solid waste disposal facilities in Seattle and, therefore, also does not present an analysis of potential sites that would otherwise be required by law.

South Park Landfill Cleanup

Work is underway to clean up the South Park Landfill, where Seattle is a potentially liable party—meaning the City is a party that potentially contributed to contamination at a Superfund site. Seattle and potentially liable parties recently completed a nine-year formal process to characterize the South Park Landfill (site of the old Seattle South Transfer Station) under an agreed order with Ecology. The landfill is a formal cleanup site under Ecology's Model Toxic Controls Act program. Completed documents include the *South Park Landfill Remedial Investigation/Feasibility Study and Cleanup Action Plan*.¹³ In 2019, a consent decree was filed that governs the cleanup of the South Park Landfill. The cleanup of the City-owned portion of the landfill (11 acres) is part of the South Transfer Station 2 (STS2) project. Final cleanup requirements adopted within the 2019 consent decree include the following:¹⁴

- Constructing a landfill cap to prevent (1) human contact with the landfill and (2) rain and stormwater from reaching landfill waste
- Installing landfill gas and surface water control systems
- Restricting future land use activities to (1) minimize potential exposure to contamination and (2) maintain effectiveness of cleanup actions
- Establishing groundwater and landfill gas monitoring

Midway Landfill Redevelopment

Several new efforts are underway to use the Midway Landfill site for transportation projects. The Washington State Department of Transportation (WSDOT) will add two lanes to U.S. Interstate 5 (I-5) that has required removing waste and modifying the landfill cover. Sound Transit is constructing the Link light rail extension to Federal Way that crosses the Midway Landfill near I-5, which may require removing additional waste for an elevated light rail track. Waste removal, backfilling, and replacing the landfill capping liner began in July 2020 and was completed in 2021. Some additional work continues in 2022.

¹³ Washington State Department of Ecology, "Document Repository for South Park Landfill," Accessed August 25, 2019, <https://apps.ecology.wa.gov/gsp/CleanupSiteDocuments.aspx?csid=1324>.

¹⁴ Washington State Department of Ecology, "South Park Landfill," Accessed August 25, 2019, <https://fortress.wa.gov/ecy/gsp/Sitepage.aspx?csid=1324>.



Midway Landfill waste removal project, which will restore remedial action components and provide space to add two lanes to Interstate 5 and build the Federal Way Link Light Rail Guideway (Source: Jeff Neuner and Kiewit Corporation)

Recommendation

SPU makes one recommendation regarding the management of the City's historic landfills.

Rec 27. Continue to explore opportunities for adaptive reuse of historic landfills, including opportunities to control costs at closed landfills and to bring the land into productive use

SPU will continue to manage closed landfills properly and explore opportunities for adaptive reuse of historic landfills. Examples include:

- Properly closing the City-owned portion of the South Park Landfill under the requirements in the *South Park Landfill Consent Decree* and redeveloping the site
- Expanding efforts on secondary uses of the Midway Landfill, including potential siting of the Sound Transit Operations and Maintenance Facility South at Midway
- Evaluating opportunities for property sales and site development at Midway and Kent Highlands historic landfills
- Completing additional studies and evaluations as directed by Ecology at Kent Highlands, Midway, and South Park historic landfills

The ongoing work and exploration of adaptive, secondary beneficial uses for closed landfills is funded and underway for the duration of the current planning period.

The next section describes how Seattle prepares for emergencies that could disrupt its complex system for managing solid waste.

Emergency Management

As a center of manufacturing, technology, trade, and tourism in the Pacific Rim, Seattle is vulnerable to both natural and human-caused hazards. The city's geography, built environment, and population put it at risk for catastrophic events including earthquakes, pandemics, and terrorism. Because of these hazards, Seattle maintains a well-developed, integrated emergency management system that considers all hazards in a central planning structure. The following all-hazards emergency response plans are relevant to Seattle's solid waste system:

- *Emergency Operations Plan (SPU)*
- *Continuity of Operations Plan (SPU)*
- *Disaster Debris Management Plan (City of Seattle)*

SPU's Solid Waste Utility also responds to incidents and events that do not require activating emergency response plans but do require a special response, such as:

- Parades, marches, or demonstrations that require special collection of dumpsters and carts (in coordination with the City Emergency Operations Center and Seattle Police Department)
- Severe weather that affects City-managed collection and transfer station schedules, like ice and snow or extreme heat
- Fires and hazardous releases in transfer stations and household hazardous waste sites

SPU Emergency Operations and Continuity of Operations Plans

The *Emergency Operations Plan (EOP)* and *Continuity of Operations Plan (COOP)* complement each other to ensure SPU can provide essential functions and services during and after emergencies. The EOP describes how SPU will respond to emergencies and restore infrastructure and systems, while the COOP describes how SPU will continue essential functions under a broad range of circumstances.

- **EOP:** Completed in 2019, the EOP contains information on how SPU will respond to potential events, crises, or disasters that could involve SPU staff, facilities, or operations.
- **COOP:** Revised in 2018, the COOP describes how critical functions, including solid waste, will be maintained in a significant emergency. The COOP outlines steps to maintain SPU's critical services, restore them to pre-established recovery time objectives, and sustain them for up to 30 days. The COOP also provides for continuity of management and decision-making if

senior and technical personnel are unavailable. SPU used the COOP in 2020 to develop the response to the COVID-19 pandemic.

City of Seattle Disaster Debris Management Plan

Last updated in 2018, the City of Seattle's *Disaster Debris Management Plan* sets guidelines for debris removal and processing after a debris-generating disaster. SPU recognizes the importance of maintaining public health and safety by planning for efficient removal of debris caused by disasters. The plan describes the City's responsibilities, procedures, and resources available after an emergency or disaster that over-taxes the normal solid waste system. The plan is designed to eliminate threats to life, public health, and safety and to ensure social and economic recovery of the affected community. The *Disaster Debris Management Plan* ensures that SPU and Seattle can:

- Address debris generated from residential or public properties in a timely manner after a debris-generating event
- Institute a plan to address debris generated on commercial and private property after a significant debris-generating event
- Ensure that vegetative debris, recyclable debris, and prohibited materials are diverted from landfilling after a debris-generating event
- Maintain clear and concise documentation of activities eligible for Federal Emergency Management Agency (FEMA) reimbursement under the Public Assistance Grant Program during response and recovery phases

SPU renewed standby contracts in 2020 for disaster debris management consultants and debris collectors. The following sections provide more detail about the disaster plan, including solid waste collection, impacts on facilities, and recycling.

Scope of Disaster Debris Management Plan

When activating the *Disaster Debris Management Plan*, SPU will follow two key sections: (1) Concept of Operations, and (2) Recovery. The Concept of Operations section lays out the planning and assumptions that would guide debris removal for specific disasters. After Seattle meets life safety needs, removal efforts would then occur in the recovery phase of an emergency. Two contracts support the *Disaster Debris Management Plan*: one for disaster debris collection and disposal, and one for debris monitoring and collection of FEMA records.

Solid Waste Collection and Emergencies

While increased volumes of solid waste may occur after a disaster, SPU will handle that waste through its existing contractors and steps outlined in the COOP. As a result, the *Disaster Debris Management Plan* does not separately plan for solid waste collection.

Current contracts for residential, commercial, and self-haul waste collection, transfer, and disposal require minimum levels of services despite unplanned events. For example, when Union Pacific Railroad shut down its rail lines, Waste Management, Inc. trucked solid waste containers to Seattle. Although solid waste services may stop during the initial response phase of a major disaster, SPU may also be able to provide these services, potentially at a reduced level, during the later extended response and recovery phases. SPU will use all available solid waste handling resources to provide the maximum achievable level of solid waste service during the recovery phase of a major disaster. During lower impact events, such as a severe windstorm, SPU may use normal solid waste resources to handle additional materials such as vegetative debris during the recovery period.

Local Solid Waste Facilities Capacity Impacts

Waste management activities also occur in the city outside of Seattle's collection contracts. These activities include private food and yard waste and recycling collection in the commercial sector, C&D collection and transfer, and recycling processing. Such activities are outside the scope of the *Disaster Debris Management Plan*. These materials are, however, transferred or recycled at local transfer and composting facilities. The capacity at these facilities is limited. If a disaster generates additional material through these private systems, SPU's ability to use the facilities may be impaired. Therefore, Seattle will rely on temporary debris storage and reduction sites to stage, reduce, and haul away debris.

Debris Diversion and Recycling

A secondary goal of the *Disaster Debris Management Plan* is to evaluate and maximize material recycling or diversion for beneficial use. Recycling facility options for recoverable disaster debris include Cedar Grove Composting, Lenz Enterprises, Renton Concrete, and Seattle Iron and Metal.



8

Construction and Demolition Debris

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Chapter 8 Construction and Demolition Debris

Overview

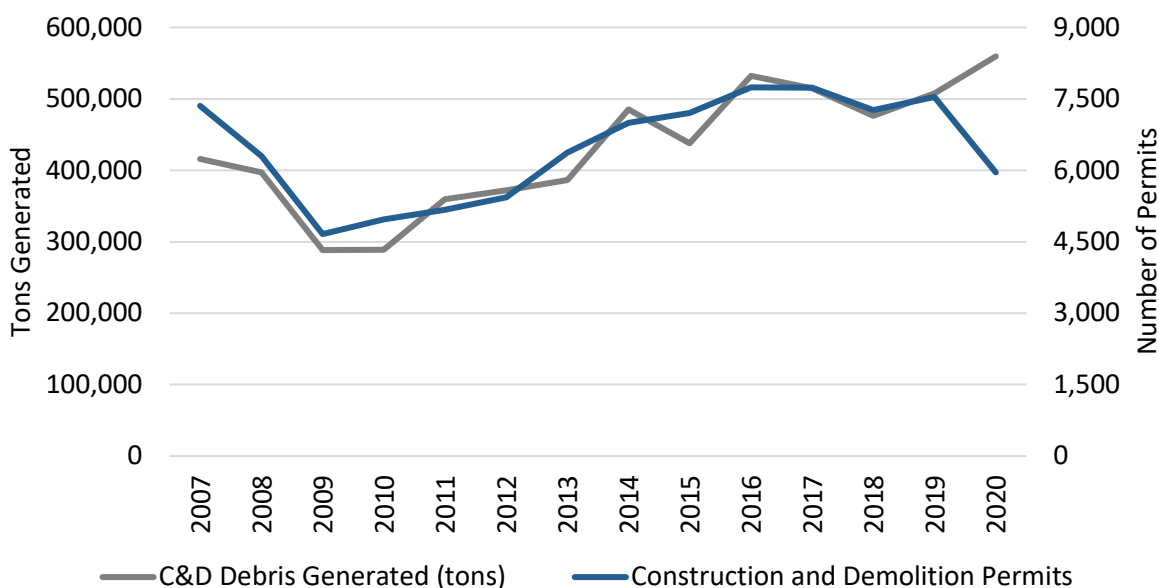
Construction and demolition (C&D) debris includes wood waste, metals, asphalt roofing, gypsum, concrete, and other materials generated by construction and demolition activities. C&D materials are self-hauled by construction contractors, third-party private haulers, or the City's contracted C&D waste collector to private recycling facilities for sorting or to private transfer stations for disposal. In some cases, construction contractors collect C&D materials in intermodal freight containers at C&D jobsites so they can be hauled directly to railheads for transport to a landfill.

C&D debris accounts for a large portion of Seattle's overall waste, estimated at approximately 560,000 tons in 2020 compared to nearly 712,000 tons of other waste from businesses and residents.¹ Typical C&D materials include concrete, asphalt paving, aggregates, wood waste, structural metals, asphalt composition roofing, gypsum wallboard, and insulation from C&D projects.

C&D debris generation is highly variable and closely correlated with economic activity, particularly in the construction industry (Figure 8.1 on page 8.3). The number of construction permits issued by the Seattle Department of Construction and Inspection (SDCI) has grown for nine out of the past 11 years, and SDCI anticipates that permits for new construction, remodeling, and demolition will generally continue at current rates, after recovering from dip in 2020 due to the COVID-19 pandemic. As a result, Seattle Public Utilities (SPU) expects C&D debris generation to be roughly as high as it is now for the foreseeable future.

¹ Seattle Public Utilities, "2020 Waste Prevention & Recycling Report," October 1, 2020, https://www.seattle.gov/Documents/Departments/SPU/Documents/Recycling_Rate_Report_2020.pdf.

Figure 8.1 C&D Debris Generation and Seattle Building Permits (2007-2020)



Sources: Permit counts from SDCI; tons from SPU, "2020 Annual Waste Prevention & Recycling Report."

In addition to recycling and disposal, many building materials can be reused. Factors that influence the potential for reuse include style trends, supply, condition while installed, and ease of removal without damaging. As with other types of waste, reuse is the highest and best use of discarded building materials. Salvage is the removal of select materials from a building before demolition. Salvaged materials include items such as cabinets, windows, wood flooring, and architectural features. The typical home or commercial space often contains many reusable items. Deconstruction, an alternative to demolition, is the systematic disassembly of a structure in the opposite order it was constructed to maximize salvage of material for reuse. While salvage of selected items is often free, full deconstruction typically costs more than demolition.

C&D Debris Terms:

Deconstruction: Taking apart a structure in an orderly and systematic manner to maximize salvage, reuse, and recycling

Salvage: Recovery of valuable or useful C&D materials for reuse.

Beneficial use: The use of solid waste as an ingredient in a manufacturing process, or as an effective substitute for natural or commercial products in a manner that does not pose a threat to human health or the environment. One example is using clean wood as industrial boiler fuel in certain boilers.



Reclaimed lumber from a grant-supported Sledge Seattle project to deconstruct a house by hand and salvage the lumber for reuse in new construction (Source: Sledge Seattle, 2019).

Beneficial use is another way to divert C&D debris from landfills if reuse or recycling are not possible. A common example is using C&D debris as a fuel for industrial boilers to replace other fuels.

This chapter describes Seattle's policies that improve C&D debris recycling and then describes the C&D waste management system—from collection to recycling, reuse, and beneficial use, to final disposal.

C&D Debris Requirements Encourage Reuse and Recycling

To reduce the amount of C&D debris landfilled and monitor progress on C&D debris recycling, SPU adopted several regulations related to recycling C&D debris, assessing the feasibility of salvage before demolition, and reporting C&D debris quantities and destinations. To enforce C&D debris recycling regulations, SPU periodically inspects construction sites and C&D debris processing facilities. The section details Seattle's requirements to encourage C&D reuse and recycling and efforts to increase deconstruction.

Disposal Bans

In March 2011, the Seattle City Council passed [Ordinance 123553](#), codified in Seattle Municipal Code [21.36.089](#).²³ The ordinance prohibits disposing of asphalt paving, bricks, and concrete in any type of garbage container at construction sites. It also prohibits disposing of these materials at private or public transfer stations. Materials must be delivered to a [qualified C&D recycling facility](#).⁴ Exceptions to this disposal ban include painted materials, those made with hazardous materials, or those present only in very small quantities.

Disposal bans began in 2012 with education and outreach about the new requirement, and penalties were not applied until 2013. In 2014, Seattle implemented disposal bans on metal, cardboard, and new construction gypsum scrap. In 2015, the disposal bans expanded to include clean wood. To enforce C&D debris disposal bans, SPU periodically inspects construction sites. Additional disposal bans are currently on hold, pending the development of recycling markets for these materials.

Salvage Assessments

To improve diversion and reuse of C&D materials, Seattle requires salvage assessments for certain construction projects, in addition to banning specific C&D materials from disposal. Salvage assessments document the quantity of materials that could be salvaged and reused on-

² <http://clerk.seattle.gov/search/ordinances/123553>

³ https://library.municode.com/wa/seattle/codes/municipal_code/281112?nodeId=TIT21UT_SUBTITLE_IIISOWA_C21.36SOWACO_SUBCHAPTER_IISOWACO_21.36.089CODEWARERE

⁴ <https://www.seattle.gov/utilities/construction-resources/collection-and-disposal/construction-and-demolition/qualified-facilities>

or off-site before deconstruction and demolition of a project. Examples of salvageable materials include clean wood, siding, roofing materials, plumbing, and lighting fixtures.

All demolition and alteration projects of 750 square feet or greater or \$75,000 or more in value must complete a salvage assessment before they can obtain a building permit from SDCI.

Seattle adopted this requirement to increase building material diversion by raising awareness of materials that can be salvaged and resold and connecting construction decision-makers with building salvage professionals.

For alteration projects, the salvage assessment can be completed by an owner or owner's representative. For whole building removal, the assessment must be completed by a salvage verifier, which is a salvage or reuse retail company or a professional deconstruction or demolition contractor with knowledge of salvage retail markets.



Kitchen tile removal for salvaging (Source: Second Use, 2020)

C&D Facility Qualification

To comply with Seattle's C&D debris recycling requirements and disposal bans, construction contractors and C&D debris haulers are required to deliver C&D materials to qualified facilities for processing if they contain significant amounts of materials banned from disposal. SPU confirms the recycling activities at these receiving and processing facilities to ensure they comply with Seattle's C&D debris disposal bans. These facilities must meet state and local permitting requirements as well as performance standards for recovering key C&D materials from waste sent to landfill disposal. They must also report to Seattle on incoming and outgoing

construction materials that are reused, recycled, beneficially used, and disposed.⁵ This reporting helps Seattle track C&D debris generation and recycling. SPU's enforcement of C&D recycling and management requirements includes periodically inspecting construction sites and processing facilities.

Waste Diversion Reporting

All demolition projects and all new construction and alteration projects with a value of \$75,000 or greater or with an area of work that is 750 square feet or more must submit a [Waste Diversion Report](#) to SPU upon completion of the project.⁶

Waste Diversion Reports identify quantities of C&D materials generated from a specific project and where they were delivered for reuse (onsite), salvage (offsite), recycling, and landfill disposal. SPU may randomly audit Waste Diversion Reports for timeliness of submission and completeness. Audits may also investigate whether materials were delivered to qualified facilities in compliance with City regulations.

Recommendations

To improve compliance with C&D debris recycling and reporting requirements and increase C&D debris recycling, SPU makes the following recommendations:

Rec 28. Expand construction and demolition debris industry outreach and education

Education and compliance strategies include dedicated education and outreach support to C&D industry professionals and additional review of and follow-up on Waste Diversion Reports.

Rec 29. Improve enforcement of and incentives for compliance with construction and demolition system rules

Increase enforcement of existing C&D system rules, such as flow control, disposal bans, and disposal taxes, as applied to C&D haulers, transfer sites, and sorting facilities. Consider new levers and price signals to improve recycling compliance and ensure processing of most C&D waste rather than disposal.

⁵ Qualified facility recycling rate reports are completed by facilities and include their diversion rate estimates each quarter. Qualified C&D recycling facilities are required to provide Seattle with data on incoming and outgoing construction materials for reuse, recycling, beneficial use, and disposal.

⁶ http://www.seattle.gov/documents/Departments/SPU/Manual_WDR_Form.pdf

Deconstruction

Where demolition simply destroys a building, deconstruction involves deliberately removing individual materials so they can be reused elsewhere. Recycling, deconstruction, and salvaging materials for reuse must happen in ways that add minimal extra time and labor, which increase costs. Limited space and safety concerns also create challenges for diversion on job sites as structures may contain potentially hazardous material or materials that are difficult to remove or recycle.

The number of demolition permits has increased over the last few years to 731 permits in 2020 but is still lower than during the last economic peak in 2007 (806 permits).⁷ The combination of high numbers of demolished buildings and growing challenges of homelessness has highlighted the need to reduce the likelihood of buildings sitting vacant. SDCI previously incentivized residential deconstruction by expediting permits for deconstruction compared to demolition, but due to the larger concern around vacant buildings, SDCI now expedites permits for demolition.

Given that Seattle does not currently incentivize deconstruction and demolition is typically the less expensive option, SPU is working with King County to evaluate the feasibility of a residential deconstruction ordinance and contractor certification program. SPU and King County formed the Deconstruction Advisory Group to develop an ordinance that would require deconstruction or alternative methods to substantially increase deconstruction, such as the deconstruction policy implemented by the City of Portland, Oregon. Portland requires deconstruction instead of demolition of single-family homes or duplexes built in 1916 or earlier or designated a historic resource.⁸ Portland's ordinance covers approximately one-third of single-family demolition permits.



Sledge Seattle deconstructed a house by hand and salvaged lumber for reuse in new construction as part of an SPU grant project. (Source: Sledge Seattle, 2019)

⁷ Seattle Department of Construction and Inspection.

⁸ City of Portland Bureau of Planning and Sustainability, "Deconstruction Requirements," Accessed August 25, 2019, <https://www.portlandoregon.gov/bps/70643>.

Recommendations

The following recommendations focus on increasing C&D debris salvage and deconstruction. Though intended for implementation in the short-term planning period (within five years), these recommendations may take longer, as efforts specific to salvage and deconstruction for reusable building materials—and particularly requirements for deconstruction—depend on market conditions for reused and recyclable C&D material.

Rec 30. Promote salvage and deconstruction for reusable building materials

In this strategy, SPU would support establishing a salvage lumber warehouse or network of reusable lumber processors and retailers. In addition, SPU would explore opportunities to increase salvage through voluntary and regulatory efforts in partnership with SDCl. SPU would also be strengthening current salvage assessment requirements to promote follow-through implementation of salvage plans, an action recommended by Seattle SWAC in its response to the [2020 Waste Prevention & Recycling Report](#).⁹

Rec 31. Require deconstruction (instead of demolition) for select project sizes and/or project types to increase construction and demolition debris recovery

This strategy involves developing requirements for project sizes and/or types with high diversion potential to use deconstruction instead of demolition. For preliminary planning and evaluation, this strategy focuses on single-family houses and assumes approximately 30% of permitted demolitions (about 150 houses per year) would be affected by the requirement. Seattle SWAC recommended this strategy in its response to the [2020 Waste Prevention & Recycling Report](#).¹⁰

C&D Collection, Reuse, Recycling, and Disposal

SPU defines “recycling,” “beneficial use,” and “disposal” of C&D by how the material will be used, also called the end market, in [Administrative Rule #SPU-DR-01-07](#).¹¹ Examples of recycling

⁹ Seattle Public Utilities, “2019 Waste Prevention and Recycling Report,” October 1, 2020, https://www.seattle.gov/Documents/Departments/SPU/Documents/Recycling_Rate_Report_2019.pdf.

¹⁰ Ibid.

¹¹ <https://www.seattle.gov/Documents/Departments/SPU/Documents/DR0107WhatConstitutesBeneficialUseforConstructionDemolitionWaste.pdf>

end markets include concrete made into aggregate for road base, wood waste made into paper pulp for paper products, and gypsum wallboard reprocessed into new wallboard. An example of beneficial use is unpainted and untreated wood waste chipped and sent to an industrial boiler for energy recovery. The Washington State Department of Ecology may also approve a specific use as beneficial use under [Washington Administrative Code 173-350-200](https://apps.leg.wa.gov/wac/default.aspx?cite=173-350-200).¹²

Disposal includes using mixed C&D debris at a landfill as alternative daily cover (ADC) for garbage or as industrial waste stabilizer to solidify waste prior to placing in industrial waste landfills. Disposal also includes energy recovery at a mass burn facility that generates electricity from burning waste. Seattle's definitions of these end markets for C&D debris help ensure that materials are reused or recycled, when possible, rather than used as fill or directly disposed.

Collection

Seattle Municipal Code limits the hauling of C&D debris destined for disposal using dumpsters and drop-boxes to designated contractors selected by SPU. Seattle has contracted for disposed C&D debris collection since 2001 and awarded the current contract to Waste Management, Inc. in 2019. Material hauled by Seattle's contracted collector represents only a small portion (less than 1%) of the C&D debris generated within the city, because most of Seattle's C&D debris is either self-hauled by the construction contractors that generate the material, hauled by third-party private haulers for recycling, or collected directly in intermodal freight containers for transport by rail to landfill for disposal. The following explains who may haul C&D debris in Seattle based on the type of destination facility, either disposal or diversion.



¹² <https://apps.leg.wa.gov/wac/default.aspx?cite=173-350-200>

SPU staff by an intermodal container during a transfer station tour (Source: SPU Image Library)

Hauling for disposal. Waste Management, Inc. is the only company allowed to charge a fee for hauling C&D debris from any construction site within city limits for disposal. Businesses are not required to use the City-contracted collector if they haul their own waste or they haul wastes resulting from another service provided by the business.

Hauling for diversion (recycling or beneficial use). Any company or person can collect C&D debris materials if they are destined for recycling or beneficial use, which are both considered to be diversion. However, the collected materials may contain no more than 10% non-recyclable or non-beneficially used material, by volume. Recycling collection containers must be clearly labeled. C&D debris generators can save money if they recycle because they avoid city and state solid waste (garbage) taxes.

C&D recyclables can be collected either source-separated (each material type separated onsite) or commingled (mixed materials) recycling. An example of source-separated recycling is a drop box for clean wood waste only. New construction sites often use source-separated recycling containers because materials are easy to separate at each stage of building construction. By state law, jobsites must have a separate dumpster for waste when a recycling container is present.¹³ An example of commingled recycling is a drop box for mixed recoverable recyclables such as wood waste, metal, and wallboard. In our region, several facilities process mixed C&D waste, which offers alternatives to source-separated recycling and to disposal.

Who Can Haul C&D Debris?

C&D debris in Seattle is typically collected by the four types of people or entities and hauled to processing facilities for recycling, to private or public transfer stations for disposal, or to train yards for transporting to a landfill.

- 1 City-contracted collector.** The Seattle's contracted collector for C&D debris destined for disposal is Waste Management, Inc.
- 2 Self-haulers.** The person or entity that hauls the C&D debris is a self-hauler if they also generated the material. One example is a homeowner taking remodeling debris to Seattle transfer stations for disposal. C&D contractors who do demolition, new construction, and home or commercial remodeling are self-haulers when they take C&D debris from their own jobs to a city or private transfer station in Seattle.

¹³ Washington Administrative Code (WAC) 173-345-040, *Collection of solid waste and recyclable materials*, states "All sites where recyclable materials are generated and transported for recycling must provide a separate container for nonrecyclable materials (solid waste), using collection practices consistent with Chapter 173-350 WAC." <https://apps.leg.wa.gov/WAC/default.aspx?cite=173-345-040>.

- 3 Third-party private C&D debris haulers.** These entities offer hauling services to construction or demolition contractors. If they receive a fee for their service, they may transport only C&D debris for recycling and must deliver it to qualified receiving and recycling facilities.
- 4 Intermodal haulers.** These haulers provide intermodal freight containers to collect C&D debris from construction sites and transport them directly to railhead for long-haul transport to landfills. C&D debris collected directly in intermodal containers is excluded from the City collection contract. Construction contractors can hire any third-party private company for intermodal service. Demolition contractors often use 100-cubic-yard intermodal containers. A transfer tax applies to intermodal containers of C&D debris loaded at job sites and delivered to Seattle's two railheads for landfill disposal.

Reuse and Recycling

Although the private sector has substantially expanded C&D debris processing capacity in the Puget Sound area over the past decade, C&D debris recycling remains a dynamic industry subject to changes in economic activity and variable markets that mostly rely on the capacity and value of regional hog fuel, without any guarantees that the recycling infrastructure will remain available. Given the highly varied nature of C&D debris recycling, Seattle closely monitors local processing capacity for current and potentially recyclable C&D materials.

Effective and resilient C&D debris recycling requires strong and stable end markets for recovered building materials. SPU tracks markets for materials currently banned from disposal to identify opportunities to expand bans to additional materials. SPU monitors markets for plastic wrap, asphalt shingles, and carpet to evaluate the feasibility of future disposal bans as these have shown potential in the past.

SPU also engages in market development, which refers to efforts to develop local processing capacity and end markets. Market development may include activities such as increasing the supply of structural lumber for reuse instead of disposal or increasing the supply of clean wood for use in wood composite product or pulp and paper manufacturing, rather than diverting it to lower value "beneficial use" end markets such as industrial boiler fuel.

In the Seattle area, a wide variety of facility types receive and process C&D debris for reuse or recycling according to City qualification standards. The following sections describe and list facilities based on their qualification with Seattle as of September 2021. The City qualifies salvage and reuse facilities (Table 8.1), source-separated recyclers (Table 8.2), and mixed C&D recycling facilities (Table 8.3). Seattle prohibits the disposal of recyclable C&D debris.

Salvage and reuse facilities for building materials. These businesses collect and sell used fixtures, structural lumber, metal pieces, and other salvageable materials.

Table 8.1 Seattle Salvage and Reuse Facilities for Building Materials

FACILITY NAME	ADDRESS	MATERIALS
Ballard Reuse	1440 NW 52nd St. Seattle, WA	Reusable building materials, reusable wood, brick
Second Use Building Materials	3223 6th Avenue S. Seattle, WA	Reusable building materials, reusable wood, brick
Earthwise Building Salvage	3447 4th Avenue S. Seattle, WA	Reusable building materials, reusable wood, brick



Construction site for three new homes using reclaimed lumber in West Seattle (Source: Seattle Sledge, 2019)

Source-separated C&D debris recycling facilities. These facilities recycle single commodities that have been separated at the job site, such as clean wood waste, concrete, gypsum scrap, metal, or tear-off asphalt shingles. Source-separated facilities account for much of the C&D debris recycling in the region. These facilities are often located outside Seattle, usually have very low tip fees compared to disposal, and report achieving high recovery rates (around 95%).

Table 8.2 Source-Separated C&D Debris Recycling Facilities

FACILITY NAME	ADDRESS	MATERIALS
Ace Metals	11110 Mukilteo Speedway Mukilteo, WA	Metals
All Wood Recycling	8504 192nd Avenue NE Redmond, WA	Asphalt paving, concrete and rocks, metals, landclearing and yard debris, pallets, wood
Binford Metal Recycling	26133 78th Avenue S. Kent, WA	Metals
Bloch Steel Industries	4580 Colorado Avenue S. Seattle, WA	Metals
Cadman, Inc.	18816 NE 80th Street Redmond, WA 26111 SE Green River Road Black Diamond, WA 19221 High Rock Road Monroe, WA	Asphalt paving, bricks, clean soils
Cedar Grove Composting Co.	7400 8th Avenue S. Seattle, WA 17825 Cedar Grove Road SE Maple Valley, WA	Landclearing and yard debris, pallets, wood
CEMEX – Everett	6300 Glenwood Avenue Everett, WA	Asphalt paving, bricks, concrete and rocks, clean soils
Dirt Exchange	1521 NW 50th Seattle, WA	Asphalt paving, landclearing and yard debris, clean soils
Fruhling Sand and Topsoil	1010 228th Street SW Bothell, WA	Asphalt paving, clean soils
Icon Materials	R Street SW & Oravetz Road Auburn, WA	Asphalt paving, metals
Lautenbach Industries	13084 Ball Road Mt. Vernon, WA	Asphalt paving, concrete and rocks, metals (steel only), wood
Lloyd Enterprises, Inc.	80 5th Avenue Milton, WA	Asphalt paving, bricks, concrete and rocks, clean soils, wood
Lynnwood Recycling	16123 Highway 99 Lynnwood, WA	Metals

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FACILITY NAME	ADDRESS	MATERIALS
Maltby Container & Recycling	20225 Broadway Avenue Snohomish, WA	Asphalt paving (limits), concrete and rocks (limits), drywall (limits), metals (limits), cardboard (limits), wood (limits)
Miles Resources	2800 104th St. Court South Lakewood, WA	Concrete
National Pallet Service	15505 S. Prairie Carbon River Rd Orting, WA	Pallets
New West Gypsum	8657 S. 190th St. Kent, WA	Drywall
Non-Ferrous Metals, Inc.	230 S. Chicago St. Seattle, WA	Metals
Northwest Metal and Salvage	9607 Aurora Avenue N. Seattle, WA	Metals
Pacific Iron & Metal	2230 4th Avenue S. Seattle, WA	Metals
Pacific Topsoils, Inc.	1212 N 107th St. Seattle, WA 6000 S. 129th St. Seattle, WA 1733 127th Avenue NE Bellevue, WA 7500 NE 175 th Kenmore, WA 9830 Renton-Issaquah Road SE Issaquah, WA 20871 NE Redmond Fall City Rd Redmond, WA 8616 219th St. SE Woodinville, WA 21700 SE Lake Francis Road Maple Valley, WA	Asphalt paving, concrete and rocks, landclearing and yard debris, pallets, clean soils, wood
Palmer Coking Coal Co.	31407 3rd Ave Black Diamond, WA	Bricks, concrete and rocks, clean soils

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FACILITY NAME	ADDRESS	MATERIALS
Rainier Pallet and Crating Corp.	4402 B. St NW Auburn, WA	Pallets
Rainier Wood Recyclers	27529 Covington Way SE Covington, WA 3216 SE Redmond Fall City Rd Fall City, WA	Metals, landclearing and yard debris, pallets, wood
Renton Concrete Recyclers	500 Monster Rd SW Renton, WA	Asphalt paving, bricks, concrete and rocks
Resource Recovery Services, Inc	21818 76th Drive SE Woodinville, WA	Drywall
Resource Woodworks Inc.	627 E 60th St Tacoma, WA	Reusable building materials, wood
Schnitzer Steel	1902 Marine View Dr. Tacoma, WA 23711 63rd Ave SE Woodinville, WA	Metals
Seadrunar Recycling	28 S. Brandon St Seattle, WA	Cardboard
Seattle Iron & Metals Corp	601 S Myrtle St. Seattle, WA	Metals
Squak Mountain Materials LLC.	10430 Renton-Issaquah Rd SE Issaquah, WA	Asphalt paving, bricks, metals
Stoneway Concrete	510 Monster Rd SW Renton, WA	Asphalt paving, bricks, concrete and rocks
Sutta Company	2719 California Ave SW Seattle, WA	No materials specified
The Recycle Depot	851 Rainier Avenue S. Seattle, WA	Metals
United Metals	18827 Yew Way Snohomish, WA	Metals

FACILITY NAME	ADDRESS	MATERIALS
United Recycling	18827 Yew Way Snohomish, WA	Asphalt paving, bricks, concrete and rocks, drywall, metals, landclearing and yard debris, cardboard, pallets, clean soils, wood
Valley Recycling	312 W Valley Hwy S. Pacific, WA	Metals
Watson Asphalt and Paving Inc.	19220 Union Hill Road Redmond, WA	Asphalt paving
West Seattle Recycling, Inc.	3881 16th Ave SW Seattle, WA	Metals, cardboard
Wolford Recycling Facility	220014 W. Bostian Road Woodinville, WA	No materials specified

Qualified mixed C&D debris recycling facilities. These facilities recycle various commingled commodities such as wood waste, metal, gypsum scrap, carpet, packaging materials, and aggregates that have been collected mixed together. Nine facilities that are qualified to recycle mixed waste C&D debris operate in the Seattle-Tacoma area (Table 8.3). One additional facility is qualified to receive mixed C&D debris and transfer it to a qualified recycler. The qualified mixed C&D debris recycling facilities' tip fees in the table that follows are typically lower than disposal fees. On average, these facilities report recycling up to 90% of the loads they receive that consist of primarily clean, recyclable C&D debris.

Table 8.3 Qualified Mixed C&D Debris Recycling and Receiving Facilities

FACILITY NAME	ADDRESS	TYPE
DTG Maltby	8624 219th St SE Woodinville, WA	Mixed C&D recycling
DTG Renton	701 SW 34th St Renton, WA	Mixed C&D recycling
DTG Seattle	7201 E Marginal Way S Seattle, WA	Mixed C&D recycling
DTG Woodinville	5906 238th St SE Woodinville, WA	Mixed C&D recycling
Maltby Container and Recycling	20225 Broadway Ave Snohomish, WA	Mixed C&D recycling

FACILITY NAME	ADDRESS	TYPE
Recovery 1, Inc.	1805 Steward Street Tacoma, WA	Mixed C&D recycling
Republic's Black River Transfer Station	501 Monster Rd S Renton, WA 98055	Mixed C&D recycling
United Recycling & Container	18827 Yew Way Snohomish, WA	Mixed C&D recycling
United Recycling Seattle	74 S Hudson Street Seattle, WA	Mixed C&D recycling
Waste Management Eastmont Transfer Station	7201 W Marginal Way SW, Seattle, WA	Transfer to another Qualified Facility

To promote C&D debris waste prevention and recycling, SPU developed public information materials for contractors together with King County and SDCl in 2012.¹⁴ SPU's C&D debris waste management [website](#) now refers to King County's online [recycling database](#) for the most up-to-date information.¹⁵¹⁶

Disposal

The City of Seattle has legal authority to decide where and how to manage all of Seattle's solid waste that is not recycled or composted, including C&D debris. This legal authority is commonly called "flow control." C&D materials generated in Seattle and not delivered directly to the railhead in intermodal containers must be managed through the City's C&D disposal system, which currently includes the North and South Transfer Stations. Seattle handles C&D debris delivered by residents and small businesses to the transfer stations in self-haul loads the same way it handles other garbage. About 60,000 tons, or 62%, of the self-haul stream in the [2017–2018 self-haul waste composition study](#) was estimated to be C&D materials.¹⁷

Of the 60,000 tons of C&D debris in the self-haul disposal stream identified in the self-haul waste composition study, approximately one-fifth (nearly 13,000 tons) is material that is

¹⁴ [Construction Recycling Directory](#) (2012), which provides worksheets and guidance on how contractors can best reuse and recycle building materials

¹⁵ <http://www.seattle.gov/utilities/construction-resources/collection-and-disposal/construction-and-demolition>

¹⁶ <https://kingcounty.gov/depts/dnrc/solid-waste/garbage-recycling/recycling.aspx>

¹⁷ Seattle Public Utilities, prepared by Cascadia Consulting Group, "2017-2018 Self-Haul Waste Stream Composition Study," 2018, <https://www.seattle.gov/Documents/Departments/SPU/Documents/18%20Self-Haul%20Waste%20Stream%20Composition%20Study.pdf>.

covered by existing C&D disposal bans.¹⁸ If customers took the recyclable C&D debris directly to C&D recycling processors instead of to the City's transfer stations, this material could get recycled and Seattle's self-haul recycling rate and overall recycling rates would increase.

Residents and small businesses also sometimes dispose of C&D materials in curb or alley garbage containers that are set out for collection. An estimated additional 21,000 tons (5,000 tons in residential and 16,000 tons in commercial waste) were collected in residential and commercial garbage containers in 2018.¹⁹ Diverting recoverable C&D debris from curb or alley collection would increase Seattle's overall weight-based recycling rate.

Though some C&D debris enters Seattle's waste stream via the transfer stations, most non-recyclable C&D debris in Seattle is disposed of through private transfer stations, which typically have lower tip fees than Seattle's public transfer stations. Private transfer stations are typically set up to handle large, self-unloading trucks. Two railheads in Seattle accept large intermodal containers directly—mostly from demolition projects—for transport to a landfill. Table 8.4 lists facilities designated by the City to receive C&D debris from jobsites in Seattle for disposal of nonrecyclable mixed C&D debris.



A load of clean wood disposed at one of Seattle's transfer stations (Source: Katie Kennedy)

¹⁸ C&D materials currently banned for disposal include asphalt paving, bricks, concrete, metal, cardboard, new construction gypsum scrap, and unpainted and untreated wood. See <http://www.seattle.gov/utilities/businesses-and-key-accounts/construction/construction-waste/recycling-requirements>.

¹⁹ Estimated by applying compositions from the 2014 residential and 2016 commercial waste composition studies to 2018 tonnages.

Table 8.4 **Qualified Receiving Facilities for Disposal**

FACILITY NAME	ADDRESS	TYPE
City of Seattle North Transfer Station	1350 N 34th St Seattle, WA	Transfer station (receiving)
City of Seattle South Transfer Station	130 S Kenyon St Seattle, WA	Transfer station (receiving)
Republic Black River Transfer Station	501 Monster Road SW, Renton, WA	Transfer station (receiving)
Waste Management Alaska Street Reload Facility	70 South Alaska Street Seattle, WA	Transfer station (receiving)
Waste Management Eastmont Transfer Station	7201 W Marginal Way SW Seattle, WA	Transfer station (receiving)

Recommendations

SPU evaluated several options to expand and enhance its efforts to improve diversion of C&D debris from landfill. Based on this evaluation, SPU makes two recommendations.

Rec 32. Expand recycling market development for construction and demolition debris to support diversion of these materials from landfill

Expanded market development activities would support the sustainability and resilience of existing C&D recycling markets and foster new recycling markets to increase opportunities to recycle additional types of C&D materials. This strategy involves expanding efforts around recycling markets for asphalt shingles and clean wood as well as continued collaboration with King County Solid Waste Division on market development. Based on market conditions, SPU plans to periodically evaluate and reconsider the list of C&D materials proposed for disposal bans.

Rec 33. Enhance diversion of construction and demolition debris at transfer stations

This strategy includes enhancing education at transfer stations for self-haul customers who bring mixed C&D loads because 62% of self-haul waste is C&D debris and a large portion of this material is covered by existing C&D disposal bans^{5F}. Education would address the availability of local C&D recycling facilities and the list of recyclable C&D materials banned from disposal. Transfer station staff may redirect customers to these local C&D recycling facilities. SPU would also evaluate options for its transfer stations to capture reusable materials from loads that contain mainly one type of recoverable C&D material, such as reusable building materials and salvaged lumber.



9

Outreach, Education, Enforcement, and Compliance Support

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Chapter 9 Outreach, Education, Enforcement, and Compliance Support

Overview

To engage Seattle residents and businesses in waste prevention and recycling activities, Seattle Public Utilities (SPU) starts with outreach and education at the time a customer starts or changes waste services. SPU provides educational materials and instructions that customers can use at their homes, workplaces, or in the broader community. Where needed, SPU takes enforcement actions to achieve compliance with Seattle’s waste-related ordinances and contract provisions. Outreach, education, and enforcement of solid waste contracts and code work together across the solid waste management system, reinforcing behaviors that advance waste prevention and recycling.

This chapter describes the complementary work of the outreach and education teams and the solid waste Inspections & Compliance (Compliance) Team to advance the City’s solid waste goals. The chapter starts by describing how SPU conducts outreach and education to inform customers of solid waste information using various communications channels. It then details specific outreach and education programs by customer sector and concludes by describing how SPU enforces solid waste rules and supports contractor compliance with contract requirements.

Outreach and Education

SPU aims to effectively reach and serve all the diverse populations of Seattle, including people of color, immigrants and refugees, economically disadvantaged people, and English language learners. Recognizing that SPU’s customers come from different backgrounds and circumstances, SPU continues to grow its use of community-centered approaches for outreach and education, such as community-led design and community-based social marketing. For

instance, Seattle now provides more in-language, culturally relevant, and picture-based signage for solid waste carts and containers than ever before. SPU uses transcreation to provide audience-specific outreach and education. Where translation simply changes words into another language, transcreation ensures the meaning is clear and relevant in another culture. Figure 9.1 shows an example of a transcreated flyer where SPU adapted both the words and format.

Figure 9.1 Examples of Transcreated Flyers



Source: Seattle Public Utilities.

Different audiences require different approaches, some of which may be more expensive to implement than others. In balancing SPU's overall goals, an approach that appears most cost efficient in theory may not necessarily be the most cost effective in practice. For example, sending a letter to all residents might be the cheapest way to provide information to residents, but to effectively reach the intended audience, the letter may need to be provided in multiple languages or combined with a follow-up outreach phone call. Achieving service equity involves accounting for all the costs of implementing education, outreach, and enforcement activities that are needed to achieve the necessary behavior changes for different audiences. Creating

effective outreach also involves conducting tests and pilots to identify and confirm the best approach for reaching specific audiences.

In general, SPU avoids a one-size-fits-all approach to outreach and education by identifying and tailoring targeted messages and approaches that are most effective for diverse audiences and finding opportunities to reach all communities. SPU works closely with its partners to develop and/or promote SPU's solid waste programs. SPU partners with other City departments, school districts, local governments, and state and nonprofit agencies to better serve its customers. SPU also partners with its contracted solid waste service providers to develop and deliver education to customers on properly sorting materials. SPU invites input from the public through the Contact Center's customer service team as well as Seattle's Solid Waste Advisory Committee (SWAC), which provides opinion and analysis on solid waste issues, programs, and services.

Since adopting its *2011 Solid Waste Plan Revision*, SPU has continued to expand its partnerships with community-based organizations, particularly those that serve people of color, low-income households, immigrants, refugees, indigenous peoples, and English language learners. For example, SPU partners with community organizations to deliver linguistically and culturally relevant community engagement through the [Community Connections Program](https://www.seattle.gov/utilities/protecting-our-environment/community-programs/environmental-justice-and-service-equity/community-connections).¹ Effective programs include these communities during the planning stage of a program or project, not just during implementation. Other SPU programs that use community partnerships to offer culturally relevant education include the Green Business Program, Natural Yard Care Program, and the Multifamily Outreach Program.

SPU also uses customer surveys to inform outreach and education efforts. Feedback from customers has helped define which tactics are most effective when promoting solid waste programs. In addition to survey efforts, SPU conducts customized focus groups to gather information on awareness, participation, and barriers related to specific audiences. For example, in 2016, SPU conducted in-language focus groups with multifamily residents who



SPU's residential recycling poster in Spanish (Source: Seattle Public Utilities)

¹ <https://www.seattle.gov/utilities/protecting-our-environment/community-programs/environmental-justice-and-service-equity/community-connections>

spoke Spanish, Chinese, Vietnamese, and Somali to learn about the barriers that each group experiences in keeping food scraps out of the garbage. SPU used insights from these efforts to develop new program strategies.

Seattle requires its contracted collection service providers to also provide education and outreach to customers, including culturally appropriate and in-language communications materials. Required customer engagement activities for the collection contractors include outreach and education on:

- How to sign up for and change services (commercial customers only)
- When to set out materials (collection calendars)
- How to properly sort materials and minimize contamination of recyclable and compostable materials
- Reminders on proper waste sorting using “Oops Tags,” which collection truck drivers leave on containers when customers do not place materials in the correct container

City collection contractors are also required to provide door-to-door tenant education and develop an overall outreach campaign with an emphasis on reaching people of color, people who speak Tier 1 languages (Cantonese, Korean, Mandarin, Somali, Spanish, Tagalog, and Vietnamese), and people born between the years 1981 and 1996. The next section describes the ways in which SPU delivers solid waste information to customers.

Customer Communications

SPU delivers culturally relevant and image-based solid waste information to utility customers through different communication and customer service channels. To understand which messages resonate with customers, SPU tracks measures of engagement for website usage, app activity, and other communication tools, such as page views and unique visitors to online material, described below.

City Websites

Seattle uses several webpages to communicate with customers:

- [SPU's website](http://www.seattle.gov/utilities) is a key source of information for Seattle's solid waste programs and services. The website describes Seattle's solid waste services, rates, and rules.² It also holds planning

² <http://www.seattle.gov/utilities>

documents, reports, informational brochures, and instructional videos to show residents and businesses how to properly manage their waste.

- The [Collection and Disposal](#) page of SPU's website provides customers solid waste information either by waste type (recycling, food and yard waste, garbage) or by customer sector (single-family, multifamily, commercial, self-haul). The website has forms customers can use to request service changes or report a missed collection.³
- The [Where Does it Go?](#) online lookup tool on SPU's website allows customers to look up how to recycle, compost, or dispose of hundreds of items.⁴
- The [City of Seattle Utility Services Website](#) allows customers to log into their utility account to see their services and bills, get updates on services, pay invoices, report missed pick ups, and make requests such as changes to service levels, replace missing carts, or request special services.⁵

Social Media

SPU uses multiple social media channels, such as Facebook, Twitter, Instagram, TikTok, Pinterest, YouTube, and Nextdoor, to share information and engage with customers. With the COVID-19 pandemic placing restrictions on in-person outreach, SPU has pivoted from traditional print-based media and ramped up social media efforts, resulting in online views from thousands of customers each week. SPU posts information on solid waste topics three to four times a week, including:

- *Where Does it Go Wednesday* posts with information about how to sort confusing items.
- Promotion of outreach events, such as Recycle and Reuse Collection events, where customers can drop off hard-to-recycle items, such as clothing, furniture, and foam.
- *Ask Evelyn Live*, a weekly show on Instagram TV that started in April 2020, addresses customers questions about solid waste. Short clips from shows are promoted on Facebook, Instagram, TikTok, and SPU's YouTube channel and are used for additional social media promotion.
- Pinterest boards highlight waste sorting and reduction behaviors and tips.



A social media post promoting Ask Evelyn (Source: SPU's Instagram account)

³ <http://www.seattle.gov/utilities/your-services/collection-and-disposal>

⁴ <https://www.seattle.gov/utilities/your-services/collection-and-disposal/where-does-it-go#/a-z>

⁵ <https://myutilities.seattle.gov/eportal/#/>

Mobile Apps

SPU promotes two mobile phone apps that customers can use to request solid waste services and get updated information:

- The [Recycle It](#) app provides collection day notifications, enables customers to report service issues, and connects to the *Where Does It Go?* tool for information on waste sorting.⁶ The Recycle It app sends customers weekly notifications the day before their collection day to remind them of which carts to put out that week.
- The [Find It, Fix It](#) app allows customers to report issues to the City, such as illegal dumping.⁷

Contact Center

Customers can receive information about SPU programs and services and access their billing and service information by calling the contact center at (206) 684-3000. Contact center services are designed to help utility customers set up and manage services and understand the program rules, costs, and overall goals. Contact center staff receive training on solid waste programs to provide quality customer assistance.

Mailed Materials

SPU also uses several non-digital tools to communicate with customers. SPU sends the printed materials to customers, including an annual mailer, an every-other-month newsletter, and additional direct mail on specific topics.

Annual collection calendar and services mailer. At least once a year, SPU's single-family, multifamily, and commercial customers receive mailers that outline their solid waste services, collection calendars, and billing services. Single-family customers and multifamily property managers receive an annual collection calendar with the scheduled pick up day(s). Once a year in February or March, single-family customers also receive a *Where Does it Go?* flyer with sorting guidelines and information on curbside and drop-off services for recycling and safe disposal of a wide range of items. Multifamily property residents receive annual sorting guidelines, although they typically receive service through their property manager's account.

⁶ <https://www.seattle.gov/utilities/your-services/collection-and-disposal/recycling/recycle-it-app>

⁷ <https://www.seattle.gov/customer-service-bureau/find-it-fix-it-mobile-app>

At Your Service newsletter.⁸ Customers who receive paper bills receive a physical copy of this two-page newsletter included with bi-monthly billing. Those who use electronic billing receive it as a link in their electronic statement. The newsletter highlights SPU's services for customers, field operations (giving customers a behind-the-scenes view of SPU's services), and updates on services and billing.

Direct mail on specific topics. SPU also uses direct mail for specific needs, such as informing customers citywide on how to sort materials and the impacts of improper sorting, or for certain customers to address issues at specific sites or share information on programs for specific types of customers. These letters can be created and mailed automatically for specific needs where the issue is recurring. SPU can send these letters to the service address in multiple languages to address customer language needs.

Containers, Labels, and Signage

SPU views waste containers, labels, and signage as opportunities to reinforce desired behaviors of waste prevention, recycling, and composting. As a result, SPU has been working to use consistent color-coding in all solid waste containers, posters, stickers, and flyers across programs and customer types: gray or black for garbage, blue for recycling, and green for food and yard waste (also called compost).



SPU containers use blue for recycling, gray or black for garbage, and green for food and yard waste (Source: SPU Image Library)

⁸ <https://atyourservice.seattle.gov/>

Color-coded containers. Residential carts have consistently used the gray/black, blue, and green color scheme for many years. SPU is still working to standardize multifamily residential garbage dumpsters to be gray. Since 2017, SPU's contracted collectors have been delivering gray containers when multifamily customers need new or replacement garbage dumpsters, which will eventually eliminate the non-standard green garbage dumpsters that remain in use throughout the city. Although not required, the City's contracted waste collectors have also started to use gray dumpsters for commercial garbage customers in Seattle, and, in some cases, elsewhere in the region.

Signage and labeling. Like other education materials, SPU's solid waste container signage focuses on five main material types to reduce customer confusion and contamination: paper, cardboard, plastic bottles/containers, metal, and glass. Container signage includes posters, labels, or decals and consistently uses the same images and icons as other education materials. SPU has translated signage into Seattle's four most common languages, which are English, Chinese, Spanish, and Vietnamese, and is also transcreating solid waste materials into these languages.

"Oops" Tags. When needed, collection drivers leave an "Oops" Tag for customers to remind them of the solid waste rules (See Figure 9.2). These are updated yearly.

Figure 9.2 "Oops" Tags Showing Materials Accepted and Not Accepted in Food and Yard Waste or Compost, Recycling, and Garbage



Source: Seattle Public Utilities.

Recommendation

To support proper customer sorting of materials at collection containers, SPU makes the following recommendation.

Rec 34. Continue and expand use of large, color-coordinated, multilingual, and icon-based container decals to encourage proper sorting of waste

In 2017, SPU developed large, color-coordinated, multilingual, and icon-based container decals. They are currently applied to new dumpsters and embedded in the lid of all new carts. SPU should continue to use the decals on new dumpsters and carts, but also explore a focused effort to apply the new decals to existing dumpsters and carts to increase the availability of this signage to a broader range of program participants, particularly in areas where a high percentage of residents speak English “less than very well.” Additionally, SPU should work to design culturally relevant signage in consultation with community-based organizations.

Customer Programs

SPU's work to highlight customer programs, set customers up with appropriate solid waste services, educate customers on the impacts of their behavior, and communicate regulations helps advance Seattle's solid waste and resource conservation goals. SPU uses community-based social marketing, among other strategies, to effectively engage customers and encourage them to divert or prevent as much waste as possible. When delivering outreach and education to customers, SPU aims to:

- Provide communications, outreach, education, and technical assistance that is effective, racially equitable, inclusive, and culturally relevant to enable all waste generators to access and benefit from SPU's solid waste services in a way that meets customer needs

Customer Programs on Specific Topics Discussed in Other Chapters

Natural yard care, food waste prevention, and other prevention: Chapter 4, *Waste Prevention and Reuse*

Recycling and composting: Chapter 5, *Recycling and Composting Policy and Market*

Construction and demolition (C&D) debris: Chapter 8, *Construction and Demolition Debris*

- Build public awareness of how to participate in community solid waste programs, how to save money on solid waste bills, the impacts of waste generation and recycling, and the benefits to public and environmental health of disposing of waste properly
- Maintain flexibility to adjust outreach, education, and technical assistance approaches over time to reflect changes in SPU priorities, demographics, key topics, or audiences
- Support awareness of and compliance with solid waste rules and regulations designed to promote prevention and reduction of waste
- Inform residents about the impacts of service disruptions such as snowstorms, extreme heat, flooding, and earthquakes

To achieve these objectives, SPU and its contractors use a variety of outreach and education strategies and tactics, which are described by customer sector in the following sections.

Commercial Outreach and Education

Most solid waste outreach and education programs for Seattle's commercial customers provide extensive technical assistance through SPU's [Green Business Program](#) or the City-contracted solid waste collectors.⁹ Technical assistance provides tailored support to help businesses and organizations prevent and reduce waste by changing their equipment, operations, or systems. As a partner of the statewide [EnviroStars program](#), SPU cooperates and coordinates with other jurisdictions around the state to share resources and recognize businesses that implement resource conservation actions, including waste reduction and diversion.¹⁰

SPU staff, consultants, and community partners (including community-based organizations and solid waste service providers) provide waste prevention, recycling, and composting resources, education, and technical assistance at no cost to commercial or nonresidential customers. These efforts include a focus on providing in-language support for immigrant and refugee-owned businesses.

In the commercial sector, customers receive direct mail materials customized to their business types such as postcards or event notifications sent to food service, automotive, or other sectors. Focused outreach to food service businesses provides information on food service packaging requirements and provides various forms of support through training and resources. SPU also provides signs, indoor containers, posters, and stickers to help businesses set up recycling and compost collection. Posters and stickers are available in English, Amharic,

⁹ <http://www.seattle.gov/utilities/protecting-our-environment/sustainability-tips/green-your-business>

¹⁰ <https://envirostars.org/>

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Cambodian, Chinese, Japanese, Korean, Laotian, Oromo, Russian, Somali, Spanish, Tagalog, Thai, Tigrinya, and Vietnamese.



SPU consultant provides technical assistance to a business customer (Source: Seattle's 2019 Waste Prevention & Recycling Report)

Compost posters for restaurants are available showing foods relevant to eight different cuisines, and they can be further customized on request. Businesses can use the [waste poster order form](#) on the SPU website to request that flyers and stickers be sent to them by a mailing house.¹¹ Technical assistance includes onsite waste audits, in-language training for staff, and recommendations on collection service levels.

Outreach and Education to Institutions

Through the Green Business Program, SPU also provides support to various institutions including hospitals, colleges, universities, and large commercial entities. SPU provides technical assistance, assesses waste service levels and access, and supports implementation of new

¹¹ <https://www.seattle.gov/utilities/protecting-our-environment/sustainability-tips/waste-prevention/at-work/waste-poster-order-form>

services or service changes to help reduce and manage these customers' solid waste streams. SPU provides additional support to schools for both waste prevention and diversion, including:

- **Technical assistance** to improve sorting, recommend container sizes and collection frequencies tailored for customer needs, and collaborate with school staff, service providers, and students to increase recycling and compost rates and to decrease overall waste generation.
- **Education** to drive sustained behavior change that increases waste prevention and improves sorting, which can reduce contamination in recycling and food and yard waste streams. This education can take the form of support to staff and students within the school, field trips to SPU transfer stations, and engagement with school green teams.

Single-Family Outreach and Education

With several programs that promote recycling and composting to single-family customers, SPU relies on audience research and data analysis to develop messages that will resonate with customers to reinforce desired behaviors, such as keeping recyclables empty, clean, and dry, or sorting waste into the proper containers. According to 2015 survey data, the top three most effective ways to deliver outreach message to single-family customers are: (1) direct mail, (2) community organizations, and (3) word-of-mouth.

Partnerships with community organizations and outreach at community events help SPU reach single-family residents in coordination with multifamily and commercial programs. SPU does extensive ongoing outreach through its community partners to reduce contamination in recycling and food and yard waste. SPU partners with Environmental Coalition of South Seattle (ECOSS) to contact customers who need additional assistance with how to sort or what containers to use. As needed, ECOSS also sends SPU requests for additional technical assistance or educational materials on behalf of customers.

SPU's Inspection & Compliance Team (Compliance Team) also uses a data-driven approach to identify single-family residential customers who need additional technical assistance with difficult issues such as recurring contamination such as garbage in the recycling or food and yard waste containers, improper storage or placement of containers, illegal dumping, or damaged or missing containers. These customers occasionally require onsite visits from SPU's Compliance Team to address site-specific compliance needs.

SPU follows up with customers on compliance-related solid waste issues in different ways. For example, customers whose recycling or composting containers are contaminated with garbage two or more times within six weeks receive a letter informing them of the issue and providing resources to address it. As part of a pilot program, customers with repeat contamination

violations in a small number of zip codes also received a follow-up call offering additional resources and support to correct the source of the contamination, ranging from additional education materials to onsite technical assistance. This technical assistance helps establish trust between SPU and its customers and gives SPU new insights into customer needs.

Self-Haul Outreach and Education



Education rooms at Seattle's transfer station providing information on recycling interactive activities (Source: SPU Image Library)

Seattle's two transfer stations provide education to their customers, mainly through signage in recycling areas and interactions with scale house and floor staff. The stations maintain an email list of the most frequent commercial customers to communicate with them as needed.

Both transfer stations offer a dedicated onsite education and viewing room. The onsite education and viewing rooms allow visitors to observe the activities on the tipping floor. The rooms also feature interactive exhibits on recycling and historic photos of waste collection. The North Transfer Station offers a toy model of the transfer station. At the South Transfer Station, the J.P. Patches Viewing Room overlooks the tipping floor to allow for observations by visitors and includes educational displays and videos.

Multifamily Outreach and Education

Once a year, SPU sends sorting guidelines to all 180,000 multifamily households. This mailing is an important strategy to inform households on how to participate in Seattle's recycling and composting efforts. Residents also receive information on how to report solid waste issues at their property. SPU sends annual mailers to all 7,000 multifamily account holders (typically the property owner or property manager) to inform them of SPU's free solid waste resources and how to request them.

SPU reviews building blueprints during the design phase of new multifamily properties to make sure they have enough space and adequate access to allow effective solid waste collection. SPU provides property developers and managers with a guide on choosing the appropriate size and

type of collection services to help them design new properties with adequate space and access for solid waste collection. When the building is ready for occupancy, solid waste inspectors from the Compliance Team have a one-on-one in-person session with property maintenance staff on setting up collection services, solid waste rules, and best practices for diversion.

Once a building is set up, SPU provides onsite technical assistance to multifamily properties as needed. These visits are conducted by outreach team members (SPU staff and inspectors, consultants, or contracted service provider staff) after solid waste collection services are set up.

In addition, the multifamily outreach team uses several metrics to identify and proactively visit buildings on an ongoing basis, prioritizing buildings that have lower recycling and/or compost service levels than SPU recommends, or higher garbage service levels (see Chapter 6, *Solid Waste Handling Collection and removal*, for recommended levels). SPU also visits and assists buildings that need support when they receive reports or complaints from property staff, residents, solid waste compliance staff, or the public.

During an onsite technical assistance visit, outreach staff walk through the building and around the site with property staff to evaluate solid waste collection. During the visit, they assess the ease and convenience of resident access to solid waste containers. The team notes where residents dispose of each of the solid waste streams taking notes, such as areas on every floor, on one floor, outside. The team also records other solid waste infrastructure information, such as the number of floors, towers, and whether the building has solid waste chutes, which enable residents to dispose of waste on each floor and transfers it to a central location at the bottom of the building. Based on data collected during the visit, outreach staff provide recommendations for improving resident participation and reducing contamination. The recommendations include optimizing the levels of collection service and the way collection containers are set up. Sometimes these recommendations reduce customer solid waste costs.

SPU also provides property staff with free tools such as large signage, compostable bag dispensers, and food scrap containers for small trash rooms and for individual apartment units. Figure 9.3 presents examples of multilingual icon-based decals that SPU offers to ensure recycling and compost bins are clearly labeled for English language learners. Property managers, property owners, and residents can also request flyers, posters, and stickers through the [SPU website](http://www.seattle.gov/utilities/your-services/collection-and-disposal/multi-family-properties/for-managers-and-owners/help-residents#order).¹²

¹² <http://www.seattle.gov/utilities/your-services/collection-and-disposal/multi-family-properties/for-managers-and-owners/help-residents#order>

Figure 9.3 Multilingual Icon-Based Bin Decals



Source: Seattle Public Utilities.

Once SPU has provided technical assistance to help optimize solid waste collection, SPU may conduct a resident training event at the property. A multilingual team of environmental educators will give a presentation, conduct a tabling event, or go door-to-door to provide the necessary information to address the main issues found during technical assistance. The team of educators may also distribute tools such as food scrap containers.

Finally, SPU supports “Recycling Volunteers” at multifamily buildings. A Recycling Volunteer can be a resident, property manager, or maintenance staff person who volunteers to learn about Seattle solid waste guidelines, post signage, and then educate other building tenants about proper sorting. This program helps empower a volunteer interested in helping their building recycle better to oversee proper handling and sorting of waste materials. Recycling Volunteers can be particularly helpful to tenants in buildings that may not have an onsite manager. SPU applies a one-time \$100 credit to the solid waste bill of participating properties, which normally benefits the property owner. SPU is exploring ways in which the Recycling Volunteer could benefit and be empowered to make improvements related to solid waste services.

To assess outcomes of these multifamily efforts, SPU collects information on the outreach conducted and qualitative information on how successfully the building is recycling or diverting food waste. To help evaluate the equity of service delivery, SPU reviews the distribution of outreach each year to assess whether buildings of different sizes and in all geographic areas are being served by technical assistance and other outreach efforts. SPU uses this information to adjust outreach in the following year.



SPU staff member at an annual event for property managers (Source: 2019 Waste Prevention & Recycling Report)

Construction and Demolition Debris Outreach and Education

SPU provides limited, industry-specific outreach on C&D debris requirements and recycling to:

- **Waste collectors** to remind them of C&D debris hauling regulations
- **Mixed C&D sorting facilities and construction professionals** on materials banned from disposal
- **Construction professionals** on conducting assessments for recoverable building materials on alteration and demolition projects.

SPU connects with construction professionals using information from the [SPU required forms](#) for building permit applicants. Chapter 8, *Construction and Demolition Debris*, contains recommendations for C&D education and outreach.¹³

¹³ <http://www.seattle.gov/utilities/construction-resources/collection-and-disposal/construction-and-demolition>

Recommendations

To expand and enhance education, outreach, and enforcement efforts that promote waste prevention and diversion behaviors, SPU makes these three recommendations.

Rec 35. Continue and expand use of available metrics to inform outreach strategy and measure outcomes

SPU's education and compliance staff should continue to work in coordination when conducting outreach to customers. In the multifamily sector, SPU should continue to focus on large buildings, buildings with service levels for recycling and compost that are below the recommended amount, and buildings with high solid waste collection costs. SPU should review solid waste service level data more often, such as monthly or quarterly. This data-informed approach helps SPU direct outreach and education to multifamily buildings with the highest potential to divert material. Because this approach may identify a greater need for outreach, SPU should also explore ways to scale up technical assistance efforts if needed, such as by working with several groups of consultants to provide education.

SPU should also evaluate its pilot program that provides technical assistance to single-family customers based on data regarding recurring contamination and decide whether and how to expand these data-driven outreach efforts citywide and to other customer sectors.

Ongoing measurement and evaluation of outreach and education activities helps SPU measure outcomes and ensure they provide effective, equitable, inclusive, and culturally competent outreach and education. To better inform outreach and measure outcomes, SPU should develop and implement performance measures on the following topics:

- **Measures to assess customer reach**, including awareness and use of solid waste services.
- **Racial equity-related metrics**, such as demographic distribution of education or enforcement activities. SPU seeks to ensure that residents living in the north and south areas of Seattle are being served, as these areas rank higher in priority in the Racial and Social Equity Index (which considers race, the population of English language learners, and potential socioeconomic and health disadvantages).¹⁴
- **Measures to assess community participation in planning, design, and implementation of SPU's education, outreach, and technical assistance programs**, as well as the number and strength of partnerships that support these efforts.

¹⁴ The Racial and Social Equity Index Map is a geographic analysis by the Office of Planning and Community Development that supports City planning, program, and investment priorities. It is described in more detail in Chapter 2, *Maximizing and Measuring Impact: Moving Upstream, Beyond the Recycling Rate*. The map can be accessed online at the following link:

<https://www.arcgis.com/home/item.html?id=f2e813896b04413ea57b5eeb76c61d8b>.

- Research and identify opportunities to **evaluate the performance of education, outreach, and technical assistance activities** and tie activities to waste prevention and/or diversion outcomes to the extent possible.

Rec 36. Continue participating in the regional Communication Consortium to unify solid waste messaging between Seattle and King County municipalities

Items accepted for recycling or composting can differ across jurisdictions, which creates confusion for SPU's customers who live or work outside Seattle. Unifying education and outreach messages across the region should reduce confusion and simplify education, helping to achieve desired customer behavior. In this strategy, SPU should support unified messaging on curbside recycling for Seattle and King County residents by continuing to participate in the regional Communication Consortium, a collaboration between communications staff from SPU and neighboring jurisdictions that resulted from the [Responsible Recycling Task Force](#).¹⁵

Continuing the Communication Consortium involves staff attending monthly meetings to develop consistent messaging and branding of communications materials, including transcreated materials, across the region. The Communication Consortium has already developed education materials to decrease contamination and sorting confusion in the recycling and compost waste streams, through the Recycle Right and Compost Right campaigns in 2019 and 2020. The success of this effort has brought in additional members from the Washington State Department of Ecology to participate and extend campaigns to a state-wide audience.

¹⁵ King County Solid Waste Division, "Responsible Recycling Task Force," Accessed August 25, 2019, <https://kingcounty.gov/depts/dnrp/solid-waste/about/advisory-committees/recycling-task-force.aspx>.

Rec 37. Expand waste prevention and diversion outreach and education in schools

SPU has piloted waste prevention and diversion programs in several schools, focusing primarily on Seattle Public Schools serving K-12 students. SPU school education and outreach should expand to also support independent schools. SPU should work to identify best practices for school waste prevention and diversion programming based on the results from ongoing pilot programs. SPU anticipates expanding school education and outreach to increase its reach and support schools in meeting waste prevention and diversion goals. For example, Seattle Public Schools have a waste generation goal of four cubic feet, per student, per month. To enable schools to share resources and education more effectively, SPU can work to create a peer-to-peer network for schools and facilitate information-sharing.

Sometimes outreach and education are not enough to ensure voluntary compliance with waste-related regulations. The next section describes Seattle's enforcement program for municipal code and compliance support for waste-related contracts.

Code Enforcement and Collection Contract Compliance Support

SPU attempts to give all customers the same opportunity to follow the solid waste code by providing standard, or universal solid waste education and tools. Most customers follow the solid waste rules most of the time. For customers that do not comply with the solid waste code, SPU conducts code enforcement activities, starting with outreach and technical assistance, to achieve compliance with solid waste rules and regulations. By enforcing solid waste code, SPU's compliance activities help advance Seattle's goals to provide safe, reliable, and efficient solid waste collection services, keep the city clean and safe, minimize waste generation, and maximize recycling and composting.

Seattle's Solid Waste Compliance Team, which includes both field operations and data management staff, concentrates most enforcement activities around the following Seattle Municipal Code (SMC) requirements for solid waste disposal, containment, container placement, recycling, and service levels. Requirements for residential customers relate to garbage container number, size, and waste sorting (SMC 21.36.050). Requirement for nonresidential customers relate to solid waste disposal, container number, and size (SMC 21.36.042 and SMC 21.32.044). All customers must follow requirements related to garbage container maintenance, condition, and weight (SMC 21.26.060 and SMC 21.26.070); container

placement (SMC 21.36.80); mandatory recycling of certain materials (SMC 21.36.083); service levels appropriate for the amount of garbage and rubbish collected (SMC 21.40.050 and SMC 21.40.070).

The Compliance Team also:

- **Provides litter code enforcement**, assisting the Clean City program to address illegal dumping submissions on the *Find It, Fix It* app that are at or near an existing solid waste collection service location.
- **Supports compliance with solid waste requirements for new construction in the land use code** by providing consultation on safe and adequate solid waste storage and access to SPU staff reviewing new construction designs for compliance with solid waste requirements in the land use code.
- **Enforces the SPU Director's Rule, "Temporary Container and Bag Placement and Removal At Curbs and Public Alleys,"** which allows temporary placement and removal of solid waste containers and bags for customers located within designated business districts in the Clear Alleys Program (CAP).¹⁶ The CAP is described in more detail later in this section.

Regulations and Requirements Discussed in Other Chapters

Single-use bags and food service packaging ordinances: Chapter 4, *Waste Prevention and Reuse*

C&D reporting requirements and recycling and facility certification: Chapter 8, *Construction and Demolition Debris*

Recycling requirements for residential and commercial waste generators, including the CAP: Chapter 6, *Solid Waste Handling Collection and Removal*

Secure load requirements and recycling collector reporting requirements: Chapter 7, *Solid Waste Transfer, Processing, Disposal, and Emergency Management*

Separate from code enforcement, the Compliance Team helps ensure reliable and equitable solid waste collection for City customers by assisting the Solid Waste Contracts Manager to enforce performance components of the two solid waste collection contracts. The Compliance Team provides the Solid Waste Contracts Manager, who oversees the City's solid waste collection contracts, with information compiled by inspectors in the field or through analysis of customer or contractor data, to enforce performance expectations of the collection contractors. An operations plan codeveloped by SPU and the contractors details how the City enforces performance components of the collection contracts.

¹⁶ https://www.seattle.gov/Documents/Departments/SPU/Documents/01_029884.pdf

Using Data Collection and Analysis to Monitor Compliance with Code and Collection Contract Requirements

SPU supports safe and efficient solid waste collections and compliance with solid waste-related code or collections contracts by tracking and auditing data from a variety of sources, detailed below. The Compliance Team uses these data sources to ensure reliable collections, monitor compliance, guide enforcement activities, and evaluate progress toward diversion goals. Compliance data can also help SPU understand the communication needs of residents and businesses by revealing which challenges occur repeatedly among a given set of customers. By identifying patterns in customer behavior, SPU can better tailor not only education and outreach messaging, but also SPU's approaches to achieving compliance. SPU reviews monitoring and performance data for the following areas:

- Regular reports from City-contracted collectors, which include reporting on collection of extra waste setout for collection (referred to as "extra setouts") over a six-month period and monthly contractual performance reports. "Extra setouts" refers to additional garbage, recycling, or yard waste that do not fit into the resident's curbside collection containers, which must be placed in a separate bag for collection and meet setout guidelines and rules. The variable bill that contracted collectors send to the City contains a wide variety of data and metrics used to verify contractor compliance and to conduct customer outreach and education.
- Solid waste subscription data, which indicate which types of services customers have, container sizes, and frequency of collection. The Compliance Team analyzes these data to help ensure customers are meeting all solid waste service requirements in the solid waste code.
- Collection exceptions data, which refers to information about nonstandard collections. Drivers note collection exceptions based on their observations while driving a route, such as

Beyond Code Compliance

In addition to providing solid waste-related code enforcement, the **Solid Waste Inspection & Compliance Team** advances SPU's diversion goals and helps ensure safe and efficient collections by:

- Supporting enforcement of performance components in the solid waste collection contracts through onsite audits of containers, for example
- Managing new service set ups and service changes for multifamily customer accounts and troubleshooting multifamily services issues
- Improving customer data, such as identifying and correcting billing errors in customer databases
- Investigating escalated customer issues through research and analysis to resolve them

excess waste set out by customers or issues related to blocked or locked containers. The Compliance Team uses this information to schedule field visits to conduct customer outreach and education or assess solid waste services and access.

- Work order requests related to service and billing errors that customers or contractors report. The work order requests are generated through the Customer Care and Billing (CCB) database or the SPU Customer Portal. To satisfy customer requests and resolve collection service issues, the Compliance Team compiles information it collects from making site visits in the field, reviewing customer service and billing history data, or speaking to customers and collection drivers directly.
- Geographical Information Systems (GIS) site datasets that map solid waste data, allowing allow SPU to identify areas that would benefit from additional compliance support, measure diversion program success, and find contamination in recycling and composting. Data compiled by the Compliance Team and customer-sector outreach and education teams where they are partnering on inspections of select multifamily, commercial, and C&D debris dumpsters for service level and diversion compliance. This work may include area-based customer and contractor audits in all areas of Seattle of customers who are not subscribed to adequate service as well as random audits to check on diversion requirements.
- Data collected during commercial and multifamily education and technical assistance efforts, which includes information about how collection service is set up on the property, notes about collection issues or best practices observed on site, and activity tracking for outreach and engagement.
- Find It, Fix It app reports of illegal dumping and overflowing solid waste containers. The Compliance Team reviews these reports and, if appropriate, contacts affected customers to determine whether the customer can assist with the issue or if the issue requires SPU to provide cleanup efforts.



Overflowing containers in an alley (Source: SPU Image Library)

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SPU uses several tools to gather, store, and analyze these data including GIS mapping and SPU's CCB database using an Oracle system. SPU uses GIS mapping to visualize and evaluate the distribution of collection exceptions and field activity data. SPU also analyzes billing and contamination data provided by collection drivers and tracks the actions taken to address contamination issues.

SPU's CCB Oracle system contains much of the performance data on both customers and collection contractors based on data collected from the Contact Center, customer reports, and collection drivers. This system provides hourly updates from the City to the City-contracted collectors and from these collectors back to the City. These updates indicate the status of the collection and any site or container issues that need to be addressed. It also includes data on variances in billing, such as extra pickups required for excess material. Along with data variances in billing, these updates detail improper use of solid waste services, including contamination of recycling or food and yard waste carts, that SPU uses to guide enforcement and customer education actions.



SPU's contractors and a member of the Compliance Team (foreground) review CAP services in the International District (Source: Pat Kaufman)

Data tools in development include the following:

- SPU is piloting an online inspection tool used on smart phones to enhance the inspector's data collection and enforcement activity in the field, or onsite.
- To be able to enforce code and contract compliance in the CAP, SPU is developing a way to send service requests through the City's software system to the collection contractors for those areas.

Enforcement and compliance activities require high quality data to identify customer risk issues and priority areas, particularly around areas with the largest opportunities for solid waste diversion. The Compliance Team conducts day-to-day solid waste data quality efforts to correct errors that impede safe and efficient solid waste collection services, prevent the advancement of diversion goals, or impact timely and accurate billing. The Compliance Team reviews the collection contractor and City's error data weekly to make corrections and improve data quality.

Enforcement at Multifamily Residential and Commercial Properties

Both the multifamily and commercial sectors receive education from SPU's outreach and education teams and contractors, including waste collectors, who provide technical assistance and in-language training, described earlier in this chapter. Compliance activities for these sectors include:

- **Weekly contamination inspections of multifamily dumpsters for any recycling or food waste in the garbage.** Currently, the Compliance Team can also replace missing or outdated container decals, address poor solid waste service management or container location issues, and/or replace broken or damaged dumpsters. The Compliance Team performs routine inspections of commercial dumpsters in select business districts for code compliance.
- **Weekly audits to confirm the accuracy of contractor-reporting of fees.** Customers are charged for extra food waste and garbage set out for collection.
- **Follow-up with customers whose collection driver has left an "Oops" tag on their container indicating the presence of recycling or food waste in the garbage.** The Compliance Team, together with outreach and education staff, sends a letter to the customer explaining how to properly sort their materials. If a driver issues a third "Oops" tag, the property can be fined \$50 per instance of contamination. The Compliance team consults outreach and education staff for assistance prior to issuing fines.
- **Referrals from the Compliance Team to SPU's outreach and education staff.** Outreach and education staff, instead of the Compliance Team, provide technical assistance and

compliance guidance through a growing partnership that allows each group to focus on diversion priorities.

Figure 9.4 “Oops!” Tags for Garbage, Recycling, and Food and Yard Waste



Source: Seattle Public Utilities.

Enforcement in Commercial Business Districts

The Compliance team works with the commercial education program and Seattle's collection contractors to partner on education and enforcement with nonresidential customers that need additional support in select densely developed high-traffic areas called "business districts." The Compliance Team monitors larger commercial districts weekly to ensure safe solid waste practices. Issues that are more common in business districts than in other areas include illegal dumping, dense dumpster placements, narrow and congested alleys, and litter and scatter around dumpsters.

The Compliance Team inspects commercial dumpsters and encourages the use of locking dumpsters for safe and organized collection areas. Enforcement at larger properties that use compactors is a particular challenge that requires a high level of resources and planning. Space

constraints in compactor staging areas present a key challenge to enforcement and compliance activities in both the commercial and multifamily sectors because they make onsite inspections difficult, if not impossible, to access compactors for code enforcement. Inspecting compactors at the transfer stations presents difficulties because compactors are often hauled at night outside of regular business hours.

The CAP helps to address six business districts throughout Seattle with older buildings that lack private storage for customer dumpsters. CAP customers use approved bags for solid waste services for garbage and recycle. These bags are picked up multiple times per day to keep the solid waste off the ground. The CAP program also picks up all illegal dumping in the alleys, keeping the alleys cleaner and safer. Keeping those alleys cleaner for pedestrian foot traffic and vehicle loading and unloading areas requires frequent collection and cleanup.

Enforcement at Single-Family Residential Homes

The Compliance Team enforces rules that apply to single-family customers by doing the following:

- **Weekly audits of data provided by City-contracted collectors to confirm accuracy of extra setouts and charges.** These audits help verify contractor billing and compliance with performance components in the collection contracts.
- **Review “Oops” tag data provided by City-contracted collectors to help identify customers who are not meeting the contracts or code requirements.** According to the collection contracts, truck drivers must tag containers containing excessive levels of contamination with an “Oops” tag and report the contamination using their on-board tablet. This information is then processed for education assistance, customer outreach, technical assistance, and compliance. “Oops” tags alert customers about how to address a range of issues, from garbage in the recycling to overweight containers.
- **Review reports of repeat contamination violations to ensure customers receive assistance to sort materials properly.** Solid waste collection drivers note repeated, continual contamination at sites on their route and include a brief description of the issue. When continual contamination issues are reported, SPU staff follow up with outreach via phone and a letter to help communicate code requirements. If a customer continues to contaminate recycling or food and yard waste (compost) streams despite these efforts, the City-contracted collector and SPU may agree to not service the contaminated containers and require a special pick up of the material as garbage.



SPU educational materials and flyers about waste sorting on an outreach table (Source: SPU Image Library)

As Seattle grows, SPU and the collection contractors must continually adapt to the complexities of an expanding customer base in an increasingly dense city. Changes in the cityscape due to growth and densification present many challenges for safe, efficient, and reliable solid waste collections. In the single-family sector, some of key challenges SPU is working with its partners to address include:

- **Increasing multi-unit townhome development in neighborhoods historically populated with single-family homes.** The proliferation of townhomes means customers set out more carts in limited areas, such as at the curb in small planting strip areas. Placing more carts in small areas can result in unreliable collections due to poor driver access, billing errors due to difficulties differentiating between customer containers, and litter due to poor customer access or unauthorized use of containers.
- **Increasing development of large multifamily properties with compaction services in historically single-family areas.** Properties with waste compactors require different collection trucks than single-family collection, resulting in more collections trucks in the neighborhoods overall. This requires the collection contractor to increase their crews and fleets, which can present challenges. Large multifamily compactors also present collection challenges as they require longer collection times and increased right-of-way access to load the compactors onto truck trailers for hauling.

These challenges can lead to unreliable collections and poor customer compliance with solid waste rules and regulations. To address these challenges, SPU works to adapt its compliance and enforcement to better support its customers.

Recommendation

To boost compliance with solid waste rules, SPU makes the following recommendation:

Rec 38. Expand efforts to increase compliance with solid waste code and requirements across customer sectors

SPU should identify and implement strategies to address non-compliance that cover all of Seattle's municipal solid waste codes. SPU should be more consistent in its enforcement activities across sectors and areas of the city. SPU can also expand partnerships with solid waste outreach and education efforts to address common issues. For example, increasing residential education on bulky pick up options may reduce illegal dumping issues. Specific areas of opportunity for increased enforcement include:

- To scale enforcement efforts, designate the Compliance Team as official “commissioned officers” with the power to write tickets for noncompliance.
- Improve the accuracy of dumpster inspections to better identify contamination. For example, SPU should develop an inspection and monitoring program to address large, compacted dumpsters, which are harder to inspect than other containers.
- Test using solid waste sensors in large garbage dumpsters for automated assessment of solid waste contents.
- Implement regular site visits to select large, regularly contaminating multifamily properties, focusing on improving set-up and monitoring of food waste collection and recycling. These properties need continued assistance to remain in compliance with solid waste code.
- Increase inspection at construction job sites to enhance compliance and increase C&D debris diversion. This will require developing an understanding of the building construction schedule.
- Increase the oversight and enforcement of business district solid waste commercial and multifamily services to enhance the cleanliness and safety of business district solid waste storage and service areas. The focus should be enforcement of solid waste code, such as the container maintenance code and the required services code.
- Require locking of dumpsters in business district areas and improve locking mechanisms to reduce illegal dumping and extreme scatter.

- Increase enforcement of CAP cart use found in the CAP Directors Rules to reduce out-of-compliance containers in the CAP areas, such as glass only recycle carts. This would improve overall alley conditions while improving compliance with solid waste code.
- Continue to implement and monitor outcomes from pilot partnerships with SPU's education and outreach staff regarding properties with more complex barriers to compliance. SPU should also consider opportunities to expand the program in the future.
- Increase enforcement of bans on food waste in recycling and garbage to help improve recycling quality and compliance with proper sorting.



10

Administration and Financing of the Solid Waste System

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Chapter 10 Administration and Financing of the Solid Waste System

Overview

The previous chapters in *Seattle's 2022 Solid Waste Plan Update (2022 Plan Update)* have described the services and activities that Seattle Public Utilities (SPU) provides, contracts for, or oversees to ensure solid waste in Seattle is managed responsibly. SPU's wide-ranging services help reduce waste generated in Seattle, maximize recycling and composting, collect and transfer waste efficiently, and process and dispose of waste safely.

This chapter explains how SPU administers and finances these services that support Seattle's solid waste system. It first describes key groups in SPU's organizational structure that administer or advise on SPU's solid waste services. Then it discusses how Seattle finances 1) operations and maintenance of the system through customer rates and 2) capital projects through customer rates, debt financing in the form of bonds, and cash. As part of the discussion of financing capital projects, this chapter includes SPU's six-year construction and capital acquisition program for solid waste handling and the estimated long-range needs for solid waste facilities 20 years in the future.

Organizational Structure

The Solid Waste Utility, one of three lines of business SPU, oversees solid waste services related to garbage, recycling, compost (food and yard waste), and other solid and moderate risk waste materials. Services include:

- Providing garbage, recycling, and food and yard waste collection and processing for Seattle's residential, multifamily, commercial, and self-haul solid waste customers
- Managing contracts related to waste collection, processing, and disposal services

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- Conducting inspections and other activities to ensure compliance with waste requirements
- Educating and providing assistance to customers to encourage waste prevention and diversion of waste through recycling and composting
- Operating Seattle's solid waste transfer stations
- Providing moderate risk waste collection and disposal services for the Hazardous Waste Management Program in King County
- Managing the City's historical landfills



SPU's Compliance Team (Source: SPU Image Library)

The Solid Waste Utility consists of the following teams:

- Solid Waste Planning and Program Management
- Solid Waste Operations
- Household Hazardous Waste and Landfills

Seattle's **Clean City programs** provide waste-related services that address illegal dumping, litter, community cleanup, and abandoned vehicles. Clean City programs are located within SPU's People, Culture, and Community Branch and are supported by the City's General Fund, separate from the Solid Waste Utility.

The **Environmental Justice and Service Equity (EJSE) team** supports SPU departments to carry out Seattle's Race and Social Justice Initiative (RSJI) and delivers inclusive and equitable services

to customers across the city. Environmental justice and service equity are key elements of the strategies that guide SPU's work:

- Embed race and social justice and service equity across SPU
- Engage historically underrepresented groups when working with communities
- Continue to align efforts within SPU to City, County, and community efforts

Environmental justice and service equity are the foundations of SPU's goal to be a community-centered utility. RSJI policies, such as the use of the RSJI toolkit, help SPU identify and overcome service equity gaps when planning a project, program, or policy.

SPU's priority is that race, language, income, age, or disability do not disadvantage customers or communities in receiving services. SPU needs to be fair and ethical in how risks and benefits are distributed throughout its projects. SPU considers the health of people and the environment and understands that not all customers have access to government services in the same way.

SPU also works closely with Seattle's **Solid Waste Advisory Committee (SWAC)**, a community advisory board that provides input on programs and decision-making within SPU and works to:

- Address issues in waste management including waste prevention, recycling, food and yard waste, collection contracts, and transfer stations
- Advise SPU on its findings and recommendations, including Seattle's Solid Waste Management Plan
- Communicate with other governmental agencies about solid waste issues

The SWAC's charter establishes the committee's purpose and clarifies its authority, roles, responsibilities, operating procedures, and rules.¹

Financial Policies

Financial policies help determine how much revenue SPU must collect from its customers each year to meet the costs of management, planning, operations, programs, maintenance, and capital improvements. Accordingly, rates are generally set to meet the financial policies as well as to meet projected systemwide solid waste needs.

¹ Seattle Public Utilities. "Solid Waste Advisory Committee Charter. April 2021.
(www.seattle.gov/Documents/Departments/SPU/CAC/SWAC-Charter.pdf)

SPU cannot determine rate impacts of specific courses of action recommended in *2022 Plan Update* without first considering financial policies. These policies include formal financial policies adopted via legislation as well as informal guidelines that have evolved over time in response to specific issues. SPU uses financial policies and guidelines to determine how to finance solid waste system management, planning, operations, programs, maintenance, and capital improvements.

Financial policies support the resiliency of SPU services in the face of potential future changes and disruptions. The goals of these policies are to:

- Ensure the financial integrity of the solid waste utility
- Smooth future rate increases for solid waste customers over the near- and medium-term
- Ensure an equitable allocation of capital costs between current and future ratepayers

Seattle adopted several formal financial policies in 2004 and added a debt service coverage policy in 2014:

- **Net income.** Net income should be generally positive.
- **Cash target.** The target for year-end operating fund cash balance is 20 days of contract payments for collection and disposal services. SPU follows a more stringent internal policy for 45 days of operating cash, as recommended by bond rating agencies.
- **Cash funding of the Capital Improvement Program (CIP).** A minimum of \$2.5 million (in constant 2003 dollars) of the annual CIP should be funded with cash. SPU also follows informal guidelines that call for funding the greater of \$2.5 million (in 2003 dollars) or 10% of the CIP in years of higher spending.
- **Debt service coverage.** Each year, debt service coverage on first-lien debt should be at least 1.70 times debt service cost with credit for City taxes, and at least 1.50 times debt service cost without credit for City taxes. See the Financial section below for details.
- **Maintenance of capital assets.** For the benefit of both current and future ratepayers, the solid waste system will seek to maintain its capital assets in sound working condition.
- **Variable rate debt.** Variable rate debt should not exceed 15% of total outstanding debt.
- **Debt structure.** As a general practice, the solid waste system will have level nominal debt service and will not defer the repayment of principal.

The next section describes the financial health these policies have created for SPU.



SPU Staff look through documents with a contracted collection drive (Source: SPU Image Library)

Financial Health

Financially healthy organizations have the flexibility to respond to unexpected circumstances, such as unanticipated repairs or a shortfall in earnings. Flexibility can mean redirecting expenditures, borrowing money to meet an unexpected need, or other approaches.

Debt service coverage is a key performance indicator of SPU's financial health. Debt service coverage is an annual measure of the revenue an organization has available to repay debt, divided by debt payments. SPU's debt-service coverage policy target is 1.70 with credit for City taxes and 1.50 without credit for City taxes. SPU has surpassed this target in the past and expects to meet the target in the period covered by the *2022 Plan Update*.

Credit ratings also reflect the financial health of an organization. They are an informed assessment of the long-term security of bond investments. Seattle's solid waste system has

excellent bond ratings: AA by Standard and Poor's and Aa3 by Moody's. These rating agencies account for a variety of factors including:

- Financial policies
- Strength of the local economy
- Legal security
- Risk factors
- Comparative rate levels
- Management capability and performance
- Willingness of elected officials to raise rates

SPU uses the **asset management** approach to capital planning and budgeting. Asset management aims to ensure that SPU fully considers a "triple bottom line"—financial, environmental, and social impacts—when making decisions about its programs and assets. SPU has implemented a comprehensive asset management program since 2002. SPU's current asset management program has focused mainly on capital (infrastructure) assets and projects, but SPU plans to apply this approach to additional non-capital (programmatic) decisions in the future.

An asset management approach helps SPU ensure cost effectiveness in service delivery in the long run. This cost effectiveness is reflected in SPU's financial results over the past five years (Table 10.1). From 2014 to 2020, SPU has consistently met its financial targets.

Table 10.1 SPU Financial Results 2014–2020 (in millions of dollars)

REVENUES AND EXPENDITURES	2014	2015	2016	2017	2018	2019	2020
Revenues							
Operating Revenues	157.5	174.8	183.7	209.6	205.6	225.0	224.1
Total Revenues	157.5	174.8	183.7	209.6	205.6	225.0	224.1
Expenses							
Solid Waste Collection	96.9	100.0	104.6	107.5	108.0	107.5	108.7
Operations and Maintenance	28.9	39.7	37.1	44.9	43.2	42.4	44.3
Taxes	20.2	20.6	21.8	27.8	28.6	30.1	30.2
Depreciation and Amortization	9.5	9.4	7.7	12.2	14.9	14.8	13.9
Total Expenses	155.5	169.7	171.2	192.4	194.7	194.8	197.0
Other Income (Expense)	0.1	-3.7	-2.8	-5.4	-5.9	-2.2	-2.2
Net Income	2.1	1.4	9.7	11.9	5.0	28.0	24.9
Financial Indicators							
Debt Service Coverage with credit	3.23	3.46	2.92	3.99	3.50	4.75	4.42
Target	1.70	1.70	1.70	1.70	1.70	1.70	1.70
Debt Service Coverage	1.53	2.02	1.65	2.43	1.87	3.04	2.69
Target	1.50	1.50	1.50	1.50	1.50	1.50	1.50
Cash Balance	32.4	42.2	36.2	55.9	60.1	70.9	93.6
Target	5.3	5.5	5.7	5.9	5.9	6.1	6.4
Cash Funding of the CIP	3.2	5.4	11.0	3.5	3.5	3.5	3.6
Target	3.2	3.3	3.3	3.4	3.5	3.5	3.6

Source: Seattle Public Utilities (September 2021.)

Funding Sources

Solid waste services are funded through the Solid Waste Fund, an enterprise fund established in 1961 by City ordinance. An enterprise fund is an account in which revenues generated from a utility are kept separate and balanced against expenditures.

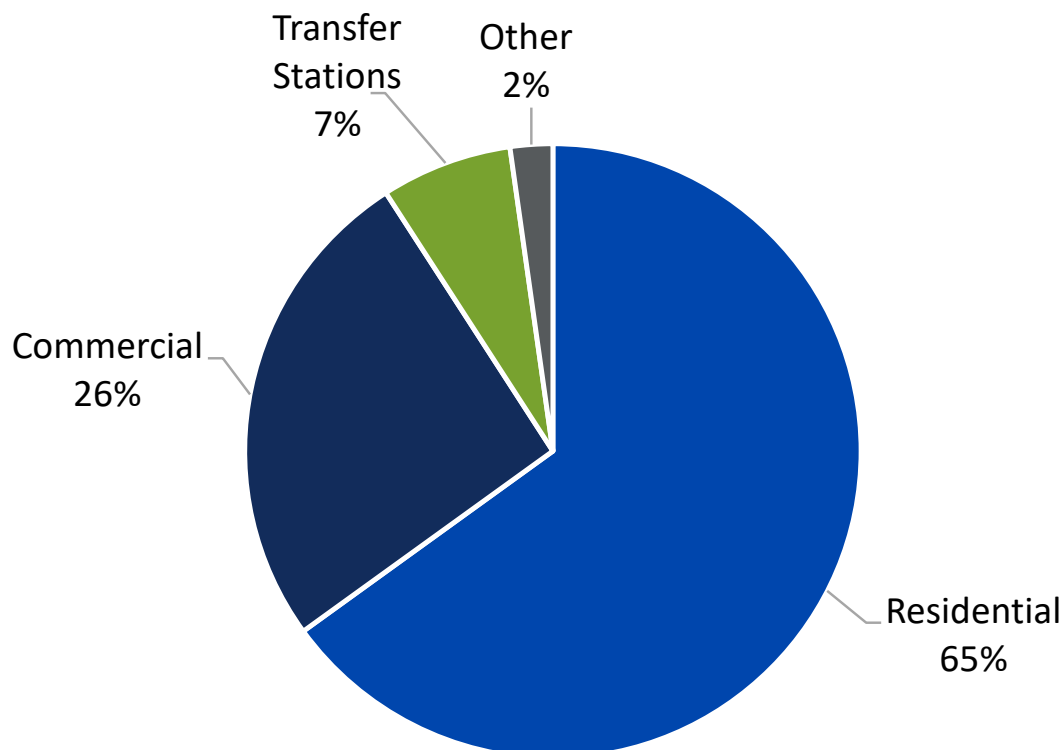
The primary source of funding for SPU's solid waste operational costs are revenues from commercial and residential solid waste collection and disposal. To finance capital spending, SPU

relies on borrowing and rate revenues. The solid waste system is in a period of large capital improvements with projects under way to complete remediation at the South Park Landfill followed by the redevelopment of the old South Transfer Station campus on the landfill. SPU will use a combination of cash and debt financing to fund the capital improvements over the next few years.

Four primary sources of operating revenue fund Seattle's solid waste programs (Figure 10.1):

- 1 Residential collection rates charged to single-family and multifamily accounts
- 2 Commercial collection rates charged to business accounts
- 3 Self-haul tipping fees charged to self-haul customers at the City's transfer stations
- 4 Solid waste tonnage fees charged to all entities (including SPU) engaged in or carrying on the business of collecting and transferring non-recyclable solid waste

Figure 10.1 Seattle Solid Waste Revenue Sources 2020



Source: Seattle Public Utilities (September 2021)

The Solid Waste Fund also earns other miscellaneous revenues, including revenue from the marketing of collected recyclables and grants.

Pay-As-You-Throw Solid Waste Rates

SPU develops solid waste rates, which the mayor proposes for the City Council's approval. Rates are developed based on the following objectives:

- Provide financial soundness
- Advance economic efficiency
- Promote customer equity
- Encourage customer conservation
- Contribute to transparency and customer understanding
- Reduce impacts on low-income customers

SPU also considers affordability during rate setting. In 2007 to 2008, SPU conducted an analysis that identified ways to measure and improve rate affordability. SPU has already adopted the recommended changes to its Utility Discount Program, which provides rate assistance for low-income customers. See the discussion below regarding the Utility Discount Program.

More recently, in 2019, SPU prepared an *Accountability and Affordability Strategic Plan*, which focuses on managing future rate increases and corporate performance.² The plan focuses on four key results areas:³

- 1 Reasonable rates that keep rates as low as possible for as long as possible
- 2 Assistance to help ensure customers can access utility services without risk of shutoff
- 3 Responsible investment to maximize value for the least cost, balancing service levels, investments, needs, and risks
- 4 Performance that provides more transparency to customers on how SPU spends money

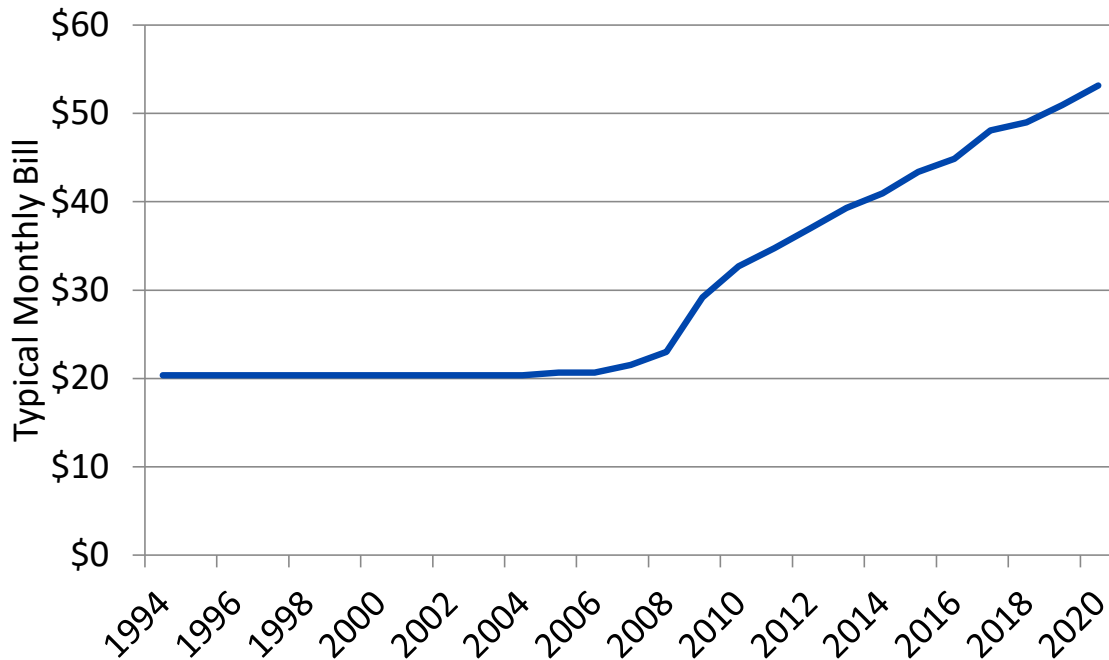
The largest component of solid waste costs is operations and maintenance expense including collection, processing, and disposal contract costs as well as transfer station operations costs. Because costs stayed relatively flat, rates did not change in 1994–2004 and increased slightly in 2005–2006. However, since 2007, a series of rate increases have helped pay for significant cost increases in new contracts that started in 2009. Rate increases have also helped finance significant capital investments in the transfer stations. The typical single-family monthly bill includes a 32-gallon garbage cart with weekly service, a 96-gallon food and yard waste cart with

² Seattle Public Utilities, "SPU's Accountability and Affordability Strategic Plan," June 2019, www.seattle.gov/Documents/Departments/SPU/AboutUs/SBP_AA_Plan_Report_2019-06-17.pdf.

³ Mami Hara, Seattle Public Utilities, "RE: Status Report for Resolution 31760 Amendment #14 Regarding Affordability and Accountability Strategy," August 1, 2018, www.seattle.gov/Documents/Departments/SPU/AboutUs/Affordability_Accountability_Strategy_Report.pdf.

weekly service, and a 96-gallon recycling cart with every-other-week service (Figure 10.2). The typical single-family monthly bill was approximately \$53 in 2020.

Figure 10.2 SPU Single-Family Monthly Solid Waste Bills 1994–2020



Source: Seattle Public Utilities (September 2021.)

In SPU's rate structure, all rates increase as service levels increase. Often referred to as a "pay-as-you-throw" (PAYT) system, this rate structure incentivizes waste reduction, recycling, and composting. Garbage is the most expensive service and is offered to single-family customers at six price levels that increase with the volume of service. As customers reduce waste generation overall and divert more material from the garbage into the recycling or food and yard waste carts, they can save money by decreasing their garbage service and lowering their cost for overall solid waste services. Recycling service is built into the garbage rate (offered at no additional cost) and compost service for food and yard waste costs significantly less than garbage.

One of the drawbacks of the PAYT system is that this rate structure may also increase contamination when customers undersubscribe to garbage service and place non-recoverable materials in recycling or compost containers.

Seattle considers rates comprehensively across all solid waste services to balance sometimes competing goals, including covering costs while incentivizing desired behavior and maintaining

affordability of services. SPU uses rate reviews to evaluate and ensure that all communities and geographic areas benefit equally from the incentivized rate structure.

Residential Rates

All residential (single-family and multifamily) customers must subscribe to garbage collection service, described in Chapter 6, *Solid Waste Handling, Collection, and Removal*. Customers choose the level of service they need. All residential customers receive every-other-week recycling service at no additional charge with garbage collection. They must subscribe separately to food and yard waste collection service and can request Beyond the Cart collection to recycle selected items not accepted in commingled recycling. Qualified customers can receive a utility discount to increase the affordability of waste services.

Garbage Carts

Most single-family and multiplex customers (“cart customers”) have weekly curb or alley service (Table 10.2). For an additional fee, garbage cart customers can choose backyard collection service.

Table 10.2 SPU Monthly Residential Garbage Cart Rates 2020

SERVICE LEVEL (WEEKLY PICK UP)	MONTHLY RATE
Micro-can (12 gallons)	\$25.00
Mini-can (20 gallons)	\$30.60
32-gallon cart	\$39.80
64-gallon cart	\$79.55
96-gallon cart	\$119.40
Extra bundle/bag	Each \$12.35

Garbage Dumpsters

Residential garbage dumpster service is available for apartment buildings with five or more residential units. Rates are set per container pick up and vary with container size. Table 10.3 shows typical residential garbage dumpster service levels and rates. Dumpsters up to eight cubic yards in size are available.

Table 10.3 SPU Monthly Multifamily Residential Garbage Dumpster Rates 2020

SERVICE LEVEL PER CONTAINER WEEKLY PICK UP (UNCOMPACTED)	MONTHLY RATE
1 Cubic Yard	\$251.14
2 Cubic Yards	\$360.47
3 Cubic Yards	\$469.81

Food and Yard Waste

All residential customers must subscribe to weekly food and yard waste collection service unless they participate in backyard composting. SPU made food and yard waste service mandatory for single-family residential customers in 2009 and for multifamily residential customers in 2011. Rates for weekly collection through SPU contracts are presented in (Table 10.4).

Table 10.4 SPU Food and Yard Waste Collection Rates 2020

SERVICE LEVEL (WEEKLY PICK UP)	MONTHLY RATE
Mini Can (13 gallons)	\$6.60
32-gallon Cart	\$9.90
96-gallon Cart	\$12.65
Extra Bundle (yard waste)	\$6.35

Beyond the Cart Recycling Collection for Special Items

SPU provides the following special collection options:

- No cost: expanded polystyrene blocks and used cooking and motor oil
- \$5.00 per pick up: small propane canisters, CFLs, household batteries
- \$20.00 per pick up: special items box for multiple small special items (such as electronics, household batteries, small appliances)
- \$30.00 per item: large furniture, appliances, and TVs larger than two feet long in all dimensions
- \$38.00 per item: items containing CFCs (also called chlorofluorocarbons), such as refrigerators and freezers manufactured before 2005

Utility Discount Program

Seattle offers rate assistance to seniors, persons with disabilities, and low-income customers. Qualified low-income customers receive a 50% discount on their solid waste bill. Customers who live in apartment buildings and who do not receive a SPU bill directly instead receive a fixed credit on their Seattle City Light bill.

Commercial Garbage Rates

Seattle has set commercial garbage rates since April 2001, when the City started contracting with private haulers to provide collection to commercial customers. At that time, Seattle rolled back some commercial rates to their 1994 levels. Businesses and nonprofit organizations can choose to subscribe to contracted garbage collection service or self-haul waste to the transfer stations. Table 10.5 shows 2020 garbage rates for some typical commercial service levels.⁴

Table 10.5 SPU Commercial Garbage Rates 2020

SERVICE LEVEL PER CONTAINER WEEKLY PICK UP	MONTHLY RATE
1 Cubic Yard (uncompacted)	\$223.64
2 Cubic Yards (uncompacted)	\$364.15
3 Cubic Yards (uncompacted)	\$505.66

⁴ Full list of service levels for commercial customers is available on the SPU website:
<https://www.seattle.gov/utilities/your-services/accounts-and-payments/rates/collection-and-disposal/garbage-rates/commercial-garbage-rates>

Self-haul Garbage Rates

Rates at the transfer stations vary depending on the kind or type of material (Table 10.6). Effective April 1, 2020, all vehicles are weighed on their way in and out of the stations and charged based on the weight of their garbage load.

Table 10.6 SPU Self-haul Disposal Rates 2020 (effective April 1, 2020)

TYPE OF WASTE	MINIMUM CHARGE	PER-TON RATE
Appliances	\$30	\$8 per appliance + tonnage rate for other materials
Clean wood waste	\$21	\$113.00 (\$20 minimum for up to 380 lbs.)
Garbage	\$31	\$149 (\$31 minimum for up to 420 lbs.)
Recyclables	No charge	No charge
Yard waste	\$21	\$113.00 (\$21 minimum for up to 380 lbs.)

Recommendation

In support of considering rates comprehensively across all solid waste services, not just for stand-alone services, SPU has developed the following recommendation.

Rec 39. Continue to regularly review rates to ensure they provide incentives for program success, are set equitably, and balance affordability and program costs

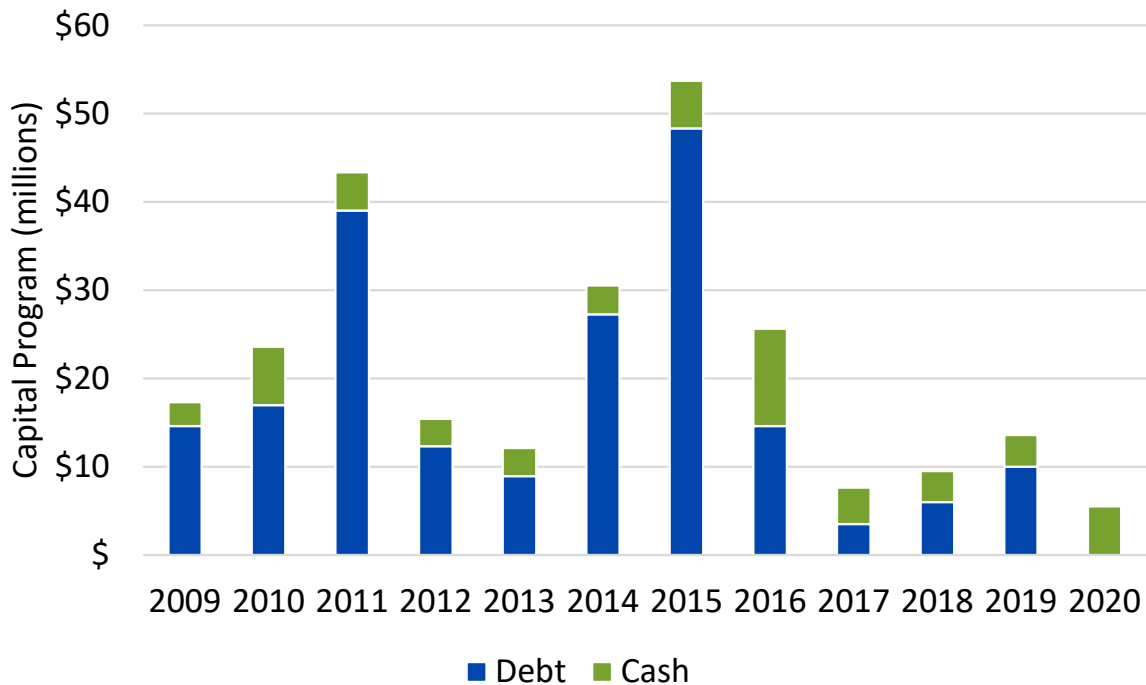
SPU should continue to perform rate analysis and design review every three years. In this process, SPU reviews rates to make sure they (1) provide incentives for waste prevention and diversion, (2) are set equitably, and (3) balance affordability with covering the costs of providing solid waste services and programs.

Debt Financing

To finance its capital investments, such as rebuilding transfer stations, SPU generally cannot rely on rate revenues alone. Historically, SPU has financed its capital program primarily with debt from issuing revenue bonds, while still using some rate revenues and cash. Specifically, SPU finances at least \$2.5 million (in 2003 dollars) of the capital program with rate revenues or cash, or at least 10% of the CIP in years of higher spending.

Before 2008, the Solid Waste Fund's Capital Improvement Plan (CIP) was small. SPU issued bonds in 1999 to fund landfill closure and miscellaneous transfer station improvements, but a large portion of the CIP was financed with rate revenues. From 2003 to 2007, SPU drew on a line of credit to fund land purchases and other capital investments. In 2007 and 2011, SPU issued bonds to fund the transfer station rebuild project. Figure 10.3 shows capital spending and debt financing from 2009 through 2020. Future capital spending and debt financing are discussed in the next section.

Figure 10.3 SPU Capital Spending and Debt Financing 2009–2020



Source: Seattle Public Utilities (September 2021.)

Projected Monetary Needs and Financing Strategy

This section highlights the costs of operating SPU's solid waste system and meeting its waste reduction and recycling objectives. First, it discusses the 6-year capital improvement plan, 20-year capital facilities budget, and the outlook for operations and maintenance (O&M). It then outlines likely methods of financing those activities and compares the revenue needs if SPU continues its current programs (status quo) versus implemented the recommendations in the *2022 Plan Update*.

Six-Year Capital Improvement Program Plan

In 2020, Seattle City Council approved the 2020–2025 Adopted CIP.⁵ City Council adopts a budget—meaning it legally permits expenditures—for only a single year at any time. However, for CIP, it also endorses a budget that extends five years after the adopted budget. Endorsed budgets are projected baselines and do not reflect actual authority to expend funds. Endorsed budgets require subsequent adoption before they become allowable expenditures. The CIP is broken down into four major programs, as shown in Table 10.7.

Table 10.7 Proposed Solid Waste Capital Improvement Plan (in \$1,000s) 2022–2027

PROGRAM	2022	2023	2024	2025	2026	2027	TOTAL
New Facilities	\$6,156	\$13,009	\$14,988	\$4,147	\$1,503	\$300	\$40,102
Rehabilitation & Heavy Equipment	\$2,450	\$550	\$1,850	\$350	\$250	\$200	\$5,650
Shared Cost Projects	\$4,561	\$2,550	\$2,517	\$795	\$823	\$338	\$11,584
Technology Capital	\$1,508	\$1,508	\$1,508	\$1,507	\$1,508	\$1,508	\$9,045
Total	\$14,675	\$17,616	\$20,862	\$6,800	\$4,084	\$2,345	\$66,381

Source: Seattle Public Utilities (September 2021.)

The **New Facilities** program includes projects that plan, design, and construct new facilities to enhance solid waste operations. In 2021, SPU continues the implementation of its *2004 Solid*

⁵ City of Seattle, "2020 Adopted Budget," 2019, <http://www.seattle.gov/Documents/Departments/FinanceDepartment/20adoptedbudget/SPU.pdf>.

Waste Facilities Master Plan. The key project drivers of the New Facilities program are the South Recycling Center and the South Park Development project.

SPU is conducting the final phase of the South Transfer Station Rebuild project to replace the South Recycling and Disposal Station constructed in 1965 on the historic South Park Landfill. One part of this project, the South Transfer Station rebuild, is complete. In the current phase, SPU will remediate the City-owned portion of the South Park Landfill under a consent decree with the Department of Ecology and make minor operational improvements. This work is in design and is scheduled to be completed in 2024. Following remediation, SPU will redevelop the old South Transfer Station campus based on current opportunities and needs in the South Seattle Community. Planning for this phase will begin in 2022.



SPU's South Transfer Station during construction (Source: SPU Image Library)

The **Rehabilitation and Heavy Equipment** program designs and constructs projects to repair and improve the historic Kent Highlands and Midway Landfill under a consent decree for those sites.

The **Shared Cost Projects** program includes capital costs that typically benefit multiple lines of business such as the Water and the Drainage and Wastewater lines of business. The costs are "shared," or paid for, by more than one of SPU's utility funds.

The **Technology Capital** portfolio is managed in six program areas, which provide a department-wide view of technology investments to address SPU's strategic, business, and City-wide priorities. The Technology Capital portfolio includes customer contact and billing; enterprise information management; IT infrastructure; project delivery and performance; science and system performance; and asset information management.

Long-Term Capital Facilities Budget and Projected Financing

In addition to the six-year CIP, SPU has developed its best estimate of a capital facilities budget through 2042, given what is known and anticipated at this time (Table 10.8). The long-term capital budget is expected to be the same for the status quo and the package of recommendations.

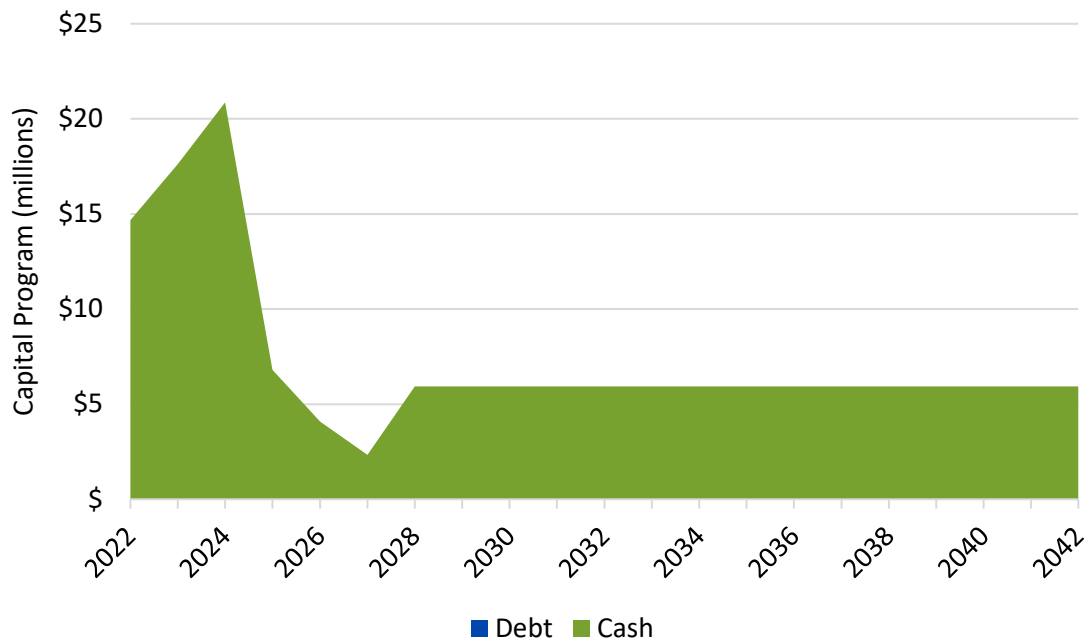
Table 10.8 SPU Solid Waste Capital Facilities Plan (\$ thousands) 2022–2042

BUSINESS AREA	2022-2027	2028-2042
New Facilities (Major Facility Maintenance)	\$40,152	\$27,800
Rehabilitation and Heavy Equipment (Landfill Improvements & Planning)	\$5,650	\$13,200
Shared Cost Projects	\$11,584	\$27,000
Technology Capital	\$9,045	\$21,100
Total	\$66,381	\$89,100

Source: Seattle Public Utilities (September 2021.)

Previously, SPU financed most of its CIP with debt during the period of significant capital spending associated with rebuilding its transfer stations. Starting in 2020 and continuing into the future, SPU projects that the solid waste CIP will be financed with cash (Figure 10.4).

Figure 10.4 SPU Projected Capital Financing (\$ thousands) 2022–2042

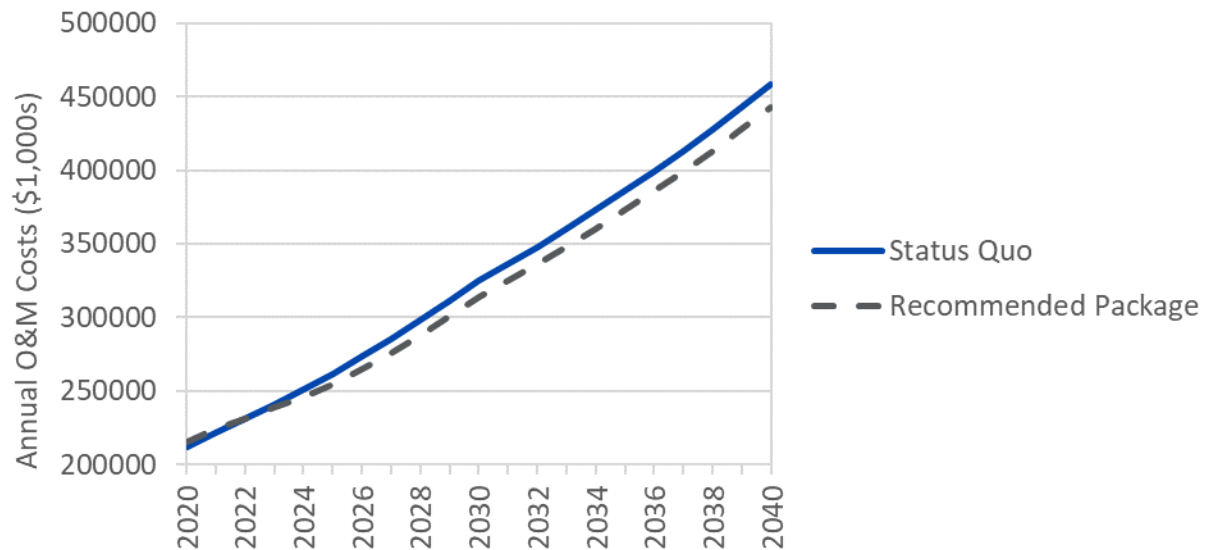


Source: Seattle Public Utilities (September 2021)

Operations and Maintenance Outlook

Solid waste system O&M expenses (excluding debt service and taxes) are expected to grow due to inflation, customer growth, and implementation costs for new and expanded programs. For inflation, contract terms include escalators based on inflation indices. SPU labor costs will follow the paths prescribed in the various collective bargaining agreements. Projected O&M costs are slightly lower under the package of recommendations than under the status quo. Figure 10.5 compares O&M projections for the status quo and recommended package.

Figure 10.5 Projected SPU Solid Waste O&M Spending 2020–2040



Source: Seattle Public Utilities (August 2019.)

The Solid Waste Fund's 2020 adopted O&M budget by cost center for solid waste services is shown in Table 10.9. Costs are shown by branch, but all costs relate to the solid waste system and are supported by the solid waste fund. As shown, about 53% of utility-wide budgeted expenditures from the solid waste fund are for collection, processing, and disposal contracts and transfer station operations. Other significant costs included city and state taxes (14%) and debt service (7%).

Table 10.9 SPU Adopted Solid Waste O&M Budget by Branch and by Function 2020

SPU BRANCH (COSTS IN \$ THOUSANDS)				
Major Cost Centers	Solid Waste Utility	General Manager/CEO	People, Culture, and Community	
Collect, process, disposal contracts	\$659	-	-	Table columns continue below
Hazardous Waste Management Program payment	-	-	-	
Hazardous Waste Management Program reimbursable	\$3,141	-	\$275	
Transfer station operations	\$13,485	-	-	
Landfill maintenance	\$1,807	-	-	
Solid waste planning and performance management	\$5,423	-	-	
Rates, budget, accounting, contracts, IT, fleets, facilities	-	\$510	-	
Personnel, safety, service equity	-	-	\$1,420	
Economists, communications, community relations, legislative liaison, department leadership	\$425	\$929	\$360	
Pre-capital planning	\$11	\$47	-	
Non-projects general	\$416	\$0	\$6,509	
Allocated City costs	-	-	-	
Taxes	-	-	-	
Debt Service	-	-	-	
G&A Credit	(\$3,972)	(\$238)	(\$3,814)	
Total	\$21,395	\$1,249	\$4,751	

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SPU BRANCH (COSTS IN \$1,000S)				
Major Cost Centers	Finance and Admin.	Project Delivery and Engineering	SPU General Expense (no employees)	
Collect, process, disposal contracts	-	-	\$112,107	Table columns continue below
Hazardous Waste Management Program payment	-	-	\$4,651	
Hazardous Waste Management Program reimbursable	-	-	\$1	
Transfer station operations	-	-	-	
Landfill maintenance	-	-	\$112	
Solid waste planning and performance management	-	-	-	
Rates, budget, accounting, contracts, IT, fleets, facilities	\$4,223	-	-	
Personnel, safety, service equity	\$906	-	-	
Economists, communications, community relations, legislative liaison, department leadership	-	-	-	
Pre-capital planning	\$31	\$14	\$79	
Non-projects general	-	\$2,692	\$6,633	
Allocated City costs	-	-	\$8,209	
Taxes	-	-	\$29,752	
Debt Service	-	-	\$15,450	
G&A Credit	(\$986)	(\$1,216)	-	
Total	\$4,174	\$1,490	\$176,994	

Seattle's 2022 Solid Waste Plan Update
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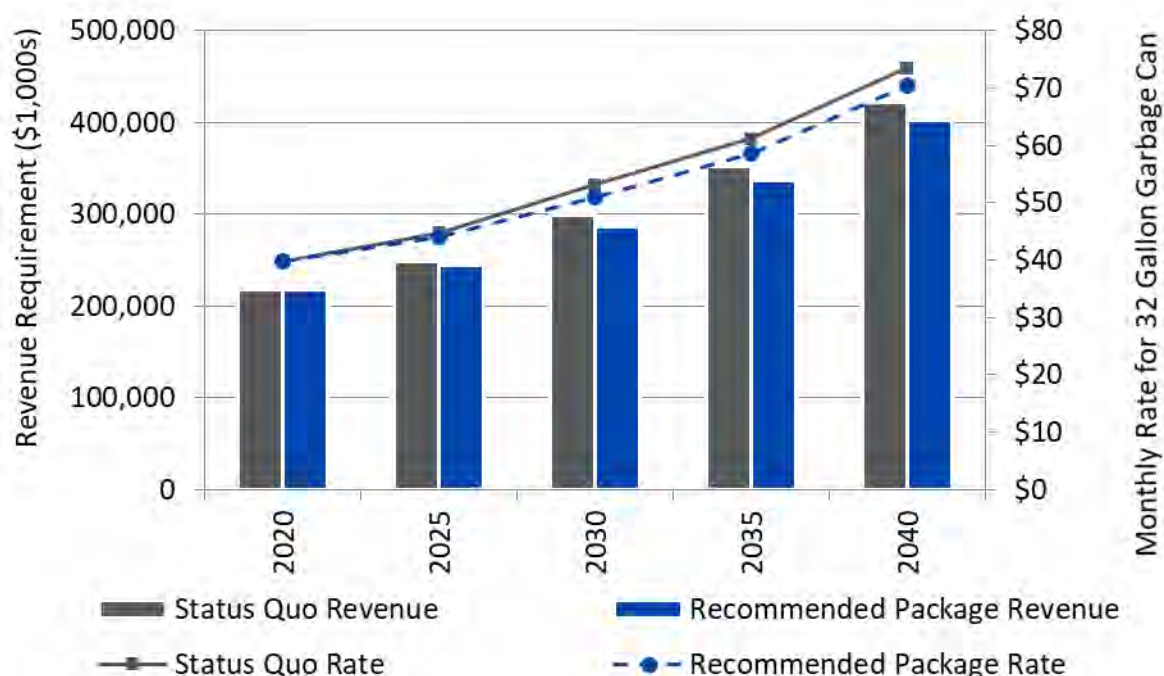
SPU BRANCH (COSTS IN \$1,000S)				
Major Cost Centers	Water Line of Business	Drainage and Wastewater Line of Business	Utility Total	
Collect, process, disposal contracts	-	-	\$112,766	Table columns continue below
Hazardous Waste Management Program payment	-	-	\$4,651	
Hazardous Waste Management Program reimbursable	-	-	\$3,417	
Transfer station operations	-	-	\$13,485	
Landfill maintenance	\$3	-	\$1,922	
Solid waste planning and performance management	-	-	\$5,423	
Rates, budget, accounting, contracts, IT, fleets, facilities	-	\$211	\$4,944	
Personnel, safety, service equity	-	-	\$2,326	
Economists, communications, community relations, legislative liaison, department leadership	-	-	\$1,714	
Pre-capital planning	\$3	\$17	\$203	
Non-projects general	\$1,643	\$1,199	\$19,093	
Allocated City costs	-	-	\$8,209	
Taxes	-	-	\$29,752	
Debt Service	-	-	\$15,449	
G&A Credit	(\$423)	(\$357)	(\$11,006)	
Total	\$1,227	\$1,069	\$212,348	

Source: Seattle Public Utilities (September 2021.)

Revenue and Rate Projections

To meet the financial policies discussed above, rate increases would be required under both the status quo and recommended scenarios (Figure 10.6). SPU revenue requirements are higher under the status quo scenario than if SPU implements the recommendations. Both scenarios start with a revenue requirement of about \$217 million in 2020 and rise by 2040 to about \$420 million for the status quo and \$400 million for the recommended scenario (Figure 10.6). Similarly, customer rates for monthly collection would be approximately 4% lower under the recommended scenario than under the status quo.

Figure 10.6 Status Quo and Preferred Scenarios 2020–2040



Source: Seattle Public Utilities (August 2019.)

Rates will rise whether SPU stays with the status quo or proceeds with recommendations in the *2022 Plan Update*. Under the status quo, rates will increase to cover inflation and any new services or investments. The recommendations have new implementation costs, but they also reduce garbage tons moving through the system. Cost savings from less garbage more than offsets new implementation costs, thus reducing the overall revenue requirement. The following describes rate drivers that help to offset new program costs, including operational efficiencies, recovery fees, and product stewardship.

Operational Efficiencies

SPU has made strides in identifying operating efficiencies and reducing costs to enhance overall resilience. Continued identification and implementation of operating efficiencies can help offset rate increases. For example, SPU's new transfer stations have more capacity and therefore reduce reliance on private transfer stations. There may also be opportunities to reallocate existing staff resources to new recycling and waste reduction activities.

Recovery Fees

Consumer or producer recovery fees, paid when a product is produced or sold, could be a source of funding for solid waste. These fees could help pay for some solid waste system costs, thereby reducing the amount that needs to be recovered from ratepayers.

Cost Internalization and Other Product Stewardship Initiatives

SPU's costs will be lowered and rate increases mitigated by programs that encourage consumers to choose products with fewer environmental impacts or that remove materials from the solid waste stream (producer take-back initiatives).



APPENDIX

A

Planning History and Progress on Prior Recommendations

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Appendix A Planning History and Progress on Prior Recommendations

This appendix provides an overview of the history of Seattle's solid waste plans and summarizes Seattle's progress on recommendations from the *2011 Solid Waste Plan Revision (2011 Plan Revision)*.

Planning History Overview

Washington's 1969 legislation (RCW 70A.205) set the requirement for local solid waste plans. Seattle operated under King County's 1974 and 1982 solid waste management plans until 1989.

1989 – On the Road to Recovery

Seattle's first solid waste plan was the *1989 Integrated Solid Waste Management Plan, On the Road to Recovery*.

In 1987, Seattle faced a crisis with its waste management system. The last two remaining landfills, closed in 1983 and 1986, had become Superfund sites that would cost more than \$90 million to make environmentally safe. Seattle began hauling garbage to the King County landfill, which radically raised tip fees paid to dispose of garbage. By 1987, Seattle's solid waste customer rates had increased by 82 percent.

The Solid Waste Utility (now part of SPU) considered incinerating the City's garbage. The public immediately and overwhelmingly expressed their opposition. Residents did not want an incinerator in their neighborhood and many were concerned about air pollution and final disposal of the ash. SPU responded to public concerns and used the crisis as an opportunity to launch innovative waste reduction and recycling programs that had never been attempted on so large a scale.

1998 – On the Path to Sustainability

In 1998, Seattle prepared its second *Solid Waste Management Plan, On the Path to Sustainability*. Seattle's 1998 *Solid Waste Plan* incorporated the key concepts of zero waste, waste prevention, sustainability, and product stewardship that continue to drive the City's contemporary approach to solid waste management. The plan's vision of zero waste was to:

- Increase waste reduction and resource conservation throughout the city
- Recycle 60 percent of waste by 2008
- Increase the efficiency, fairness, convenience, and accessibility of services
- Expand local markets and increase purchases of recycled-content products
- Increase consumer and producer responsibility for sustainable waste management practices
- Implement the Seattle Sustainable Building Action Plan
- Improve sustainable waste management and resource conservation practices in City of Seattle operations
- Keep Seattle's neighborhoods clean and safe by partnering with communities

2004 – Renewed Commitment to Zero Waste

The 1998 *Solid Waste Plan* was updated by a 2004 *Solid Waste Plan Amendment* that the Washington State Department of Ecology (Ecology) approved in 2005. The 2004 *Solid Waste Plan Amendment* renewed and enhanced Seattle's vision for a zero waste future, including:

- In 2010, the solid waste system will be even more streamlined, with integrated residential and commercial contracts and services, state-of-the-art transfer and processing facilities, and minimum transport and handling.
- More **local markets** will be available, including infrastructure for processing food waste and construction debris.
- Garbage generation will decline. Both residents and businesses will recycle aggressively. Builders, manufacturers, and retailers will play a major role in sustainable design and product take-back.
- Organics composting will help restore Seattle's soils and watersheds. The City's internal waste reduction, recycling, and buy-recycled programs will be exemplary.
- By 2025, the way Seattle thinks about waste will radically shift. Most products will be designed to be readily reused or recycled, and all costs will be incorporated into the price of the product. Garbage disposal will be obsolete. Consumers, producers, and utilities will provide the most efficient infrastructure for managing different products and materials.

2007 – Zero Waste Resolution

In 2007, SPU and the Seattle City Council jointly conducted the Seattle Solid Waste Recycling, Waste Reduction, and Facilities Opportunities (Zero Waste) study. This study examined whether other methods Seattle might use to reduce the amount of its solid waste and divert more from landfill disposal were available.

Following the 2007 study, the Mayor and City Council adopted Resolution 30990, the *Zero Waste Resolution*. The resolution re-committed the City to its 60 percent recycling goal for the year 2012. It also set a longer-term goal of 70 percent recycling by the year 2025.

2011 – Picking Up the Pace Toward Zero Waste

The previous amendment focused on actions and strategies that could be taken to meet the recycling goals in Resolution 30990. The *2011 Plan Revision* continued the trend toward a model of resource management and consideration of life cycle costs and benefits, aligning with the vision and principles outlined in Washington State's [Beyond Waste Plan 2009 update](#). Progress on recommendations from the *2011 Plan Revision* is presented starting on Page A.6.

2016 – Plan Status Review

Statute (RCW 70A.205.075) requires Ecology-approved solid waste plans to be reviewed every five years to ensure the current status of the solid waste system is adequately outlined in the plan. In 2016, SPU and SWAC reviewed the recommended actions from the *2011 Solid Waste Plan Revision*; solid waste facilities; processing and disposal method; financing and rates; and pertinent plans, regulations, and ordinances. Based on this status review, SPU and SWAC recommended conducting an amendment as the next update to Seattle's Solid Waste Plan. SPU started drafting the *2019 Solid Waste Plan Amendment* but could not complete the document in a timely manner.

2022 – Draft 2022 Solid Waste Plan Update

Due to several factors, including impacts from the COVID-19 pandemic, which started in 2020, SPU experienced delays in drafting an amendment to the *2011 Solid Waste Plan Revision*. Following these delays, the Department of Ecology updated its guidance in November 2020, requiring SPU to submit a revision rather than an amendment. SPU's revised comprehensive solid waste management plan from 2011 is the *2022 Solid Waste Plan Update*.

Progress on Recommendations from the *2011 Plan Revision*

This section summarizes progress on prior recommendation from the *2011 Plan Revision*, organized by topic:

- Waste prevention
- Recycling program planning, policies, design, and management
- Solid waste management operations
- Other Seattle solid waste programs
- Clean city programs
- Education, outreach, technical assistance, and enforcement

Waste Prevention

This section summarizes progress on prior recommendations from 2011 related to waste prevention in the following categories:

- Reuse and repair (Table A.1)
- Food, yard, and other organics (Table A.2)
- Product-related waste prevention programs (Table A.3)
- Other waste prevention activities (Table A.4)

The *2011 Plan Revision* included recommendations specific to extended producer responsibility (EPR) programs in the chapter on waste prevention. In the *2022 Solid Waste Plan Update (2022 Plan Update)*, Chapter 5, *Recycling and Composting Policy and Markets*, covers EPR programs on recycling program planning, policies, and design. Table A.5 presents EPR-related recommendations and status updates.

Table A.1 Progress on Past Recommendations for Reuse and Repair

RECOMMENDATION	STATUS
Continue existing transfer station reuse programs (charity drop boxes) until new facilities are built; reprogram as needed for new facilities	On track
Collaborate with charities and others to continue to find ways to divert usable items and materials	On track
Continue to support City policies requiring donation of usable electronic equipment to schools	Managed by other City departments
Promote private donation of electronic products to organizations that refurbish them	On track
Continue involvement and support for industrial commodity exchange programs, focusing on market development for recycled commodities as needed	Reprioritized and on hold
Launch a reusable bag campaign for retail stores in 2014	Done (implemented in 2012)
Enhance diversion of reusables from self-haul loads in 2015	On track
Launch market development for textiles in 2016	On track

Table A.2 Progress on Past Recommendations for Food, Yard, and Other Organics

RECOMMENDATION	STATUS
Continue to promote home onsite organics management: backyard composting of food scraps and landscape waste; grasscycling	On track; updated to include mulching and other soil-building methods
Continue programs for commercial onsite organics management: promote restaurant and retail donations to food banks and feeding programs; work with food banks to minimize their disposal costs by diverting more food waste to composting; promote food purchasing and preparation efficiency as a complement to programs designed to increase commercial food waste composting	Revising strategy
Offer consulting services to help restaurants and institutional kitchens buy and serve food with less waste, if funds are available	Revising strategy

RECOMMENDATION	STATUS
For the near term, focus grant monies on schools to establish system-wide approaches to school food and yard waste collection	Done

Table A.3 Progress on Past Recommendations of Product-Related Waste Prevention Programs

RECOMMENDATION	STATUS
Continue to press the quick-serve restaurant industry, food courts and institutional food service businesses to use primarily compostable single-use food service products	On track
Move forward with efforts that support food packaging regulation and food waste composting: proper containers are used in public areas of quick-serve restaurants and other food service businesses; food service businesses have collection contracts, so materials are sent to proper processing; extensive public education to support food packaging programs	On track
Implement a plastic bag ban from stores in 2015	Legislation adopted in 2011; ban implemented 2012
Implement junk mail and Yellow Pages phone books opt-out	Done
Continue to use and monitor the online junk and catalog opt-out service established in 2011	Revised; SPU did not renew contract with Catalog Choice; shifted focus to education only
Given a favorable decision in the Yellow Pages publishers' lawsuit seeking to block the Phone Books Opt-Out Registry, strongly promote the opt-out service to reduce paper use	Cancelled due to court ruling in favor of yellow pages publishers
Work with phone book companies and publishers to change Washington Utilities Commission regulations that require delivery of white pages phone books	Done

Table A.4 Progress on Past Recommendations for Other Seattle Waste Prevention Activities

RECOMMENDATION	STATUS
Push City departments toward additional green purchasing decisions in facilities construction	Managed in other City departments – Finance and Administrative Services
Work on guidelines requiring more recycling and recycled content in “standard” specifications for work in public right-of-way	Managed in other City departments – Finance and Administrative Services
Seek packaging waste reduction and more controls on chemicals purchasing to reduce toxics exposures for staff and other City facility users	Managed in other City departments – Finance and Administrative Services
Contribute to standards setting for “ecolabels” and suppliers—from green office supplies to green fleets	Managed in other City departments – Finance and Administrative Services
Continue the City’s role as a resource for businesses that are utility customers and other government agencies	On track
Continue to include PaperCuts as a part of outreach to businesses whenever possible	On track
Continue community grants, with near-term focus on organics reduction in schools	School grants done; grant program canceled 2014–2017 due to other priorities and relaunched in 2018 as a community focused program

Recycling Program Planning, Policies, Design, and Management

Table A.5 summarizes progress on prior recommendations from 2011 related to recycling program planning, policies, design, and management.

Table A.5 Progress on Past Recommendations for Recycling Program Planning, Policies, Design, and Management

RECOMMENDATION	STATUS
Continue to operate current programs as a base for future new recycling programs	On track
Continue to require quick-serve restaurants, food courts, and institutional food services to use recyclable or compostable single-use food service products	On track
Add food waste and compostable paper to single family organics disposal ban in 2014	Done
Extend commercial landfill disposal ban to include additional materials in 2014	Done
Implement a plastic wrap landfill disposal ban in 2014 at city transfer stations and in commercial garbage containers	On hold due to market challenges
Implement multifamily organics (food and compostable paper) landfill disposal ban in 2015	Done
Implement a product stewardship program for architectural paint in 2015	Statewide program starting 2021
Implement commercial organics (food and compostable paper) landfill disposal ban in 2016	Done in 2014
Revise City's recycling goals to 60% by 2015 and 70% by 2022	Done; now tracking progress and revisiting appropriate goals

Appendix A – Planning History and Progress on Prior Recommendations

RECOMMENDATION	STATUS
Implement carpet take-back program in 2012	In 2012–2013, SPU conducted efforts to encourage carpet recycling and support a carpet stewardship bill; SPU continues to monitor recycling markets for carpet
Develop a strategic framework for product stewardship actions, including assessment of products and materials that can be regulated locally or at the state level	On track
Continue work with Northwest Product Stewardship Council, Hazardous Waste Management Program in King County, and others to increase the range and effectiveness of product stewardship at the state level	On track
Continue support for proposed state legislation regarding return of unwanted, leftover pharmaceuticals, medical sharps, and carpet	Revised strategy; local legislation established a program in Seattle and King County for pharmaceuticals and statewide program began in 2020. Medical sharps and carpet awaiting state legislation opportunities.
Monitor and support the development of plans for producer-paid end-of-life management for mercury-containing lighting products resulting from 2010 state legislation	Done; monitoring continues
Work with partners to determine the best strategies and timing for new state legislation covering products such as latex and oil-based paint	State paint legislation passed 2019; ongoing for other products
Support Northwest Product Stewardship Council dialogue regarding product stewardship for packaging and printed paper	Ongoing
Continue support for the Product Stewardship Institute and the national product dialogs the institute supports	Ongoing

Appendix A – Planning History and Progress on Prior Recommendations

RECOMMENDATION	STATUS
Pursue local legislation for select products, which may include take-back, where state or regional action is not forthcoming	Pursued for pharmaceuticals; other products suitable for local legislation are under consideration
Track efforts toward product stewardship solutions for products and materials included in City's curbside collection program	Ongoing; key recommendation of the Responsible Recycling Task Force
Monitor product stewardship programs' material reuse and recovery rates; evaluate future support compared to existing programs such as curbside collection	Ongoing
Emphasize job creation potential of product stewardship programs	On hold; not a current priority with product stewardship partners
Work with the Northwest Product Stewardship Council to expand Washington State's Electronic Product Recycling Law to include additional types of electronic products	Ongoing; awaiting best strategy and timing for revising existing e-waste stewardship law
Continue to ensure electronics disposal meets or exceeds Basel Action Network Electronic Recycler's Pledge of True Stewardship, Ecology's Environmentally Sound Management and Performance Standards for Direct Processors, and upgraded Basel Action Network e-Stewards standards as may be adopted by the Seattle City Council	Done; in 2017, Finance and Administrative Services renewed the City's commitment to only use e-Stewards Certified Recyclers for processing the City's waste electronics to ensure they are properly managed
When renewing in 2014, upgrade electronics disposal standards in Seattle's surplus electronics contract to the new Basel Action Network e-Stewards standards	Done; in 2017, Finance and Administrative Services renewed the City's commitment to only use e-Stewards Certified Recyclers for processing the City's waste electronics to ensure they are properly managed

RECOMMENDATION	STATUS
Incorporate end-of-life-management and product stewardship into purchasing	In progress; managed by Finance and Administrative Services, which is working to update the City's environmentally preferable purchasing ordinance

Solid Waste Management Operations

This section summarizes progress on prior recommendations from 2011 related to all aspects of garbage, recycling, and food and yard waste management operations:

- Collection (Table A.6)
- Transfer facilities (Table A.7)
- Processing and disposal (Table A.8)

Table A.6 Progress on Past Recommendations for Collection Contracts and Operations

RECOMMENDATION	STATUS
Implement universal multifamily organics service in 2012	Done (actual start in 2011)
Continue the current practice of contracting for collection services to encourage competition and achieve best prices for SPU ratepayers	Ongoing
Consider changing single-family garbage collection to every other week after evaluating 2012 pilot project	Done; decided not to proceed based on pilot results
Continue monitoring contractor performance to ensure contractors meet obligations and customers receive promised service	Ongoing

Table A.7 Progress on Past Recommendations for Transfer Facilities Operations

RECOMMENDATION	STATUS
Continue to maintain all structures, systems, and equipment to keep existing transfer stations safe and functional while in use	Done
Ensure interim major equipment purchases are compatible with new transfer facilities	Done
Seek opportunities to make services equitable for all Seattle populations, particularly those historically underserved	Ongoing
Continue trip reduction strategies	Not a current strategy for transfer stations
Implement pre-scale recycling at rebuilt transfer stations	North Transfer Station complete; South Recycling Center postponed to evaluate best use of the site
Implement Alaskan Way Viaduct Contingency Plan for managing materials from City's North Transfer Station during viaduct closure	Done
Rebuild the North and South Transfer Stations	Done
Renew redevelopment planning of existing South Transfer Station when resources are available and decisions on the north site are made	Done
Continue planning for staffing and equipment transition to new transfer facilities	Done

Table A.8 Progress on Past Recommendations for Processing and Disposal Contracts and Operations

RECOMMENDATION	STATUS
Continue to contract for processing of recyclable materials collected by SPU contracts	Ongoing
Continue to allow open market processing for recyclable materials privately collected from the commercial sector	Ongoing
Evaluate optimal contracting approach in anticipation of 2013/2016/2019 contract end dates	Done

Appendix A – Planning History and Progress on Prior Recommendations

RECOMMENDATION	STATUS
If recycling gains lag, consider testing “dirty” materials recycling facility (MRF)	Conducted feasibility analysis to consider for future use of SPU site at South Transfer Station; options for that site are still being considered
Continue to contract for processing of organic materials collected by SPU contracts	Ongoing
Continue to allow open market processing services for organic materials collected from the commercial sector	Ongoing
Support composting capacity development; pursue competitive process after current contract end dates 2013/2014/2015	Done; new contracts in place through 2022 or 2024
Support changes to food packaging and labeling in ways that promote composting and reduce contamination	Ongoing; in 2017, required tinting for compostable plastic bags (green or brown; while non-compostable bags cannot be these colors). Supported 2019 state legislation for compost labeling and tinting
Continue to contract for landfill disposal	Contract successfully renegotiated
Do not pursue or authorize direct combustion of mixed garbage, recycling, and food and yard waste; do not authorize such facilities	No proposals or requests submitted to Seattle for combustion facilities
Monitor and consider emerging technologies	Ongoing
Evaluate contracting approach and disposal alternatives as the long-term disposal contract comes to an end in 2028	Ongoing
Implement pet waste and diaper composting program in 2020	2018–2019 feasibility study is on hold

Other Seattle Solid Waste Programs

This section summarizes progress on prior recommendations from 2011 related to other garbage and recycling programs. This section includes the following tables:

- Construction and demolition (C&D) debris (Table A.9)
- Historic landfills (Table A.10)
- Moderate risk waste (Table A.11)
- Special waste (Table A.12)

Table A.9 Progress on Past Recommendations for C&D Debris

RECOMMENDATION	STATUS
Implement Seattle Sustainable Building Action Plan	In 2011, the Sustainable Buildings and Sites Policy superseded the Sustainable Building Policy; between 2000 and 2013, 32 of 34 City-funded projects achieved LEED certification
Implement transfer station floor sorting program for C&D loads that appear to have at least 50% C&D material in 2013	Pilot conducted in 2015; determined to be costly and unsafe
Develop educational materials to direct contractors to source-separated drop-off services or C&D mixed load processors in lieu of SPU's transfer stations	Ongoing
Set the C&D debris recycling rate goal to 70% by 2020	On track (in 2020, 66% was recycled and another 7% was beneficially used following Administrative Rule #SPU-DR-01-07)
Continue current programs linked to Waste Prevention: LEED and Built Green, voluntary salvation assessment promotion, and change definitions for waste diversion credits	Ongoing for LEED & Built Green Promotion; ongoing for salvage assessments (required since 2015)
Develop training programs for hybrid deconstruction techniques for residential and small commercial structures	On hold

RECOMMENDATION	STATUS
Develop and widely promote a certification program for C&D debris processing facilities in coordination with the local industry and other solid waste planning jurisdictions	Done
Implement a disposal ban for asphalt, bricks, and concrete paving 2012 at construction jobsites and City and private transfer stations.	Legislation adopted in 2011; ban implemented in 2012
Implement landfill disposal bans for certain materials by 2013 at construction jobsites and City and private transfer stations: metal, cardboard, plastic wrap, carpet, scrap gypsum from new construction	Metal, cardboard, new construction gypsum scrap recommended for 2013, implemented in 2014; plastic wrap and carpet recommended for 2013 but not implemented; planned for 2022 as set out in Director's Rule SW-640 ¹
Implement landfill disposal ban for certain materials in 2014 at construction jobsites and City and private transfer stations: clean wood, tear-off asphalt shingles	Done in 2015 for clean wood at construction job sites and private transfer stations but behind schedule for City transfer stations (date TBD); asphalt shingles planned for July 2020
Implement a commercial landfill disposal ban on C&D materials in commercial garbage containers in 2017	On hold due to market challenges

Table A.10 Progress on Past Recommendations for Historic Landfills

RECOMMENDATION	STATUS
Continue to monitor and maintain Kent Highlands and Midway in accordance with regulatory requirements and to the satisfaction of adjacent communities	Ongoing

¹ Seattle Public Utilities, "Director's Rule: Construction and Demolition Disposal Ban Delay—Carpet, Plastic Film Wrap and Tear-Off Asphalt Shingles," 2012, ([https://www.seattle.gov/Documents/Departments/SPU/Documents/SW-640CD_DisposalBanDelay\(final\).pdf](https://www.seattle.gov/Documents/Departments/SPU/Documents/SW-640CD_DisposalBanDelay(final).pdf)).

RECOMMENDATION	STATUS
Reduce monitoring requirements as appropriate with regulatory concurrence	On track
Continue to monitor and control landfill gas at Interbay and Genessee	Ongoing
Respond to problems at historic in-city landfills on a case-by-case basis	Ongoing
Pursue possible site de-listing and future beneficial use of the Kent Highlands and Midway landfill sites	On track

Table A.11 Progress on Past Recommendations for Moderate Risk Waste

RECOMMENDATION	STATUS
Maximize service hours and Seattle's collection facilities as much as possible	Seattle's collection facilities are open 9:30 am to 4:30 pm to the public during the following days of the week: South: Thurs, Fri, and Sat North: Sun, Mon, and Tues
Continue collecting CESQG collection	Ongoing

RECOMMENDATION	STATUS
Expand outreach for hazardous materials collection services; expand focused outreach to the elderly, homebound, non-English speaking population, and historically underserved communities	SPU assisted the Hazardous Waste Management Program to develop and adopt its <i>Racial Equity Strategic Plan</i>, which allows the Hazardous Waste Management Program to expand services into historically underserved communities. SPU added awareness of disproportionately impacted populations including pregnant women, people of color, immigrant populations, refugees, lower income communities, and elderly or disabled persons.
Work to secure state product stewardship legislation for unwanted medicines, mercury-containing lighting, and paint	Done; state-level product stewardship legislation has passed for medications, paint, and mercury-containing lights

Table A.12 Progress on Past Recommendations for Special Waste

RECOMMENDATION	STATUS
Continue to maintain up-to-date referral information for special wastes	Ongoing on website

Clean City Programs

This section summarizes progress on prior recommendations from 2011 related to Clean City programs.

Table A.13 Progress on Past Recommendations for Clean City Programs

RECOMMENDATION	STATUS
Implement the 2009–2010 private property recommendation by the Anti-Graffiti Task Force	Done
Amend the Seattle Municipal Code (SMC 12.A.08.020) to include stickers in the list of prohibited materials (anti-graffiti)	Not done; City Council chose not to proceed
Redeploy abatement resources across City departments to better address graffiti abatement on multi-space parking pay stations	Done
Enhance community involvement and public education activities: develop community outreach and engagement plan; convene anti-graffiti outreach coalition	On track
Develop and launch a tool to determine customer satisfaction with SPU's anti-graffiti services	Done
Long-term: increase emphasis on prevention, apprehension and prosecution, and interdepartmental/interagency collaboration	On track
Further develop enforcement protocol and enhance staff training for safe and effective enforcement	On track
Long-term: increase emphasis on enforcement	On track
Develop formalized roles, responsibilities, and design standards for bus zone transition projects	On track

Education, Outreach, Technical Assistance, and Enforcement

Table A.14 presents progress on prior recommendations from 2011 related to education and enforcement. In the *2011 Plan Revision*, these recommendations were included together with recommendations on recycling planning, programs, and policies. For the *2022 Plan Update*, these topics were moved to a dedicated section on education, outreach, technical assistance, and enforcement for clarity and to emphasize the importance of their role in the City of Seattle's garbage, recycling, and food and yard waste management strategies.

Table A.14 Progress on Past Recommendations for Education and Enforcement

RECOMMENDATION	STATUS
Launch new education programs in 2013 to small businesses about free recycle containers and audits of top self-haulers	Done for small businesses; self-hauler audits not yet completed
Restore education funding for all sectors to pre-recession levels in 2013	On track
Enhance commercial organics outreach in 2013	Done
Increase enforcement of residential bans in 2012	On track
Increase enforcement of commercial paper ban in 2012	On track



APPENDIX

B

Recycling Contamination Reduction and Outreach Plan

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Appendix B – Recycling Contamination Reduction and Outreach Plan

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Appendix B Recycling Contamination Reduction and Outreach Plan

This appendix presents Seattle’s Recycling Contamination Reduction & Outreach Plan approved by the Department of Ecology on July 19, 2021. It has been edited only to update chapter references to other parts of Seattle’s *2022 Solid Waste Plan Update (2022 Plan Update)* and to match the formatting of the rest of the *2022 Plan Update*.

The goal of the Recycling Contamination Reduction & Outreach Plan (CROP) is to reduce contamination of the materials collected in Seattle’s single-family, multifamily, drop box, and commercial recycling programs. This, in turn, helps Seattle more fully realize the economic, environmental, social, and public health benefits of these programs. The CROP does not specifically include strategies to reduce contamination of other material streams such as organics or construction and demolition debris. However, many of the same strategies apply to these streams and may be included in future CROP updates.

The CROP intends to meet the requirement in [RCW 70A.205.045\(10\)](#) that counties with a population of more than 25,000 and cities within these counties with independent Solid Waste Management Plans (SWMP) include a CROP in their SWMP by July 1, 2021.

The CROP is concerned with what is called “traditional recyclables,” which for Seattle means: paper, cardboard, metal, plastic containers, and glass containers. Seattle has developed this CROP consistent with the 2021 Solid Waste Plan Update. Seattle has already implemented a robust suite of strategies to reduce contamination, therefore instead of using the template provided by the Department of Ecology, this CROP presents detailed documentation of the contamination reduction strategies that are already in place. The CROP also includes a list of potential future strategies.

Background on Seattle's Solid Waste System

This section provides some context on Seattle's solid waste system, including customer sectors, collection methods, designated list of recyclables collected, relevant contracts, and rate structure.

Customer sectors

The City of Seattle recognizes four customer sectors:

- 1 Single-family: Residences with one to four dwelling units.
- 2 Multifamily: Apartment and condominium buildings with five or more dwelling units.
- 3 Commercial: Business and institutions, which are serviced directly by the haulers.
- 4 Self-haul: Customers that haul their solid waste to either of the two City-owned transfer stations. This sector is referred to as "drop box" in Ecology's CROP template.

Single-Stream Recycling Collection Methods by Customer Sector

Table B.1 Single-Stream Recycling Collection Methods

SECTOR	MODE	CONTAINERS USED	FREQUENCY OF COLLECTION
Single-family	Single-stream	Carts	Every-other-week
Multifamily	Single-stream	Carts, dumpsters, and compactors	Every-other-week for 60% of the buildings and more often for the rest
Commercial	Single-stream	Carts [†] , bags*, dumpsters, and compactors	Variable
	Source separated	Various types of containers	Variable
Self-haul	Mixture of source separated and commingled [‡]	Various types of containers	N/A

Source: Chapter 5, *Recycling and Composting Policy and Markets*.

[†] Businesses that subscribe to garbage service that need a limited amount of recycling service can subscribe to a curbside cart-based every-other-week collection service for up to two carts at no additional charge (known as small recycling services for businesses). The cost of this limited recycling service is embedded in the cost of garbage collection service for these customers. Customers requiring more recycling can obtain those services from a collection contractor on the open market.

* Bags are used by a small number of customers as an alternative to having dumpsters in public alleys. The Clear Alleys Program (CAP) offers a prepaid bag system for business and multifamily residences in designated business districts that do not have storage in their buildings for containers. Bags are used for garbage and recycling.

‡ Glass, paper, and plastic are collected commingled. Cardboard and mixed metal are collected source separated. All scrap metal is accepted, without the size restrictions that exist in the other sectors.

Designated Recyclables by Customer Sector

Table B.2 Designated Recyclables for Single-family, Multifamily, and Commercial†

CATEGORY	INCLUDES
Paper	Mixed-waste paper, cardboard, newspaper, poly-coated paper, and aseptic packaging.
Metal	Tin cans, aluminum cans, pots, pans, foil, and scrap metal larger than 3 inches but smaller than two feet in any direction and less than 35 pounds.
Plastic	Plastic bottles, jars, tubs, cups, and food containers (excluding expanded polystyrene foam [EPS]), rigid plastics #1-6, lids larger than 3 inches, planter pots, and five-gallon buckets.
Glass	Glass bottles and jars.

Source: Chapter 5, *Recycling and Composting Policy and Markets*.

† Private sector recycling providers/collectors may alter their guidelines of acceptable materials.

Table B.3 Designated Recyclables for Self-haul

CATEGORY	MATERIALS INCLUDED
Paper	Mixed-waste paper, cardboard, newspaper, poly-coated paper, and aseptic packaging.
Metal	Tin cans, aluminum cans, pots, pans, foil, and scrap.
Plastic	Plastic bottles, jars, tubs, cups, and food containers (excluding EPS), rigid plastics #1-6, lids larger than 3 inches, planter pots, and five-gallon buckets.
Glass	Glass bottles and jars.

NOTE: Glass, paper, and plastic are collected commingled. Cardboard and mixed metal are collected source separated. All scrap metal is accepted.

Source: <http://www.seattle.gov/utilities/your-services/collection-and-disposal/transfer-stations/north-station/station-features>

Seattle removed plastic bags from the accepted list in 2020 to reduce contamination in the recycling process.

Collection or Material Processing Contracts

- Hauling of residential garbage, recycling, and organics, and of commercial garbage in Seattle is limited to designated contractors.
- Currently, two City-contracted companies, Waste Management, Inc. and Recology, collect residential garbage, recycling, and organics, as well as commercial garbage. Current contracts with these companies began on April 1, 2019 and continue through March 31, 2029.
- Seattle includes elements in collection contracts that support its broader goals, such as:
 - Minimum recycled content for collection carts. Seattle requires the current collection contractors to purchase waste carts with at least 30% post-consumer recycled content. This requirement supports recycling market development.
- Contractors take residential garbage and organics to one of two City-owned transfer stations. Residential recyclables are picked up and deposited at a City-contracted Material Recovery Facility (MRF), or processor, where materials are sorted, separated, and prepared for sale. Seattle covers the disposal costs of the contamination in recycling program containers from our customers. Seattle allows the contracted MRF to dispose of customer generated contamination at no costs through City disposal system.
- Seattle currently contracts with Republic Services for recycling processing at their Republic Services Recycling Complex and Transfer Station. The contractor is responsible for the processing and marketing of all recyclables collected under City contracts.
- All non-recycled garbage in Seattle must ultimately go to the City's contracted landfill.
- For commercial customers, collection and processing of recyclable materials is typically provided by direct arrangements between the commercial customer and a private vendor. Vendors collect both mixed and source-separated materials and deliver them to a variety of processors. Since 1997, the City has required private recyclers to report annually on materials collected, material sources, and delivery destinations as part of their business license renewal.

Rate Structure Incentives

SPU's rate structure incentivizes waste reduction, recycling, and composting. Garbage is the most expensive service and is offered at several different price levels that increase with the volume of service. As customers reduce waste generation overall and divert more material from the garbage into the recycling or compost carts, they can decrease their garbage service and save money. Residential recycling service is offered at no additional cost (i.e., it is embedded into the garbage rate), and compost service costs significantly less than garbage.

Solid Waste Regulations

The City of Seattle has several solid waste regulations to ensure access to solid waste services and encourage diversion. The bullets below include solid waste regulations that while are not directly related to contamination reduction, provide context on the solid waste system.

- **Disposal bans:** Seattle Municipal Code prohibits the disposal of recyclables in residential (Seattle Municipal Code [SMC] 21.36.083) and commercial (SMC 21.36.082) garbage.
- **Residential service requirements:** All residential (single-family and multifamily) customers must subscribe to garbage collection service. Garbage service includes embedded recycling collection. Single-family customers are automatically signed up for recycling when they request garbage collection. Multifamily buildings are required to provide their residents with recycling service.
 - For multifamily buildings, SPU provides recommendations on appropriate service levels depending on the number of dwelling units, as illustrated in the table below.

Table B.4 Multifamily Recommended Service Levels Per Week Per Dwelling Unit

STREAM	GALLONS	CUBIC YARDS
Garbage (uncompacted)	30	0.15
Recycle (uncompacted)	30	0.15
Compost	2	0.01

Source: <http://www.seattle.gov/utilities/your-services/collection-and-disposal/multi-family-properties/for-managers-and-owners>

- As part of SPU's goal to provide equitable services to all customers, multifamily residents are provided solid waste services that are as close as possible to those provided to single-family residents.
- Multifamily residents, who are not SPU account holders (i.e., they do not have or manage solid waste, water, and wastewater services for their individual dwelling unit), are empowered to report solid waste issues by email to the SPU education team or to report anonymously when they lack sufficient service.
- **Commercial service requirements:** Commercial businesses are not required to subscribe to garbage collection service. They can self-haul their garbage to a City- or privately-owned transfer station; however, their recyclables are required to be separated.

Available Tonnage and Composition Data

Since the start of curbside recycling in the late 1980s, solid waste data tracking has been a priority for Seattle. The sections below highlight the most relevant efforts.

Tonnage by Stream and Sector

SPU keeps track of tonnage by stream and sector. This information is published in the [Solid Waste Quarterly Reports](#) available online. These reports, along with additional information, are rolled up into an Annual Waste Prevention & Recycling Report, [published most recently in 2020](#).

The Annual Waste Prevention and Recycling Report does not currently provide the tonnage of traditional recyclables. Instead, it aggregates the tonnage of what was collected as recyclables and compostables. However, the Solid Waste Quarterly Reports have tonnage information about recyclables by sector, which is provided below.

Table B.5 Annual Traditional Recyclable Tonnage by Sector 2019

SECTOR	RECYCLABLES WITHOUT CONTAMINANTS (TONS)	CONTAMINANTS (TONS)	NOTES
Single-family	50,505	5,691	
Multifamily	24,802	3,201	
Commercial	134,485	N/A (most of the material is source separated)	Includes 2,814 tons collected from the small recycling service for businesses.
Self-haul	4,176	N/A	

Sources: SPU 2019 4th Quarter Solid Waste Reports (Single-family, Multifamily, and Commercial small recycling service for businesses); Econometric model estimation (Commercial at large information); and 2019 Washington State Recycling Survey for Ecology (Self-haul), 2019.

Composition Studies

SPU conducts waste composition studies by stream and sector to gain an understanding of the typical types and amounts of materials that make up each stream, including those going into the wrong container, such as contaminants in the recycle/compost, and

recyclables/compostables in the garbage. This information is used for planning purposes, for example, to decide which materials, streams, and/or sectors will be targeted in future outreach. All the historic reports are available here:

<https://www.seattle.gov/utilities/about/reports/solid-waste-reports/composition-studies>.

In addition, the recycling composition studies are conducted every four to five years to confirm customer contamination amounts, which have implications for disposal of material recovery facility (MRF) contracted contamination into the City's disposal system.

The most recent published residential composition study on recyclables was conducted in 2015 (Table 5). In April 2021, SPU will collect a final round of samples to complete the City's most recent residential garbage and recycling study. Results of the 2020-2021 residential garbage and recycling composition studies should be available in Q3 2021.

Table B.6 Residential Recycle Composition 2015

SECTOR	PAPER (W/O CARDBOARD) [% OF STREAM BY WEIGHT]	CARDBOARD [% OF STREAM BY WEIGHT]	GLASS [% OF STREAM BY WEIGHT]	PLASTIC [% OF STREAM BY WEIGHT]	METAL [% OF STREAM BY WEIGHT]	CONTAMINANTS [% OF STREAM BY WEIGHT]
Single-family	40.7	15.0	26.5	5.0	2.6	10.1
Multifamily	36.5	19.6	25.2	4.9	2.4	11.4

Source: SPU, [2014 Residential Recycling Stream Composition Study, 2015](#).

Most of the recycling tonnage collected in the commercial and self-haul sectors is source-separated and hence suffers less from contamination. Therefore, composition studies on these two sectors are not considered a priority compared to residential garbage studies and garbage studies across all sectors.

Contamination Issues

The most prevalent contaminants in the recycling, according to the 2015 composition study listed above, are shown in Table 6.

Table B.7 Most Common Contaminants

CONTAMINANT CATEGORY NAME (AS USED IN STUDY)	EXAMPLES OF MATERIALS IN CATEGORY	% OF STREAM
Other non-recyclables	Items that do not fit in any of the 34 defined categories	3.1
Non-conforming paper	Tissues and photographs	2.7
Non-conforming plastic	Tarps, bubble wrap, and EPS	1.4
Food, green waste, and wood	Food scraps, yard waste, and clean wood	1.3
Non-conforming metal	Products containing a mixture of metals, detached metal can lids, and aerosol containers	0.8
Textiles and clothing	Purses, belts, shoes and other clothing and textiles	0.6
Non-conforming glass	Window glass, light bulbs, and glassware	0.6

Source: SPU, [2015 Residential Recycling Stream Composition Study, 2015](#).

At the time of the study, plastic bags were accepted (if bagged together) in the recycling. More recent studies, such as the 2019 surveys conducted by the Recycling Partnership with material recovery facilities and cities in Washington, identified the following recycling contaminants as the most problematic and costly to manage:

- Plastic bags and film
- Tangles including rope, cords, chains, and hoses
- Food and liquids
- Shredded paper
- Bagged garbage
- Non-program plastics
- Hypodermic needles

In response to these studies and to decrease contamination, Seattle removed plastic bags from the accepted list in January 2020. In Seattle, shredded paper is accepted in the compost stream, which offers our customers an option for diverting this material from the garbage.

The contracted MRFs, collection providers, and the City of Seattle experience operational impacts and costs associated with contamination. For example, the Department of Ecology outlined the most severe impacts in their CROP template as:

- Slow down the sorting and processing of materials.
- Reduce the quality and value of secondary material feedstocks.
- Result in costly shutdowns.
- Damage collection, processing, and remanufacturing equipment.
- Cause serious injuries to collection and processing facility staff.

According to the Recycling Partnership, the greatest costs associated with managing a contaminated recycling stream at national MRFs come from disposal of residuals (40%), value lost from contaminated recyclables (26%), and labor required to remove contamination from sorting equipment (14%), which together account for 80% of total contamination-related costs.

The Washington State Recycling Contamination Reduction Outreach Plan signals that regional and MRF-shed strategies could be effective in tackling contamination. Noting, for example, that all the residential recyclables collected throughout the state are funneled to only eight MRFs.¹

Current Strategies for Contamination Reduction

Seattle, as the largest city in Washington State (population > 770,000), plays an important role in the amount and quality of recyclables collected throughout the state. For example, King County is responsible for 43% of the residential recycling materials that is collected curbside in Washington State.² Fortunately, Seattle has a well-established solid waste system to increase diversion and decrease contamination in recycling. This system relies on the following four strategies: regulation, operations/contracts, education, and enforcement. Each of these tactics are used as opportunities arise, conditions change, and as customers become more engaged. The top strategies Seattle uses to reduce contamination in recycling are outlined below.

¹ Washington State Department of Ecology, "Washington State Recycling Contamination Reduction Outreach Plan (CROP)," September 2020. Page 15, Figure 8.

² Washington State Department of Ecology, "Washington State Recycling Contamination Reduction Outreach Plan (CROP)," Page 19, Figure 13.

Coordinated Operations, Compliance, and Education Efforts

Operations staff training: Drivers receive training on solid waste, in particular on what constitutes contamination and how to respond to it.

Driver tagging, compliance, and education: Contracted haulers and SPU staff address contamination issues through the following process:

- Solid waste collection drivers inspect containers at collection time.
- Containers with more than 20% contamination in plain view are not collected. They receive an “Oops” tag, encouraging customer to call SPU. SPU provides guidance on how to get their materials collected: customers may choose to remove the non-recyclable material and have it collected as recycling or pay a special collection fee for the cart to be collected as garbage.
- Containers with between 10-20% contamination in plain view are collected. They receive an “Oops” tag and a contamination note is logged in the customer account.
- If there is another instance of contamination within the next four to six weeks, SPU will mail a letter informing the customer of the issue and providing support to address it. This letter is sent in English, Vietnamese, Chinese, and Spanish.
- A pilot program began in September 2020 to test the impact of additional follow up phone calls to customer who have received letters in a subset of zip codes (98104, 98106, 98108, 98118, and 98144). SPU consultants conducting these calls are able to help customers who need in-language information.
- If there is a third or a fourth instance of contamination, the drivers will leave an “Oops” tag noting the number of times they have been flagged and request a contamination inspection by an SPU solid waste inspector, who will contact the customer to address the issue.
- If there is a fifth instance of contamination, the driver will leave the container and an “Oops” tag encouraging the customer to call SPU. If requested, an SPU solid waste inspector will



*Sample of SPU “Oops” tag
(Source: Seattle Public Utilities)*

contact the customer to address the issue. The customer could be charged for a special pickup fee to collect the container as garbage.

- In the multifamily sector, the customer could be fined \$50 per instance of contamination if a third “Oops” tag is issued. In practice, this is hardly ever enforced.

Special item curbside collection and collection events

- Seattle provides residential customers with the option to request a curbside “special item” collection of the following materials: foam blocks, batteries, mercury-containing light bulbs, electronics, small appliances, small gas canisters, and cooking and motor oil.
- There are about a dozen recycling and reuse events held every year throughout Seattle where customers can dispose of foam blocks, batteries, electronics, small appliances, clothing, small furniture, and shred documents.
- In addition to providing customers with additional recycling options, these services keep materials that require special handling out of the recycling cart.

Education and Outreach

Emphasis on waste prevention and reuse

- Shift to prevention, reuse, and refill strategies for food serviceware and packaging where possible.
- Research, pilot, promote, and advocate for prevention strategies and reuse/refill options to address single-use items that are hard to recycle or create contamination issues. One example is SPU’s Waste-Free Community Matching Grant Program that funds community-initiated and led waste prevention and reuse projects.
- SPU’s main sorting guidelines flyer include a reuse panel that complements the compost, recycle, and garbage panels.



A sample of SPU's sorting guidelines flyer (Source: Seattle Public Utilities)

Emphasis on consistency: A powerful strategy to prevent contamination is emphasizing consistency whenever customers interact with the solid waste system. This includes using a consistent color scheme across solid waste programs and sectors, as well as setting expectations on the type and frequency of direct mailings that customers receive. Past and current efforts include:

- *Harmonization of collected materials:* In Seattle, the materials accepted in the recycle stream are the same across all sectors, or “harmonized.”
- *Color coordination:* SPU has been working to achieve consistent color coordination in all solid waste containers, posters, stickers, and flyers across all sectors and programs.
 - The designated stream colors are gray or black for garbage, blue for recycling, and green for compost.
 - While carts have been following this scheme for many years, this has not been the case for dumpsters. However, starting in 2017, all the residential garbage dumpsters delivered to multifamily sites are gray. There are still many green garbage dumpsters used throughout the city, but as customers update their service levels or the containers age-out, it is expected that the non-conforming dumpsters will be exchanged with dumpsters that follow Seattle’s solid waste color-coordination scheme.
 - Although this is not a requirement for commercial customers, contractors have also started to use gray dumpsters for commercial garbage. In some cases, the contractors have implemented this change in their programs in other municipalities in the region.



Residential recycling, compost, and trash collection containers (Source: SPU Image Library)

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Appendix B – Recycling Contamination Reduction and Outreach Plan



(Top left) Sample of commercial front of house recycle guidelines, (top right) sample of general residential recycle guidelines, (bottom) sample of multifamily top 5 items recycle guidelines (Source: Seattle Public Utilities)

Focus on five main categories: Outreach focuses on five main categories of recyclable materials to reduce customer confusion and contamination: Paper, cardboard, plastic bottles/containers, metal, and glass.

Emphasis on equitable outreach: SPU strives to eliminate racial, social, and cultural barriers to ensure that customers can take advantage of Seattle's program and services. Some of these efforts are described below.

- Multilingual container decals that include:
 - The four most common languages in Seattle (English, Chinese, Spanish, and Vietnamese)

- Large size (24" x 11" for dumpsters, 9" x 7" for carts)
 - Color-coordination
 - Images and consistent icons
- Culturally relevant and image-based information:
 - Developed through a research-based and culturally competent translation process known as transcreation.

Well established communication channels to customers: SPU has many ways to distribute materials, such as flyers and posters, with the latest guidelines and updated information to customers.

- **Annual residential mailings:** All residential customers receive at least one annual direct mailing. Single-family customers receive a recycling collection calendar. Multifamily residents receive sorting guidelines.
- **Targeted mailings:** In the commercial sector, customers receive customized targeted direct mail materials (e.g., postcards or event notifications sent to food service, automotive, or other sectors).
- **Multifamily online order form:** Property managers and residents can request that flyers, posters, and stickers be sent to them by a mailing house (<http://www.seattle.gov/utilities/your-services/collection-and-disposal/multi-family-properties/for-managers-and-owners/help-residents#order>).
- **Commercial online order form:** Businesses can request that flyers and stickers be sent to them by a mailing house (<https://www.seattle.gov/utilities/protecting-our-environment/sustainability-tips/waste-prevention/at-work/waste-poster-order-form>).
- **Newsletters:** Curb Waste and Conserve (<https://content.govdelivery.com/accounts/WASEATTLE/bulletins/29c5950>) is a 2-3 times a year newsletter that was mailed to all residential customers through 2019, when it switched to an electronic-only format.



Sample of culturally relevant and image-based information (Source: Seattle Public Utilities)

Customized education: SPU, in partnership with contractors, consultants, and community-based organizations (CBOs), provides outreach either virtually, in person, or by phone.

- Outreach partners are often bilingual solid waste subject matter experts that provide in-language training and tools to Seattle businesses, as well as multifamily and single-family customers.
- Outreach approaches vary depending on the sector. For example, during site visits to businesses, staff evaluates on-site recycle bins and containers to identify contamination and provide information on how to improve sorting.
- Targeted education is conducted as needed. For example, commercial and multifamily customers that are part of the CAP program are currently contacted to improve overall program participation, which includes reducing contamination in the recycling.
- Outreach partners conduct tabling at farmers' markets and community events to provide sorting information and written materials. Seattle funds a master composter and sustainability steward volunteer program to support Seattle's waste reduction and recycling efforts.
- SPU works with public and private schools and supports their efforts to educate students and teachers on how to sort correctly and reduce contamination in their recycle and compost.



Sample of SPU residential mailing with information about recycling (Source: Seattle Public Utilities)



Multilingual educators conducting multifamily outreach. (Source: 2019 Waste Prevention & Recycling Report)

Institutional Partnerships: SPU works closely with large institutions (such as the University of Washington, Seattle University, and Seattle Public and Schools) and provides them with support, tools, and signage, as needed.

Tools and Materials

- Color-coordinated recycle bins that are clearly labeled are provided to businesses and schools for free. Some multifamily sites that need bins for recycling collection near mailboxes also receive these.
- Large signage that can be used in solid waste enclosures and trash rooms are available on request (available in sizes 24" x 36" and 32" x 50", example shown below).



Large signage and solid waste collection containers at a multifamily site (Source:SPU Image Library)

Website and *Where Does it Go* Webtool: SPU's website (<http://www.seattle.gov/utilities/your-services/collection-and-disposal>) provides customers solid waste information by stream and customer sector (single family, multifamily, commercial).

- The *Where Does it Go* online lookup tool allows customers to look up how to recycle, compost, or dispose of hundreds of items (<http://www.seattle.gov/utilities/your-services/collection-and-disposal/where-does-it-go#/categories>).

Recycle It App: The *Recycle It* App is a mobile phone app that sends customers weekly notifications ahead of collection day to remind them to put their carts out. It also connects them to sorting and service resources and informs them of generalized collections issues (available at www.seattle.gov/recycleit).

Social media channels: SPU has multiple social media channels (Facebook, Twitter, Instagram, TikTok, and Pinterest) to provide information and engage with customers. Since December 2019, SPU's social media efforts have ramped up resulting in impressions with thousands of customers each week. Posts about solid waste topics are posted three to four times a week, including:

- *Where Does it Go* posts provide information about how to sort confusing items.
- Promotion of outreach events, such as Recycle and Reuse Collection events where customers can drop off hard to recycle items (e.g., clothing, furniture, and foam).
- *Ask Evelyn Live*, a weekly show on Instagram TV that started in April 2020, addresses customer questions about solid waste. Short clips from shows are promoted on TikTok and used for additional social media promotion.
- Pinterest boards highlight waste sorting and reduction behaviors and tips.

Regulations and Partnerships

Local Regulations: Seattle has enacted regulations to help decrease contamination in the commercial sector (SMC 21.36.086), including:

- *EPS ban:* Businesses are prohibited from using plastic foam or EPS packaging.
- *Bag ban:* Business are prohibited from using single-use plastic carryout (shopping) bags. As a result, consumers are more likely to use reusable bags or receive recyclable paper bags.
- *Compostable serveware:* Food service businesses are required to use compostable food serveware if recyclable packaging used on-site is not clean enough after customer use to be accepted in Seattle's recycling. This includes serveware used in "dine-in" food consumption, as well as straws and utensils. Disposable plastic straws and utensils are prohibited.

State Regulations: SPU participates in proposing and advocating for state legislation to address many contamination issues that occur within Seattle due to inconsistent regulations and programs throughout the state that fail to implement best practices and lead to resident and business confusion. Examples include:

- E2SHB 1542, passed in 2019, which established the requirement for CROP development (this document) and established the Recycling Development Center.
- E2SSB 5397, passed in 2019, which began as a proposal to address all plastic packaging through establishing an Extended Producer Responsibility (EPR) system and passed as a study bill. The resulting study and recommendations were delivered to the legislature in November 2020 and SPU is engaged in next steps to implement the recommendations through additional policy proposals.
- ESHB 1569, passed in 2019, which requires tinting and labeling of compostable plastics so that they are more easily distinguished from non-compostable plastics.
- ESSB 5323, passed in 2020, establishes a state-wide ban on thin plastic bags and provides consistency in bag regulations across the state. It improves and expands regulations already in place through Seattle's bag ordinance, which is preempted by the state law. This will reduce plastic bag contamination in Seattle resulting from local businesses being confused by varying rules and customers receiving thin plastic bags when shopping outside of Seattle, as well as by eliminating plastic bag use by new sectors, such as for takeout food.
- E2SSB 5022, passed in 2021, includes many elements to reduce contamination including:
- Eliminating the existing state requirement that the "chasing arrows" be included in plastic resin codes on plastic packaging.
- Banning many EPS foam products statewide.
- Requiring an "opt-in" approach for single-use food serviceware, where customers must request single-use items such as utensils, straws, condiment packets, and drink lids in order to receive those items.

Regional and national partnerships to improve recycling

- **King County's Responsible Recycling Task Force:** Seattle has been an active participant of this regional effort that pursues "a philosophy that ensures we take responsibility for the waste and recyclables we generate so that they are sorted, processed, and if necessary, disposed in a responsible manner. It ensures that our recycled materials do not cause harm here or elsewhere, including other countries. It also motivates producers and consumers to

reduce wasteful packaging and products and increase the use of recycled and recyclable materials.”³

- **Recycle Right Campaign:** A regional communications campaign to reduce contamination in the recycle stream by ensuring that recyclables are empty, clean, and dry; keeping plastic bags out; and emphasizing the five categories of accepted materials (paper, cardboard, plastic containers/bottles, metal containers, and glass containers). This regional effort is the product of an ongoing collaboration (Recycle Right Communication Consortium) between SPU, King County Solid Waste, City of Bellevue, Sound Cities Association, Waste Management, Republic Services, Recology, and Cedar Grove to create regional messaging that reduces contamination by focusing on a harmonized messages for all municipalities in the region.
- **Government Reuse Forum and National Reuse Network:** Seattle actively participates in these networks for U.S. based state and local governments and non-governmental organizations to develop and launch policies and infrastructure to steward the transition from single-use to reuse.
- **US Plastics Pact:** Seattle is a Founding Activator and active participant of the US Plastics Pact. The Pact is a collaborative to unify diverse public-private stakeholders across the plastics value chain to rethink the design, use, and reuse of plastics to create a path forward to realize a circular economy for plastic in the United States. The Pact has created a road map for addressing problematic plastics and policies that will help reduce contamination, including Extended Producer Responsibility.

Potential Future Strategies for Contamination Reduction

SPU plans to continue implementing the current strategies for contamination reduction outlined above for the next six years. Additionally, there are some further efforts that are already part of future work plans. These strategies are outlined below:

³ King County's Responsible Recycling Task Force, "Recommendations to Achieve a Responsible Recycling System," January 10, 2019. (<https://kingcounty.gov/~media/depts/dnrp/solid-waste/about/planning/documents/task-force-final-recommendations.ashx?la=en>)

Coordinated Operations, Compliance, and Education Efforts

Years 1-3:

- Expand coordination efforts to deal with frequent contamination by creating a systematic procedure to address containers that are often contaminated based on the lessons learned from the contamination pilot program described.

Years 1-6:

- Solid waste containers best management practice improvements: As the Solid Waste Compliance team works with customers, they will evaluate dumpsters and carts to make sure that the site has up-to-date decals, gray garbage dumpsters, and that damaged, or extremely dirty containers are replaced.
- When all interventions, education, and outreach efforts with customers have been exhausted, enforcement and/or fines will be used. SPU will make sure that an equity lens is used when applying fines. ⁴

Education and Outreach

Years 1-2:

- Develop a “contamination reduction” decal for recycle dumpsters that emphasized the following messages: “no plastic bags,” “break down boxes,” and “keep lids closed.”
- Increase efforts to get residents to flatten cardboard, which can help reduce overflow issues and open lids. Open lids may decrease the quality of the recyclables if they become wet from rainwater.

Years 1-6:

- Continue to research, pilot, promote and advocate for prevention strategies and reuse/refill options to address single-use items that are hard to recycle or create contamination issues.
- Emphasize educating customers on the items that belong in the garbage.
- Continue to expand virtual education, which has allowed Seattle to reach customers that were hard to reach before the COVID-19 pandemic.
- Commercial sector strategies:

⁴ Fines are not applied to single-family customers at this time.

- Work with large venues (such as sport stadiums) and special event organizers to improve their waste stations and sorting to reduce contamination and provide correct sorting messaging to attendees.
- Use a “targeted universalism” approach, which focuses on equity and ensuring that all commercial sites are provided support to move their operations into compliance⁵.
- Multifamily sector strategies:
 - Conduct a pilot program to provide multifamily residents with tote bags to store and transport their recyclables to reduce the amount of plastic bags in recycling.
 - Improve resident access to recycling by providing recycling carts for on-floor trash rooms. These would be paired with signage focusing on the top five recycle categories.

Regulations and Partnerships

Years 1-6:

- Continue participating in partnerships focused on ensuring improved reuse, recycling, and contamination reduction, for example, through EPR policies. Seattle supports local, state, and national efforts to implement and expand programs. For example, in 2020 SPU contributed to policy approaches included in the federal *Break Free from Plastics Act*. In 2021, SPU advocated for legislation to establish a comprehensive producer responsibility system for all plastic packaging (HB 1118/SB 5022). State or national EPR legislation would harmonize materials collected at a state, regional, or national scale and other attributes of EPR would do much to minimize contamination.

⁵ powell, john a., Stephen Menendian, and Wendy Ake, “Targeted Universalism: Policy & Practice.” Haas Institute for a Fair and Inclusive Society, University of California, Berkeley, 2019. (belonging.berkeley.edu/targeted-universalism)

Department of Ecology Acceptance

Below are screenshots of the letter from the Department of Ecology that confirm Seattle's CROP includes all required elements.



DEPARTMENT OF ECOLOGY

*Northwest Regional Office • 15700 Dayton Ave North • Shoreline, Washington 98133-9716
(206) 594-0000
711 for Washington Relay Service • Persons with a speech disability can call 877-833-6341*

July 19, 2021

Stephanie Schwenger, MPA
Solid and Hazardous Waste Lead Planner
City of Seattle, Seattle Public Utilities

RE: City of Seattle Contamination Reduction and Outreach Plan (CROP) as part of the 2021 Solid Waste Management Plan (SWMP) Revision

Dear Stephanie,

I hope this note finds you well. I am writing to inform you that Ecology has completed its review of the following materials you submitted to us on July 1, 2021.

- The Seattle CROP, dated July 1, 2021.
- A cover letter that includes a timeline for the 2021 Solid Waste Plan revision.

Ecology has also received the most relevant portions of the working draft of the 2021 Solid Waste Management Plan revision. This is helpful for seeing how the CROP fits into the larger SWMP, and the status of the SWMP. Ecology received the draft Chapters 4 and 5 on July 16, 2021.

Based on our review of these materials, we have determined that your CROP includes all of the elements listed below that are required under [RCW 70A.205.045\(10\)](#).

1. A list of actions to reduce contamination in existing recycling programs for single-family and multi-family residences, commercial locations, and drop boxes.
2. A list of key contaminants identified by the jurisdiction or Ecology.
3. A discussion of problem contaminants and their impact on the collection system.
4. An analysis of the costs and other impacts on the recycling system from contamination.
5. An implementation schedule and details on conducting outreach. Contamination reduction outreach may include sharing community-wide messaging through newsletters, articles, mailers, social media, websites, community events, educating drop box customers about contamination, and improving signage.

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Appendix B – Recycling Contamination Reduction and Outreach Plan

Attached to this letter is a Review Table to both synthesize where the CROP includes the above elements and to provide comments for your consideration as the CROP is incorporated into the larger SWMP.

Congratulations on completion of the above steps to fulfill the RCW and advance contamination reduction. We look forward to partnering with you in this important work. Please don't hesitate to contact me if you have any questions.

Sincerely,

Diana Wadley

Diana Wadley

Regional Planner and Grant Manager
Solid Waste Management Program
Northwest Regional Office
Department of Ecology

cc:

Peter Guttchen, Department of Ecology

Seattle Recycling Contamination Reduction and Outreach Plan Review		
Ecology review – 7/19/21		
Required element	Met or not met	Comments
Required Element #1 List of Action Steps to Reduce Contamination	Fully met	Pages 8-18, with actions beyond outreach (i.e. regulatory, and reuse), as well.
Required Element #2 List of Key Contaminants	Met	Pages 6-7, Contamination Issues section. Of note is how only plastic type numbers 1-6 are listed in Table 2, Designated Recyclables for Single-family, Multifamily, and Commercial. In recent conversation about which items are in the contract with the MRF (Republic), it seemed #7s were included, and #7s are also included in Table 4-1 of the draft Chapter 4 provided on July 16. As noted in our previous comments, it would be useful to include a discussion either here or in the SWMP regarding what factors Seattle considers when setting its accepted items list. One reason this list is important is that it defines what is contamination under RCW 70A.205.070(4)(b) in Seattle's recycling programs by what it excludes. Under this section of the RCW, contamination is defined as "any material not included on the local jurisdiction's acceptance list."
Required Element #3 Discussion of problem contaminants & impacts on the collection system	Met	Met on page 7 using Ecology data. Ecology encourages you to further discuss the impacts of contamination on the collection system as this CROP gets incorporated into the SWMP. This could include data gathered directly from the haulers and the MRF.

Seattle Recycling Contamination Reduction and Outreach Plan Review		
Ecology review – 7/19/21		
Required element	Met or not met	Comments
Required Element #4 Analysis of costs and other impacts on the recycling system	Met	Met on pages 7 and 8 using Ecology data. Ecology encourages you to include and discuss the local data you have on the impacts and costs of contamination on the City's recycling system. For example, it is noted on page 3 that Seattle covers the disposal costs of the contamination in recycling program containers from its customers. This would be useful to explore further. You could also include a discussion of the outreach and education costs focused on contamination reduction.
Required Element #5 (a) Details on conducting outreach	Fully met	Pages 8-18, with actions beyond outreach (i.e. regulatory, and reuse) outlined on pages 15-16. Thank you for the reply in the response document to Ecology's June 9 th input that the terms "plastic containers" and "other plastics" may invite wishcycling. We stand by the comment, especially now that we know that #7 plastics are not desired. Perhaps this can be revisited in the future, such as with the Communications Consortium.
Required Element #5 (b) An implementation schedule	Met	The future strategies on pages 17 and 18 have target years assigned to them, and the time span is six years.



APPENDIX



Plans and Regulations Consulted

Appendix C Plans and Regulations Consulted

Seattle's solid waste planning is informed by and must comply with various state and local regulations, guidelines, and plans, including requirements outlined in the Revised Code of Washington (RCW). Seattle's *2022 Solid Waste Plan Update (2022 Plan Update)* draws on the *2011 Solid Waste Plan Revision* while also considering the past decade of regulatory and planning developments around the solid waste industry and emerging social and environmental concerns.

Chapter 1, *Development of the 2022 Solid Waste Plan Update*, describes key plans and regulations that Seattle Public Utilities (SPU) reviewed and incorporated into the *2022 Plan Update*. SPU also reviewed the following plans and regulations for updates since the *2011 Solid Waste Plan Revision* and determined that they align with or do not alter SPU's Plan or current programming:

- City of Seattle Comprehensive Emergency Management Plan – Introduction
https://www.seattle.gov/Documents/Departments/Emergency/PlansOEM/2021%20EMAP%20Updated%20Plans/2021-10-26_CEMPIntroduction.signed2.pdf
- City of Seattle Comprehensive Emergency Management Plan - Continuity of Operations
https://www.seattle.gov/Documents/Departments/Emergency/PlansOEM/2021%20EMAP%20Updated%20Plans/2021-07-27_AnnexVI.COG.signed.pdf
- City of Seattle Comprehensive Plan
<http://www.seattle.gov/opcd/ongoing-initiatives/seattle-2035-comprehensive-plan>
- City of Seattle Climate Strategy
http://greenspace.seattle.gov/wp-content/uploads/2018/04/SeaClimateAction_April2018.pdf
- City of Seattle Disaster Debris Management Plan
Not available online
- City of Seattle Food Action Plan
http://www.seattle.gov/Documents/Departments/OSE/FoodAccess/Food%20Action%20Plan/Seattle_Food_Action_Plan_10-24-12.pdf

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Appendix C – Plans and Regulations Consulted

- City of Seattle Shoreline Master Program Plan
<http://www.seattle.gov/dpd/codesrules/changestocode/shorelineupdate/documents/default.htm>
- King County Local Hazardous Waste Management Plan
<https://kingcountyhazwastewa.gov/about-us/about-us-library>
- Revised Code of Washington Chapter § 173-351, Criteria for Municipal Solid Waste Landfills
<https://apps.leg.wa.gov/WAC/default.aspx?cite=173-351&full=true>
- Revised Code of Washington Chapter § 35.21, Cities & Towns Miscellaneous Provisions
<https://apps.leg.wa.gov/rcw/default.aspx?cite=35.21&full=true>
- Revised Code of Washington Chapter § 70A.500, Electronic Product Recycling
<https://app.leg.wa.gov/RCW/default.aspx?cite=70A.500>
- Revised Code of Washington Chapter § 70A.300, Hazardous Waste Management
<https://app.leg.wa.gov/RCW/default.aspx?cite=70A.300>
- Revised Code of Washington Chapter § 70A.505, Mercury-Containing Lights – Proper Disposal
<https://app.leg.wa.gov/RCW/default.aspx?cite=70A.505>
- Washington Advised Code Chapter § 173-350, Solid Waste Handling Standards
<https://apps.leg.wa.gov/wac/default.aspx?cite=173-350&full=true>
- Revised Code of Washington Chapter § 70A.205, Solid Waste Management – Reduction and Recycling
<https://apps.leg.wa.gov/rcw/default.aspx?cite=70A.205>
- Revised Code of Washington Chapter § 70A.214, Waste Reduction
<https://app.leg.wa.gov/RCW/default.aspx?cite=70A.214>
- Revised Code of Washington Chapter § 70A.200, Waste Reduction, Recycling, and Model Litter Control Act
<https://app.leg.wa.gov/RCW/default.aspx?cite=70A.200>
- Revised Code of Washington Chapter § 70A.305, Hazardous Waste Cleanup – Model Toxics Control Act
<https://app.leg.wa.gov/RCW/default.aspx?cite=70A.305>
- SPU Water System Plan
https://www.seattle.gov/util/cs/groups/public/@spu/@water/documents/webcontent/1_0_72555.pdf
- SPU Continuity of Operations Plan
Not available online
- SPU Stormwater Management Program Plan
<https://www.seattle.gov/Documents/Departments/SPU/Documents/Plans/Seattle-2021-StormwaterPlan.pdf>

Seattle's 2022 Solid Waste Plan Update
Appendix C – Plans and Regulations Consulted

- SPU Risk and Resiliency Strategic Plan
https://www.seattle.gov/documents/Departments/SPU/AboutUs/SPU_SBP_AppendixF_Risk_andResilience_CouncilSubmittal.pdf

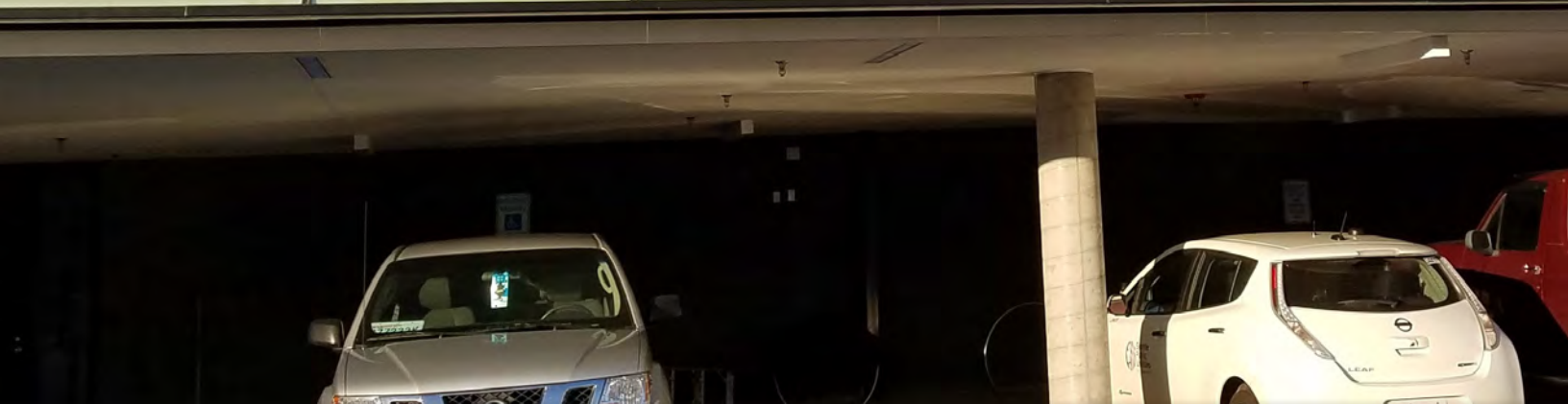
The following plans and regulations were not reviewed as they have not been amended with substantive changes since the *2011 Plan Revision*:

- City of Seattle SMC Chapter 25.08 Noise Control
https://library.municode.com/wa/seattle/codes/municipal_code?nodeId=TIT25ENPRHIPR_C25.08NOCO_SUBCHAPTER_IGEPR
- Revised Code of Washington Chapter § 36.58, Solid Waste Disposal
<https://app.leg.wa.gov/rcw/default.aspx?cite=36.58&full=true>
- Revised Code of Washington Chapter § 70A.210, Pollution Control – Municipal Bonding Authority
<https://app.leg.wa.gov/rcw/default.aspx?cite=70A.210&full=true>
- King County Board of Health Code
<https://kingcounty.gov/depts/health/board-of-health/code.aspx>
- SPU Cedar River Watershed Habitat Conservation Plan
<http://www.seattle.gov/util/cs/groups/public/@spu/@ssw/documents/webcontent/spu01006105.pdf>

**NORTH
TRANSFER
STATION**

**COMMUNITY
VIEWING ROOM**

**COME UP
& EXPLORE
LEARN • PLAY**



APPENDIX

D

Stakeholder Engagement Summary

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Appendix D Stakeholder Engagement Summary

This stakeholder engagement summary describes efforts by Seattle Public Utilities (SPU) to engage stakeholders, build public awareness, and invite comment on the draft of *Seattle's 2022 Solid Waste Plan Update (2022 Plan Update)*.

Purpose

SPU's main goal for engagement efforts was to create meaningful opportunities for a variety of stakeholders to provide feedback on the draft *2022 Plan Update*. SPU also used this opportunity to reflect on how to use that feedback to shape decision-making. In particular, SPU aimed to begin a dialogue with historically underserved communities to build a relationship between SPU and its community partners, to inform the *2022 Plan Update*, and to support future efforts to improve service delivery in these communities.

Background

On June 11, 2013, the Washington State Department of Ecology (Ecology) approved the City of Seattle's *2011 Comprehensive Solid Waste Management Plan Revision: Picking Up the Pace Toward Zero Waste (2011 Plan Revision)*. State law requires all Ecology-approved local solid waste management plans be reviewed at least every five years. After completing a review in February 2016, SPU's Solid Waste Utility and Ecology determined that the *2011 Plan Revision* required an Amendment. In 2018, SPU started drafting what was intended to be the *2019 Solid Waste Plan Amendment*, but the document was not completed due to impacts of COVID-19 and other factors. Following these delays, Ecology updated its guidance in November 2020, requiring SPU to submit a revision rather than an amendment. SPU's revised comprehensive solid waste management plan from 2011 is now the *2022 Plan Update*. The Solid Waste Utility worked with a consultant team led by Cascadia Consulting Group (Cascadia) and with internal and external stakeholders described below to prepare a draft *2022 Plan Update*.

Centering Racial Equity

In keeping with our commitment to embed racial equity perspectives throughout the *2022 Plan Update* process and in the content of the *2022 Plan Update*, the Solid Waste Utility worked closely with SPU's Environmental Justice and Service Equity (EJSE) Team to identify ways to engage communities through the Community Connections Program, while using resources efficiently and effectively.

SPU Environmental Justice and Service Equity

The EJSE Team helps SPU and partner departments carry out the City of Seattle's Race and Social Justice Initiative, as well as Racial Equity Toolkits. EJSE's aim is to deliver inclusive and equitable service to customers across the city. Three key strategies guide EJSE's work:

- 1 Embed race and social justice and service equity across SPU
- 2 Work to include under-represented groups when working with communities
- 3 Continue to align SPU efforts with City, County, and community efforts

Additional information about the EJSE Team and its programs can be found on the SPU [EJSE web page](#).¹

EJSE's Community Connections Program

In 2016, the EJSE Team developed the Community Connections Program to better support People of Color and immigrant, refugee, and low-income customers. To do this, Community Connections funds multi-year partnerships with trusted community-based organizations (CBOs) and leaders – called Community Connections partners – that serve a variety of ethnic and language groups. Partners receive paid training on SPU and solid and hazardous waste. In turn, Community Connections partners adapt and deliver in-language, culturally appropriate presentations and activities to their communities. Partners ask community members for input about SPU's services and approach. EJSE and other SPU staff work with partners to respond to community input.

¹ <https://www.seattle.gov/utilities/about-us/spu-and-the-community/environmental-justice-and-service-equity>

The goals of the Community Connections program are to:

- Build deep and lasting relationships with historically marginalized communities.
- Collect and report community input on SPU Solid Waste and the Hazardous Waste Management Program in King County.
- Create an authentic line of communication between partners and SPU.

At the time of the *2022 Plan Update* process, the Community Connections Program had active partnerships with three CBOs. The EJSE Team partnered with these three organizations to engage some of Seattle's historically underserved communities:

- 1 CISC (formerly known as Chinese Information and Service Center)
- 2 ECOSS (formerly known as Environmental Coalition of South Seattle)
- 3 Horn of Africa Services

Relationship-Based Community Engagement

During the *2022 Plan Update* planning phase, SPU used [SPU's Racial Equity Toolkit](#)² to identify and explore tactics for engaging historically underserved communities. In addition to identifying engagement tactics for the *2022 Plan Update* itself, this process revealed that achieving the City's long-term recycling goals requires building and maintaining sustainable relationships with *all* Seattle communities, including – and especially – those who have historically been underserved. These relationships will enable planning and program managers in the Solid Waste Utility to center race in program design and decision-making that happens between solid waste plan updates.

The strategy of engaging with CBOs through Community Connections partners sought to:

- Respect and reinforce existing, authentic community relationships held by Community Connections partners
- Acknowledge and build on learnings from previous engagement with these communities
- Enable CBO staff to tailor engagement approaches for each community organization based on its unique interests
- Lay the groundwork for the Solid Waste Utility to incorporate racial equity into planning and implementation work going forward, as well as to inform the Solid Waste Utility's best practices for community engagement

² Seattle Public Utilities, "Racial Equity Toolkit," 2012,
https://www.seattle.gov/Documents/Departments/RSJI/RacialEquityToolkit_FINAL_August2012.pdf.

Audiences and Stakeholders

In partnership with SPU's Community Affairs Division and EJSE Team, the Solid Waste Utility identified eight stakeholder groups to engage in the *2022 Plan Update* process. These stakeholder groups are outlined in Table D.1. SPU should continue to seek ways to engage all stakeholders in future efforts like this one.

Table D.1 *2022 Plan Update Stakeholder Groups*

	STAKEHOLDER GROUP	ORGANIZATIONS OR COMMUNITIES INCLUDED
INTERNAL	SPU employees	▪ Solid Waste Utility ▪ Community Affairs Division ▪ Environmental Justice and Service Equity Division ▪ Andrew Lee, Interim SPU General Manager and CEO
	City, County, and State agencies and departments	▪ King County Solid Waste Division ▪ Hazardous Waste Management Program in King County ▪ Seattle and King County Public Health ▪ Washington State Department of Ecology
	Local elected officials	▪ Seattle Mayor's Office ▪ Seattle City Council
EXTERNAL	General public	▪ Seattle residents, businesses, and solid waste customers
	Community-based organizations for historically underserved communities	▪ Community Connections partners: – CISC – ECOSS – Horn of Africa Services
	Local solid waste, recycling, and composting organizations	▪ Contracted City of Seattle haulers ▪ Materials brokers ▪ Organics (food and yard waste) processors ▪ Recycling facilities ▪ Construction and demolition facilities

STAKEHOLDER GROUP	ORGANIZATIONS OR COMMUNITIES INCLUDED
SPU Solid Waste Advisory Committee (SWAC)	▪ Seattle community members, including residents, businesses, waste management industry, and public interest groups
Nongovernmental environmental organizations (NGOs)	▪ Sustainable Packaging Coalition ▪ Zero Waste Washington

Key Messages

Below are the key messages that SPU included in the stakeholder engagement activities described in this document:

Key Project Messages

- 1 The purpose of Seattle's *2022 Plan Update* is to protect the public health and the environment by identifying how Seattle's solid waste services and facilities will be managed and financed over the next twenty years.
- 2 The *2022 Plan Update* will address how Seattle plans to meet its recycling and waste diversion goals while reaffirming Seattle's commitment Race and Social Justice Initiative priorities.
- 3 The *2022 Plan Update* will identify potential new metrics for measuring success with a renewed focus on waste prevention strategies, including describing how metrics will inform SPU's solid waste management programs and processes going forward.
- 4 The *2022 Plan Update* will identify areas of anticipated future risk and guide the Solid Waste Utility in developing strategies to reduce those risks. Risk areas include but are not limited to climate change, disasters, global recycling market fluctuations, technological advances, affordability challenges, systemic and institutional racism that disproportionately impacts historically underserved communities, and workforce availability and capabilities.
- 5 The *2022 Plan Update* will reflect updated economic and environmental analyses of existing and future waste management programs using the Recycling Potential Assessment Model and Measuring the Environmental Benefits Calculator (MEBCalc™), respectively.

Plan Narrative

An international leader in solid waste management for decades, Seattle has advanced a zero-waste vision thanks to public support for environmentally progressive programs and thoughtful planning. To move upstream toward zero waste, SPU is looking at the whole life cycle of materials to eliminate waste and toxics, prevent pollution, reduce carbon emissions, and conserve natural resources as early as possible. We get closer to zero waste by producing and using less.

Key Plan Highlights

The *2022 Plan Update*:

- Emphasizes centering racial equity and building resiliency in our approach to solid waste management
- Aligns with zero waste policy in SPU's *Strategic Business Plan*, Seattle's *Climate Action Plan*, and *Washington State's Solid and Hazardous Waste Plan: Moving Washington Beyond Waste and Toxics*
- Explains SPU's lifecycle view of solid waste management that focuses "upstream" on minimizing waste at the source to reduce harmful impacts
- Discusses limitations of the recycling rate to measure waste prevention and offers alternatives
- Calls for development of metrics and targets to measure climate, programmatic, and policy impacts

External Stakeholder Engagement Strategies

In partnership with SPU's Community Affairs Division and EJSE Team, the Solid Waste Utility designed and tailored engagement strategies for each of the four external stakeholder groups and SPU's SWAC. These strategies are described in Table D.2 on the next page.

Table D.2 Engagement Strategies by External Stakeholder Group

STAKEHOLDER GROUP	ENGAGEMENT STRATEGY	SUMMARIES
CBOs for historically underserved communities	Solid Waste Utility and EJSE partnered with Community Connections partners to develop tailored discussion guides for each of the three CBOs. Topics included awareness of solid waste services, barriers and motivators to service usage, and desired communication channels for future engagement.	Summaries of CBO engagement are in the Community-Based Organizations Discussion Summaries section on page D.19.
Local Solid Waste, Recycling, and Composting Organizations	Cascadia interviewed five industry stakeholder organizations – identified by the Solid Waste Utility – representing waste haulers and processors. Cascadia developed interview questions and received responses in the form of emails, phone interviews, and in-person interviews.	A summary and the list of organizations interviewed is in the Industry and NGO Stakeholder Interview Summary section on page D.26.
Partner Agencies and NGOs	Cascadia interviewed three partner agencies and two environmental interest organizations identified by the Solid Waste Utility. Cascadia developed interview questions and received responses in the form of emails, phone interviews, and in-person interviews.	A summary and the list of organizations interviewed is in the Industry and NGO Stakeholder Interview Summary section on page D.26.
Seattle residents, businesses, and solid waste customers (“General Public”)	SPU provided a four-week public comment period and advertised it through various channels outlined in the Public Comment Communications Tactics section on page D.11.	The online public comment form is presented on page D.33.
SPU SWAC	The project team provided briefings and solicited input at 26 SWAC meetings leading up to the public comment period.	SWAC meeting notes can be found on Seattle Public Utilities’ website . ³

³ Seattle Public Utilities, “SWAC Meeting Schedule, Agenda and Notes,” <https://www.seattle.gov/utilities/protecting-our-environment/volunteer/solid-waste-advisory-committee>.

Stakeholder Input Themes

All stakeholder groups that SPU engaged while developing the draft *2022 Plan Update* shared these recommendations with the Solid Waste Utility:

- Continue to invest in education but also prioritize upstream efforts to address root causes of waste, focusing especially on promoting extended producer responsibility and other initiatives with manufacturers and retailers
- Continue to lead on equity and racial justice, especially in customer engagement and service delivery
- Be consistent and collaborative, both within the utility and with other city agencies and partners, when developing and implementing messaging and engagement strategies

Community Connections partners shared the below recommendations:

- Foster ongoing, mutually beneficial relationships with community leaders that acknowledge their wealth of knowledge
- Provide culturally relevant engagement through trusted community organizations
- Provide more capacity for spoken, in-language customer service
- Provide signage on containers that is culturally relevant and picture-based

Industry stakeholders, including local solid waste, recycling, and composting organizations and NGOs shared the below recommendations:

- Clearly articulate SPU's vision for sustainable materials management, design and implement supportive policy, and hold all stakeholders accountable to make the vision a reality
- Adapt to and support changing recycling markets by staying flexible, minimizing contamination, and promoting strong (and ideally, local) end markets

SPU's SWAC shared the below recommendations:

- Look for alternatives to weight-based recycling metrics to measure progress against goals, such as waste prevention and greenhouse gas emissions

SPU used stakeholder input to inform and affirm the goals, priorities, and recommendations in the *2022 Plan Update*. SPU has followed up with stakeholders to communicate how their input was used.

Public Comment Communications Tactics

The Solid Waste Utility released the draft *2022 Plan Update* for public comment with the goals of generating public awareness of the *2022 Plan Update* process, explaining changes since the *2011 Plan Revision*, and providing the opportunity for comment.

Online Public Comment Form

SPU provided an online comment form to gather input on the draft *2022 Plan Update* in a structured way for efficient review and synthesis of the input. The form was published on SPU's website, accessible via a link on both the homepage and the *2022 Plan Update* page.

Press Release and Daily Journal of Commerce Notice

SPU issued a press release at the start of the public comment period inviting the public to review the draft *2022 Plan Update* and comment using the online comment form. SPU sent the press release to a media advisory list that is maintained by SPU's Public Information Office and includes a diverse set of media contacts. Contacts include mainstream news, community blogs, community-specific in-language publications, radio, and television outlets. As required by SPU's policy, SPU also published an announcement of the public comment period to the Daily Journal of Commerce.

Social Media and Paid Advertisements

SPU's Community Affairs Team worked with staff to share key messaging about the *2022 Plan Update* through SPU's social media channels such as Twitter, Facebook, Instagram, Ask Evelyn IG Live Show, and Nextdoor. Promotion also included paid ads with ethnic media social outlets. Promotion across SPU's social media channels resulted in engagement with over 200,000 customers, a relatively high rate of engagement for the timeframe and budget spent.

SPU also promoted the public comment period with ethnic media partners including NW Asian Weekly, Daybreak Star Radio, Mas Radio, South Seattle Emerald, and Seattle Medium. This media outreach focused on diverse communities, as described below. The *2022 Plan Update* received 80 live radio mentions, over 75 radio spots, boosted promotions across social media channels, six ads on websites, four ads in newsletters, and two templates (also called "copy") for emails. Combined across all partners, the ads reached over 330,000 viewers, listeners, readers, and followers. For the amount of budget spent and the timeframe for running ads, this

is considered a relatively high rate of engagement across SPU's customer base, focused on the target communities.

Website

SPU updated its website, including its *2022 Plan Update* page, with relevant information about the *2022 Plan Update* process, a link to the draft *2022 Plan Update*, and a link to the public comment form. SPU also announced the public comment period on SPU's [At Your Service blog](#).⁴ Through the four-week public comment period, the website had 798 page views and 597 new visitors.

Following the public comment period, SPU updated the website to reflect the next phase of work on the *2022 Plan Update*. Following adoption, the website will be the primary source of information about the approved *2022 Plan Update*.

Printed Handouts, Posters, and Flyers

SPU distributed flyers to self-haul transfer station customers. These printed materials contained key messages and a scannable digital code (called a quick response, or QR code) or that linked to the draft *2022 Plan Update* and public comment form. In addition, SPU staff created several digital and print materials for outreach:

- [One-Pager](#)⁵ with a quick summary of the plan and description of the public comment periods
- [Frequently Asked Questions](#)⁶ section on the *2022 Plan Update* web page
- [Chapter Summaries](#)⁷ with short descriptions of the contents of each chapter
- [Partner Toolkit](#)⁸ with sample blogs posts, sample social posts, and customizable emails and scripts

⁴ <https://atyourservice.seattle.gov>

⁵ <https://www.seattle.gov/documents/Departments/SPU/Documents/Plans/2022SolidWasteDraftOnePager.pdf>

⁶ <https://www.seattle.gov/utilities/about/plans/solid-waste/2022-plan-update>

⁷ <https://www.seattle.gov/documents/Departments/SPU/Documents/Plans/2022SolidWasteDraftChapterSummaries.pdf>

⁸ <https://www.seattle.gov/documents/Departments/SPU/Documents/Plans/2022SolidWasteDraftPartnerToolkit.pdf>

Partnering with SWAC, Other Departments, and Organizations

SPU's Community Affairs Team worked with staff to create an outreach toolkit to share with other departments including the Office of Sustainability, Office of Economic Development, and Department of Neighborhoods, as well as Council Districts Newsletters. SPU also partnered with interested organizations including Zero Waste Washington, Ecology, and SWAC members to promote the public comment period using the Partner Toolkit.

Emails

SPU emailed all stakeholders who completed an interview as part of the *2022 Plan Update* process an invitation to participate in the public comment period. SWAC members used email to send invitations to their connections. SPU's solid waste staff emailed invitations to their industry message boards, partner agencies, consultants, and contractors.

Historically Underrepresented Communities

SPU's EJSE Team reached out to the CBO partners in the Community Connections Program to deliver project messages to historically underserved communities in culturally relevant ways. Community Connections partners chose the best format to share this information within their communities and provided opportunities for their community to comment via the online form.

In addition, SPU's strategy for paid advertisements focused on working with ethnic media to provide additional outreach to underserved communities (described on page D.11). This media outreach focused on populations including Hispanic/Latinx, Asian, Persons of Color, Indigenous, and South Seattle residents. Combined across all partners, the ads reached over 330,000 viewers, listeners, readers, and followers.

Language Access

Through the Language Line, the survey was available in Seattle's top-tier languages: Cantonese, Mandarin, Spanish, Vietnamese, Somali, Amharic, Korean, and Tagalog. Stakeholders could call a phone number printed on materials and the website to hear and answer the survey questions thought an interpreter. In addition to the ethnic media ads described in the section above, SPU also worked with Spanish language radio, MRadio, to purchased ad spots in Spanish to promote public comment and to show Spanish-translated ads on their website and social media.

Public Comment Results

During the public comment period (April 11 to May 6), SPU received 16 responses through the online public comment form. Most commenters strongly supported the *2022 Plan Update* (13 people), two commenters supported it, and one person said they had no opinion. Many comments provided requests or suggestions that related to the implementation phase for recommendations and have been shared with relevant program managers at SPU. Those comments addressed the following themes:

- Requests for more details on potential solutions for waste collection in dense neighborhoods, such as those with townhomes, where curb space is limited
- Request for more active language in racial justice messaging
- Expressions of gratitude for SPU's grant support of a specific program that prevents food waste
- Requests for more information on where, how, and whether materials collected for recycling are recycled
- Requests for more garbage and recycling collection options
- Request for updates on progress toward goals in the *2022 Plan Update* and for a summary of the impact it has on the community
- Concern about implementing recommendations, particularly those related to contamination reduction and waste prevention
- Support of more zero waste stores to reduce packaging waste

Based on public comment feedback, SPU added clarifying language to some of the text in Chapter 2, *Maximizing and Measuring Impact: Moving Upstream, Beyond the Recycling Rate*, and made a few additional minor edits to the text. SPU did not receive any comments during public review of the State Environmental Protection Act Determination of Non-Significance.

Publishing the Final *2022 Plan Update*

After the City Council adopts the *2022 Plan Update*, SPU will share it with the public using the below tactics:

- Publish to the SPU website
- Provide physical copy at Seattle Public Utilities in the General Managers Office
- Provide physical copies in all Seattle public libraries

Stakeholder Engagement Materials and Summaries

This section describes stakeholder engagement materials and presents summaries of engagement efforts that occurred before the public comment period.

SPU Racial Equity Toolkit Summary

Before beginning the 2022 Plan Update, SPU conducted a Racial Equity Toolkit, summarized below.

Project Problem Statement: This project will amend the approved *2011 Plan Revision* to ensure it protects the public health and the environment by identifying how to manage and finance Seattle's solid waste services and facilities over the next twenty years. As part of this process, the project team will facilitate a transparent and inclusive process to elicit input from everyone who contributes to the success of Seattle's solid waste management programs and operations, both within SPU and among the public. The purpose of this inclusive engagement process will be to inform the *2022 Plan Update* on both traditional solid waste planning and program topics and new considerations related to resilience and racial equity.

Racial Equity Vision: The project team shares a vision to apply and embed racial equity perspectives throughout the planning process and in the content of the *2022 Plan Update* using the framework of targeted universalism. Further, the project team envisioned that its work will assist in laying the groundwork for how the Solid Waste Utility incorporates racial equity into planning and implementation work going forward, possibly leading to the creation of Solid Waste Utility best practices for community engagement.

By applying the Racial Equity Toolkit and Stakeholder Analysis to the *2022 Plan Update*, SPU identified several follow-up tasks listed in Table D.3.

Table D.3 Follow-up Tasks from Racial Equity Toolkit and Stakeholder Analysis

TASK DESCRIPTION	INTENDED BENEFITS OF DESCRIBED TASK	STAFFING/RESOURCE NEEDS
1. Identify priority public audiences – specifically racial or ethnic groups – for engagement	Ensure input from customer stakeholder groups that historically have not provided input.	Consultant team, SPU project manager, SPU Solid Waste Utility staff, and EJSE (including Community Connections partners).
2. Determine business engagement needs, particularly from small and women and minority-owned business enterprises (WMBE)	Ensure input from customer stakeholder groups that historically have not provided input.	Consultant team, SPU project manager, SPU Solid Waste Utility staff, and EJSE (including Community Connections partners). Possibly also leverage SPU EnviroStars or ECOSS relationships with small and ethnically owned businesses.
3. Engage Community Connections partners	Ensure input from customer stakeholder groups that historically have not provided input and that the <i>2022 Plan Update</i> can better meet the needs of these stakeholder groups.	Consultant team, SPU project manager, SPU Solid Waste Utility staff, EJSE (including Community Connections partners), and potentially Department of Neighborhoods (DON) Community Liaisons (CLs).
4. Identify cohorts or focus group topics for SPU division engagement. As part of this, identify whether stakeholders outside of Solid Waste Utility also should participate (such as, Customer Service)	Obtain more detailed feedback on key planning topics and themes identified in the stakeholder survey (such as, waste prevention, contamination reduction) to inform the <i>2022 Plan Update</i> .	Consultant team, SPU project manager, SPU team members (to participate in meetings). EJSE to provide racial equity orientation prior to each meeting/cohort to ensure racial equity is centered and considered in all planning discussions.

Seattle's 2022 Solid Waste Plan Update
Appendix D – Stakeholder Engagement Summary

TASK DESCRIPTION	INTENDED BENEFITS OF DESCRIBED TASK	STAFFING/RESOURCE NEEDS
5. Follow-up with SPU Government Affairs to identify whether Tribal input and review is needed and appropriate for the <i>2022 Plan Update</i>	Ensures these stakeholder groups are informed of and able to provide input as appropriate and needed.	SPU Government Affairs, Consultant Team, SPU project manager.
6. Develop and implement report-back process for all stakeholder groups identified as collaborators	Maintain relationships with stakeholder groups by ensuring SPU reflects their input accurately and communicate how their input is incorporated into the <i>2022 Plan Update</i> . Failure to do so could result in loss of willingness of key target audiences to participate in future stakeholder engagement efforts.	Consultant team, SPU project manager, SPU Solid Waste Utility staff, EJSE (including Community Connections partners), and potentially nonprofit organizations and DON CLs.
7. Confirm the review and approval process from SPU Executive Leadership and elected officials: confirm the who does final approval and on what timeline.	Ensure timely completion and acceptance of the preliminary draft and final <i>2022 Plan Update</i> . Communicate with elected officials and other approving bodies early and often about the approach used and results from centering racial equity in the <i>2022 Plan Update</i> .	Consultant team, SPU project manager, SPU Solid Waste Utility management.

By applying the Racial Equity Toolkit and Stakeholder Analysis to the *2022 Plan Update*, SPU identified a related recommended action for reporting back to reporting back to stakeholders about how their input was used. The Racial Equity Toolkit includes a question about how and when this recommendation action will be presented to the appropriate upstream management or governing body for the project (Table D.4).

Table D.4 Recommended Action for Upstream Management

RECOMMENDATION AND BRIEF DESCRIPTION	HOW AND WHEN WILL THIS RECOMMENDATION BE PRESENTED TO THE APPROPRIATE UPSTREAM MANAGEMENT OR GOVERNING BODY?
1. Ensure including a report-back process for all key stakeholder groups from which SPU solicits input to summarize what was heard from them and how their input was incorporated into the <i>2022 Plan Update</i> (or if not, why not). <i>This report-back process was not explicitly included in the initial project scope, but the project team sees this as a best practice that helps maintain (and even strengthens) SPU's relationship with key stakeholder groups.</i>	We will share plans and include updates about our stakeholder report-back process in regular internal monthly project updates to upstream management during regular check-ins with Solid Waste Utility and SPU management. The planning team has agreed to design stakeholder report-back processes in a manner suitable for the available project budget and timeline.

By applying the Racial Equity Toolkit and Stakeholder Analysis to the *2022 Plan Update*, SPU identified several lessons learned that should be applied to future related plans, projects, programs, or services (Table D.5).

Table D.5 Lessons Learned from Racial Equity Toolkit and Stakeholder Analysis

LESSONS LEARNED
1. Many of the discussion topics in the Racial Equity Toolkit and Stakeholder Analysis are directly relevant to the public involvement plan (or similar public engagement document) required by these types of projects. Future efforts could potentially integrate the toolkit and stakeholder analysis more into the public involvement plans to reduce the time needed to complete both. 2. The Racial Equity Toolkit and Stakeholder Analysis are critical to informing project scope, particularly for public involvement. They should be completed before releasing a Request for Proposals (RFP) and selecting an external consultant. Information uncovered in the process of the toolkit and stakeholder analysis can alter the scope of work.

LESSONS LEARNED

3. Effective and inclusive public engagement requires complex coordination between SPU, other City departments, the consultant team, CBOs, and other groups. SPU should consider this coordination when designing the project schedule and budget for similar work, especially given the emphasis on reaching People of Color, people with low incomes, and other historically underserved communities within the competing demands on and constrained resources of Community Connections and CBOs for this type of community work.
4. At project initiation, the project team should expect there will be unknowns and uncertainty when undertaking a process like this one. For example, the specific approach for activities like community engagement are often not determined until later in the process after gathering input from several organizations (see #3 above). Keep this in mind when setting project budget and timeline.
5. A process to report back to community members who provide input into the *2022 Plan Update* is critical both to the success of both the current project and also to lay groundwork for successful future community engagement. Project scopes and budgets for future work of this kind should account for returning to community groups and stakeholders in a feedback loop.

Community-Based Organizations Discussion Summaries

CISC

Overview

CISC is a community-based nonprofit organization that helps immigrants throughout King County achieve success in their new communities. They serve the Chinese immigrant community and immigrants from Eastern Europe, Latin America, and other parts of Asia. In the spring of 2019, CISC hosted a stakeholder conversation about solid waste services as part of the Community Connections outreach contract. This conversation both informed the *2022 Plan Update* and established a baseline framework for future outreach projects including suggestions for improving communications with their communities. Contributing stakeholders included single-family residents, multifamily residents, and property managers. Some conversation highlights include:

- Language and cultural relevancy are crucial elements to education and outreach
- Fostering relationships with community leaders will help create more consistent two-way communication

- Providing question-and-answer sessions in local communities would help build trust and the feeling that SPU is responsive

Awareness of SPU Solid Waste Services

Community members categorized SPU services by awareness level (low to high):

- Availability of waste collection services: **low**
- Availability of recycling for common materials: **low**
- Availability of SPU communication and reporting tools: **low**
- Requirement to use the correct bin for waste and recycling food and yard waste: **medium**
- Ability to prevent waste by using durable items: **medium**

Identified Opportunities

- SPU should involve trusted community resources in educating both adults and children. SPU should support or provide curriculum in public schools.
- If sorting is perceived as too complicated or if the culturally relevant items are difficult to sort, people stop trying to sort. Culturally relevant signage and tools for property managers would increase implementation rates.
- SPU can align recycling and composting guidelines with other counties' implementation plans to simplify outreach efforts.

Feedback on Bin Signage and Locations

- Waste containers hardly ever have pictures on them, which creates a lack of clarity.
- Signage and pictures, when they are present, are rarely culturally relevant or in-language.
- Composting is particularly confusing for residents due to a lack of container signage. Container labels quickly become unreadable.
- Bins are more accessible in single-family homes and multifamily units when garbage is located on the same floor as their living space.

Barriers

The biggest barriers outlined by community members include:

- Confusion when sorting items
- Difficulty communicating with customer service due to language barriers, timely access to interpreters, and lack of familiarity with technical reporting tools

Community members identified the following opportunities for reducing barriers:

- In-language materials
- Visual aids for bins and consistency of signage
- Required participation by property owner or manager
- Bins and containers that are clearly marked
- Onsite, hands-on recycling assistance and training

Motivators

Motivators for participating in recycling, composting, and waste prevention programs vary by community. Community members identified the following motivators as most relevant:

- Protecting the environment, particularly in relation to its impact on health
- Preserving the planet for future generations
- Ensuring affordability and saving money
- Addressing concern over growing landfills and lack of space to dispose of waste
- Working together as a community to collectively protect our planet and connect with each other

Information Needs

It is crucial to work in partnership with community members to share information through appropriate channels. Social media and apps rated relatively low among community members. Community members identified the following as their most preferred information channels:

- Transcreated labels on bins
- In-language mailers
- Word of mouth by other community members
- Trusted community organizations
- Property owners or managers
- In-language workshops by community members

ECOSS

Overview

ECOSS is a community-based nonprofit organization that educates and empowers businesses and diverse communities to implement environmentally sustainable practices. They work with Asian, Southeast Asian, Pacific Islander, African, and Hispanic/Latinx communities. In the spring of 2019, ECOSS hosted a conversation with their staff about solid waste services as part of the

Community Connections outreach contract. This conversation both informed the *2022 Plan Update* and established a baseline framework for future outreach projects including suggestions for improving communications with their communities.

Some conversation highlights include:

- Education of community members on solid waste programs is important, but education does not address the root causes of waste
- To create a more consistent communication program, SPU must foster relationships with community leaders and organizations
- SPU should incentivize and pay community members for their time to participate in ambassador neighborhood programs, focus groups, and feedback sessions

Awareness of SPU Solid Waste Services

ECOSS staff categorized SPU services by awareness level (low to high):

- Availability of composting programs for food and yard waste, including compostable products: **low**
- Ability to use the correct bin for waste and identify which items are recyclable: **low to medium**
- Availability of garbage collection and yard waste composting services: **high**

Identified Opportunities

- Currently, customer service is available only in English. SPU should provide additional spoken language capacity through customer service.
- SPU's focus should not just be on education of community members. SPU is in a powerful position to also push big corporations to commit to waste prevention.
- SPU should guide businesses to zero waste by setting up model stores and rewarding those who reduce, recycle, and compost.

Feedback on Bin Signage

- Waste containers hardly ever have pictures on them, which creates a lack of clarity
- Signage and pictures, when they are present, are rarely culturally relevant or in languages other than English
- Waste containers are usually marked only by color to signify stream, and those colors often vary between bins (especially compost colors), which can be very confusing

Barriers

The biggest barriers outlined by community members include:

- Bins are not clearly labeled with pictures to show where items go
- Property managers do not provide tools or education materials for residents
- Bins are not accessible or available to multifamily residents or businesses
- Multifamily building common areas may have limited or inconvenient space for recycling and food and yard waste containers
- Homes have limited space inside, such as in the kitchen, for multiple waste containers
- Community members have experienced difficulty communicating with customer service due to language barriers, timely access to interpreters, and lack of familiarity with technical reporting tools

Community members identified the following opportunities for reducing barriers:

- In-language materials
- Visual aids on what goes in each bin
- Participation by property owners or managers
- Bins and containers that are clearly marked and fit into small spaces

Motivators

Motivators for recycling, composting, and waste presentation vary by community. Community members identified the following motivators as most relevant:

- Protecting the environment
- Preserving the planet for future generations
- Ensuring affordability and saving money
- Working together as a community to collectively protect our planet and connect with each other

Information Needs

It is crucial to work in partnership with community members to share information through appropriate channels. Social media and apps rated relatively low among community members. Community members identified the following as their most preferred information channels:

- Transcreated labels on bins
- In-language mailers
- Word of mouth by other community members

- Trusted community organizations
- Property owners or managers
- In-language workshops by community members

Horn of Africa Services

Overview

Horn of Africa Services is a community-based nonprofit organization that serves East African immigrant and refugee communities in Seattle. In the spring of 2019, Horn of Africa Services hosted a community conversation about solid waste services as part of the Community Connections outreach contract. This conversation, which included both Horn of Africa Services staff and community members, both informed the *2022 Plan Update* and established a baseline framework for future outreach projects including suggestions for improving communications with their communities.

Some conversation highlights include:

- Outreach to their community is most successful through trusted community-based organizations, like Horn of Africa Services
- SPU should utilize billing (both paper and digital) processes and mailers to connect with customers in language and receive ongoing feedback

Awareness of SPU Solid Waste Services

Community members categorized SPU services by awareness level (low to high):

- Availability of garbage collection and disposal, and recycling of food and yard waste: **low**
- Ability to access information via social media and apps: **low**
- Availability of recycling for common materials: **medium**
- Requirement to sort trash, recyclables and food and yard waste, and waste prevention: **medium**

Identified Opportunities

- SPU should expand community training on identifying recyclable items
- SPU should work with manufacturers to label recyclable products to help consumers easily identify them

Feedback on Bin Signage

- Bins are accessible in multifamily, single-family, and business units but are rarely labeled
- Waste containers do not have pictures unless they are provided at an SPU or City event
- Signage is rarely culturally relevant or in-language at large events
- Waste containers are usually marked only by color to signify stream (green, blue, and black)

Barriers

The biggest barriers outlined by community members include:

- Bins are not clearly labeled with pictures to show where items go
- Property managers do not provide tools or education materials for residents
- Multifamily building common areas may have limited or inconvenient space for recycling and food and yard waste containers
- Homes have limited space inside, such as in the kitchen, for multiple waste containers

Community members identified the following opportunities for reducing barriers:

- In-language materials
- Visual aids on what goes in each bin
- Participation by property owner/management
- Bins and containers that are clearly marked and fit into limited space
- On-site, hands-on training

Motivators

Motivators for recycling, composting, and waste presentation vary by community. Community members identified the following motivators as most relevant:

- Protecting the environment
- Preserving the planet for future generations
- Addressing concern for growing landfills and lack of space to dispose of waste
- Working together as a community to collectively protect our planet and connect with each other

Information Needs

It is crucial to work in partnership with community members to share information through appropriate channels. Social media and apps rated relatively low among community members. Community members identified the following as their most preferred information channels:

- Transcreated labels on bins
- In-language mailers
- Word of mouth by other community members
- Trusted community organizations
- Property owners or managers
- In-language workshops by community members

Industry and NGO Stakeholder Interview Summary

This section summarizes the input received from industry and NGO stakeholders, which helped to inform the *2022 Plan Update*.

Overview

To collect stakeholder feedback for the *2022 Plan Update*, Cascadia developed key questions and received responses from ten respondents in the form of email, phone interviews, or in-person interviews from February through April 2019. SPU identified the stakeholders to engage, which included haulers and processors, partner agencies, and NGOs.

Cascadia asked each stakeholder the following four questions:

- 1 In your mind, what, if anything, was missing from the *2011 Plan Revision* and its summary list of recommendations?
- 2 Where is the waste industry headed in 5 years? In 10 years? In 20 years?
- 3 What do you see as your organization's role and most important actions in shaping in this future vision?
- 4 What do you see as SPU's role and most important actions in shaping this future?

Cascadia also tailored a few questions for specific stakeholder groups, listed below:

- 5 For **partner agencies**: What current efforts of collaboration between King County and SPU should be expanded? What future opportunities for collaboration should be explored?
- 6 For **non-governmental organizations** and **partner agencies**: One of SPU's goals is to minimize lifecycle environmental impacts through waste prevention (beyond reuse). What do you see as the most impactful strategies or actions needed to achieve this?

- 7 For haulers and processors:** Given that disruption and risk in recycling and compost markets are likely long-term issues, what do you see as the role for King County? SPU? Collectors and processors? Others?

Representatives from ten organizations identified by Seattle Public Utilities provided input:

- Cedar Grove Composting
- Hazardous Waste Management Program in King County
- Lenz Enterprises
- Northwest Product Stewardship Council (NWPSC)
- Public Health Seattle and King County (PHSKC)
- Recology
- Republic Services
- Sustainable Packaging Coalition
- Waste Management
- Zero Waste Washington

Summary Themes from Stakeholder Input

The following sections summarize key themes expressed by respondents across stakeholder groups during the interviews.

Seattle has been and should continue to be a leader.

Stakeholders across all subgroups noted Seattle's past and present leadership and said that SPU should continue to push the envelope around waste prevention and sustainable waste management, such as by setting a benchmark for others, testing new innovations, and modeling actions for the state and beyond. Some opportunities stakeholders identified for SPU to continue to demonstrate its leadership include:

- Communicating a strong vision and implementing supportive policies, including new metrics for measuring success in materials management
- Continuing to focus on upstream waste management efforts, such as supporting local and state efforts on waste prevention and product stewardship and engaging manufacturers
- Supporting end-market development through broad efforts, as well as through the City's own procurement practices

As described further below, SPU's key stakeholders and partners also express a willingness to collaborate, advance new technology and ideas, and demonstrate leadership with the City.

Flexibility is vital to adapt to changing markets, technologies, materials, workforces, and other factors.

Stakeholders emphasized a need for flexibility to adapt to changing conditions, such as market fluctuations, a changing waste stream, workforce changes, and rapid technological advancements. They noted recent commodity market disruption due to China's scrap import policies and labor market challenges related to workforce shortages. Looking to the future, stakeholders anticipated shifts in packaging trends that will make material recovery more challenging, such as an increase in flexible packaging and fewer cans and glass. They also anticipate that Seattle will need to be ready to adopt or adapt to changes in processing technologies, collection technologies, workforce availability, and commodity end-markets. They mentioned a role for Seattle in testing new technologies and promoting end-markets in Washington. They also mentioned a need to build flexibility and sustainability into cost structures and contracts in the context of a continued trend of decreasing waste generation, as well as in the event of unforeseen disruptions.

Focus on the biggest net environmental impacts and choose quality over quantity when it comes to waste prevention and recovery.

Stakeholders expressed an interest in focusing on actions that maximize broad environmental benefits. They mentioned putting more focus on upstream waste prevention, for example, by promoting the use of durable goods. Some also suggested that SPU consider all environmental costs and benefits of system decisions, such as when deciding which materials to accept for curbside recycling. Other actions related to broader environmental benefits that stakeholders recommended include:

- Engage the public on the big picture and issues such as waste prevention, recycled content, and circular economy, instead of engaging them around individual products, to move upstream and make a larger environmental impact
- Increase waste prevention efforts through City procurement guidelines as well as targeted, material-specific programs and policies
- Engage manufacturers voluntarily to redesign products for recycling and waste prevention
- Promote additional extended producer responsibility programs to incentivize product designs that reduce waste and improve recyclability
- Maintain the value of the recycling stream through a responsible recycling framework and focusing on materials with the greatest benefits

In recycling, close the loop with marketable commodities, reduced contamination, and strong (ideally local) end markets.

Stakeholders noted the importance of creating marketable commodities and reducing contamination. Specifically, they mentioned the need to:

- Ensure that materials put in the recycling cart actually get recycled by having recycling processors account for materials through the supply chain.
- Invest in processing equipment and automation for material recovery facilities (MRFs).
- Engage customers to reduce contamination, using both education, feedback, and enforcement.
- Better manage contamination at transfer stations to improve the quality and value of recovered materials.
- Increase attention on end-markets and engage in market development. For food and yard waste, this could involve sending finished compost back to customers who use food and yard waste collection or to City departments that could use compost.
- Focus on quality over quantity.
 - In recycling, this may mean focusing more on capture rates than recycling rates and revising the accepted materials list or collecting some materials at depots based on end-markets.
 - In composting, this could include regulating or creating a certification system for compostable products.

Stakeholders are willing partners who see many opportunities to collaborate with SPU and increase regional consistency.

Stakeholders across all subgroups expressed interest in collaborating with Seattle to advance sustainability. Haulers and processors mentioned ways they have or could increase sustainability in their operations. For example, most haulers anticipate a switch to renewable fuel, such as landfill natural gas, and/or electric collection fleets in the near future. They also mentioned opportunities such as investing in technological innovations, using their drivers to monitor for contamination, engaging customers proactively, helping develop markets, and providing their perspectives when SPU considers changing programs or policies.

Partner agencies identified opportunities to increase their collaboration with SPU both to use resources efficiently and to increase consistency in regulations and programs. They saw opportunities to collaborate to:

- Support regional efforts (including implementation of recommendations from the Responsible Recycling Task Force, which is now called RE+) to improve recycling quality, reduce contamination, and strengthen end markets and to promote waste prevention and other upstream efforts
- Implement new policies, such as disposal bans or extended producer responsibility programs, and harmonize waste-related regulations across the region
- Reinforce and expand efforts around equity and racial justice in service delivery, including working in and with communities and community networks, to maximize partnership opportunities, provide coordinated messaging, and avoid duplicative engagement
- Gather and analyze data on waste streams and research new technology to reduce contamination and expand domestic processing opportunities

NGOs also mentioned opportunities to collaborate with local government agencies, such as the Hazardous Waste Management Program in King County, as well as with their organizations, with manufacturers on product redesign for waste prevention and recycling, and with local community groups through increased funding for zero waste grants.

Engage the public to “recycle right” and think about the bigger picture of waste prevention and recycled content.

Stakeholders noted the importance of engaging the public both to ensure they are recycling right and to broaden their enthusiasm for recycling into enthusiasm for waste prevention. They saw opportunities to expand and improve public education around contamination reduction and recycling right, including through harmonizing messages regionally. They also mentioned engaging the public on bigger picture issues such as broad waste prevention beyond individual materials like straws, lifecycle impacts of materials, and the circular economy.

New models are needed to ensure funding is sustainable in the future. One model may be product stewardship and extended producer responsibility.

Stakeholders mentioned the need to explore new funding models to ensure sustainable funding as waste decreases and to combat the notion that recycling is free. Commodity markets fluctuate and, while change is expected, the levels and types of changes are unpredictable. Stakeholders emphasized that a willingness from SPU to build flexibility into cost structures and contracts with partners will help in adapting rapidly to unforeseen changes. In the long term, as

garbage quantities decrease and recycling and composting increase, new cost structures may be needed to ensure sustainable funding for recycling and composting.

Several stakeholders specifically called out a need to promote extended producer responsibility and work with manufacturers to redesign products for recycling and waste prevention to:

- Shift the paradigm on how to pay for solid waste management from solid waste utilities and ratepayers to producers
- Enhance the haulers' and processors' ability to manage new products and the changing waste stream, as well as create a structure to pay them for managing new types of waste
- Create a system to manage challenging materials, such as sharps

Other Stakeholder Feedback

In addition to the broad themes detailed above, other stakeholder feedback for the *2022 Plan Update* from specific groups is noted below.

Haulers

The changing workforce will pose a challenge.

Hauler and processor stakeholders noted a worsening shortage of drivers, mechanics, operators, sorters, and similar workers. They saw a need for the solid waste management industry, including SPU, to work together to build the next generation of workers and to prepare for shortages and changes in the next workforce. Stakeholders also mentioned the need to attract workers by improving driver conditions through increased vehicle automation, for example.

Exploring new technologies and approaches is important.

Haulers and processors monitor and will invest in new technology and equipment. Haulers and processors described technological advancements as driving business growth and creating new opportunities in the industry. They said that developments in automation will improve collection and sorting processes and lead to greater diversion. Driverless vehicles and advanced sorting equipment, such as material sensors and a “robot MRF” were noted as examples of innovative business advancements expected in the future. Investments in new technology, equipment, and data analysis support other stakeholder priorities, such as reducing contamination, increasing domestic recycling and local composting or other organics processing capacity, and operating more sustainably.

Other topics

Other issues emphasized by individual haulers and processors included:

- Safety should be just as important a part of the plan as the environment
- Seattle should promote policies at the state and local levels to work upstream, such as engaging manufacturers to design for reuse and recycling
- Seattle should better articulate its vision to ensure everyone understands why they should participate in achieving it
- Seattle should review and improve past ordinances, such as food serviceware mandates, based on what has been learned

Partner Agencies

Exploring new technologies and approaches is important.

Partner agencies mentioned exploring new technologies or collection methods, with some focus on local options. Recommendations included:

- Supporting grants or pilot projects for other technologies to manage food and yard waste to address the capacity limitations of local compost facilities
- Collaborating to explore new technologies for processing materials like plastics and paper domestically
- Collaborating to explore alternative moderate risk waste (MRW) collection methods for people who do not drive or who have other barriers to using existing drop-off facilities

One respondent also mentioned that local recycling capacity may decrease in the near future if local facilities are not able to meet new state regulations.

Opportunities for collaboration

In addition to opportunities for collaboration noted above in the Summary Themes from Stakeholder Input, some other opportunities for collaboration specific to partner agencies included to:

- Implement Responsible Recycling Task Force recommendations, with a particular emphasis on harmonizing accepted curbside materials and messaging regionally, and even statewide.
- Coordinate messaging to talk with customers about their waste holistically (in other words, not just “hazardous” versus “not hazardous”) and to promote waste prevention, safer and low-waste alternatives, thoughtful consumption, and proper waste handling.

- Reinforce and expand efforts around equity and racial justice. In addition to working in and with communities, expand efforts related to data collection around specific communities, and ensure staff understand the equity and racial justice work underway across the utility to avoid duplicating efforts.
- Explore ways to support expanding and improving regional sorting and processing infrastructure.
- Explore co-locating MRW facilities within Seattle's transfer stations to improve MRW collection and identify alternatives to drop-off facilities to ensure access to proper MSW and MRW disposal for everyone.
- Explore sustainable funding models for solid waste management as garbage and overall waste quantities decrease.
- Make biomedical regulations uniform between Seattle and King County, for example, around sharps collection.
- Coordinate plans for disaster debris management to keep MRW out of disaster debris and promote proper disposal.
- Reduce rodent levels by ensuring waste is set out in downtown alleys only shortly before collection.

Non-Governmental Organizations

Other topics mentioned by individual NGOs included:

- Develop new metrics to calculate the full impact of consumption in Seattle (including residents and business), not just of City agency actions
- Increase enforcement of existing recycling and waste prevention regulations
- Develop procurement guidelines for waste prevention
- Enhance funding for local community groups
- Increase focus on toxic chemicals upstream and downstream; for example, furniture currently entering the solid waste stream may contain toxic flame retardants

Public Comment Form

Shown starting on next page.



Seattle's 2022 Solid Waste Plan Update: Moving Upstream to Zero Waste

Public Comment Form

1. How supportive are you of Seattle's draft 2022 *Solid Waste Plan Update: Moving Upstream to Zero Waste* overall?

- ☐ I strongly support
- ☐ I somewhat support
- ☐ I somewhat oppose
- ☐ I strongly oppose
- ☐ No opinion

2. What comments or suggestions do you have regarding Seattle's draft 2022 *Solid Waste Plan Update: Moving Upstream to Zero Waste*? Please include the page number(s), whenever possible.

3. If you would like to upload a document with your comments, please do so here. Files may be a PDF or Word (DOC or DOCX) document and must be smaller than 16mb.

Choose File

Choose File

No file chosen

Make sure to click the "Submit" button at the end of the form before leaving or closing this webpage to fully submit your comments.

Have questions about Seattle's draft 2022 *Solid Waste Plan Update*? Email SPU_SolidWastePlan@seattle.gov.

The following questions are for statistical purposes only. Responses are optional.

4. How did you learn about Seattle's draft 2022 *Solid Waste Plan Update* website and public comment opportunity? Select all that apply.

- ☐ Seattle Public Utilities website or newsletter
- ☐ Social media
- ☐ Print media
- ☐ Email
- ☐ A friend or colleague
- ☐ Transfer station flier
- ☐ I work for the City of Seattle
- ☐ Other (please describe)

5. Which of the following describes you? Select all that apply.

- ☐ I live in Seattle in an apartment or condo
- ☐ I live in Seattle in a house
- ☐ I work in Seattle in the solid waste, construction, or demolition industries
- ☐ I work in Seattle, but not in the solid waste, construction, or demolition industries
- ☐ Other (please describe)

6. What is your zip code?

7. What is your race(s)/ethnicity(ies)

8. What is your gender?

9. What is your age?

- ☐ Under 18
- ☐ 18-34
- ☐ 35-49
- ☐ 50-64
- ☐ 65 or older

Thank you for taking the time to comment on Seattle's draft *2022 Solid Waste Plan Update*. Click the "Submit" button to submit your comments.

Privacy notice

Information provided in this form is considered a public record and may be subject to public disclosure. For more information, see the [Public Records Act, RCW Chapter 42.56](#). To learn more about how we manage your information, see our Privacy Statement at <http://www.seattle.gov/tech/initiatives/privacy>.



Seattle's 2022 Solid Waste Plan Update: Moving Upstream to Zero Waste

Thank you for taking the time to comment on *Seattle's draft 2022 Solid Waste Plan Update*. Your comments have been recorded and will be taken under consideration as the *2022 Solid Waste Plan Update* is finalized.



APPENDIX

E

Recycling Potential Assessment Model and Environmental Benefits Analysis

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Appendix E Recycling Potential Assessment Model and Environmental Benefits Analysis

Jeffrey Morris, Ph.D., Economist, Sound Resource Management Group

Luis Hillon, Ms.C., Principal Economist, Seattle Public Utilities

Jennifer Bagby, Ph.D., Director of Corporate Services, Seattle Public Utilities (retired)

This appendix describes the two economic models Seattle Public Utilities (SPU) used to develop scenarios for and analyze the benefits of some of the waste prevention and recycling actions, or alternatives, recommended in the *2022 Solid Waste Plan Update (2022 Plan Update)*. The first model, the Recycling Potential Assessment (RPA) Model, forecasts tonnages and financial costs and benefits of the alternative actions. The Measuring the Environmental Benefits Calculator (MEBCalc) calculates the environmental benefits from the same set of alternatives.

This table shows the 39 recommendations in the *2022 Plan Update* and indicates whether SPU modeled the benefits and costs in the RPA and MEBCalc models. Note that SPU and its consultant could not model all recommendations either due to lack of available, quantifiable data.

Table E.1 2022 Plan Update Recommendations

Recommendation	Modeled in RPA and MEBCalc	Chapter
Overarching		
Rec 01. Lead with race and incorporate racial justice in solid waste programs, education, and outreach in support of SPU's commitment to providing racially equitable, inclusive, and culturally competent services.	✗	1
Maximizing and Measuring Impact		
Rec 02. Keep developing overarching goals consistent with waste prevention and reduction activities instead of continuing to emphasize recycling rate goals focused on diversion.	✗	2
Rec 03. Expand solid waste data analytics, metrics, and evaluation to improve assessment of services and operations.	✗	2
Waste Prevention and Reuse		
Rec 04. Prioritize and support waste prevention with program research, data analysis, and metrics.	✗	4
Rec 05. Increase community awareness of waste prevention through coordinated outreach.	✓	4
Rec 06. Expand food waste prevention to reduce food waste.	✓	4
Rec 07. Expand efforts to rescue safe, edible food from the waste stream by getting it to those that need it most.	✗	4
Rec 08. Reduce single-use items and promote durable or reusable alternatives.	✓	4
Rec 09. Expand support for community organizations working to prevent waste.	✗	4
Rec 10. Expand support of the City's sustainable and green purchasing policies.	✗	4
Rec 11. Explore and expand market opportunities for reused material and repair services.	✗	4
Rec 12. Promote and support waste prevention for textiles and monitor emerging textiles recycling technologies.	✓	4
Recycling and Composting Policy and Markets		
Rec 13. Advocate for responsible recycling policies recommended by the Responsible Recycling Task Force.	✗	5
Rec 14. Continue and expand efforts to reduce the amount of contamination, or non-recyclable material, in the recycling and food and yard waste.	✗	5
Rec 15. Support market and infrastructure development for recycling.	✗	5
Rec 16. Continue to explore and implement product stewardship policies and programs that require producers, manufacturers, and/or retailers to take back and recycle the products they sell.	✓	5
Rec 17. Continue to support and expand industry-led, voluntary retail take-back of plastic wrap and bags.	✓	5

Recommendation	Modeled in RPA and MEBCalc	Chapter
Rec 18. Require all single-use food service packaging to be compostable and harmonize acceptance standards for compostable products.	✓	5
Rec 19. Continue to refine and develop strategies to keep more food waste and compostable paper out of the garbage.	✓	5
Rec 20. Continue to support market development for compost products.	✗	5
Rec 21. Assess options for diaper and pet waste recovery.	✓	5
Solid Waste Handling, Collection, and Removal		
Rec 22. Conduct research to inform future collection, processing, and disposal contracts.	✗	6
Rec 23. Adopt collection infrastructure incentives or requirements in multifamily construction to ensure tenants have sufficient solid waste services and convenient access to solid waste containers.	✓	6
Rec 24. Explore collection infrastructure requirements for new construction of townhomes and live-work units.	✗	6
Rec 25. Improve alley and public right-of-way access for collection vehicles.	✗	6
Rec 26. Expand the Clean City education campaign to increase awareness of the City's litter and cleanup programs.	✗	6
Solid Waste Transfer, Processing, Disposal, and Emergency Management		
Rec 27. Continue to explore opportunities for adaptive reuse of historic landfills, including opportunities to control costs at closed landfills and to bring the land into productive use.	✗	7
Construction and Demolition Debris		
Rec 28. Expand construction and demolition debris industry outreach and education.	✓	8
Rec 29. Improve enforcement of and incentives for compliance with construction and demolition system rules.	✓	8
Rec 30. Promote salvage and deconstruction for reusable building materials.	✓	8
Rec 31. Require deconstruction (instead of demolition) for select project sizes and/or project types to increase construction and demolition debris recovery.	✓	8
Rec 32. Expand recycling market development construction and demolition debris to support diversion of these materials from landfill.	✓	8
Rec 33. Enhance diversion of construction and demolition debris at transfer stations.	✓	8

Recommendation	Modeled in RPA and MEBCalc	Chapter
Outreach, Education, Code Enforcement, and Compliance Support		
Rec 34. Continue and expand use of large, color-coordinated, multilingual, and icon-based container decals to encourage proper sorting of waste.	✗	9
Rec 35. Continue and expand use of available metrics to inform outreach strategy and measure outcomes.	✓	9
Rec 36. Continue participating in the regional Communication Consortium to unify solid waste messaging between Seattle and King County municipalities.	✗	9
Rec 37. Expand waste prevention and diversion outreach and education in schools.	✓	9
Rec 38. Expand efforts to increase compliance with solid waste code and requirements across customer sectors.	✓	9
Administration and Financing of the Solid Waste System		
Rec 39. Continue to regularly review rates to ensure they provide incentives for program success, are set equitably, and balance affordability and program costs.	✗	10

Recycling Potential Assessment Model

Seattle Public Utilities uses the Recycling Potential Assessment (RPA) Model to:

- Forecast waste generation
- Calculate estimates of tonnages that the City can divert from landfill due to recycling, waste reduction and composting
- Provide financial cost and benefit estimates for each of the scenarios analyzed in the model

The RPA Model consists of two separate RPA components: one model for the municipal solid waste (MSW) stream and one model for the construction and demolition debris (C&D) waste stream. The MSW and C&D RPA models are structured very similarly, so this overview generally applies to both models. Unlike the MSW model, the C&D model includes beneficial uses of the materials as well as recycling. Beneficial use includes energy production or landfill cover. This appendix will point out other differences out as it describes the models.

Terminology: MSW

This appendix uses the term MSW to mean waste typically generated by the commercial, residential, and self-haul sectors.

SPU defines the waste streams, not so much by the materials that are included in them but in the method and location of disposal. SPU considers waste collected from within Seattle,

delivered to transfer stations and placed into containers for transportation to the municipal solid waste landfill in Arlington, Oregon, to be MSW garbage. SPU considers waste collected separately under the C&D collection contract, which is destined for disposal in a C&D landfill, to be C&D waste.

On the other hand, SPU credits recycling tonnages to either the C&D sector or the MSW sector depending on the recycled material. For example, SPU counts any recycled wood waste towards the C&D recycling rate. SPU counts plastic film towards the MSW recycling rate, even though plastic film occurs in both the C&D and MSW waste streams. SPU handles the material accounting in this fashion because, in many cases, the recycling reports SPU uses to track recycled materials are not specific enough to tell whether collectors would have disposed the material in a C&D or MSW landfill had it not been recycled.

The next sections describe the four modules that comprise the RPA model: waste generation, recycling tonnages, cost module and reporting module.

Waste Generation Module

The first step in the RPA model involves forecasting the amount of waste generation in Seattle, broken down into three sectors for the MSW model (residential single-family and multifamily, commercial, and self-haul). The C&D model has just one overall sector. The forecast estimate equations use econometric techniques and include a variety of economic, demographic, price, and weather variables.

SPU breaks down each forecasted waste stream down into 20 material types, based on the waste stream composition data Seattle regularly collects. The model forecasts waste generation, by sector by material, for the next 20 years.

Recycling Tonnages Module

The next step in building the RPA Model involves completing the recycling module, which contains data about existing programs and assumptions about alternatives proposed for the *2022 Plan Update*.

SPU models existing recycling and composting programs based on how much they are currently diverting (the existing recovery rate). SPU collects detailed recycling data on a regular basis for programs such as the Seattle's curbside residential and self-haul recycling programs. For city-contracted services, daily "truck level" data are available for total tons collected for each sector, and SPU uses periodic recycling composition data to analyze the tons collected by material

type. For other customer sectors, such as most of the commercial recycling, SPU obtains tons recycled from an annual report all recyclers in Seattle submit as required for their business license renewal. These reports include data on annual tons collected by material.

SPU models new alternative recycling programs proposed by staff using judgment about what ultimate recovery rate an alternative program will achieve how quickly the program will reach that steady recovery rate. The model is set up to run “scenarios,” which are groups of programs that SPU staff assemble according to some overall themes or scenario descriptions. A base scenario typically models existing recycling programs without any alternative programs. Other scenarios then layer on top of the base existing programs.

For each alternative program, SPU develops parameters that include what sector and material the program will address, the year the program starts and how quickly the alternative program takes full effect. When SPU includes an alternative program in a scenario that targets the same material as an existing program, SPU attributes only the new tonnages to the alternative program. For example, SPU has a curbside organics program that diverts food waste, and if SPU then wants to model an alternative program that makes the food waste mandatory, the tons attributed to the new mandatory program are the additional tons diverted after SPU calculates the existing program tons.

Financial Costs and Benefits Module

The next step in the model is to calculate program costs and financial benefits. The calculations use the factors in the waste generation and recycling tonnages modules just described.

For program costs, SPU can model each program using a variety of types of costs. The intention is to model program costs at a detailed enough level so that as program recovery rates are varied, costs will vary in a meaningful way. Programs can have fixed and/or variable cost components. The variable components can vary by household, employee, or tons. Programs can also have capital costs, and the life of the capital can be set to reflect what makes sense for that program's capital types. Examples of typical program costs are costs of collection, bin or cart costs, and education and processing costs.

The financial benefits of recycling include costs SPU does not have to incur—which is the cost to have recyclable material handled as garbage and disposed in a landfill. When Seattle recycles, the City diverts tons of material from garbage, so these tons no longer need collecting, transferring, hauling to the rail head, and landfilling. Savings occur at each step of the way and are the direct financial benefits to recycling. These savings are often referred to as “avoided costs.”

To calculate these benefits, the model includes the variable costs to collect, transfer, transport and dispose of the MSW or C&D as inputs. Note that the City does not gain savings from all the costs of collecting a ton of garbage when the ton is diverted to recycling. Only the part of the costs that vary with tons is saved. For example, SPU calculates the variable part of the residential collection cost based on SPU's collector contracts. SPU reimburses contractors for collection based on a formula that has fixed and variable components. When tonnages vary, SPU can estimate the effect on the contractor payment using the formula in the collection contract. SPU developed the formulas in the contracts to try to reflect how collection costs accrue. There are large fixed costs associated with collection, including the cost of the collection trucks and the costs to pick up waste at each household weekly, for example. The variable portion of the costs is small for collection since the truck must pass by the household each week, regardless of the amount of waste that customers put out for disposal.

Similarly, SPU uses transfer station and self-haul cost models to determine the variable portion of these two functions. Finally, SPU considers disposal costs to be 100% variable with tons. This is because for MSW Seattle has a long-term contract where SPU pays a per-ton fee for rail haul and disposal, and the fee does not depend on how many tons are delivered.

The cost model uses the above information in the calculation of the financial benefits of recycling. The result of the cost model is the additional costs of adding the recycling program (which include education, collection, any capital costs, processing, etc.), and the benefits (or avoided costs) of not having to collect the material for disposal in a landfill.

Reporting Module

SPU uses the final module in the RPA model to develop reports so SPU can present detailed results of each model run as needed. Results reported include displaying the tons recycled by year by material and by program. Reports also show the recovery rate for each material by sector, and an overall recycling rate. The C&D model also shows a beneficial use rate for materials diverted from disposal but not recycled. The report tables following this write-up are examples of the reports generated by the reporting module.

Environmental Benefits of Recycling

Since the 2004 Plan Amendment, *On the Path to Sustainability*, SPU has estimated both environmental and economic benefits of recycling. This section describes the steps used to model the environmental benefits. It provides background on the methodology and the MEBCalc model, including detail on how SPU quantifies environmental benefits. The results of

applying the methodology appear in Results of Seattle's Solid Waste Recycling, Composting, and Beneficial Use on page E.25.

Life Cycle Environmental Impacts Assessment and MEBCalc

Handling and disposal of municipal solid waste (MSW) and construction and demolition (C&D) discards causes external environmental costs and benefits. Externalities are impacts on the environment that are not reflected in the financial price (cost) of the activity.

For example, using recycled materials instead of virgin raw material resources to manufacture paper, aluminum cans, or tin cans creates measurable environmental benefits. Many of these benefits are from reduced energy use in the production process of creating these products and the associated avoided emissions. There are also measurable benefits of diverting organics from landfills. Landfilled organics produce methane, a powerful greenhouse gas. The MEBCalc model both quantifies and monetizes these benefits.

Over the past 20 or more years, economists and LCA researchers have made strides in estimating the costs of pollution on human health and other environmental receptors. Sources of new data and research have included:

- Regulatory impact analyses (RIAs) mandated by federal law and executive order
- Research on potential impacts of climate change
- Human, other-than-human species, and ecosystem health analyses of the impacts and costs of pollution and other environmental dis-amenities (for example, noise and odor)
- Life cycle analysis of pollution and energy embodied in materials and products, as well as emitted during resource extraction, refining, and manufacturing of those materials and products
- Economic analysis on the value of additional years of life and the costs of increased morbidity

Collection and public availability of data sets on pollutant releases and pollution profiles of resource extraction and refining, as well as on material and product manufacturing, product use, and end-of-useful-life management of product and packaging discards has also improved. Some of these data are maintained in publicly available data bases, including:

- EPA's National Emissions Inventory (NEI)
- EPA's Greenhouse Gas Inventory (GHGI)
- EPA's Toxics Release Inventory (TRI)

- EPA's Compilation of Air Pollutant Emissions Factors (AP-42) for more than 200 industrial air pollution source categories (where a category is a specific industry sector or group of similar emitting sources)
- Data gathered, codified, and maintained by state environmental protection agencies
- Data gathered and maintained by state and local clean air and clean water management, control, and permitting agencies

Researchers have also made progress connecting pollution to environmental and public health damages. In particular, the United Nations Intergovernmental Panel on Climate Change IPCC developed and helped popularize an index that uses a single number to define the quantity of climate-forcing emissions released into Earth's atmosphere each year. IPCC updates these results periodic assessment reports and codifies them in global warming potentials (GWPs) for each atmospheric pollutant that contributes to trapping of incoming solar heat energy.

Examples of GWPs important for MSW management from the *IPCC 2014 Fifth Assessment Report* range from 1 for carbon dioxide (CO₂) to 28 for methane (CH₄) and 265 for nitrous oxide (N₂O). The *IPCC 2014 Fifth Assessment Report* GWPs top out at 23,500 for sulfur hexafluoride (SF₆). These GWPs are averages over the 100 years following a pollutant's release. GWPs over a shorter period are different, except for CO₂, and are also available from IPCC assessment reports. For example, for the 20 years following release methane's average GWP is 84. The difference between average GWPs for methane over 100 versus 20 years is mostly because once in the atmosphere methane begins to oxidize to carbon dioxide and water vapor. Methane's lifetime in the atmosphere is over after about 12 years.

GWPs express the global warming potential of any greenhouse gas (GHG) relative to the global warming potential of carbon dioxide. Using GWP weights, then, SPU can sum up in terms of carbon dioxide equivalents (eCO₂ or CO₂e) the relative global warming potential of a profile of greenhouse gas releases from an activity or pollution source. SPU may then compare that activity's total GWP to any other activity's total GWP, provided SPU has a GHG emissions profile for both. GWPs allow comparison of the climate impact among alternative methods for producing the same product or material or carrying out the same activity, such as burying or burning MSW discards.

Along with climate change, SPU also considered human health and environmental impacts, some of which SPU assessed in the quantitative results for MSW and C&D diversion in this section. The impacts assessed, with their summary substance impact potential indicator shown in parentheses, are:

- Climate change (carbon dioxide equivalents, eCO₂)
- Human health respiratory (particulate matter 2.5 microns in diameter or less equivalents, ePM_{2.5})
- Human toxicity (toluene equivalents, eT)
- Human carcinogenicity (benzene equivalents, eB)
- Waterways eutrophication (nitrogen equivalents, eN)
- Atmospheric acidification (sulfur dioxide equivalents, eSO₂)
- Ecosystems toxicity (2,4-Dichlorophenoxyacetic acid equivalents, e2,4-D)
- Ozone depletion (trichlorofluoromethane equivalents, eCFC-11)
- Ground level smog formation (ozone equivalents, eO₃)

SPU used the [EPA's Tool for the Reduction and Assessment of Chemical and Other Environmental Impacts \(TRACI\)](#) to assess these impacts. As of version 2.1, this tool provides characterization factors for the public health and environmental impacts of 3,944 chemicals and other substances, with a characterization factor for each substance for each of the 9 impact categories just listed. Many chemicals and substances have characterization factors of zero for some impacts. For example, for climate change, only 91 of the 3,944 have characterization factors greater than zero.

For climate change, the characterization factors are GWPs. For the other eight impact categories, TRACI's characterization factors also are based on consensus among researchers and scientists on the relative effects of each pollutant in comparison to the impact category's impact potential indicator substance.

Given an emissions profile for the life cycle of a product, material, MSW activity or other pollution emitter of interest, TRACI 2.1 provides impact potentials for 9 human health and environmental impacts. This makes possible, for example, comparison of recycled-content versus virgin-content production impacts for an MSW material diverted from garbage and its associated virgin-content production life cycle, to recycling and its associated recycled-content production life cycle. Life cycle impacts for some materials are available from life cycle supply chain analysis conducted by inquiries of:

- Virgin- and recycled-content manufacturers regarding their outputs and associated inputs of materials, energy, and chemicals
- Suppliers of these input materials, energy, and chemicals

- Suppliers of suppliers, and so on

Such inquiries require many judgements about which inputs require follow-up with suppliers of those inputs, and how far up the supply chain to proceed with the investigation. For life cycle impacts of materials and products that have not been investigated by such process-oriented life cycle assessments (LCAs), economic input-output life cycle assessments (EIO-LCAs) are available from several sources, for example, Carnegie Mellon University Green Design Institute's models at www.eiolca.net.

SPU uses the MEBCalc from Sound Resource Management Group, Inc. (SRMG) to estimate environmental benefits and costs from Seattle's diversion of MSW and C&D discards to recycling, composting, and in the case of C&D wood wastes, beneficial use as an industrial fuel. The MEBCalc tool bases its LCA results on TRACI's characterization factors and life cycle inventory and activity data from well-recognized and well-regarded sources, such as:

- EPA's Waste Reduction Model (WARM)
- Research Triangle Institute's MSW Decision Support Tool's *Life-Cycle Data Sets for Material Production of Aluminum, Glass, Paper, Plastic and Steel in North America*¹
- The Environmental Paper Network's Paper Calculator
- The Sustainable Packaging Coalition's Comparative Packaging Assessment tool (COMPASS, now available through Trayak at <https://trayak.com/company>)
- California Air Resources Board's *Method for Estimating Greenhouse Gas Emissions Reductions from Recycling*
- Oregon Department of Environmental Quality's *Life Cycle Inventory of Packaging Options for Shipment of Retail Mail-Order Soft Goods, Final Peer-Reviewed Report*
- Carnegie Mellon University Green Design Institute's EIO-LCA models (available at www.eiolca.net)
- California Department of Resources Recovery and Recycling's (CalRecycle) study on used oil recycling – R. Geyer *et al*, *Life Cycle Assessment of Used Oil Management in California*
- Association of Plastic Recyclers' report by Franklin Associates, *Life Cycle Impacts for Postconsumer Recycled Resins: PET, HDPE, and PP*
- Numerous peer-reviewed journal articles, such as:
 - For wood wastes: Jeffrey Morris, "Recycle, bury or burn wood waste biomass? LCA answer depends on carbon accounting, emissions controls, displaced fuels, & impact costs," *Journal of Industrial Ecology*, 21 (4) 844-856, 2017.
 - For organic wastes: Sally Brown and Ned Beecher, "Carbon accounting for compost use in urban areas," *Compost Science*, submitted and now in peer review, 2019.

¹ The U.S.EPA funded this decision support tool; SPU used this tool in earlier efforts to evaluate the environmental benefits of recycling and composting.

When using MEBCalc tool, the last step involves estimating environmental costs and benefits to monetize each public health and environmental impact using estimated damage costs for releases of the nine indicator pollutant substances. At the time SPU evaluated the proposed alternatives in 2019, the nine damage estimates (2018 dollars) for emissions of one ton of each impact indicator substance were:

- 1 \$68 per ton of CO₂ equivalent climate warming potential
- 2 \$524,418 per ton of PM_{2.5} equivalent potential damages to human respiratory health
- 3 \$152 per ton of toluene equivalent potential human toxicity
- 4 \$4,301 per ton of benzene equivalent potential human carcinogenicity
- 5 \$16,793 per ton of nitrogen equivalent potential waterways eutrophication
- 6 \$221 per ton of SO₂ equivalent potential atmospheric acidification
- 7 \$4,217 per ton of 2,4-D equivalent potential ecosystem toxicity
- 8 \$69,833 per ton of CFC-11 equivalent potential ozone depletion
- 9 \$60 per ton of ozone (O₃) equivalent potential smog formation

When available, analysis of environmental costs and benefits during 2007 through 2018, and projections of those damage costs for 2019 through 2030, account for changes over time in damage cost estimates. For example, the federal government's Interagency Working Group on the Social Cost of Carbon estimates climate change costs for a carbon dioxide release in 2010 or 2015 or 2020 and so on for every fifth year through 2050.

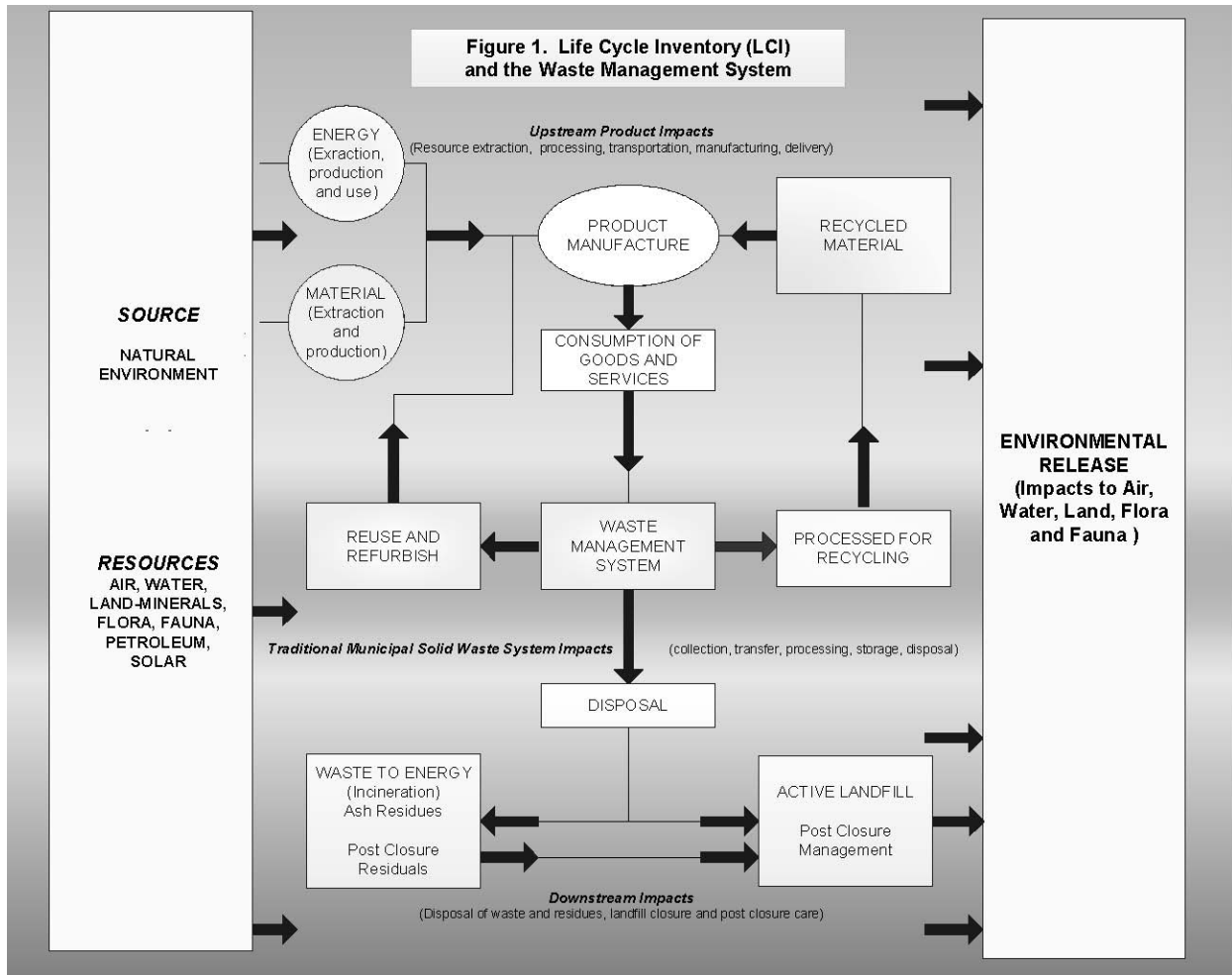
Acidification damage costs vary over time, partially due to the spot allowance clearing price at each year's EPA auction of sulfur dioxide (SO₂) emission allowances under the Clean Air Act's Acid Rain Program. For example, recent decreases in clearing prices at EPA's annual auction are likely in part caused by closure of coal-fired power plants, reducing the demand for sulfur dioxide emission allowances.

In addition, the 2007–2008 financial crisis, resultant economic contraction, and very slow economic recovery also substantially reduced energy demand. This meant that the caps under EPA's Acid Rain Program no longer served to constrain sulfur dioxide emissions by energy producers such as coal-fired power plants. Lower energy demand means that energy producers are less likely to bump up against their SO₂ emissions limits and thus have less need to buy additional emissions permits during the annual auctions.

Human health damage costs for respiratory diseases caused by particulate emissions increase over time, all else being the same. Increased economic activity and population growth put more human receptors in the emission pathways for the increases in particulates emitted into the atmosphere that are generated by economic growth.

Figure E.1 illustrates material flow and the types of externalities associated with the life cycle of materials.

Figure E.1 Flow of Materials and Life Cycle Environmental Impacts



Source: Seattle Public Utilities

Quantifying and Monetizing External Benefits

SPU used the MEBCalc tool to estimate and quantify the environmental value of recycling and composting programs from 2007 through 2018, and to evaluate the environmental benefits of MSW recycling and composting plans for 2019 through 2030, and to assess environmental benefits and costs for construction and demolition (C&D) recycling and beneficial uses. This tool accounts for the environmental costs of collection, processing and hauling activities of recycling, as well as the environmental costs of collection, hauling (by truck and rail), and

landfill disposal of these materials in the garbage that are avoided by recycling. These environmental costs are deducted from the environmental benefits of producing products using recycled rather than virgin feedstocks to provide an estimate of the net environmental benefits (or costs, in some cases) of diverting discards to recycling, composting or beneficial use.

SPU takes a series of steps to go from estimating tons of a variety of recycled materials to estimating a dollar value of the environmental benefit of recycling. First, SPU obtains estimated recycled and composted tons, by material, from the outputs of the RPA Model. Then a variety of tools and databases (some of which were listed above) provide information on quantities of pollutants that are not produced when material is recycled or composted instead of being thrown away. For example, research shows that manufacturing a new aluminum can from a recycled aluminum can uses much less energy, which results in the release of fewer pollutants due to the lower energy requirement. Less pollution means lower public health and other environmental impacts from producing the aluminum can. Based on the costs that pollution causes for public health and the environment, SPU can then calculate the environmental and public health cost savings from making a new aluminum can out of a recycled can rather than newly mined bauxite and other virgin raw materials.

Large numbers of pollutants are reduced for each of the life cycle environmental impacts for all the recycled and composted materials. To estimate these reductions, SPU uses one pollutant as an index for each of the life cycle environmental impacts. The most familiar example is CO₂ (carbon dioxide). SPU converts reductions of all other pollutants, such as methane, to units of CO₂ equivalents to add them together. The aggregated quantity is called carbon dioxide equivalents, denoted as eCO₂. In the next step in the analysis, SPU monetizes, meaning places a dollar value on, the reduction in CO₂. This step of monetization allows all the life cycle impacts to be summarized in dollars and added onto the financial costs and benefits of recycling calculated in the RPA model.

The current analysis quantifies external environmental benefits and provides monetary values for nine different types of environmental impacts. This allows SPU to represent some of the upstream savings when material is recycled instead of disposed. The next section describes the nine damages (impacts) SPU has valued, followed by a discussion of other impact categories and benefits not quantified.

Life Cycle Impact Categories

There are many challenges to estimating the cost of pollution externalities, which typically involves two major steps. First, economists quantify pollutant emissions in terms of one or

more of their public health, ecosystem health, and other environmental impacts. Second, economists “monetize” these impacts, or calculate an estimated economic cost.

One challenge is that a pollutant may have more than one environmental impact. For example, SO₂ emissions to the atmosphere can cause human respiratory impacts when SO₂ reacts with other compounds in the atmosphere to form small particles that, when inhaled, cause respiratory illnesses. SO₂ also is a precursor, meaning a chemical that contributes to creating, to acid rain because it combines with water, oxygen, and other chemicals in the atmosphere to form sulfuric acid. Sulfuric acid then deposits on buildings, cars, and trees, as well as in waterways, causing harm to plant and animal life and to buildings, among other impacts. Each of these impacts likely has a different cost per pound or ton of SO₂ emitted from a fossil fuel-fired power plant or other emissions source.

LCA and its impact assessments provide a methodology for converting emissions of numerous pollutants into a manageable number of mutually exclusive environmental impacts. Mutually exclusive impact categories mitigate the double counting problems that could occur with pollutants such as sulfur dioxide that can cause more than one type of environmental impact. EPA's TRACI (Tool for the Reduction and Assessment of Chemical and other environmental Impacts) model is a life cycle impact assessment tool with mutually exclusive impact categories.

TRACI provides indexing weights known as characterization factors for each pollutant that is a potential cause of each environmental impact. These characterization factors allow emissions of disparate pollutants that cause each impact to be aggregated/summed into an equivalent quantity of emissions for a single reference pollutant that also causes the impact.² This greatly simplifies reporting and analysis of different levels of pollution. By grouping pollution impacts into a handful of categories, environmental costs and benefits modeling can reduce the complexity of making policy decisions from tracking data on hundreds or thousands of pollutants. This makes environmental impact data far more accessible to policy makers.

As an example of this aggregation technique, all GHG releases are converted and summed into carbon dioxide equivalents, or eCO₂, which serves as a measure for the climate change potential from releases of all GHGs.

² Jane C. Bare, *Developing a Consistent Decision-Making Framework by Using the U.S. EPA's TRACI*, U.S. Environmental Protection Agency, Cincinnati, OH, 2002; Jane C. Bare, Gregory A. Norris, David W. Pennington and Thomas McKone, TRACI: The Tool for the Reduction and Assessment of Chemical and Other Environmental Impacts. *Journal of Industrial Ecology* 2003, 6(3-4): 49-78; and Jane C. Bare, TRACI 2.0: the tool for the reduction and assessment of chemical and other environmental Impacts 2.0. *Clean Technologies and Environmental Policy*, 2011, 13(5) 687-696, provide expositions on the original and more recent versions of the TRACI model.

Another example illustrates how the TRACI model avoids double counting. Substances that are scored by TRACI 2.1 as having human respiratory impacts greater than zero include filterable and condensable particulate matter, SO₂, nitrogen oxides (NO_x), and total suspended particulates. These substances all have zero characterization factor scores for human health carcinogenic and toxicity impacts. What might seem like another possibility for double counting is thus avoided using the TRACI methodology.

MEBCalc uses TRACI characterization factors for nine environmental impacts. The nine environmental impacts for which TRACI supplies characterization factors are:

- 1 Climate change** – The potential increase in greenhouse effects due to anthropogenic emissions. CO₂ from burning fossil fuels is the most common source of greenhouse gases (GHGs). Methane from anaerobic decomposition of organic material is another large source of greenhouse gas. The reference substance for climate change potential is carbon dioxide and the pollutants that have climate impacts are characterized and converted by the TRACI model into eCO₂.
- 2 Human respiratory disease and death from particulates** – Potential human health impacts from anthropogenic releases of coarse particles known to aggravate respiratory conditions such as asthma, releases of fine particles that can lead to more serious respiratory symptoms and disease, and releases of particulate precursors, such as nitrogen oxides and sulfur oxides. The reference substance for human respiratory disease potential is particulate matter no larger than 2.5 microns. Pollutants that have respiratory health impacts are converted into reference pollutant equivalences, denoted by ePM_{2.5}.
- 3 Human disease and death from toxics** – Potential human health impacts (other than respiratory and carcinogenic effects) from releases of chemicals that are toxic to humans. Many chemical and heavy metal pollutants are toxic to humans, including 2,4-D, benzene, DDT, formaldehyde, permethrin, toluene, chromium, copper, lead, mercury, silver, and zinc. The reference substance used for human toxicity potential is toluene and pollutants that have human toxicity impacts are characterized and converted by the TRACI model into toluene equivalents, denoted by eT.
- 4 Human disease and death from carcinogens** – Potential human health impacts from releases of chemicals that are carcinogenic to humans. Many chemical and heavy metal pollutants are carcinogenic to humans, including 2,4-D, benzene, DDT, formaldehyde, kepone, permethrin, chromium, and lead. The reference substance for human carcinogenic potential used herein is benzene and the pollutants that have human carcinogenic impacts are aggregated into benzene equivalents, denoted by eB.

- 5 Eutrophication** – Potential environmental impacts from the addition of mineral nutrients to the soil or water resulting from emissions of eutrophying pollutants to air, soil, or water. The addition to soil or water of mineral nutrients, such as nitrogen and phosphorous, can yield generally undesirable shifts in the number of species in ecosystems and a reduction in ecological diversity. In water, nutrient additions tend to increase algae growth, which can lead to reductions in oxygen and death of fish and other species. The reference substance for eutrophication potential is nitrogen and pollutants that have eutrophying impacts are characterized by nitrogen equivalents, eN.
- 6 Acidification** – Potential environmental impacts from anthropogenic releases of acidifying compounds, principally from fossil fuel and biomass combustion, which affect trees, soil, buildings, animals, and humans. The main pollutants involved in acidification are sulfur, nitrogen, and hydrogen compounds, such as sulfur oxides, sulfuric acid, nitrogen oxides, hydrochloric acid, and ammonia. The reference substance for acidification potential used in SPU's analysis is sulfur dioxide and the pollutants that have acidifying impacts are characterized by sulfur dioxide equivalents, eSO₂.
- 7 Ecosystems toxicity** – The relative potential for chemicals released into the environment to harm terrestrial and aquatic ecosystems, including wildlife. Many chemical and heavy metal pollutants are toxic to ecosystems, including 2,4-D, benzene, DDT, ethyl benzene, formaldehyde, kepone, permethrin, toluene, chromium, copper, lead, silver, and zinc. The reference substance used for ecotoxicity potential is 2,4-D and pollutants that have toxicity impacts to ecosystems are characterized by 2,4-D equivalents, denoted by e2,4-D.
- 8 Ozone depletion** – The relative potential for chemical compounds released into the atmosphere to cause degradation of the earth's ozone layer. The reference substance for ozone depletion potential (ODP) is trichlorofluoromethane, CFC-11, where CFC is the acronym for chlorofluorocarbon. CFC-11 is sometimes called R-11.
- 9 Ground level smog formation** – The relative potential for chemical compounds released into the atmosphere to react with sunlight, heat, and fine particles to form ozone (O₃). For example, nitrogen oxides (NO_x) and volatile organic compounds (VOCs) can be released when fuels are combusted and are some of the chemical compounds that contribute to ground level smog formation. The reference substance for smog formation is ozone itself.

For each of these nine environmental impacts the reference substance score refers only to the appropriate specific aspect of the reference substance's impact. For example, the TRACI score for human carcinogens is measured in benzene equivalents that are based on the relative strength of each pollutant's carcinogenic effects compared to benzene's carcinogenic effects. Other effects associated with the same pollutants are expressed relative to the reference substances for other impacts.

Developing reference substance scores from TRACI characterization factors for pollutants is the first step in estimating the environmental costs of externalized pollution. The next step involves developing dollar costs for emissions of the reference substances. Available estimates for these costs for a reference substance may vary widely. The cost of climate impacts for CO₂ emissions provides a good example of the lack of a widespread consensus on environmental costs.

One low-end cost that might be used for CO₂ as the reference substance for climate change is its trading price for voluntary greenhouse gas emission reductions. Operating much as the markets in sulfur dioxide emissions allowances do, except without the Clean Air Act-mandated emissions caps, voluntary markets may be available for trading voluntary greenhouse gas emissions reduction pledges. Over recent years prices on voluntary markets have ranged widely, dropping to near zero and perhaps averaging around \$5 per short ton.³ Values on the European Union Emissions Trading System for emissions permits based on mandatory caps are higher, ranging around \$20 per short ton, but fluctuating down to nearly zero and up to \$35.⁴ Fluctuations in the EU's carbon prices have been due to a variety of factors specific to the EU's carbon cap and trade system. In addition, the financial chaos of 2007-08 and the following recession contributed to that market's instabilities. When demand for goods and services falls, mandatory caps may no longer provide binding constraints that require firms to buy carbon credits to meet their emissions caps.⁵ Hence demand to purchase credits from carbon markets falls.

Prices on both voluntary and mandatory markets for GHG emissions tend to be lower than prices derived from direct attempts to estimate the costs of climate change and relate those costs to today's emissions of GHGs. This may reflect the social and political difficulties of imposing costs on today's economic activity that are based on potential future scenarios that are not well understood or universally accepted.

One example of a well-respected, relatively recent study is the review of the economic costs of climate change conducted by Nicholas Stern, the former Chief Economist at the World Bank. That review determined that a reasonable estimate for the cost of then-current greenhouse gas

³ Richard G. Newell, William A. Pizer, Daniel Raimi, Carbon Markets 15 Years after Kyoto: Lessons Learned, New Challenges. *Journal of Economic Perspectives*, 2013, 27(1), 123-146.

⁴ Ibid.

⁵ EPA's annual auction of sulfur dioxide emissions allowances under its acid rain program illustrates the price volatility that can be induced in a cap-and-trade system as a result of economic cycles. The spot market auction clearing price was in a steady upward trajectory from \$126 in 2000 to \$860 in 2006. The financial crisis of 2007–2008 reversed that trend with the 2007 and 2008 clearing prices falling to \$433 and \$380, respectively. The following Great Recession coincided with a steepening decline to \$62 and \$36 in 2009 and 2010, respectively. Reflecting the displacement of coal-fired power by other energy sources for generating electricity, clearing prices in the 2011-2019 auctions were, in chronological order, \$2, \$1 and \$0.17, \$0.35, \$0.11, \$0.06, \$0.04, \$0.06, and \$0.04.

emissions was \$85 per metric ton of eCO₂. This estimate was based on the risk of catastrophic environmental impacts in the future if substantial reductions in greenhouse gas emissions were not implemented at that time in the mid-2000s.⁶

A 2011 working paper from the U.S. offices of the Stockholm Environment Institute provides a very high estimate near \$1,000 per metric ton of carbon dioxide equivalents.⁷ Near the other end of the spectrum for climate costs of carbon emissions is a study that estimated GHG emissions costs to be lower than prices for emissions permits under mandatory cap and trade. That estimate is \$8 per metric ton, published in an article in a prestigious economics journal.⁸

In 2013, the federal Interagency Working Group on the Social Cost of Carbon issued revised estimates for the social cost of carbon emissions. Table E.2 shows these estimates as a function of the social discount rate and the year in which an additional metric ton of CO₂ is emitted.^{9,10} Because climate impact costs are projected to increase as time passes and the amount of CO₂ in the atmosphere increases, the discounted value of future impacts from a current year's emissions rises as years go by and those future events come ever closer. Also, a lower discount rate results in higher discounted present values of those future costs.¹¹

⁶ Nicholas Stern, *The Economics of Climate Change: The Stern Review*, Cambridge University Press, Cambridge, England and New York, NY, 2007.

⁷ Frank Ackerman and Elizabeth A. Stanton, *Climate Risks and Carbon Prices: Revising the Social Cost of Carbon*. Stockholm Environment Institute – U.S. Center working paper, Somerville, MA, 2011.

⁸ Nicholas Z. Muller, Robert Mendelsohn, William Nordhaus, Environmental Accounting for Pollution in the United States Economy. *American Economic Review*, 2011, 101 (August), 1649-1675.

⁹ Interagency Working Group on Social Cost of Carbon, U.S. Government (with participation by Council of Economic Advisers, Council on Environmental Quality, Dept. of Agriculture, Dept. of Commerce, Dept. of Energy, Dept. of Transportation, EPA, National Economic Council, OMB, Office of Science and Technology Policy, and Dept. of Treasury), Technical Support Document – Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis – Under Executive Order 12866, May 2013.

¹⁰ "Avg" in the table refers to the average future damage costs estimated by three different integrated climate impact assessment models for an increase in one metric ton of CO₂ emissions in a given year. 95th refers to the most likely damage cost for the three models, meaning that estimated costs have only a 5% chance of being higher than this level for emissions in the year indicated by table rows.

¹¹ There is much debate among economists as to what the social discount rate should be, with some suggesting that the discount rate in future years should follow the declining exponential function tending toward zero for more distant years. See, for example, Paul R. Portney and John P. Weyant (eds.), *Discounting and Intergenerational Equity*, Resources for the Future, Washington, DC, 1999.

Table E.2 Revised Social Cost of CO₂, 2010–2050 (in 2007 dollars per metric ton of CO₂)

Discount Rate Year	5.0% Avg	3.0% Avg	2.5% Avg	3.0% 95th
2010	11	33	52	90
2015	12	38	58	109
2020	12	43	65	129
2025	14	48	70	144
2030	16	52	76	159
2035	19	57	81	176
2040	21	62	87	192
2045	24	66	92	206
2050	27	71	98	221

Note: CO₂ costs are emissions-year specific.

A further issue that one encounters when developing economic cost estimates for environmental impacts is that some impacts are more global and others more local. CO₂ emissions have global impacts whereas emissions of other pollutants, say chromium or cadmium or lead, likely have effects that are more severe close to the place where they are emitted, or more severe given the type of media to which they are emitted. TRACI 2.1 begins to deal with this issue by providing separate cancer, non-cancer and ecotoxicity characterization factors for emissions to urban versus non-urban air, emissions to fresh versus saltwater, and emissions to agricultural land versus non-agricultural land. Such distinctions are very useful if one knows the point source of the emissions to be characterized. They also can provide an indication of the effect that uncertainty about location of emissions can have on the estimates of environmental impact potentials.

For the estimates of environmental costs and benefits developed in this appendix for Seattle's recycling and composting programs, the following listing shows the 2018 costs in 2018 dollars for each of the nine environmental impacts covered, and the source for each of those nine impact cost estimates:

- **Cost of eCO₂ emissions = \$68 per ton.**

Estimate based on the U.S. Interagency Working Group on the Social Cost of Carbon (with participation by Council of Economic Advisers, Council on Environmental Quality, Dept. of Agriculture, Dept. of Commerce, Dept. of Energy, Dept. of Transportation, EPA, National Economic Council, OMB, Office of Science and Technology Policy, and Dept. of Treasury), *Technical Support Document – Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis – Under Executive Order 12866, May 2013*. \$58 is the federal Interagency

Working Group on the Social Cost of Carbon's estimate for future costs of climate change (in 2007 dollars) per metric ton of carbon dioxide emitted in 2015, assuming a 2.5% social discount rate. SPU and its consultant interpolated 2018 emissions cost from the federal Interagency Working Group on the Social Cost of Carbon's estimates for 2015 and 2020. They then converted that estimate from 2007 to 2018 prices using price index data from the U.S. Department of Labor Bureau of Labor Statistics (BLS).

- **Cost of ePM_{2.5} emissions = \$524,418 per ton.**

Estimate based on value of particulate emissions reductions developed in the report: U.S. EPA, *Technical Support Document: Estimating the Benefit Per Ton of Reducing PM_{2.5} Precursors from 17 Sectors*, January 2013, Table 5 Summary of the total dollar value (mortality and morbidity) per ton of directly emitted PM_{2.5} and PM_{2.5} precursor reduced by each of 17 sectors in 2016 (2010\$, 3% discount rate) and Table 7 Summary of the total dollar value (mortality and morbidity) per ton of directly emitted PM_{2.5} and PM_{2.5} precursor reduced by each of 17 sectors in 2020 (2010\$, 3% discount rate). Value used in MEBCalc for 2018 estimated by interpolation between 2016 and 2020 weighted averages of reductions in each of the 17 economic/geographic sectors. The 2018 interpolation is converted from 2010\$ to 2018\$ using BLS price index data.

- **Cost of eT emissions = \$152 per ton.**

This value for toluene is based on health costs of mercury emissions reductions as estimated in Giang and Selin (2015), Benefits of mercury controls for the United States, *Proceedings of the National Academy of Sciences*.

- **Cost of eB emissions = \$4,301 per ton.**

Value for benzene from Eastern Research Group (2006), Draft Report: Cost Benefit Analysis for Six "Pure" Methods for Managing Leftover Latex Paint – Data, Assumptions, and Methods. Prepared for the Paint Product Stewardship Initiative.

- **Cost of eN emissions = \$16,793 per ton.**

Value for nitrogen based on its water eutrophication cost when released to water. See Compton *et al* (2017), Assessing the social and environmental costs of institution nitrogen footprints, *Sustainability* 10 (2) 114-122, Table 1, page 117, and Sobota *et al* (2015), *Environmental Research Letters* 10 025006, Table 1, page 4.

- **Cost of eSO₂ emissions = \$221 per ton.**

Cost is based on estimated acid rain damage costs to buildings from acidic air emissions of nitrogen oxides and ammonia. See Compton *et al* (2017), *op. cit.*, Table 1, page 117. Nitrogen oxides and ammonia emissions converted to SO₂ equivalents using TRACI characterization factors for acidification impacts.

- **Cost of e2,4-D emissions = \$4,217 per ton.**

Cost is based on Morris and Bagby (2008), Measuring Environmental Value for Natural Lawn and Garden Care Practices, *International Journal of Life Cycle Assessment*, 13(3) 226-234.

- **Cost of eCFC-11 emissions = \$58,949 per ton**
Cost is based on carbon tetrachloride global warming potential (GWP) of 1400 and ozone depletion potential (ODP) of 0.74.
- **Cost of eO₃ emissions = \$60 per ton**
Cost is based on U.S. EPA Office of Air and Radiation (2016), Allowances Allocation: Final Rule TSD – Technical Support Document (TSD) for the Cross-State Air Pollution Rule (CSAPR) Update for the 2008 Ozone NAAQS, Docket ID No. EPA-HQ-OAR-2015-0500, August 2016, Table 1, Page 4.

Reflections on Impacts Not Quantified, Material Types Not Evaluated, and Externalized Costs Not Well-Estimated

Due to the absence of emissions data for the specific pollutants tracked under some of these categories, the lack of quantitative measures to relate emissions to impacts, and/or the absence of well-researched monetization estimates, SPU and its consultant did not quantify the of benefits the following environmental and resource depletion impacts:

- Fossil fuel depletion potential
- Habitat alteration potential
- Indoor air quality
- Water use
- Land use

Estimates of damage costs may underestimate the actual costs to future generations of current releases of pollutants and depletion of resources. The problem is particularly acute for ecosystem impacts, given the currently limited understanding of long-run impacts from:

- Accelerated species extinctions and decreases in biodiversity
- Associated decreases in various aspects of ecosystems' ability to, among other things, cycle nutrients, clean the air and clean the water

Future costs from cumulative impacts of global warming are also difficult to predict. Estimates of human health costs from toxic and carcinogenic releases do not presently appear to account adequately for impacts (cumulative and interactive) of many of the chemical releases to the environment. There may be as many as 75,000 to 100,000 chemical compounds used in industrial processes and commerce. To put this into perspective, the nine pollution impact categories quantify releases to air and water for less than four thousand substances.

Finally, the RPA model currently tracks discards diversion for about 20 categorical types of materials. One of those is a miscellaneous category. Miscellaneous materials are reported in aggregate by RPA modeling. In the environmental impact analysis using MEBCalc, between 6% and 10% of MSW discards diverted from disposal to recycling or composting are not evaluated for their environmental benefits.

Results of Seattle's Solid Waste Recycling, Composting, and Beneficial Use Analysis

The following charts illustrate the magnitude of the additional benefits from recycling MSW and C&D materials for both past years (2007–2018) and planned future recycling through 2030. For C&D, three charts also illustrate the substantial environmental costs of using discards as industrial fuels to displace natural gas.

Municipal Solid Waste Results

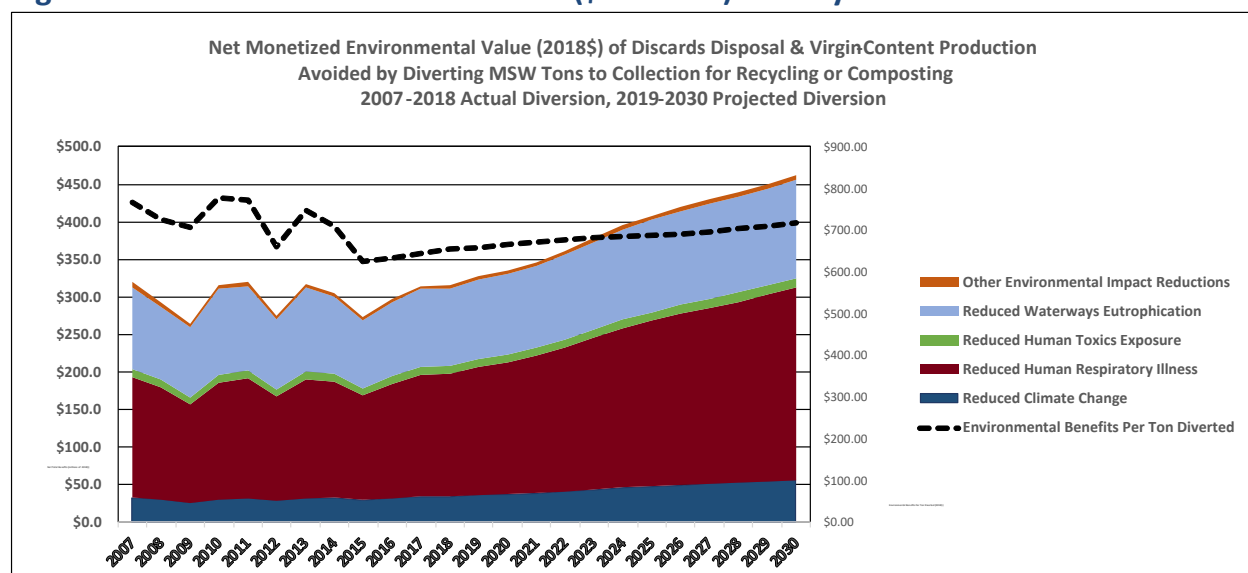
SPU and its consultant calculated benefits for MSW by first starting with the tons recycled or composted from the RPA model for past and current programs and for future recommended scenarios. Then, using the techniques described above and embodied in MEBCalc, they quantified benefits across nine life cycle impact categories using an indexed pollutant for each category. The models place a monetary value on each of the indexed pollutants to allow these different life cycle impact categories to be expressed in dollar terms so they can be added together.

For MSW, Figure E.2 shows estimated environmental benefits for actual recycling and composting from 2007 through 2018 and for RPA-projected recycling and composting during 2019 through 2030. Over the 12 years from 2007 through 2018, the environmental benefits from recycling and composting were worth between \$265 million and \$320 million (all dollar values in constant 2018\$), because Seattle recycled or composted between 368,000 and 456,000 tons of materials. Due to contaminants discarded by households and businesses in their recycling and organics collection containers, this diversion required collection of between 375,000 and 489,000 tons for processing before the collected materials could be sold for recycled-content production or used as compost. The collection, processing, and disposal environmental costs for these contaminants are figured into the net environmental benefits shown in Figure E.2, as are the environmental costs of recycling and organics collection vehicles, processing activities, recycled-content manufacturing, and composting activities.

Increases in net environmental value for the planning period 2019 through 2030 are mainly due to projected increases in diversion from 465,000 tons in 2019 to 604,000 tons by 2030. During this planning period, the net environmental value per ton diverted grows steadily.

During 2007–2018, net environmental value per ton tended to cycle downward due to average contamination in recycling and organics collection containers rising from 1.9% in 2007–2009 to 6.4% by 2016–2018. Composition of collected recyclables can also affect environmental values. For example, environmental impacts would change if Seattle used more aluminum cans, which have a high net environmental value when recycled, and fewer glass containers, which have a lower net recycling environmental value.

Figure E.2 Net Environmental Value (\$ millions) of Recycled MSW Tons 2007–2030



Contamination estimates are based on periodic collection stream composition sampling. The approximately 5-year intervals between samplings yields some, perhaps most, of the cycling shown in Figure E.2 when estimated contamination rises based on the most recent study and diverted tonnage then rises during the following years. For projections of net environmental values during the 2019-2030 planning period, MEBCalc estimates assume that contamination rates will remain at 2016-2018 levels.

As shown in Figure E.2 and Table E.3, avoided potential climate change, human health impairments (especially respiratory ailments), and waterways eutrophication account for most of the net environmental value from MSW diversion. These environmental benefits are the result of diverting materials from disposal to recycling or composting, thus avoiding the environmental emissions and associated costs of disposal and of producing products and

packaging materials using virgin energy and material resources extracted from the planet's ecosystems.

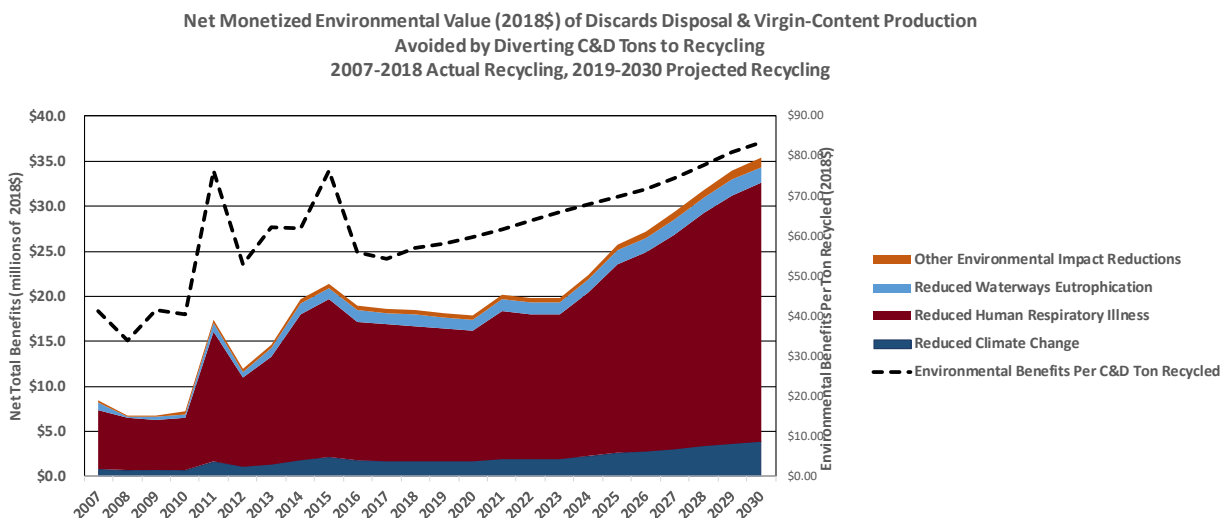
Table E.3 Net Environmental Value (millions of 2018\$) of Diverted MSW Tons 2018*

YEAR	CLIMATE CHANGE	HUMAN HEALTH – RESPIRATORY	HUMAN HEALTH – TOXICS	WATERWAYS EUTROPHICATION	OTHER 5 IMPACTS	TOTAL ENVIRONMENTAL VALUE
2010	29.8	155.9	11.0	113.5	5.0	315.3
2020	37.3	175.7	10.5	107.0	4.6	335.2
2030	56.0	256.3	12.8	130.3	6.2	461.6

**Monetized value of specific environmental impacts reductions*

Construction and Demolition Debris Results

Figure E.3 for C&D recycling shows estimated net environmental benefits for actual C&D recycling in 2007–2018 and for RPA-projected C&D debris recycling in 2019–2030. During 2007–2018, the environmental benefits from recycling and composting were worth between \$7 million and \$21 million (all dollar values in constant 2018\$), because Seattle recycled between 163,000 and 343,000 tons of C&D debris. SPU includes the environmental costs of recycling hauling vehicles, processing activities, and recycled-content manufacturing activities when calculating net benefits of avoiding C&D discards disposal and avoiding manufacturing of virgin-content replacement products for recycled C&D debris.

Figure E.3 Net Environmental Value (\$ millions) of Recycled C&D Tons 2007–2030

As shown in Figure E.3 and Table E.4, most of the net environmental value of C&D debris recycling comes from avoided potential climate change, human respiratory health impairments, and waterways eutrophication. As indicated in Table E.4, human respiratory impacts avoided by C&D recycling account for most of the environmental benefits of C&D debris recycling. Recycling ferrous metals provided more than half of these environmental benefits. Recycled concrete and asphalt, which typically account for more than half of recycled C&D debris tons, provide relatively low environmental benefits due to their use as replacements for aggregates typically used in construction and road building and repair. Production of construction aggregates is much less material- and energy-intensive than production of metallic construction materials.

Table E.4 Net Environmental Value (\$ millions) of Recycled C&D Tons*

YEAR	CLIMATE CHANGE	HUMAN HEALTH - RESPIRATORY	HUMAN HEALTH- TOXICS	OTHER 6 IMPACTS	TOTAL ENVIRONMENTAL VALUE
2010	0.7	5.8	0.4	0.3	7.2
2020	1.7	14.5	1.2	0.5	17.8
2030	3.8	28.7	1.8	1.0	35.4

*Monetized value of specific environmental impacts reductions

Figure E.4 is like Figure E.3 except that it focuses on the beneficial use of C&D wood discards rather than on the recycling of other C&D debris materials. Figure E.4 shows the net

environmental costs of using C&D wood discards as industrial fuels to replace using natural gas as fuel and landfilling the wood discards. SPU categorizes this use of C&D discards as a beneficial use rather than as recycling because diverting wood to use as an industrial fuel in place of natural gas fuel typically has negative environmental consequences, unlike recycling, which typically has positive environmental benefits. The main reasons are that (1) natural gas burns more cleanly than wood, given similar emissions controls on the combustion facility, and (2) when wood is disposed of in a modern anaerobic landfill, less than 20% of carbon in typical wood discards anaerobically degrades to produce methane and carbon dioxide in oxygen-starved landfill conditions. The small percentage of carbon in wood that biodegrades in a landfill, takes more than 100 years to break down and generate methane and carbon dioxide.

Figure E.4 shows the estimated net environmental costs for actual wood beneficial use in 2007–2018 and for beneficial use of C&D wood projected by the RPA for 2019–2030. During 2007–2018, annual net environmental costs of using wood discards as industrial fuel were between \$7 million and \$40 million (all dollar values in constant 2018\$), because between 9,000 and 49,000 tons of wood discarded through C&D activities was burned. SPU deducts the environmental costs of burning the natural gas displaced by wood fuel and of otherwise landfilling wood discards from the environmental costs of wood burning to yield the net environmental costs shown in Figure E.4.

As shown in Figure E.4 and Table E.5, increases in human respiratory health accounted for most of the net environmental costs from beneficial use of C&D wood discards. Net environmental costs also increased for potential climate change and toxics impairments.

Figure E.4 Net Environmental Cost (\$ millions) from Beneficial Use of C&D Wood Discards as Industrial Fuels Displacing Natural Gas 2007-2030

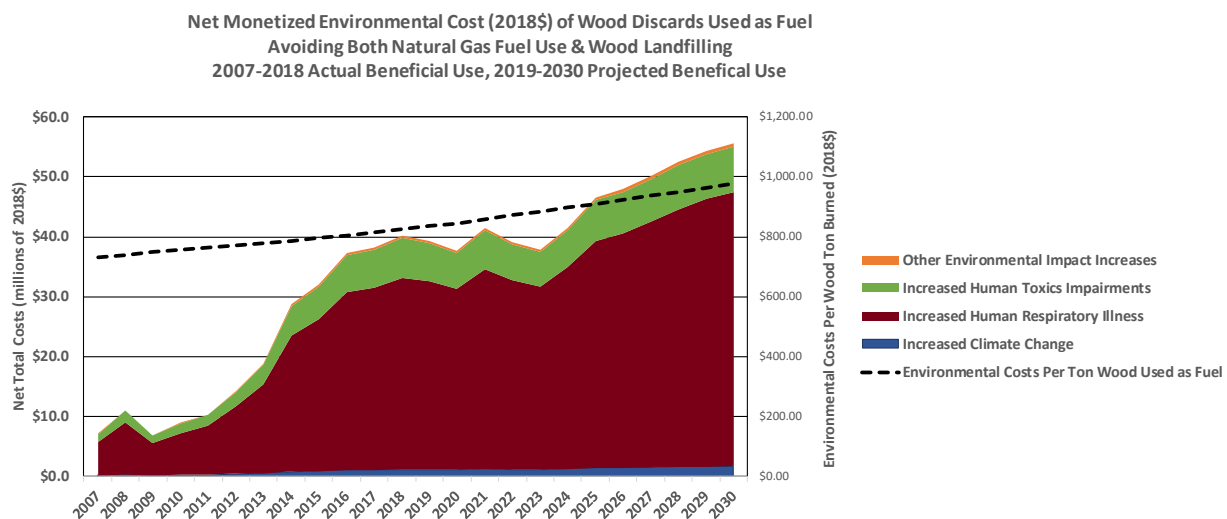


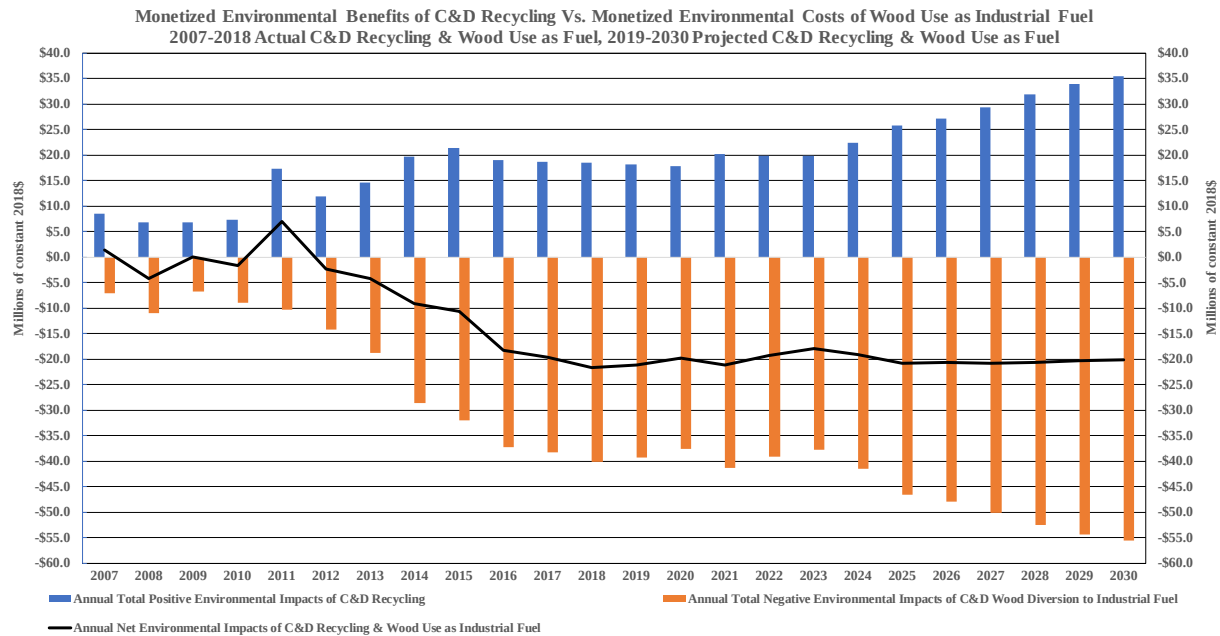
Table E.5 Net Environmental Costs (\$ millions) of Burning C&D Wood Discards*

YEAR	CLIMATE CHANGE	HUMAN HEALTH - RESPIRATORY	HUMAN HEALTH- TOXICS	OTHER 6 IMPACTS	TOTAL ENVIRONMENTAL VALUE
2010	0.2	7.0	1.6	0.1	9.0
2020	1.1	30.2	6.0	0.4	37.6
2030	1.7	45.8	7.7	0.5	55.6

Figure E.5 combines the total environmental benefits of C&D recycling shown in Figure E.3 with the total environmental costs of C&D wood diversion to industrial fuel shown in Figure E.4. Figure E.5 illustrates that, in most years, the environmental costs from beneficial use of C&D wood discards as industrial fuel exceeded the environmental benefits of recycling other C&D materials, despite the fact that recycling tonnages were 7 to 21 times greater than the quantity of C&D wood discards diverted to industrial fuel use in 2007–2018.

The few instances when C&D recycling environmental benefits exceed C&D wood burning environmental costs tended to occur when recycled C&D metal recycling surged. C&D metal tons surge either because people discard more metal or because an increase in recycling market prices causes metal recyclers to sell metals they stockpiled and did not report recycling in previous years when metal recycling prices were low. Unlike materials such as paper and cardboard, metals can typically be stockpiled outside at low cost without significant deterioration in value due to weathering.

Figure E.5 Environmental Benefits (\$ millions) from C&D Recycling vs. Environmental Costs (\$ millions) from C&D Wood Diverted to Use as Industrial Fuel Displacing Natural Gas



Recycling Potential Assessment Model Outputs

The remainder of this appendix presents tables and figures with outputs from the RPA model in two sections:

- Municipal solid waste model
- Construction and demolition debris model

Summary: Municipal Solid Waste Tons Per Year, Status Quo

Year	Curb/Apt Rec	Home Organics	Curb/Apt Org	Clean Green	R&R centers	Com Priv Rec
1997	67,509	38,287	43,130	14,137	5,000	194,323
1998	70,279	39,128	40,546	13,034	5,376	194,251
1999	73,478	41,379	39,737	13,692	6,612	199,968
2000	72,864	26,662	34,037	14,032	7,109	162,989
2001	72,382	26,662	36,990	15,034	7,103	149,453
2002	72,543	26,662	34,503	14,353	8,340	149,025
2003	73,780	26,662	33,923	14,156	8,170	126,956
2004	76,860	23,900	38,485	14,907	8,163	159,341
2005	81,139	22,700	42,603	13,925	9,232	179,265
2006	84,531	22,700	51,482	14,277	9,745	215,258
2007	86,621	22,700	54,573	14,247	11,246	219,894
2008	81,888	22,700	56,364	11,893	8,662	213,493
2009	76,584	16,000	74,230	10,149	6,179	184,593
2010	77,110	16,000	79,952	7,682	4,643	203,511
2011	75,778	16,000	78,456	6,794	3,949	215,678
2012	75,916	16,000	82,244	6,593	3,501	213,584
2013	75,909	16,000	80,816	6,290	4,040	224,079
2014	77,970	16,000	81,001	4,199	2,635	229,950
2015	77,193	16,000	87,510	4,167	2,888	230,480
2016	78,991	16,000	89,556	4,390	3,693	247,042
2017	79,775	16,000	89,770	6,127	5,681	259,105
2018	78,102	14,000	88,947	6,127	5,595	257,359
2019	80,283	14,522	92,143	6,155	5,621	264,235
2020	82,555	14,686	93,403	6,127	5,596	264,003
2021	84,001	14,993	95,312	6,106	5,576	266,192
2022	85,371	14,995	95,538	6,153	5,620	270,137
2023	86,667	15,171	96,696	6,232	5,694	275,856
2024	88,428	15,277	97,524	6,292	5,752	280,278
2025	89,102	15,408	98,252	6,296	5,766	282,816
2026	90,002	15,640	99,408	6,334	5,827	285,644
2027	90,771	16,032	100,990	6,390	5,949	288,325
2028	91,399	16,389	101,401	6,524	6,245	290,909
2029	92,704	17,410	103,624	6,693	6,759	294,584
2030	94,254	18,362	103,844	6,988	7,586	298,629
2031	95,522	19,632	105,487	7,298	8,432	300,899
2032	97,117	20,248	105,838	7,507	8,993	303,888
2033	97,192	20,482	105,616	7,585	9,235	304,459
2034	97,828	20,452	105,171	7,625	9,344	304,951
2035	98,512	20,636	105,890	7,641	9,386	306,018
2036	99,068	20,810	106,650	7,661	9,421	306,551
2037	99,010	20,987	107,310	7,642	9,400	305,646
2038	99,366	20,995	107,422	7,637	9,395	305,641
2039	99,184	21,155	108,007	7,628	9,384	304,646
2040	99,930	20,948	107,368	7,633	9,391	304,955

Seattle's 2022 Solid Waste Plan Update
Appendix E - Recycling Potential Assessment Model and Environmental Benefit Analysis

Summary: Municipal Solid Waste, Status Quo
Summary of Recycling Program Impacts (in tons per year)
Modeled waste composition data for 2025 - All Sectors

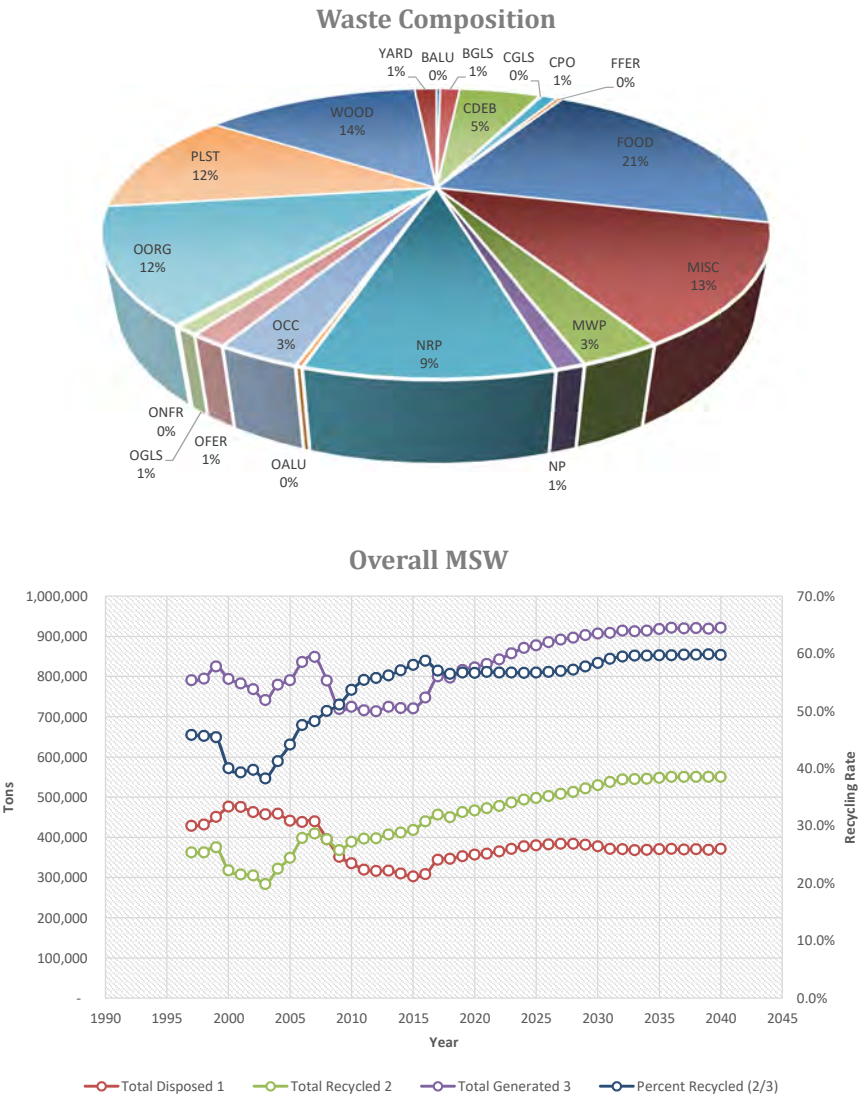
Material MSW	Total Disposed	Total Recycled	Total Generated	Percent Recycled	Curb/Apt Rec	Home Organics	Curb/Apt Org	Clean Green	R&R centers	Com Priv Rec	Total
Aluminum Beverage	956	1,531	2,486	61.6%	701	-	-	-	5	825	1,531
Beverage Glass	4,896	26,494	31,390	84.4%	11,855	-	-	-	237	14,401	26,494
Construction Debris	20,150	1	20,151	0.0%	-	-	-	-	1	-	1
Container Glass	684	874	1,558	56.1%	874	-	-	-	-	-	874
Computer Office Paper	3,719	14,762	18,481	79.9%	114	-	-	-	-	14,648	14,762
Food Cans	1,420	1,857	3,277	56.7%	1,005	-	-	-	-	852	1,857
Food	78,173	97,090	175,263	55.4%	-	2,694	14,830	-	-	79,567	97,090
Miscellaneous	48,464	42,603	91,067	46.8%	9,417	-	1,085	-	224	31,878	42,603
Mixed Scrap Paper	11,403	52,344	63,747	82.1%	22,048	-	400	-	242	29,654	52,344
Newspaper	4,137	23,743	27,880	85.2%	12,301	-	-	-	78	11,364	23,743
Other Paper	34,053	6,529	40,582	16.1%	596	-	5,933	-	-	-	6,529
Other Aluminum	944	125	1,070	11.7%	125	-	-	-	0	-	125
Corrugated Kraft	11,675	68,998	80,673	85.5%	14,734	-	-	-	793	53,471	68,998
Other Ferrous	5,270	12,652	17,921	70.6%	384	-	-	-	3,083	9,185	12,652
Other Glass	3,435	10,501	13,936	75.3%	10,501	-	-	-	-	0	10,501
Other NonFerrous	525	-	525	0.0%	-	-	-	-	-	-	-
Other Organics	46,803	764	47,567	1.6%	-	-	764	-	-	-	764
Plastics	44,947	10,205	55,153	18.5%	4,448	-	898	-	29	4,830	10,205
Wood	52,787	1,074	53,861	2.0%	-	-	-	-	1,074	-	1,074
Yard	5,500	125,492	130,992	95.8%	-	12,714	74,342	6,296	-	32,140	125,492
Total	379,942	497,639	877,581	56.7%	89,102	15,408	98,252	6,296	5,766	282,816	497,639

Summary: Municipal Solid Waste, Status Quo

Summary of Recycling Program Impacts (in tons per year)

Modeled waste composition data for 2025 - All Sectors

Year	Total Disposed	Total Recycled	Total Generated	Percent Recycled
1997	428,246	362,386	790,633	45.8%
1998	431,854	362,613	794,467	45.6%
1999	450,489	374,866	825,354	45.4%
2000	476,130	317,693	793,823	40.0%
2001	475,186	307,623	782,809	39.3%
2002	462,759	305,426	768,185	39.8%
2003	457,448	283,646	741,094	38.3%
2004	458,401	321,656	780,057	41.2%
2005	441,595	348,864	790,459	44.1%
2006	438,450	397,993	836,442	47.6%
2007	439,389	409,280	848,669	48.2%
2008	394,830	395,000	789,831	50.0%
2009	351,688	367,735	719,423	51.1%
2010	335,571	388,898	724,469	53.7%
2011	319,342	396,655	715,996	55.4%
2012	315,966	397,837	713,803	55.7%
2013	317,258	407,134	724,391	56.2%
2014	309,512	411,754	721,266	57.1%
2015	302,465	418,237	720,702	58.0%
2016	308,380	439,672	748,052	58.8%
2017	343,924	456,458	800,382	57.0%
2018	346,690	450,130	796,820	56.5%
2019	353,255	462,959	816,214	56.7%
2020	356,685	466,369	823,054	56.7%
2021	359,322	472,180	831,502	56.8%
2022	364,982	477,814	842,796	56.7%
2023	371,325	486,316	857,642	56.7%
2024	377,807	493,551	871,358	56.6%
2025	379,942	497,639	877,581	56.7%
2026	382,565	502,854	885,419	56.8%
2027	383,783	508,458	892,240	57.0%
2028	384,155	512,866	897,021	57.2%
2029	381,265	521,773	903,039	57.8%
2030	377,595	529,664	907,259	58.4%
2031	371,592	537,270	908,862	59.1%
2032	370,615	543,592	914,207	59.5%
2033	368,285	544,569	912,854	59.7%
2034	369,052	545,371	914,423	59.6%
2035	370,010	548,082	918,092	59.7%
2036	370,878	550,161	921,039	59.7%
2037	369,504	549,994	919,498	59.8%
2038	370,035	550,455	920,490	59.8%
2039	368,625	550,004	918,629	59.9%
2040	370,826	550,227	921,053	59.7%



Summary: Municipal Solid Waste, Status Quo

Summary of Recycling Program Impacts (in tons per year)

Modeled waste composition data for 2025 - Single-family Residential

Material MSW	Total Disposed	Total Recycled	Total Generated	Total Recycled	Percent Recycled
Aluminum Beverage	162	434	596		72.9%
Beverage Glass	783	7,967	8,749		91.1%
Construction Debris	982	-	982		0.0%
Container Glass	206	611	817		74.8%
Computer Office Paper	750	56	807		7.0%
Food Cans	351	690	1,041		66.3%
Food	17,993	14,610	32,603		44.8%
Miscellaneous	4,226	6,782	11,008		61.6%
Mixed Scrap Paper	2,457	15,404	17,861		86.2%
Newspaper	1,318	8,475	9,793		86.5%
Other Paper	6,742	5,807	12,549		46.3%
Other Aluminum	237	84	320		26.1%
Corrugated Kraft	924	8,822	9,746		90.5%
Other Ferrous	300	296	596		49.7%
Other Glass	221	7,043	7,264		97.0%
Other NonFerrous	146	-	146		0.0%
Other Organics	16,233	738	16,971		4.3%
Plastics	7,433	3,745	11,178		33.5%
Wood	1,256	-	1,256		0.0%
Yard	626	86,058	86,685		99.3%
Total	63,345	167,622	230,966		72.6%

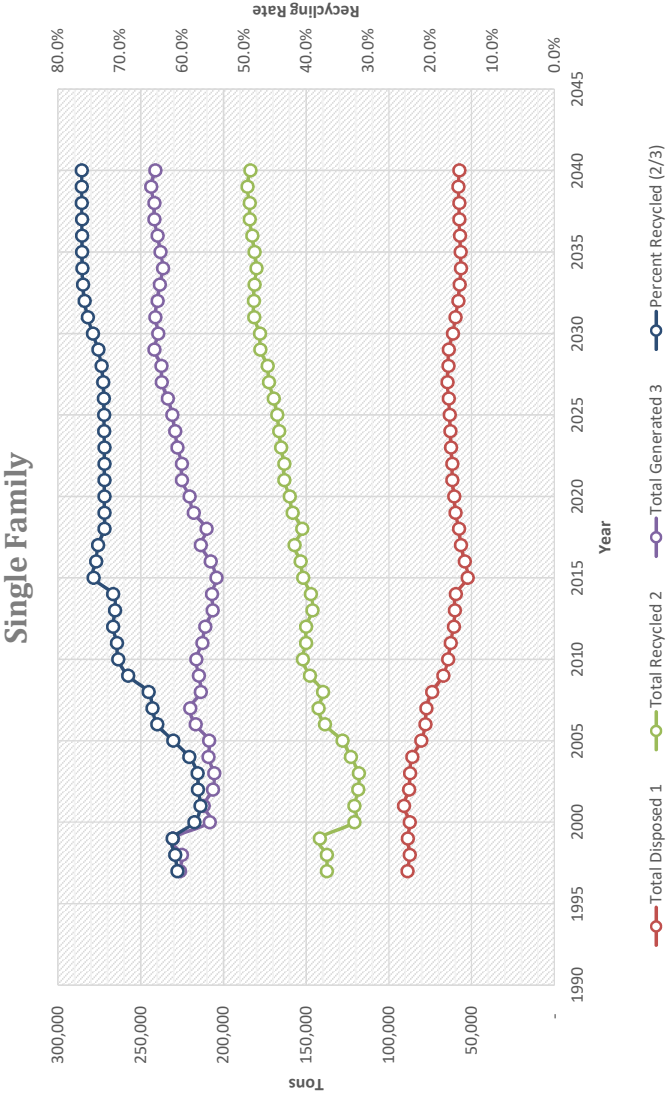
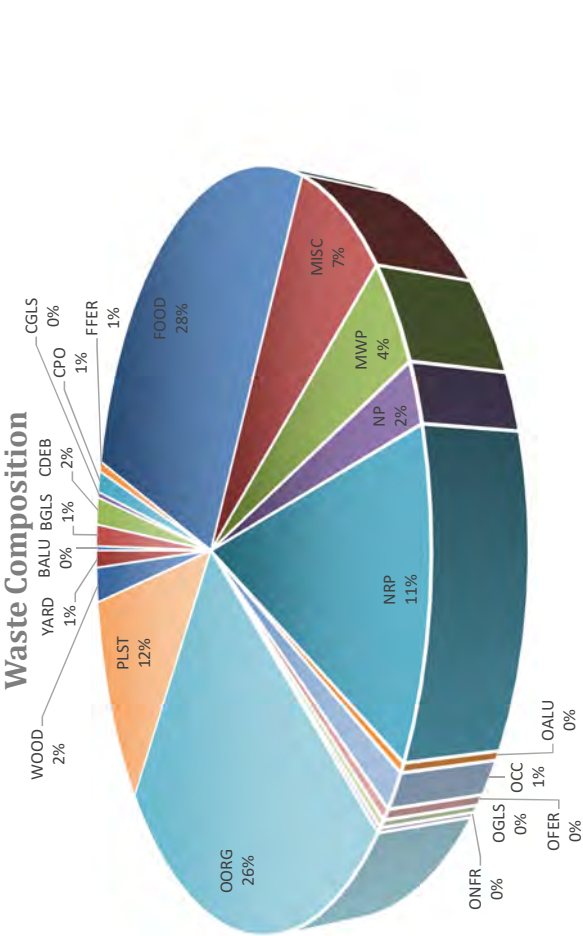
Material MSW	Curb/Apt Rec	Home Organics	Curb/Apt Org
Aluminum Beverage	434	-	-
Beverage Glass	7,967	-	-
Construction Debris	-	-	-
Container Glass	611	-	-
Computer Office Paper	56	-	-
Food Cans	690	-	-
Food	-	2,694	11,916
Miscellaneous	5,961	-	821
Mixed Scrap Paper	15,057	-	347
Newspaper	8,475	-	-
Other Paper	399	-	5,408
Other Aluminum	84	-	-
Corrugated Kraft	8,822	-	-
Other Ferrous	296	-	-
Other Glass	7,043	-	-
Other NonFerrous	-	-	-
Other Organics	-	-	738
Plastics	2,973	-	773
Wood	-	-	-
Yard	-	12,714	73,344
Total	58,868	15,408	93,346

Summary: Municipal Solid Waste, Status Quo

Summary of Recycling Program Impacts (in tons per year)

Modeled waste composition data for 2025 - Single-family Residential

Year	Total Disposed		Total Recycled		Total Generated		Percent Recycled (2/3)
	1	2	1	2	3	3	
1997	88,783	137,555	137,555	226,337	226,337	60.8%	
1998	87,560	137,686	137,686	225,247	225,247	61.1%	
1999	88,631	141,956	141,956	230,586	230,586	61.6%	
2000	87,499	120,969	120,969	208,468	208,468	58.0%	
2001	91,072	120,910	120,910	211,982	211,982	57.0%	
2002	87,834	118,640	118,640	206,474	206,474	57.5%	
2003	87,426	118,322	118,322	205,748	205,748	57.5%	
2004	86,029	123,103	123,103	209,132	209,132	58.9%	
2005	80,479	128,197	128,197	208,676	208,676	61.4%	
2006	78,078	138,810	138,810	216,889	216,889	64.0%	
2007	77,494	142,634	142,634	220,127	220,127	64.8%	
2008	73,961	139,928	139,928	213,889	213,889	65.4%	
2009	67,229	147,786	147,786	215,015	215,015	68.7%	
2010	64,309	152,175	152,175	216,484	216,484	70.3%	
2011	62,779	150,082	150,082	212,861	212,861	70.5%	
2012	60,906	150,124	150,124	211,030	211,030	71.1%	
2013	60,291	146,301	146,301	206,592	206,592	70.8%	
2014	59,772	147,220	147,220	206,992	206,992	71.1%	
2015	52,529	151,868	151,868	204,397	204,397	74.3%	
2016	54,298	153,506	153,506	207,804	207,804	73.9%	
2017	56,541	157,168	157,168	213,709	213,709	73.5%	
2018	57,725	152,564	152,564	210,289	210,289	72.5%	
2019	59,876	158,248	158,248	218,124	218,124	72.5%	
2020	60,551	160,033	160,033	220,584	220,584	72.5%	
2021	61,817	163,381	163,381	225,198	225,198	72.5%	
2022	61,818	163,391	163,391	225,209	225,209	72.6%	
2023	62,530	165,289	165,289	227,819	227,819	72.6%	
2024	62,923	166,377	166,377	229,300	229,300	72.6%	
2025	63,345	167,622	167,622	230,966	230,966	72.6%	
2026	63,983	169,663	169,663	233,645	233,645	72.6%	
2027	64,752	172,638	172,638	237,390	237,390	72.7%	
2028	64,178	173,397	173,397	237,575	237,575	73.0%	
2029	63,984	177,766	177,766	241,750	241,750	73.5%	
2030	61,365	178,080	178,080	239,445	239,445	74.4%	
2031	59,828	181,469	181,469	241,297	241,297	75.2%	
2032	58,201	181,736	181,736	239,937	239,937	75.7%	
2033	57,265	181,339	181,339	238,604	238,604	76.0%	
2034	56,537	180,070	180,070	236,607	236,607	76.1%	
2035	56,800	181,310	181,310	238,111	238,111	76.1%	
2036	57,188	182,700	182,700	239,888	239,888	76.2%	
2037	57,638	184,193	184,193	241,831	241,831	76.2%	
2038	57,649	184,250	184,250	241,899	241,899	76.2%	
2039	58,083	185,645	185,645	243,728	243,728	76.2%	
2040	57,514	183,829	183,829	241,342	241,342	76.2%	



Summary: Municipal Solid Waste, Status Quo

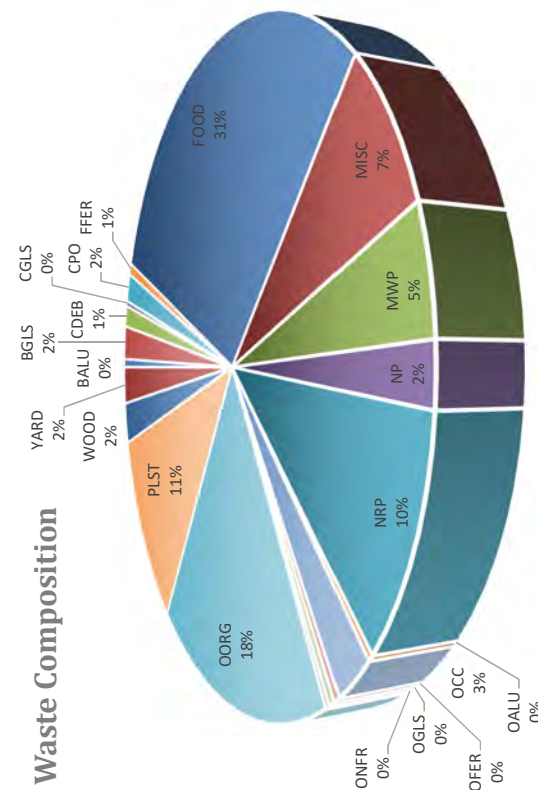
Summary of Recycling Program Impacts (in tons per year)
Modeled waste composition data for 2025 - Multifamily Residential

Material MSW	Total Disposed	Total Recycled	Total Generated	Percent Recycled
Aluminum Beverage	304	266	571	46.7%
Beverage Glass	1,225	3,888	5,113	76.0%
Construction Debris	761	-	761	0.0%
Container Glass	194	263	457	57.6%
Computer Office Paper	1,008	57	1,065	5.4%
Food Cans	399	315	714	44.1%
Food	18,844	2,914	21,758	13.4%
Miscellaneous	4,452	3,720	8,172	45.5%
Mixed Scrap Paper	2,909	7,044	9,953	70.8%
Newspaper	1,434	3,826	5,261	72.7%
Other Paper	6,025	722	6,746	10.7%
Other Aluminum	205	42	246	16.9%
Corrugated Kraft	1,747	5,912	7,659	77.2%
Other Ferrous	275	88	363	24.3%
Other Glass	288	3,458	3,746	92.3%
Other NonFerrous	199	-	199	0.0%
Other Organics	11,276	26	11,302	0.2%
Plastics	6,938	1,601	8,538	18.7%
Wood	1,476	-	1,476	0.0%
Yard	1,360	998	2,358	42.3%
Total	61,319	35,140	96,459	36.4%

Total Recycled by Program

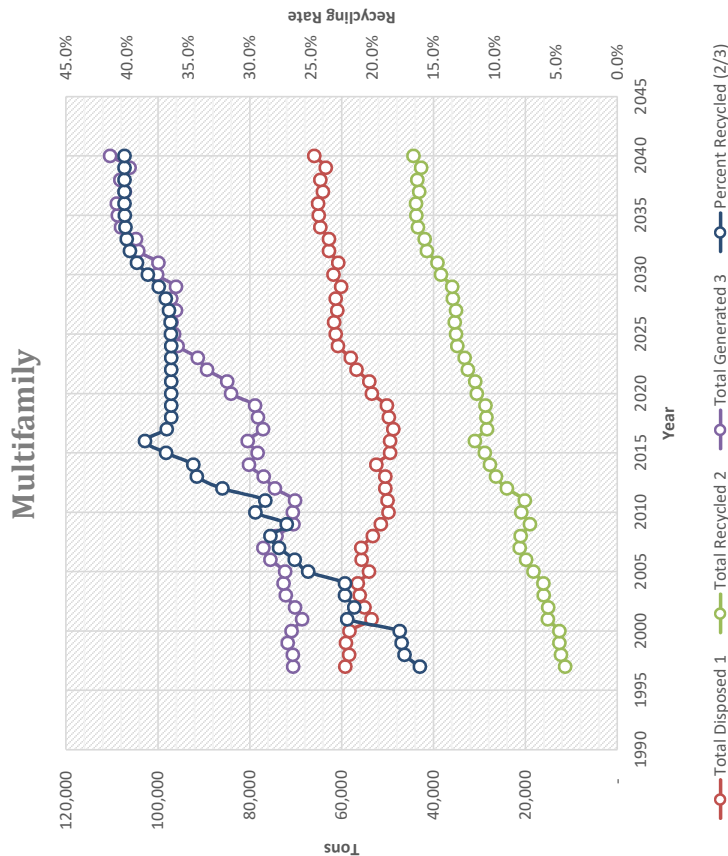
Curb/Apt Rec	Curb/Apt Org
266	-
3,888	-
-	-
263	-
57	-
315	-
-	2,914
3,456	264
6,991	53
3,826	-
197	525
42	-
5,912	-
88	-
3,458	-
-	-
-	26
1,475	126
-	-
-	998
30,235	4,906
	35,140

Waste Composition



Summary: Municipal Solid Waste, Status Quo
Summary of Recycling Program Impacts (in tons per year)
Modeled waste composition data for 2025 - Multifamily Residential

Year	Disposed	Recycled	Generated	Recycled	2/3
1997	59,189	11,371	70,560	16.1%	
1998	58,374	12,266	70,640	17.4%	
1999	59,087	12,639	71,726	17.6%	
2000	58,333	12,595	70,927	17.8%	
2001	53,487	15,124	68,611	22.0%	
2002	55,076	15,068	70,144	21.5%	
2003	56,106	16,043	72,149	22.2%	
2004	56,498	16,142	72,640	22.2%	
2005	54,080	18,245	72,325	25.2%	
2006	55,643	19,903	75,545	26.3%	
2007	55,759	21,261	77,020	27.6%	
2008	53,199	21,024	74,223	28.3%	
2009	51,497	19,028	70,524	27.0%	
2010	49,788	20,887	70,675	29.6%	
2011	49,993	20,152	70,145	28.7%	
2012	50,497	24,035	74,532	32.2%	
2013	50,547	26,423	76,970	34.3%	
2014	52,439	27,750	80,189	34.6%	
2015	49,443	28,835	78,278	36.8%	
2016	49,437	31,041	80,478	38.6%	
2017	48,773	28,376	77,150	36.8%	
2018	49,760	28,485	78,245	36.4%	
2019	50,135	28,700	78,835	36.4%	
2020	53,473	30,611	84,084	36.4%	
2021	54,020	30,924	84,945	36.4%	
2022	56,794	32,513	89,307	36.4%	
2023	58,067	33,245	91,312	36.4%	
2024	60,857	34,851	95,708	36.4%	
2025	61,319	35,140	96,459	36.4%	
2026	61,633	35,387	97,020	36.5%	
2027	60,932	35,155	96,086	36.6%	
2028	61,306	35,792	97,098	36.9%	
2029	60,120	35,971	96,091	37.4%	
2030	61,782	38,381	100,163	38.3%	
2031	60,751	39,172	99,923	39.2%	
2032	62,789	41,468	104,257	39.8%	
2033	62,799	41,951	104,750	40.0%	
2034	64,635	43,380	108,015	40.2%	
2035	65,035	43,727	108,762	40.2%	
2036	65,141	43,828	108,969	40.2%	
2037	64,062	43,113	107,175	40.2%	
2038	64,680	43,532	108,212	40.2%	
2039	63,442	42,701	106,144	40.2%	
2040	65,993	44,418	110,411	40.2%	



Summary: Municipal Solid Waste, Status Quo

Summary of Recycling Program Impacts (in tons per year)

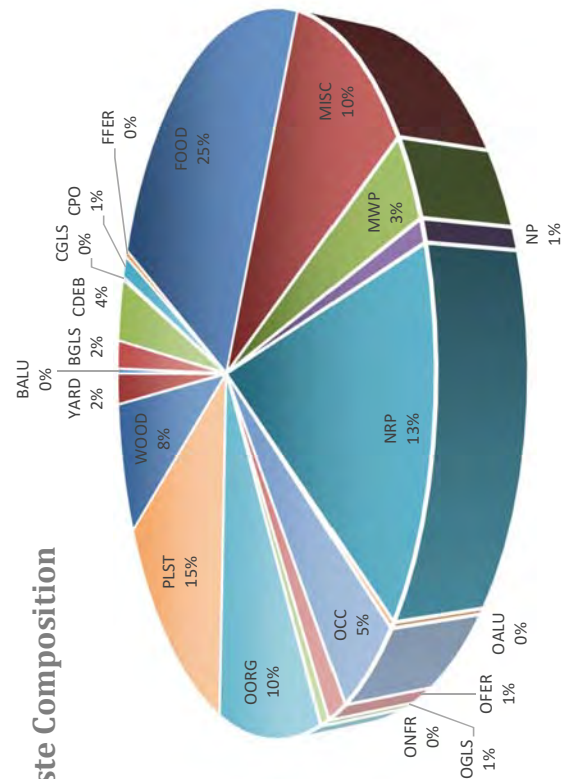
Modeled waste composition data for 2025 - Multifamily Residential

Material MSW	Disposed	Total Recycled	Total Generated	Percent Recycled
Aluminum Beverage	451	825	1,276	64.7%
Beverage Glass	2,576	14,401	16,977	84.8%
Construction Debris	5,594	-	5,594	0.0%
Container Glass	285	-	285	0.0%
Computer Office Paper	1,867	14,648	16,515	88.7%
Food Cans	596	852	1,448	58.9%
Food	37,421	79,567	116,987	68.0%
Miscellaneous	14,737	31,878	46,615	68.4%
Mixed Scrap Paper	4,762	29,654	34,416	86.2%
Newspaper	1,290	11,364	12,654	89.8%
Other Paper	19,680	-	19,680	0.0%
Other Aluminum	417	-	417	0.0%
Corrugated Kraft	6,919	53,471	60,391	88.5%
Other Ferrous	2,225	9,185	11,410	80.5%
Other Glass	1,053	0	1,053	0.0%
Other NonFerrous	89	-	89	0.0%
Other Organics	15,151	-	15,151	0.0%
Plastics	22,234	4,830	27,065	17.8%
Wood	11,765	-	11,765	0.0%
Yard	2,843	32,140	34,983	91.9%
Total	151,954	282,816	434,769	65.0%

Recycled by Program

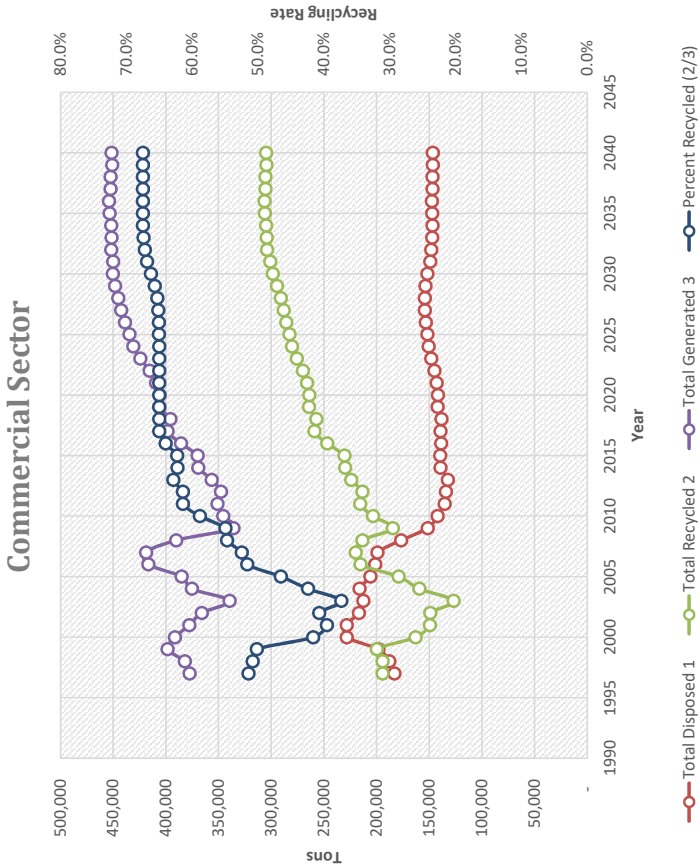
Com Priv	Rec
825	825
14,401	14,401
-	-
-	-
14,648	14,648
852	852
79,567	79,567
31,878	31,878
29,654	29,654
11,364	11,364
-	-
-	-
53,471	53,471
9,185	9,185
0	0
-	-
-	-
4,830	4,830
-	-
32,140	32,140
282,816	282,816

Waste Composition



Summary: Municipal Solid Waste, Status Quo
Summary of Recycling Program Impacts (in tons per year)
Modeled waste composition data for 2025 - Multifamily Residential

Year	Total Disposed		Total Recycled		Total Generated		Percent Recycled	
	1	2	1	2	3	4	5	
1997	183,130	194,323	194,323	377,453	377,453	51.5%	51.5%	
1998	187,899	194,251	194,251	382,150	382,150	50.8%	50.8%	
1999	198,420	199,968	199,968	398,388	398,388	50.2%	50.2%	
2000	228,417	162,989	162,989	391,406	391,406	41.6%	41.6%	
2001	228,310	149,453	149,453	377,763	377,763	39.6%	39.6%	
2002	216,923	149,025	149,025	365,948	365,948	40.7%	40.7%	
2003	212,647	126,956	126,956	339,603	339,603	37.4%	37.4%	
2004	216,111	159,341	159,341	375,452	375,452	42.4%	42.4%	
2005	205,829	179,265	179,265	385,094	385,094	46.6%	46.6%	
2006	201,306	215,258	215,258	416,564	416,564	51.7%	51.7%	
2007	199,083	219,894	219,894	418,977	418,977	52.5%	52.5%	
2008	176,774	213,493	213,493	390,267	390,267	54.7%	54.7%	
2009	151,399	184,593	184,593	335,992	335,992	54.9%	54.9%	
2010	142,182	203,511	203,511	345,693	345,693	58.9%	58.9%	
2011	135,535	215,678	215,678	351,213	351,213	61.4%	61.4%	
2012	134,090	213,584	213,584	347,674	347,674	61.4%	61.4%	
2013	132,400	224,079	224,079	356,479	356,479	62.9%	62.9%	
2014	139,456	229,950	229,950	369,406	369,406	62.2%	62.2%	
2015	139,556	230,480	230,480	370,036	370,036	62.3%	62.3%	
2016	138,804	247,042	247,042	385,846	385,846	64.0%	64.0%	
2017	139,317	259,105	259,105	398,422	398,422	65.0%	65.0%	
2018	138,378	257,359	257,359	395,737	395,737	65.0%	65.0%	
2019	142,075	264,235	264,235	406,310	406,310	65.0%	65.0%	
2020	141,949	264,003	264,003	405,952	405,952	65.0%	65.0%	
2021	143,125	266,192	266,192	409,318	409,318	65.0%	65.0%	
2022	145,243	270,137	270,137	415,379	415,379	65.0%	65.0%	
2023	148,308	275,856	275,856	424,164	424,164	65.0%	65.0%	
2024	150,660	280,278	280,278	430,938	430,938	65.0%	65.0%	
2025	151,954	282,816	282,816	434,769	434,769	65.0%	65.0%	
2026	153,284	285,644	285,644	438,928	438,928	65.1%	65.1%	
2027	154,225	288,325	288,325	442,550	442,550	65.2%	65.2%	
2028	154,386	290,909	290,909	445,295	445,295	65.3%	65.3%	
2029	153,779	294,584	294,584	448,363	448,363	65.7%	65.7%	
2030	151,948	298,629	298,629	450,577	450,577	66.3%	66.3%	
2031	149,198	300,899	300,899	450,096	450,096	66.9%	66.9%	
2032	148,160	303,888	303,888	452,048	452,048	67.2%	67.2%	
2033	147,238	304,459	304,459	451,697	451,697	67.4%	67.4%	
2034	146,985	304,951	304,951	451,936	451,936	67.5%	67.5%	
2035	147,311	306,018	306,018	453,328	453,328	67.5%	67.5%	
2036	147,497	306,551	306,551	454,048	454,048	67.5%	67.5%	
2037	147,035	305,646	305,646	452,681	452,681	67.5%	67.5%	
2038	147,023	305,641	305,641	452,664	452,664	67.5%	67.5%	
2039	146,541	304,646	304,646	451,188	451,188	67.5%	67.5%	
2040	146,688	304,955	304,955	451,644	451,644	67.5%	67.5%	



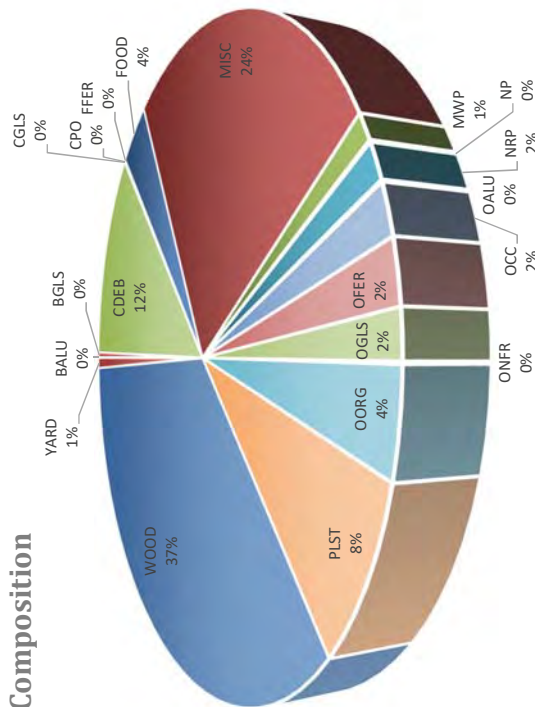
Summary: Municipal Solid Waste, Status Quo

Summary of Recycling Program Impacts (in tons per year)

Modeled waste composition data for 2025 - Self-haul

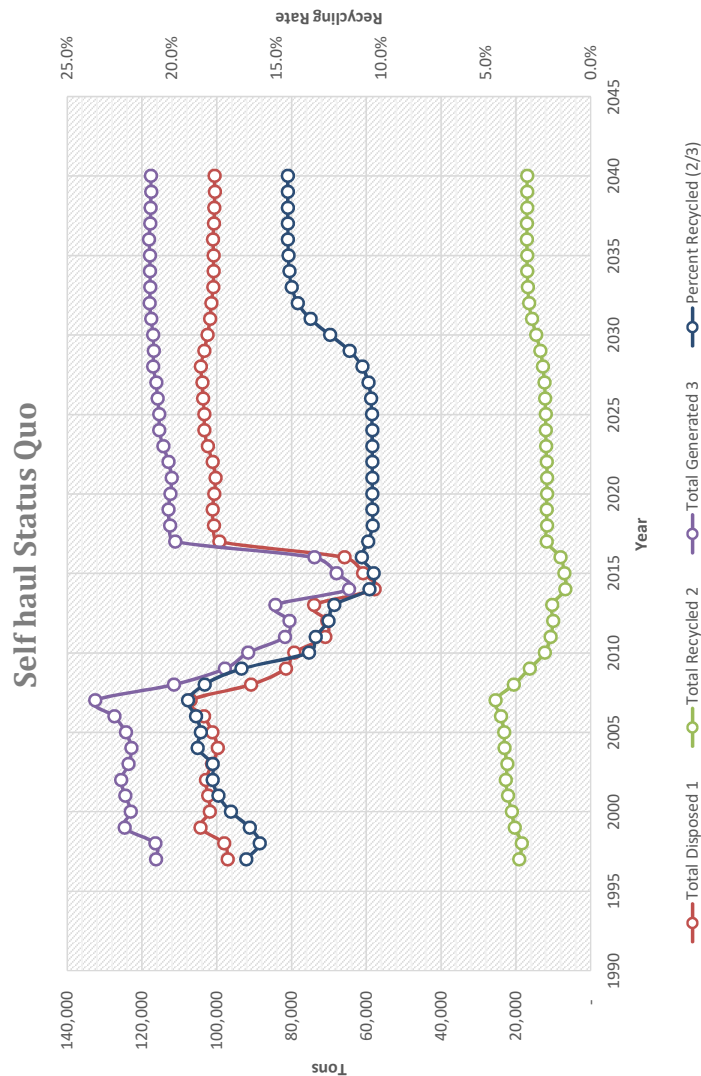
Material MSW	Total Disposed	Total Recycled	Total Generated	Percent Recycled	Clean Green	R&R centers
Aluminum Beverage	39	5	44	11.8%	-	5
Beverage Glass	313	237	550	43.1%	-	237
Construction Debris	12,814	1	12,815	0.0%	-	1
Container Glass	-	-	-	0.0%	-	-
Computer Office Paper	94	-	94	0.0%	-	-
Food Cans	74	-	74	0.0%	-	-
Food	3,915	-	3,915	0.0%	-	-
Miscellaneous	25,048	224	25,272	0.9%	-	224
Mixed Scrap Paper	1,275	242	1,517	16.0%	-	242
Newspaper	95	78	172	45.2%	-	78
Other Paper	1,606	-	1,606	0.0%	-	-
Other Aluminum	86	0	86	0.2%	-	0
Corrugated Kraft	2,085	793	2,878	27.6%	-	793
Other Ferrous	2,469	3,083	5,552	55.5%	-	3,083
Other Glass	1,874	-	1,874	0.0%	-	-
Other NonFerrous	91	-	91	0.0%	-	-
Other Organics	4,143	-	4,143	0.0%	-	-
Plastics	8,343	29	8,371	0.3%	-	29
Wood	38,290	1,074	39,364	2.7%	-	1,074
Yard	670	6,296	6,966	90.4%	6,296	-
Total	103,325	12,062	115,387	10.5%	6,296	5,766
						12,062

Waste Composition



Summary: Municipal Solid Waste, Status Quo
Summary of Recycling Program Impacts (in tons per year)
Modeled waste composition data for 2025 - Self-haul

Year	Total Disposed		Total Recycled		Total Generated		Percent Recycled	
	1	2	1	2	3	3	2/3	(2/3)
1997	97,145	19,137			116,282			16.5%
1998	98,021	18,410			116,431			15.8%
1999	104,350	20,304			124,654			16.3%
2000	101,881	21,141			123,022			17.2%
2001	102,316	22,137			124,453			17.8%
2002	102,926	22,693			125,619			18.1%
2003	101,269	22,325			123,594			18.1%
2004	99,763	23,070			122,833			18.8%
2005	101,207	23,157			124,364			18.6%
2006	103,422	24,022			127,444			18.8%
2007	107,053	25,492			132,545			19.2%
2008	90,896	20,556			111,452			18.4%
2009	81,564	16,328			97,892			16.7%
2010	79,292	12,325			91,617			13.5%
2011	71,034	10,743			81,777			13.1%
2012	70,473	10,094			80,567			12.5%
2013	74,020	10,330			84,350			12.2%
2014	57,845	6,834			64,679			10.6%
2015	60,936	7,055			67,991			10.4%
2016	65,841	8,083			73,924			10.9%
2017	99,293	11,808			111,101			10.6%
2018	100,827	11,722			112,549			10.4%
2019	101,169	11,776			112,945			10.4%
2020	100,711	11,723			112,434			10.4%
2021	100,359	11,682			112,041			10.4%
2022	101,127	11,773			112,900			10.4%
2023	102,420	11,926			114,347			10.4%
2024	103,367	12,045			115,411			10.4%
2025	103,325	12,062			115,387			10.5%
2026	103,665	12,160			115,825			10.5%
2027	103,874	12,340			116,214			10.6%
2028	104,285	12,769			117,054			10.9%
2029	103,382	13,452			116,834			11.5%
2030	102,501	14,574			117,075			12.4%
2031	101,816	15,731			117,546			13.4%
2032	101,464	16,501			117,965			14.0%
2033	100,983	16,820			117,803			14.3%
2034	100,895	16,969			117,865			14.4%
2035	100,865	17,027			117,891			14.4%
2036	101,051	17,082			118,134			14.5%
2037	100,769	17,043			117,812			14.5%
2038	100,683	17,032			117,715			14.5%
2039	100,558	17,012			117,570			14.5%
2040	100,631	17,024			117,656			14.5%



Summary: Municipal Solid Waste Tons Per Year, Recommended New Programs

Year	Curb/Apt Rec	Home Organics	Curb/Apt Org	Clean Green	R&R centers	Com Priv Rec	Targeted Outreach	Incr MF Enforce	Waste Prev Camp - SH	Mun Codes Update MF	Food Waste Prev - SF
1997	67,509	38,287	43,130	14,137	5,000	194,323	-	-	-	-	-
1998	70,279	39,128	40,546	13,034	5,376	194,251	-	-	-	-	-
1999	73,478	41,379	39,737	13,692	6,612	199,968	-	-	-	-	-
2000	72,864	26,662	34,037	14,032	7,109	162,989	-	-	-	-	-
2001	72,382	26,662	36,990	15,034	7,103	149,453	-	-	-	-	-
2002	72,543	26,662	34,503	14,353	8,340	149,025	-	-	-	-	-
2003	73,780	26,662	33,923	14,156	8,170	126,956	-	-	-	-	-
2004	76,860	23,900	38,485	14,907	8,163	159,341	-	-	-	-	-
2005	81,139	22,700	42,603	13,925	9,232	179,265	-	-	-	-	-
2006	84,531	22,700	51,482	14,277	9,745	215,258	-	-	-	-	-
2007	86,621	22,700	54,573	14,247	11,246	219,894	-	-	-	-	-
2008	81,888	22,700	56,364	11,893	8,662	213,493	-	-	-	-	-
2009	76,584	16,000	74,230	10,149	6,179	184,593	-	-	-	-	-
2010	77,110	16,000	79,952	7,682	4,643	203,511	-	-	-	-	-
2011	75,778	16,000	78,456	6,794	3,949	215,678	-	-	-	-	-
2012	75,916	16,000	82,244	6,593	3,501	213,584	-	-	-	-	-
2013	75,909	16,000	80,816	6,290	4,040	224,079	-	-	-	-	-
2014	77,970	16,000	81,001	4,199	2,635	229,950	-	-	-	-	-
2015	77,193	16,000	87,510	4,167	2,888	230,480	-	-	-	-	-
2016	78,991	16,000	89,556	4,390	3,693	247,042	-	-	-	-	-
2017	79,775	16,000	89,770	6,127	5,681	259,105	-	-	-	-	-
2018	78,102	14,000	88,947	6,127	5,595	257,359	-	-	-	-	-
2019	80,283	14,522	92,143	6,155	5,620	264,235	152	0	-	108	-
2020	82,529	14,686	93,401	6,127	5,593	261,494	407	0	1	287	1,067
2021	83,934	14,993	95,306	6,106	5,570	261,079	928	0	2	640	1,526
2022	85,215	14,995	95,525	6,153	5,604	261,157	1,813	0	5	1,209	1,778
2023	86,360	15,171	96,670	6,232	5,657	262,737	2,710	1	13	1,744	1,865
2024	87,938	15,277	97,478	6,292	5,682	263,993	3,421	2	36	2,150	1,884
2025	88,449	15,406	98,182	6,296	5,663	264,413	3,726	4	97	2,315	1,884
2026	89,193	15,635	99,304	6,332	5,701	265,441	3,859	12	264	2,386	1,882
2027	89,780	16,019	100,820	6,387	5,809	266,168	3,855	29	701	2,377	1,873
2028	90,180	16,357	101,103	6,516	6,089	266,626	3,886	65	1,771	2,390	1,861
2029	91,169	17,332	103,073	6,675	6,580	267,928	3,799	117	4,026	2,329	1,859
2030	92,297	18,209	102,935	6,953	7,370	269,305	3,878	174	7,519	2,369	1,861
2031	93,158	19,391	104,216	7,245	8,177	269,281	3,786	205	11,001	2,307	1,856
2032	94,462	19,948	104,344	7,441	8,710	270,650	3,894	228	13,324	2,369	1,863
2033	94,415	20,153	104,023	7,513	8,939	270,539	3,886	234	14,391	2,363	1,861
2034	94,979	20,112	103,545	7,550	9,043	270,723	3,996	244	14,853	2,429	1,862
2035	95,624	20,290	104,236	7,565	9,082	271,572	4,019	246	15,083	2,443	1,868
2036	96,157	20,460	104,979	7,585	9,115	272,009	4,025	247	15,188	2,446	1,871
2037	96,101	20,632	105,625	7,566	9,096	271,192	3,958	243	15,182	2,406	1,865
2038	96,445	20,641	105,734	7,561	9,090	271,183	3,996	245	15,202	2,429	1,865
2039	96,271	20,798	106,310	7,551	9,080	270,299	3,920	241	15,169	2,382	1,859
2040	96,989	20,595	105,682	7,557	9,087	270,572	4,077	250	15,200	2,478	1,861

Summary: Municipal Solid Waste Tons Per Year, Recommended New Programs

Year	Food & YW Recovery SF	School Education	Incr MF Res Ban Enforce	Take Back Plastic Film	Food Waste Prev - Comm	Comp Food Serv Pack	Container Depo Syst Com	Electronics Prod Stew	All Pack Prod Stew -	Carpet Prod Stew - Com	South Reuse Center	EPR Bags Film - MF	Serv Ware - Berk	Paint Prod Stew - Com
1997	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1998	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1999	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2000	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2001	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2002	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2003	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2004	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2005	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2006	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2007	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2008	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2009	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2010	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2012	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2013	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2017	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2019	1,373	4	137	59	-	-	-	-	-	-	5	-	-	-
2020	1,790	11	342	86	5	3,830	54	15	5	42	15	8	52	22
2021	2,865	28	769	104	14	8,712	138	38	13	112	38	21	124	59
2022	5,409	68	1,440	113	38	16,435	316	88	36	285	97	54	250	151
2023	10,566	146	2,147	118	103	24,529	598	167	97	656	221	123	413	345
2024	18,514	254	2,645	119	277	29,996	890	249	259	1,236	414	232	554	646
2025	26,348	347	2,874	119	703	32,650	1,080	302	655	1,818	605	340	639	944
2026	31,487	398	2,961	118	1,601	33,812	1,178	329	1,490	2,207	732	409	682	1,142
2027	33,826	417	2,982	117	3,001	34,216	1,223	340	2,787	2,403	794	437	702	1,243
2028	34,521	420	2,976	114	4,415	34,305	1,242	346	4,093	2,493	824	445	713	1,287
2029	34,308	417	2,929	112	5,356	34,419	1,251	349	4,951	2,532	831	448	720	1,309
2030	33,647	410	2,865	109	5,821	34,524	1,257	354	5,370	2,553	836	453	724	1,318
2031	32,655	400	2,789	106	5,994	34,459	1,253	356	5,514	2,559	840	455	724	1,321
2032	32,337	396	2,758	105	6,089	34,598	1,260	361	5,604	2,571	843	461	727	1,326
2033	32,001	393	2,730	104	6,111	34,567	1,257	361	5,616	2,569	842	461	726	1,325
2034	32,053	393	2,729	104	6,123	34,584	1,261	364	5,639	2,570	842	465	727	1,325
2035	32,154	393	2,733	104	6,146	34,690	1,267	366	5,664	2,576	842	468	729	1,329
2036	32,230	394	2,738	104	6,157	34,745	1,271	368	5,679	2,580	844	471	730	1,332
2037	32,100	393	2,728	104	6,139	34,640	1,267	367	5,662	2,573	842	469	728	1,330
2038	32,173	393	2,731	104	6,139	34,639	1,270	369	5,669	2,572	841	471	728	1,330
2039	32,022	391	2,722	104	6,119	34,526	1,266	367	5,648	2,566	840	469	725	1,328
2040	32,272	392	2,734	104	6,125	34,561	1,272	372	5,673	2,568	841	475	726	1,329

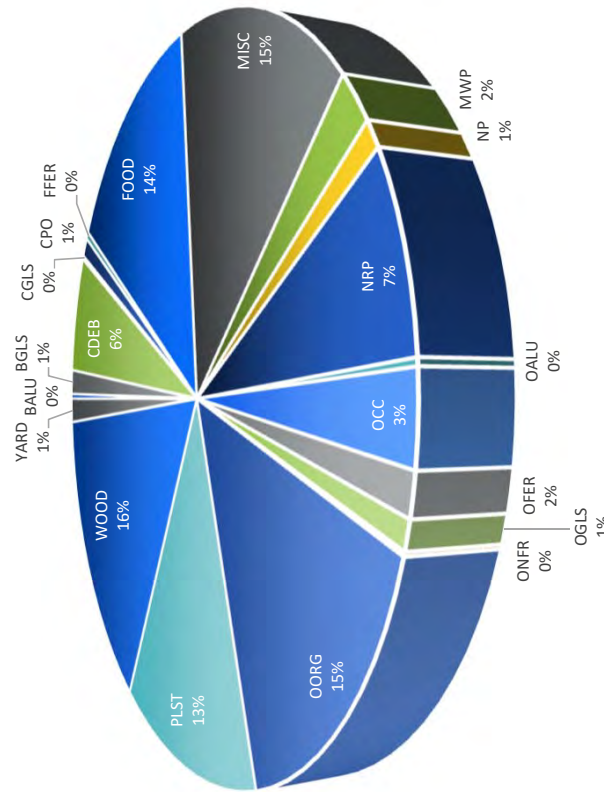
Summary: Municipal Solid Waste, Recommended New Programs

Summary of Recycling Program Impacts (in tons per year)

Modeled waste composition data for 2025 - All Sectors

Material MSW	Total Disposed	Total Recycled	Total Generated	Percent Recycled
Aluminum Beverage	810	1,676	2,486	67.4%
Beverage Glass	4,144	27,246	31,390	86.8%
Construction Debris	19,479	672	20,151	3.3%
Container Glass	584	974	1,558	62.5%
Computer Office Paper	3,134	15,347	18,481	83.0%
Food Cans	1,218	2,059	3,277	62.8%
Food	45,940	129,323	175,263	73.8%
Miscellaneous	46,908	44,159	91,067	48.5%
Mixed Scrap Paper	7,665	56,082	63,747	88.0%
Newspaper	3,786	24,094	27,880	86.4%
Other Paper	23,113	17,468	40,582	43.0%
Other Aluminum	902	168	1,070	15.7%
Corrugated Kraft	10,285	70,389	80,673	87.3%
Other Ferrous	4,952	12,969	17,921	72.4%
Other Glass	3,435	10,501	13,936	75.3%
Other NonFerrous	525	-	525	0.0%
Other Organics	46,803	764	47,567	1.6%
Plastics	43,049	12,104	55,153	21.9%
Wood	50,908	2,953	53,861	5.5%
Yard	4,080	126,912	130,992	96.9%
Total	321,722	555,859	877,581	63.3%

Waste Composition



Summary: Municipal Solid Waste, Recommended New Programs

Summary of Recycling Program Impacts (in tons per year)

Modeled waste composition data for 2025 - All Sectors

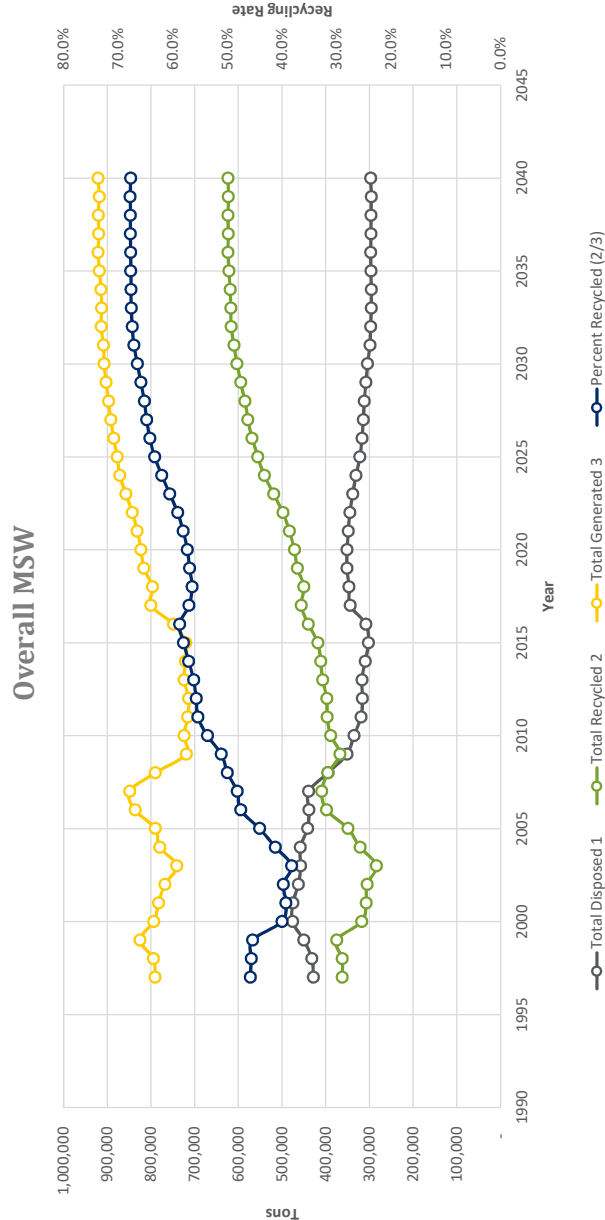
Material MSW	Curb/Apt Rec	Home Organics	Curb/Apt Org	Clean Green	R&R centers	Com Priv Rec	Targeted Outreach	Incr MF Enforce	Wast Prev Camp - SH	Mun Codes Update	Food Waste Prev - SF	Food & Recovery YW	School Education
Aluminum Beverage	698	-	-	-	5	822	33	0	1	26	-	68	-
Beverage Glass	11,610	-	-	-	232	14,100	130	0	7	102	-	339	-
Construction Debris	-	-	-	-	1	-	-	-	-	-	-	-	-
Container Glass	873	-	-	-	-	-	21	0	0	16	-	51	-
Computer Office Paper	114	-	-	-	-	14,643	109	0	6	86	-	318	11
Food Cans	1,005	-	-	-	-	852	43	0	1	34	-	101	-
Food	-	2,694	14,830	-	-	63,207	2,728	3	-	1,535	1,884	19,242	133
Miscellaneous	9,190	-	1,057	-	217	30,630	-	-	-	-	-	-	-
Mixed Scrap Paper	22,044	-	400	-	237	29,644	316	0	16	247	-	2,954	23
Newspaper	12,299	-	-	-	78	11,360	156	0	7	122	-	-	-
Other Paper	596	-	5,933	-	-	-	-	-	-	-	-	-	-
Other Aluminum	125	-	-	-	0	-	-	-	0	-	-	33	-
Corrugated Kraft	14,716	-	-	-	776	53,262	189	0	24	148	-	734	44
Other Ferrous	384	-	-	-	3,015	9,182	-	-	4	-	-	177	-
Other Glass	10,501	-	-	-	-	0	-	-	-	-	-	-	-
Other NonFerrous	-	-	-	-	-	-	-	-	-	-	-	-	-
Other Organics	-	-	-	-	-	-	-	-	-	-	-	-	-
Plastics	4,293	-	867	-	29	4,582	-	-	-	-	-	-	136
Wood	-	-	-	-	1,074	-	-	-	7	-	-	936	-
Yard	-	12,712	74,332	6,296	-	32,129	-	-	24	-	-	1,394	-
	88,449	15,406	98,182	6,296	5,663	264,413	3,726	4	97	2,315	1,884	26,348	347

**Summary: Municipal Solid
Waste of Recycling Program**
Modeled waste composition data

Material MSW	Incr MIF Res Ban Enforce	Take Back Plastic Film	Food Waste Prev - Comm	Comp Container		Electronics Prod Stew	All Pack		Carpet Prod Ste - SH	South Reuse Center - film - SF	Serv Ware - Berk Stew - SH		Paint Prod Stew - SH
				Food Serv Pack	Depo Syst - SF		Prod Stew - SF	Prod Stew - SF					
Aluminum Beverage	15	-	-	-	8	-	-	-	-	-	-	-	1,676
Beverage Glass	79	-	-	-	635	-	-	-	-	12	-	-	27,246
Construction Debris	296	-	-	-	-	-	-	-	-	375	-	-	672
Container Glass	11	-	-	-	-	-	-	-	-	-	-	-	974
Computer Office Paper	60	-	-	-	-	-	-	-	-	-	-	-	15,347
Food Cans	23	-	-	-	-	-	-	-	-	-	-	-	2,059
Food	898	-	703	21,467	-	-	-	-	-	-	-	-	129,323
Miscellaneous	-	-	-	-	-	302	-	1,818	-	-	-	944	44,159
Mixed Scrap Paper	168	-	-	-	-	-	-	-	33	-	-	-	56,082
Newspaper	72	-	-	-	-	-	-	-	-	-	-	-	24,094
Other Paper	-	-	-	10,545	-	-	-	-	-	-	394	-	17,468
Other Aluminum	9	-	-	-	-	-	-	-	-	-	-	-	168
Corrugated Kraft	198	-	-	-	-	-	236	-	-	63	-	-	70,389
Other Ferrous	85	-	-	-	-	-	-	-	-	122	-	-	12,969
Other Glass	-	-	-	-	-	-	-	-	-	-	-	-	10,501
Other NonFerrous	-	-	-	-	-	-	-	-	-	-	-	-	-
Other Organics	-	-	-	-	-	-	-	-	-	-	-	-	764
Plastics	-	119	-	638	437	-	419	-	-	-	244	-	12,104
Wood	936	-	-	-	-	-	-	-	-	-	-	-	2,953
Yard	24	-	-	-	-	-	-	-	-	-	-	-	126,912
	2,874	119	703	32,650	1,080	302	655	1,818	605	340	639	944	555,859

Summary: Municipal Solid Waste, Recommended New Programs
Summary of Recycling Program Impacts (in tons per year)
Modeled waste composition data for 2025 - All Sectors

Year	Total Disposed	Total Recycled	Total Generated	Total Recycled	Percent Recycled
1997	428,246	362,386	790,633		45.8%
1998	431,854	362,613	794,467		45.6%
1999	450,489	374,866	825,354		45.4%
2000	476,130	317,693	793,823		40.0%
2001	475,186	307,623	782,809		39.3%
2002	462,759	305,426	768,185		39.8%
2003	457,448	283,646	741,094		38.3%
2004	458,401	321,656	780,057		41.2%
2005	441,595	348,864	790,459		44.1%
2006	438,450	397,993	836,442		47.6%
2007	439,389	409,280	848,669		48.2%
2008	394,830	395,000	789,831		50.0%
2009	351,688	367,735	719,423		51.1%
2010	335,571	388,898	724,469		53.7%
2011	319,342	396,655	715,996		55.4%
2012	315,966	397,837	713,803		55.7%
2013	317,258	407,134	724,391		56.2%
2014	309,512	411,754	721,266		57.1%
2015	302,465	418,237	720,702		58.0%
2016	308,380	439,672	748,052		58.8%
2017	343,924	456,458	800,382		57.0%
2018	346,690	450,130	796,820		56.5%
2019	351,417	464,797	816,214		56.9%
2020	351,185	471,869	823,054		57.3%
2021	348,382	483,119	831,502		58.1%
2022	344,564	498,232	842,796		59.1%
2023	338,256	519,386	857,642		60.6%
2024	330,921	540,436	871,358		62.0%
2025	321,722	555,859	877,581		63.3%
2026	316,864	568,555	885,419		64.2%
2027	313,934	578,307	892,240		64.8%
2028	311,983	585,039	897,021		65.2%
2029	308,218	594,820	903,039		65.9%
2030	304,148	603,111	907,259		66.5%
2031	298,815	610,047	908,862		67.1%
2032	297,535	616,672	914,207		67.5%
2033	295,474	617,380	912,854		67.6%
2034	295,909	618,515	914,423		67.6%
2035	296,603	621,489	918,092		67.7%
2036	297,314	623,725	921,039		67.7%
2037	296,290	623,208	919,498		67.8%
2038	296,672	623,818	920,490		67.8%
2039	295,657	622,972	918,629		67.8%
2040	297,263	623,791	921,053		67.7%



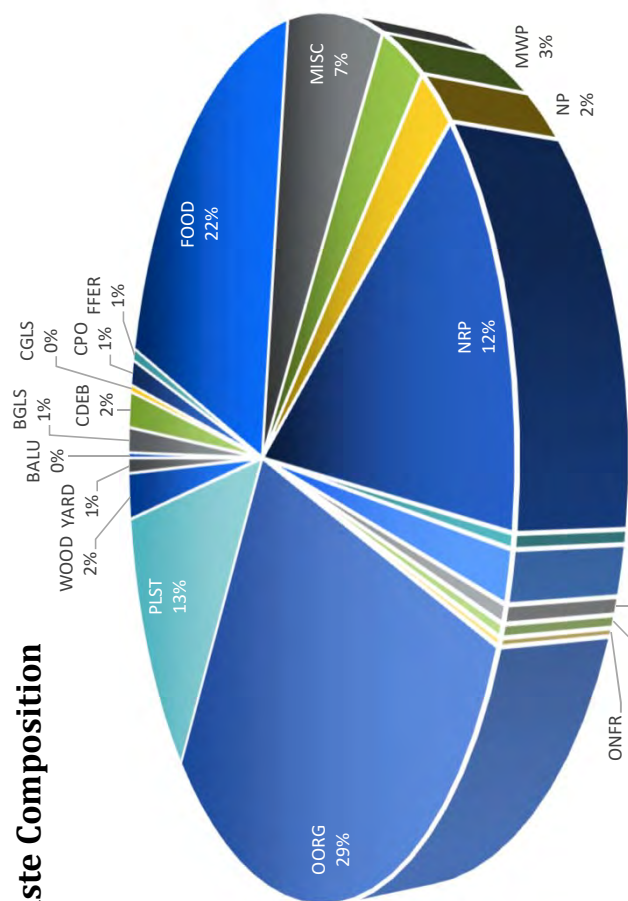
Summary: Municipal Solid Waste, Recommended New Programs

Summary of Recycling Program Impacts (in tons per year)

Modeled waste composition data for 2025 - Single-family Residential

Material MSW	Total Disposed	Total Recycled	Total Generated	Percent Recycled
Aluminum Beverage	146	450	596	75.6%
Beverage Glass	692	8,057	8,749	92.1%
Construction Debris	982	-	982	0.0%
Container Glass	186	631	817	77.2%
Computer Office Paper	678	129	807	16.0%
Food Cans	318	724	1,041	69.5%
Food	12,208	20,395	32,603	62.6%
Miscellaneous	4,104	6,904	11,008	62.7%
Mixed Scrap Paper	1,667	16,194	17,861	90.7%
Newspaper	1,294	8,499	9,793	86.8%
Other Paper	6,742	5,807	12,549	46.3%
Other Aluminum	237	84	320	26.1%
Corrugated Kraft	834	8,912	9,746	91.4%
Other Ferrous	300	296	596	49.7%
Other Glass	221	7,043	7,264	97.0%
Other NonFerrous	146	-	146	0.0%
Other Organics	16,233	738	16,971	4.3%
Plastics	7,173	4,005	11,178	35.8%
Wood	1,256	0	1,256	0.0%
Yard	425	86,260	86,685	99.5%
Total	55,840	175,126	230,966	75.8%

Waste Composition



Summary: Municipal Solid Waste, Recommended New Programs

Summary of Recycling Program Impacts (in tons per year)

Modeled waste composition data for 2025 - Single-family Residential

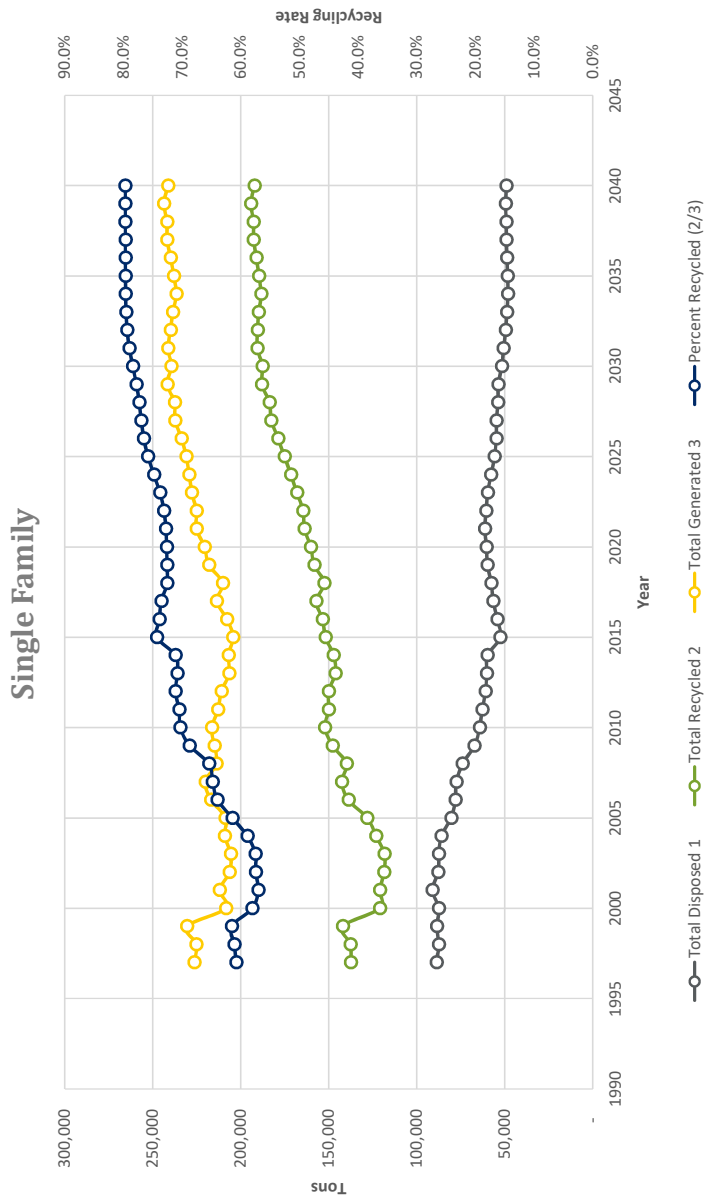
Material MSW	Curb/Apt Rec	Home Organics	Curb/Apt	Food & YW Recovery SF	Incr MF Res Ban Enforce	Wast Prev Camp - SH	Paint Prod Stew - SH	Container Depo Syst - SF	Electronics Prod Stew	All Pack Prod Stew - SF	EPR Bags Film - SF	Total
Aluminum Beverage	433	-	-	13	3	0	-	2	-	-	-	450
Beverage Glass	7,802	-	-	61	13	1	-	180	-	-	-	8,057
Construction Debris	-	-	-	-	-	-	-	-	-	-	-	-
Container Glass	611	-	-	16	3	0	-	-	-	-	-	631
Computer Office Paper	56	-	-	60	13	0	-	-	-	-	-	129
Food Cans	690	-	-	28	6	0	-	-	-	-	-	724
Food	-	2,694	11,916	5,558	227	-	-	-	-	-	-	20,395
Miscellaneous	5,789	-	797	-	-	-	145	-	172	-	-	6,904
Mixed Scrap Paper	15,055	-	347	759	31	2	-	-	-	-	-	16,194
Newspaper	8,474	-	-	-	24	1	-	-	-	-	-	8,499
Other Paper	399	-	5,408	-	-	-	-	-	-	-	-	5,807
Other Aluminum	84	-	-	-	-	0	-	-	-	-	-	84
Corrugated Kraft	8,814	-	-	73	16	1	-	-	-	7	-	8,912
Other Ferrous	296	-	-	-	-	0	-	-	-	-	-	296
Other Glass	7,043	-	-	-	-	-	-	-	-	-	-	7,043
Other NonFerrous	-	-	-	-	-	-	-	-	-	-	-	-
Other Organics	-	-	738	-	-	-	-	-	-	-	-	738
Plastics	2,869	-	746	-	-	-	-	106	-	91	193	4,005
Wood	-	-	-	-	-	0	-	-	-	-	-	0
Yard	-	12,712	73,334	193	8	12	-	-	-	-	-	86,260
	58,414	15,406	93,286	6,761	343	19	145	289	172	99	193	175,126

Summary: Municipal Solid Waste, Recommended New Programs

Summary of Recycling Program Impacts (in tons per year)

Modeled waste composition data for 2025 - Single-family Residential

Year	Total			Percent Recycled (2/3)
	Total Disposed 1	Recycled 2	Generated 3	
1997	88,783	137,555	226,337	60.8%
1998	87,560	137,686	225,247	61.1%
1999	88,631	141,956	230,586	61.6%
2000	87,499	120,969	208,468	58.0%
2001	91,072	120,910	211,982	57.0%
2002	87,834	118,640	206,474	57.5%
2003	87,426	118,322	205,748	57.5%
2004	86,029	123,103	209,132	58.9%
2005	80,479	128,197	208,676	61.4%
2006	78,078	138,810	216,889	64.0%
2007	77,494	142,634	220,127	64.8%
2008	73,961	139,928	213,889	65.4%
2009	67,229	147,786	215,015	68.7%
2010	64,309	152,175	216,484	70.3%
2011	62,779	150,082	212,861	70.5%
2012	60,906	150,124	211,030	71.1%
2013	60,291	146,301	206,592	70.8%
2014	59,772	147,220	206,992	71.1%
2015	52,529	151,868	204,397	74.3%
2016	54,298	153,506	207,804	73.9%
2017	56,541	157,168	213,709	73.5%
2018	57,725	152,564	210,289	72.5%
2019	59,813	158,310	218,124	72.6%
2020	60,368	160,216	220,584	72.6%
2021	61,326	163,872	225,198	72.8%
2022	60,591	164,618	225,209	73.1%
2023	59,756	168,063	227,819	73.8%
2024	57,790	171,510	229,300	74.8%
2025	55,840	175,126	230,966	75.8%
2026	54,848	178,797	233,645	76.5%
2027	54,704	182,686	237,390	77.0%
2028	53,893	183,682	237,575	77.3%
2029	53,719	188,032	241,750	77.8%
2030	51,720	187,725	239,445	78.4%
2031	50,683	190,614	241,297	79.0%
2032	49,486	190,451	239,937	79.4%
2033	48,780	189,825	238,604	79.6%
2034	48,196	188,411	236,607	79.6%
2035	48,435	189,675	238,111	79.7%
2036	48,771	191,117	239,888	79.7%
2037	49,157	192,674	241,831	79.7%
2038	49,167	192,732	241,899	79.7%
2039	49,538	194,190	243,728	79.7%
2040	49,052	192,290	241,342	79.7%



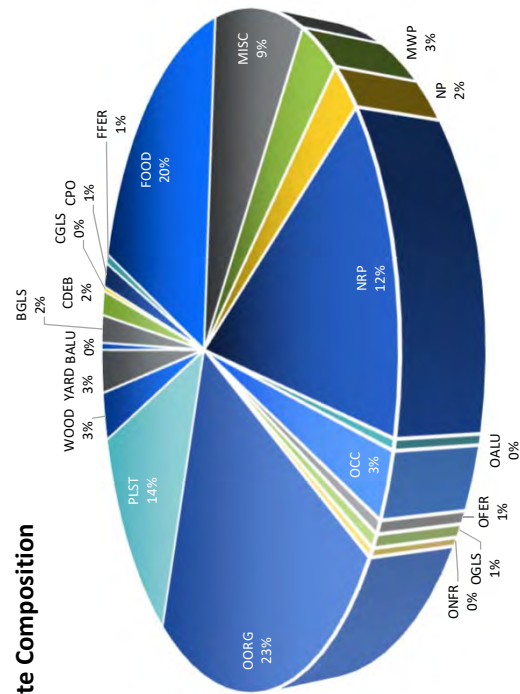
Summary: Municipal Solid Waste, Recommended New Programs

Summary of Recycling Program Impacts (in tons per year)

Modeled waste composition data for 2025 - Multifamily Residential

Material MSW	Total Disposed	Total Recycled	Total Generated	Percent Recycled
Aluminum Beverage	221	350	571	61.3%
Beverage Glass	874	4,239	5,113	82.9%
Construction Debris	761	-	761	0.0%
Container Glass	141	316	457	69.1%
Computer Office Paper	734	331	1,065	31.1%
Food Cans	291	424	714	59.3%
Food	9,891	11,867	21,758	54.5%
Miscellaneous	4,353	3,819	8,172	46.7%
Mixed Scrap Paper	1,591	8,362	9,953	84.0%
Newspaper	1,135	4,126	5,261	78.4%
Other Paper	6,025	722	6,746	10.7%
Other Aluminum	205	42	246	16.9%
Corrugated Kraft	1,270	6,388	7,659	83.4%
Other Ferrous	275	88	363	24.3%
Other Glass	288	3,458	3,746	92.3%
Other NonFerrous	199	-	199	0.0%
Other Organics	11,276	26	11,302	0.2%
Plastics	6,699	1,840	8,538	21.5%
Wood	1,475	0	1,476	0.0%
Yard	1,360	999	2,358	42.3%
Total	49,064	47,395	96,459	49.1%

Waste Composition



Summary: Municipal Solid Waste, Recommended New Programs

Summary of Recycling Program Impacts (in tons per year)

Modeled waste composition data for 2025 - Multifamily Residential

Material MSW	Curb/Apt			Food & YW		Incr MF		Targeted Outreach	Incr MF Enforce	Mun Codes Update MF
	Curb/Apt Rec	Org	Recovery	SF	Res Ban Enforce					
Aluminum Beverage	266	-	19	4	33	0	26			
Beverage Glass	3,808	-	77	16	130	0	102			
Construction Debris	-	-	-	-	-	-	-			
Container Glass	263	-	12	3	21	0	16			
Computer Office Paper	57	-	65	14	109	0	86			
Food Cans	315	-	26	5	43	0	34			
Food	-	2,914	4,503	184	2,728	3	1,535			
Miscellaneous	3,401	260	-	-	-	-	-			
Mixed Scrap Paper	6,989	53	724	30	316	0	247			
Newspaper	3,825	-	-	21	156	0	122			
Other Paper	197	525	-	-	-	-	-			
Other Aluminum	42	-	-	-	-	-	-			
Corrugated Kraft	5,901	-	112	24	189	0	148			
Other Ferrous	88	-	-	-	-	-	-			
Other Glass	3,458	-	-	-	-	-	-			
Other NonFerrous	-	-	-	-	-	-	-			
Other Organics	-	26	-	-	-	-	-			
Plastics	1,424	121	-	-	-	-	-			
Wood	-	-	-	-	-	-	-			
Yard	-	998	-	-	-	-	-			
	30,035	4,897	5,538	301	3,726	4	2,315			

Summary: Municipal Solid Waste, Recommended New Programs

Summary of Recycling Program Impacts (in tons per year)

Modeled waste composition data for 2025 - Multifamily Residential

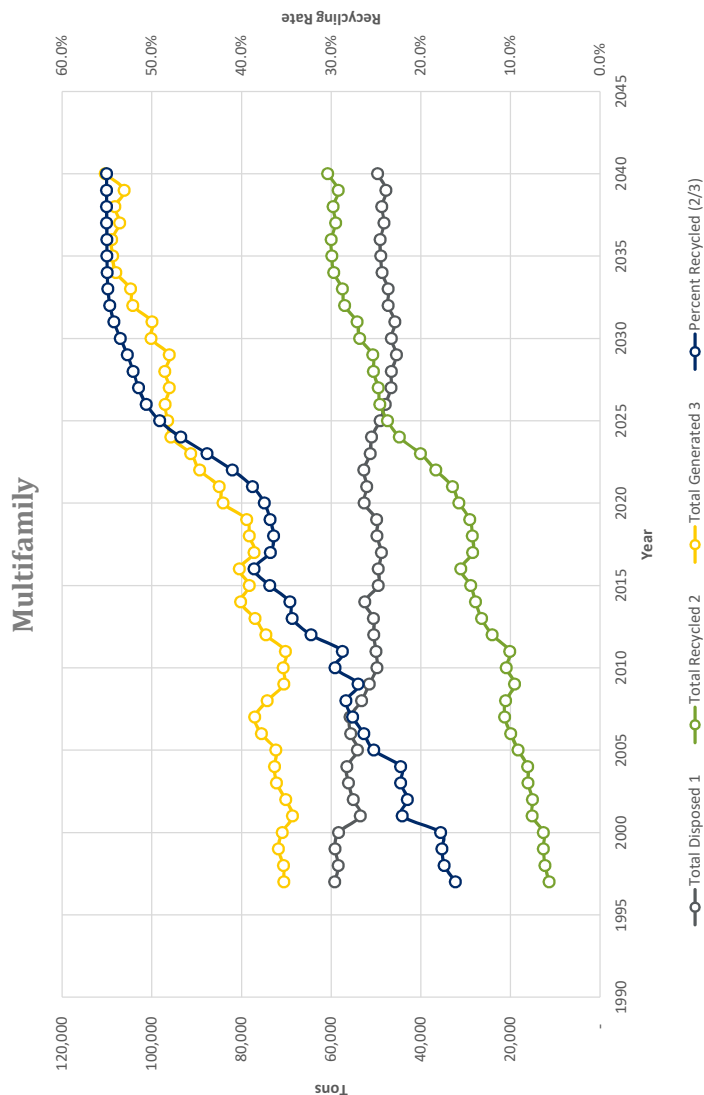
Material MSW	Waste Prev Camp - SH	Paint Prod Stew - SH	Container Depo Syst - SF	Electronics Prod Stew	All Pack Pro	EPR Bags Film - SF
Aluminum Beverage	0	-	2	-	-	350
Beverage Glass	-	-	105	-	-	4,239
Construction Debris	-	-	-	-	-	-
Container Glass	0	-	-	-	-	316
Computer Office Paper	0	-	-	-	-	331
Food Cans	0	-	-	-	-	424
Food	-	-	-	-	-	11,867
Miscellaneous	-	29	-	130	-	3,819
Mixed Scrap Paper	2	-	-	-	-	8,362
Newspaper	1	-	-	-	-	4,126
Other Paper	-	-	-	-	-	722
Other Aluminum	0	-	-	-	-	42
Corrugated Kraft	2	-	-	-	12	6,388
Other Ferrous	0	-	-	-	-	88
Other Glass	-	-	-	-	-	3,458
Other NonFerrous	-	-	-	-	-	-
Other Organics	-	-	-	-	-	26
Plastics	-	-	81	-	66	1,840
Wood	0	-	-	-	-	0
Yard	1	-	-	-	-	999
	7	29	188	130	78	47,395

Summary: Municipal Solid Waste, Recommended New Programs

Summary of Recycling Program Impacts (in tons per year)

Modeled waste composition data for 2025 - Multifamily Residential

Year	Total Disposed	Total Recycled	Generated	Total Generated	Percent Recycled (2/3)
1997	59,189	11,371	70,560	70,560	16.1%
1998	58,374	12,266	70,640	70,640	17.4%
1999	59,087	12,639	71,726	71,726	17.6%
2000	58,333	12,595	70,927	70,927	17.8%
2001	53,487	15,124	68,611	68,611	22.0%
2002	55,076	15,068	70,144	70,144	21.5%
2003	56,106	16,043	72,149	72,149	22.2%
2004	56,498	16,142	72,640	72,640	22.2%
2005	54,080	18,245	72,325	72,325	25.2%
2006	55,643	19,903	75,545	75,545	26.3%
2007	55,759	21,261	77,020	77,020	27.6%
2008	53,199	21,024	74,223	74,223	28.3%
2009	51,497	19,028	70,524	70,524	27.0%
2010	49,788	20,887	70,675	70,675	29.6%
2011	49,993	20,152	70,145	70,145	28.7%
2012	50,497	24,035	74,532	74,532	32.2%
2013	50,547	26,423	76,970	76,970	34.3%
2014	52,439	27,750	80,189	80,189	34.6%
2015	49,443	28,835	78,278	78,278	36.8%
2016	49,437	31,041	80,478	80,478	38.6%
2017	48,773	28,376	77,150	77,150	36.8%
2018	49,760	28,485	78,245	78,245	36.4%
2019	49,819	29,016	78,835	78,835	36.8%
2020	52,609	31,475	84,084	84,084	37.4%
2021	52,017	32,928	84,945	84,945	38.8%
2022	52,689	36,619	89,307	89,307	41.0%
2023	51,278	40,034	91,312	91,312	43.8%
2024	50,960	44,749	95,708	95,708	46.8%
2025	49,064	47,395	96,459	96,459	49.1%
2026	47,903	49,117	97,020	97,020	50.6%
2027	46,629	49,458	96,086	96,086	51.5%
2028	46,535	50,563	97,098	97,098	52.1%
2029	45,432	50,659	96,091	96,091	52.7%
2030	46,573	53,589	100,163	100,163	53.5%
2031	45,741	54,182	99,923	99,923	54.2%
2032	47,252	57,005	104,257	104,257	54.7%
2033	47,251	57,499	104,750	104,750	54.9%
2034	48,629	59,386	108,015	108,015	55.0%
2035	48,929	59,833	108,762	108,762	55.0%
2036	49,009	59,961	108,969	108,969	55.0%
2037	48,197	58,979	107,175	107,175	55.0%
2038	48,661	59,551	108,212	108,212	55.0%
2039	47,730	58,413	106,144	106,144	55.0%
2040	49,649	60,762	110,411	110,411	55.0%



Summary: Municipal Solid Waste, Recommended New Programs

Summary of Recycling Program Impacts (in tons per year)

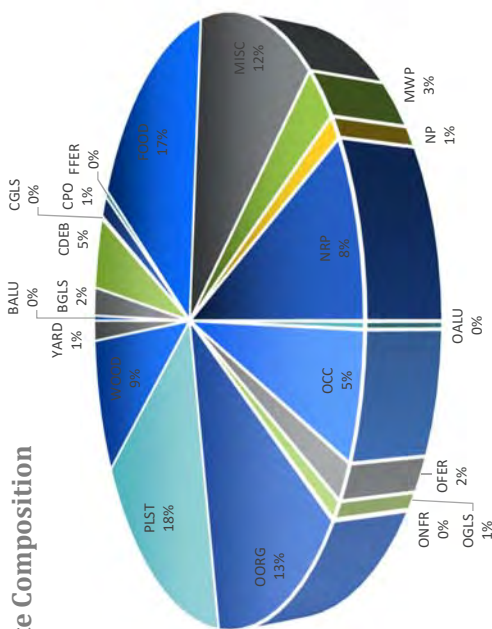
Modeled waste composition data for 2025 - Commercial

Material MSW	Total Disposed 1	Total Recycled 2	Total Generated 3	Percent Recycled (2/3)
Aluminum Beverage	405	870	1,276	68.2%
Beverage Glass	2,277	14,700	16,977	86.6%
Construction Debris	5,594	-	5,594	0.0%
Container Glass	257	28	285	9.7%
Computer Office Paper	1,629	14,885	16,515	90.1%
Food Cans	538	910	1,448	62.9%
Food	19,926	97,061	116,987	83.0%
Miscellaneous	14,161	32,454	46,615	69.6%
Mixed Scrap Paper	3,190	31,226	34,416	90.7%
Newspaper	1,265	11,389	12,654	90.0%
Other Paper	8,741	10,939	19,680	55.6%
Other Aluminum	376	41	417	9.7%
Corrugated Kraft	6,180	54,211	60,391	89.8%
Other Ferrous	2,008	9,402	11,410	82.4%
Other Glass	1,053	0	1,053	0.0%
Other NonFerrous	89	-	89	0.0%
Other Organics	15,151	-	15,151	0.0%
Plastics	20,834	6,231	27,065	23.0%
Wood	10,618	1,146	11,765	9.7%
Yard	1,641	33,342	34,983	95.3%
Total	115,933	318,836	434,769	73.3%

Recycled by Program

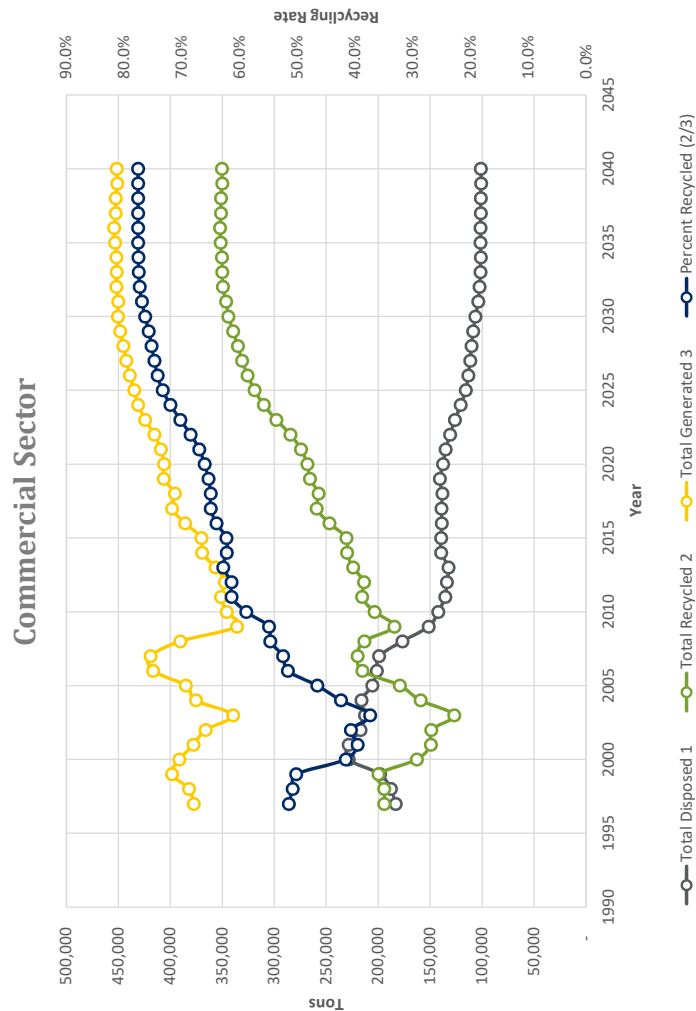
Com Priv Rec	Food & YW Recovery SF	Incr MF Res Ban Enforce	School Education	Take Back Plastic Film
30	108	111	109	114
822	36	8	-	-
14,100	201	44	-	-
-	-	-	-	-
-	23	5	-	-
14,643	194	32	11	-
852	47	10	-	-
63,207	9,182	486	133	-
30,630	-	-	-	-
29,644	1,470	78	23	-
11,360	-	25	-	-
-	-	-	-	-
-	33	7	-	-
53,262	549	120	44	-
9,182	177	39	-	-
0	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
4,582	-	-	136	119
-	936	206	-	-
32,129	1,201	-	-	-
264,413	14,048	1,060	347	119

Waste Composition



Summary: Municipal Solid Waste, Recommended New Programs
Summary of Recycling Program Impacts (in tons per year)
Modeled waste composition data for 2025 - Commercial

Year	Total Disposed		Total Recycled		Total Generated		Percent Recycled (2/3)
	1	2	3	3			
1997	183,130	194,323	377,453	51.5%			
1998	187,899	194,251	382,150	50.8%			
1999	198,420	199,968	398,388	50.2%			
2000	228,417	162,989	391,406	41.6%			
2001	228,310	149,453	377,763	39.6%			
2002	216,923	149,025	365,948	40.7%			
2003	212,647	126,956	339,603	37.4%			
2004	216,111	159,341	375,452	42.4%			
2005	205,829	179,265	385,094	46.6%			
2006	201,306	215,258	416,564	51.7%			
2007	199,083	219,894	418,977	52.5%			
2008	176,774	213,493	390,267	54.7%			
2009	151,399	184,593	335,992	54.9%			
2010	142,182	203,511	345,693	58.9%			
2011	135,535	215,678	351,213	61.4%			
2012	134,090	213,584	347,674	61.4%			
2013	132,400	224,079	356,479	62.9%			
2014	139,456	229,950	369,406	62.2%			
2015	139,556	230,480	370,036	62.3%			
2016	138,804	247,042	385,846	64.0%			
2017	139,317	259,105	398,422	65.0%			
2018	138,378	257,359	395,737	65.0%			
2019	140,677	265,632	406,310	65.4%			
2020	137,671	268,281	405,952	66.1%			
2021	135,085	274,233	409,318	67.0%			
2022	130,965	284,414	415,379	68.5%			
2023	126,160	298,005	424,164	70.3%			
2024	120,759	310,178	430,938	72.0%			
2025	115,933	318,836	434,769	73.3%			
2026	113,193	325,735	438,928	74.2%			
2027	111,627	330,923	442,550	74.8%			
2028	110,267	335,027	445,295	75.2%			
2029	108,739	339,624	448,363	75.7%			
2030	106,481	344,096	450,577	76.4%			
2031	103,773	346,323	450,096	76.9%			
2032	102,577	349,472	452,048	77.3%			
2033	101,716	349,981	451,697	77.5%			
2034	101,451	350,485	451,936	77.6%			
2035	101,641	351,687	453,328	77.6%			
2036	101,757	352,291	454,048	77.6%			
2037	101,433	351,247	452,681	77.6%			
2038	101,423	351,241	452,664	77.6%			
2039	101,090	350,097	451,188	77.6%			
2040	101,192	350,452	451,644	77.6%			



Summary: Municipal Solid Waste, Recommended New Programs

Summary of Recycling Program Impacts (in tons per year)

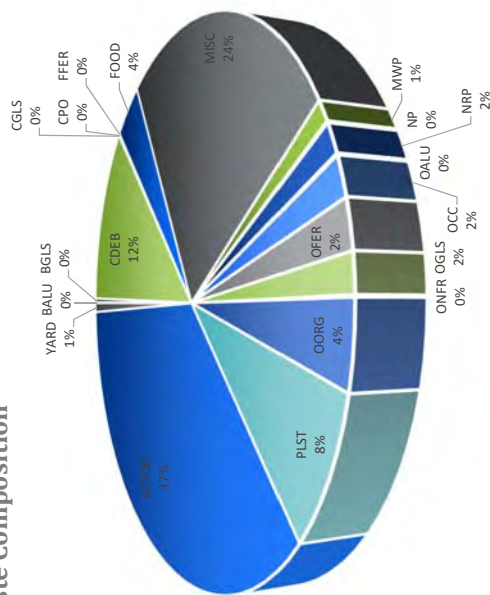
Modeled waste composition data for 2025 - Self-haul

Material MSW	Total Disposed	Total Recycled	Total Generated	Percent Recycled
Aluminum Beverage	38	6	44	13.5%
Beverage Glass	300	250	550	45.5%
Construction Debris	12,143	672	12,815	5.2%
Container Glass	-	-	-	0.0%
Computer Office Paper	93	2	94	1.9%
Food Cans	72	1	74	1.9%
Food	3,915	-	3,915	0.0%
Miscellaneous	24,291	982	25,272	3.9%
Mixed Scrap Paper	1,217	300	1,517	19.8%
Newspaper	93	80	172	46.2%
Other Paper	1,606	-	1,606	0.0%
Other Aluminum	84	2	86	2.1%
Corrugated Kraft	2,000	878	2,878	30.5%
Other Ferrous	2,369	3,183	5,552	57.3%
Other Glass	1,874	-	1,874	0.0%
Other NonFerrous	91	-	91	0.0%
Other Organics	4,143	-	4,143	0.0%
Plastics	8,343	29	8,371	0.3%
Wood	37,558	1,806	39,364	4.6%
Yard	654	6,312	6,966	90.6%
Total	100,885	14,501	115,387	12.6%

Recycled by Program

	Clean Green	R&R centers	Incr MF Res Ban Enforce	Wast Prev Camp - SH	Paint Prod Stew - SH	Carpet Prod Ste - SH	South Reuse Center
	-	5	1	0	-	-	6
	-	232	6	0	-	-	250
	-	1	296	-	-	-	375
	-	-	-	-	-	-	-
	-	-	2	0	-	-	2
	-	-	1	0	-	-	1
	-	-	-	-	-	-	-
	-	217	-	-	173	591	982
	-	237	30	0	-	-	300
	-	78	2	0	-	-	80
	-	-	-	-	-	-	-
	-	0	2	0	-	-	2
	-	776	39	0	-	-	878
	-	3,015	46	0	-	-	3,183
	-	-	-	-	-	-	-
	-	-	-	-	-	-	-
	-	-	-	-	-	-	-
	-	29	-	-	-	-	29
	-	1,074	729	3	-	-	1,806
	6,296	-	16	0	-	-	6,312
Total	6,296	5,663	1,169	4	173	591	14,501

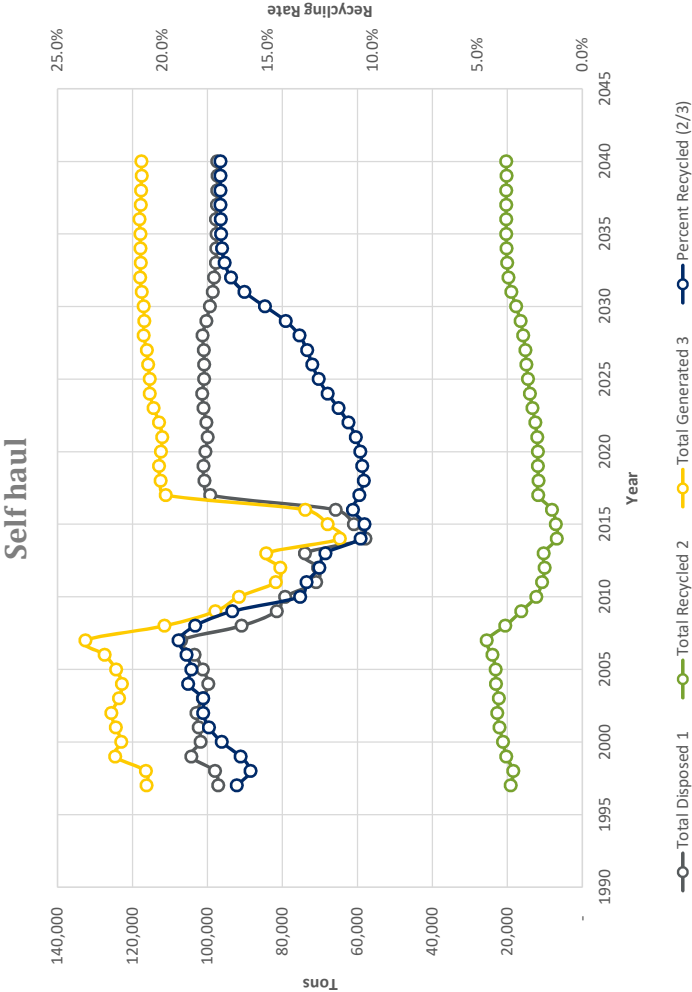
Waste Composition



Summary: Municipal Solid Waste, Recommended New Programs
Summary of Recycling Program Impacts (in tons per year)

Modeled waste composition data for 2025 - Self-haul

Year	Total Disposed	Total Recycled	Total Generated	Percent Recycled (2/3)
1997	97,145	19,137	116,282	16.5%
1998	98,021	18,410	116,431	15.8%
1999	104,350	20,304	124,654	16.3%
2000	101,881	21,141	123,022	17.2%
2001	102,316	22,137	124,453	17.8%
2002	102,926	22,693	125,619	18.1%
2003	101,269	22,325	123,594	18.1%
2004	99,763	23,070	122,833	18.8%
2005	101,207	23,157	124,364	18.6%
2006	103,422	24,022	127,444	18.8%
2007	107,053	25,492	132,545	19.2%
2008	90,896	20,556	111,452	18.4%
2009	81,564	16,328	97,892	16.7%
2010	79,292	12,325	91,617	13.5%
2011	71,034	10,743	81,777	13.1%
2012	70,473	10,094	80,567	12.5%
2013	74,020	10,330	84,350	12.2%
2014	57,845	6,834	64,679	10.6%
2015	60,936	7,055	67,991	10.4%
2016	65,841	8,083	73,924	10.9%
2017	99,293	11,808	111,101	10.6%
2018	100,827	11,722	112,549	10.4%
2019	101,107	11,838	112,945	10.5%
2020	100,537	11,897	112,434	10.6%
2021	99,955	12,086	112,041	10.8%
2022	100,319	12,582	112,900	11.1%
2023	101,062	13,285	114,347	11.6%
2024	101,412	13,999	115,411	12.1%
2025	100,885	14,501	115,387	12.6%
2026	100,920	14,906	115,825	12.9%
2027	100,974	15,240	116,214	13.1%
2028	101,288	15,766	117,054	13.5%
2029	100,329	16,505	116,834	14.1%
2030	99,374	17,700	117,075	15.1%
2031	98,618	18,928	117,546	16.1%
2032	98,220	19,745	117,965	16.7%
2033	97,727	20,075	117,803	17.0%
2034	97,632	20,233	117,865	17.2%
2035	97,598	20,294	117,891	17.2%
2036	97,777	20,356	118,134	17.2%
2037	97,503	20,309	117,812	17.2%
2038	97,420	20,295	117,715	17.2%
2039	97,299	20,271	117,570	17.2%
2040	97,369	20,286	117,656	17.2%



Seattle's 2022 Solid Waste Plan Update

Appendix E - Recycling Potential Assessment Model and Environmental Benefit Analysis

Summary: Municipal Solid Waste, Recommended New Programs Summary of Recycling Program Benefits and Costs All costs in 2019 dollars

Year	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Program Benefits	\$288,533	\$1,031,809	\$2,050,907	\$3,733,612	\$5,851,458	\$7,999,570	\$9,690,659	\$10,823,036	\$11,537,866	\$12,062,949	\$12,503,947	\$13,045,591
Program Cost	\$1,931,700	\$3,294,850	\$3,860,898	\$3,354,589	\$3,322,968	\$3,097,598	\$3,183,694	\$3,248,783	\$3,245,392	\$3,222,626	\$3,124,652	\$3,016,678
Net Benefits	(\$1,643,166)	(\$2,263,041)	(\$1,809,990)	\$379,023	\$2,528,490	\$4,901,972	\$6,506,965	\$7,574,253	\$8,292,474	\$8,840,324	\$9,379,295	\$10,028,913
Tons avoided through recycling	1,839	8,039	16,131	29,584	46,561	63,782	77,464	86,984	93,415	98,399	102,595	107,055
Program Number and Name: 101 Targeted Outreach												
Year	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Program Benefits	\$2,917,919.33	\$4,051	\$5,558	\$127,421	\$368,178	\$461,224	\$498,766	\$512,284	\$506,928	\$505,479	\$487,977	\$492,643
Program Cost	\$2,122,990.31	\$353,479	\$353,479	\$176,498	\$176,498	\$176,498	\$176,498	\$176,498	\$176,498	\$220,179	\$220,179	\$220,179
Net Benefits	\$794,929.02	(\$297,921)	(\$226,058)	\$71,441	\$191,679	\$284,725	\$322,268	\$335,785	\$330,430	\$285,300	\$267,798	\$272,465
Tons avoided through recycling	152	407	928	1,813	2,710	3,420	3,725	3,857	3,848	3,868	3,760	3,803
Program Number and Name: 102 Inr MF Enforce												
Year	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Program Benefits	\$30,466.58	\$2	\$4	\$30	\$80	\$220	\$585	\$1,530	\$3,755	\$8,405	\$15,056	\$22,206
Program Cost	\$156,431.74	\$17,649	\$17,649	\$17,649	\$17,649	\$17,649	\$17,649	\$17,649	\$17,649	\$17,649	\$17,649	\$17,649
Net Benefits	(\$125,965.16)	(\$17,645)	(\$17,645)	(\$17,619)	(\$17,569)	(\$17,429)	(\$17,064)	(\$16,120)	(\$13,895)	(\$9,244)	(\$2,593)	\$4,556
Tons avoided through recycling	0	0	0	0	1	2	4	12	29	64	116	171
Program Number and Name: 103 Wast Prev Camp - Com												
Year	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Program Benefits	\$1,088,205.38	\$-	\$232	\$638	\$1,755	\$4,802	\$13,010	\$35,017	\$92,326	\$231,452	\$522,509	\$974,058
Program Cost	\$1,749,517.63	\$-	\$440,779	\$333,688	\$275,233	\$180,431	\$181,804	\$181,115	\$179,252	\$174,357	\$162,375	\$137,139
Net Benefits	(\$661,312.25)	(\$108,247)	(\$440,546)	(\$333,050)	(\$273,478)	(\$175,629)	(\$168,794)	(\$146,097)	(\$86,925)	\$57,095	\$360,134	\$836,919
Tons avoided through recycling	-	1	2	5	13	36	97	264	701	1,771	4,026	7,519
Program Number and Name: 104 Mun Codes Update MF												
Year	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Program Benefits	\$1,835,852.27	\$17,128	\$87,921	\$165,342	\$237,000	\$289,959	\$309,930	\$316,713	\$312,584	\$310,982	\$299,405	\$301,484
Program Cost	\$62,584.17	\$17,649	\$17,649	\$17,649	\$-	\$-	\$-	\$-	\$-	\$-	\$-	\$-
Net Benefits	(\$521)	\$21,518	\$70,271	\$147,693	\$237,000	\$289,959	\$309,930	\$316,713	\$312,584	\$310,982	\$299,405	\$301,484
Tons avoided through recycling	108	287	640	1,209	1,744	2,150	2,315	2,384	2,373	2,380	2,307	2,327
Program Number and Name: 105 Food Waste Prev - Comm												
Year	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Program Benefits	\$2,047,108.44	\$-	\$145,658	\$209,675	\$253,712	\$255,019	\$254,749	\$256,873	\$264,841	\$288,552	\$343,567	\$432,868
Program Cost	\$1,432,435.76	\$-	\$240,735	\$307,610	\$151,560	\$147,049	\$145,667	\$144,600	\$141,731	\$134,456	\$116,126	\$76,430
Net Benefits	\$614,672.68	(\$95,077)	(\$97,935)	(\$41,363)	\$102,152	\$107,970	\$109,082	\$112,274	\$123,110	\$154,097	\$227,441	\$356,438
Tons avoided through recycling	-	1,067	1,527	1,778	1,867	1,891	1,903	1,934	2,010	2,208	2,647	3,341
Program Number and Name: 108 Food & YW Recover - Com												
Year	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Program Benefits	\$20,326,236.91	\$217,526	\$393,451	\$739,639	\$1,435,645	\$2,496,418	\$3,527,053	\$4,181,072	\$4,451,837	\$4,500,011	\$4,428,954	\$4,315,408
Program Cost	\$3,496,014.84	\$1,012,991	\$922,715	\$593,729	\$417,231	\$-	\$-	\$-	\$-	\$-	\$-	\$-
Net Benefits	\$16,830,222.08	(\$795,465)	(\$529,264)	\$145,910	\$1,018,414	\$2,496,418	\$3,527,053	\$4,181,072	\$4,451,837	\$4,500,011	\$4,428,954	\$4,315,408
Tons avoided through recycling	1,373	1,790	2,865	5,408	10,566	18,513	26,344	31,476	33,793	34,437	34,122	33,312

Seattle's 2022 Solid Waste Plan Update

Appendix E - Recycling Potential Assessment Model and Environmental Benefit Analysis

Summary: Municipal Solid Waste, Recommended New Programs Summary of Recycling Program Benefits and Costs All costs in 2019 dollars

Program Number and Name: 109 School Education		2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Year	Present Value												
Program Benefits	\$219,535.73	\$ 498	\$ 1,295	\$ 3,326	\$ 8,062	\$ 17,248	\$ 29,780	\$ 40,309	\$ 45,896	\$ 47,680	\$ 47,585	\$ 46,864	\$ 45,947
Program Cost	\$1,071,759.71	\$ 108,331	\$ 138,423	\$ 120,367	\$ 120,367	\$ 120,367	\$ 120,367	\$ 120,367	\$ 120,367	\$ 120,367	\$ 120,367	\$ 120,367	\$ 120,367
Net Benefits	(\$852,223.98)	(\$107,832)	(\$137,128)	(\$117,042)	(\$112,306)	(\$103,119)	(\$90,588)	(\$80,059)	(\$74,471)	(\$72,687)	(\$72,782)	(\$73,504)	(\$74,421)
Tons avoided through recycling		4	11	28	68	146	254	347	398	417	420	417	410
Program Number and Name: 111 Incr SF Res Enforce		2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Year	Present Value												
Program Benefits	\$2,269,799.69	\$ 21,727	\$ 46,646	\$ 105,618	\$ 196,896	\$ 291,695	\$ 356,618	\$ 384,721	\$ 393,271	\$ 392,710	\$ 388,550	\$ 379,383	\$ 369,618
Program Cost	\$3,375,409.87	\$ 377,070	\$ 377,159	\$ 377,314	\$ 377,705	\$ 378,618	\$ 380,330	\$ 382,618	\$ 384,356	\$ 385,238	\$ 385,537	\$ 385,548	\$ 385,312
Net Benefits	(\$1,105,610.18)	(\$355,343)	(\$330,513)	(\$271,696)	(\$180,809)	(\$86,924)	(\$23,713)	\$2,103	\$8,916	\$7,472	\$3,013	(\$6,164)	(\$15,694)
Tons avoided through recycling		137	342	769	1,440	2,147	2,645	2,874	2,961	2,981	2,973	2,923	2,853
Program Number and Name: 114 Take Back Plastic Film		2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Year	Present Value												
Program Benefits	\$109,185.81	\$ 7,222	\$ 10,384	\$ 12,445	\$ 13,462	\$ 13,890	\$ 13,968	\$ 13,851	\$ 13,645	\$ 13,314	\$ 12,919	\$ 12,562	\$ 12,246
Program Cost	\$140,197.41	\$ 44,530	\$ 44,530	\$ 23,668	\$ 6,018	\$ 6,018	\$ 6,018	\$ 6,018	\$ 6,018	\$ 6,018	\$ 6,018	\$ 6,018	\$ 6,018
Net Benefits	(\$31,011.60)	(\$37,308)	(\$34,145)	(\$11,223)	\$7,443	\$7,872	\$7,949	\$7,833	\$7,627	\$7,295	\$6,900	\$6,544	\$6,228
Tons avoided through recycling		59	86	104	113	118	119	119	118	117	114	112	109
Program Number and Name: 115 Food Waste Prev - Comm		2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Year	Present Value												
Program Benefits	\$1,466,001.32	\$ -	\$ 604	\$ 1,641	\$ 4,486	\$ 12,225	\$ 32,479	\$ 81,715	\$ 184,541	\$ 342,837	\$ 499,985	\$ 602,100	\$ 652,926
Program Cost	(\$279,369.60)	\$ -	\$ 90,276	\$ 59,932	\$ 59,496	\$ (1,890)	\$ (5,186)	\$ (13,892)	\$ (35,227)	\$ (80,238)	\$ (150,405)	\$ (221,274)	\$ (268,433)
Net Benefits	\$1,186,631.72	\$ -	\$ 513,324	\$ 1,081,109	\$ 3,889,490	\$ 14,115	\$ 37,664	\$ 95,607	\$ 219,768	\$ 423,076	\$ 650,390	\$ 823,374	\$ 921,359
Tons avoided through recycling		-	5	14	38	103	277	703	1,601	3,001	4,415	5,356	5,821
Program Number and Name: 120 Comp Food Serv Pack		2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Year	Present Value												
Program Benefits	\$22,480,179.76	\$ -	\$ 461,411	\$ 1,041,325	\$ 1,955,452	\$ 2,898,305	\$ 3,514,946	\$ 3,796,062	\$ 3,897,620	\$ 3,903,069	\$ 3,885,078	\$ 3,869,443	\$ 3,872,606
Program Cost	\$7,472,788.31	\$ -	\$ -	\$ 292,125	\$ 490,641	\$ 792,611	\$ 1,121,711	\$ 1,287,826	\$ 1,395,767	\$ 1,442,989	\$ 1,459,421	\$ 1,463,027	\$ 1,467,668
Net Benefits	\$15,007,391.45	\$ -	\$ 461,411	\$ 749,201	\$ 1,464,811	\$ 2,105,694	\$ 2,393,236	\$ 2,508,235	\$ 2,501,854	\$ 2,466,080	\$ 2,425,657	\$ 2,406,416	\$ 2,404,938
Tons avoided through recycling		-	3,830	8,712	16,435	24,529	29,996	32,650	33,812	34,216	34,305	34,419	34,524
Program Number and Name: 122 Container Depo Syst - Com		2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Year	Present Value												
Program Benefits	\$809,652.60	\$ -	\$ 7,422	\$ 18,978	\$ 43,269	\$ 81,271	\$ 119,973	\$ 144,575	\$ 156,507	\$ 161,051	\$ 162,232	\$ 162,438	\$ 162,818
Program Cost	\$76,328.32	\$ -	\$ 29,430	\$ 29,430	\$ 29,430	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Net Benefits	\$733,324.27	\$ 0	(\$22,008)	(\$10,451)	\$13,839	\$81,271	\$119,973	\$144,575	\$156,507	\$161,051	\$162,232	\$162,438	\$162,818
Tons avoided through recycling		-	54	138	316	598	890	1,080	1,178	1,223	1,242	1,251	1,257
Program Number and Name: 123 Electronics Prod Stew		2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Year	Present Value												
Program Benefits	\$226,225.32	\$ -	\$ 2,055	\$ 5,281	\$ 12,099	\$ 22,674	\$ 33,606	\$ 40,404	\$ 43,681	\$ 44,850	\$ 45,206	\$ 45,345	\$ 45,878
Program Cost	\$76,297.11	\$ -	\$ 29,418	\$ 29,418	\$ 29,418	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Net Benefits	\$149,928.21	\$ 0	(\$27,363)	(\$24,137)	(\$17,318)	\$22,674	\$33,606	\$40,404	\$43,681	\$44,850	\$45,206	\$45,345	\$45,878
Tons avoided through recycling		-	15	38	88	167	249	302	329	340	346	349	354

Seattle's 2022 Solid Waste Plan Update

Appendix E - Recycling Potential Assessment Model and Environmental Benefit Analysis

Summary: Municipal Solid Waste, Recommended New Programs Summary of Recycling Program Benefits and Costs All costs in 2019 dollars

Program Number and Name: 126 All Pack Prod Stew - Com													
Year	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	
Present Value													
Program Benefits	\$ -	\$ 647	\$ 1,780	\$ 4,858	\$ 13,164	\$ 34,930	\$ 87,693	\$ 197,890	\$ 367,184	\$ 534,898	\$ 642,565	\$ 695,618	
Program Cost	\$ -	\$ 78,236	\$ 78,236	\$ 30,091	\$ 30,091	\$ 30,091	\$ 21,063	\$ 21,063	\$ 21,063	\$ 21,063	\$ 21,063	\$ 21,063	
Net Benefits	\$ 0	(\$77,590)	(\$76,456)	(\$25,233)	(\$16,927)	\$4,840	\$66,630	\$176,827	\$346,121	\$513,835	\$621,502	\$674,555	
Tons avoided through recycling	-	5	13	36	97	259	655	1,490	2,787	4,093	4,951	5,370	
Program Number and Name: 127 Carpet Prod Stew - Com													
Year	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	
Present Value													
Program Benefits	\$ -	\$ 5,103	\$ 13,407	\$ 33,962	\$ 77,494	\$ 144,850	\$ 211,372	\$ 254,440	\$ 274,540	\$ 282,394	\$ 284,699	\$ 286,417	
Program Cost	\$ -	\$ 29,418	\$ 29,418	\$ 29,418	\$ 29,418	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	
Net Benefits	\$ 0	(\$24,315)	(\$16,011)	\$4,544	\$48,076	\$115,432	\$211,372	\$254,440	\$274,540	\$282,394	\$284,699	\$286,417	
Tons avoided through recycling	-	42	112	285	656	1,236	1,818	2,207	2,403	2,493	2,532	2,553	
Program Number and Name: 128 South Reuse Center													
Year	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	
Present Value													
Program Benefits	\$ 379	\$ 999	\$ 2,597	\$ 6,544	\$ 14,812	\$ 27,469	\$ 39,696	\$ 47,437	\$ 50,847	\$ 52,161	\$ 52,071	\$ 52,145	
Program Cost	\$ -	\$ 647,155	\$ 653,174	\$ 653,174	\$ 829,672	\$ 829,672	\$ 829,672	\$ 829,672	\$ 829,672	\$ 829,672	\$ 829,672	\$ 829,672	
Net Benefits	\$379	(\$646,157)	(\$650,576)	(\$646,630)	(\$814,860)	(\$802,203)	(\$789,976)	(\$782,235)	(\$778,826)	(\$777,511)	(\$777,601)	(\$777,527)	
Tons avoided through recycling	5	15	38	97	221	414	605	732	794	824	831	836	
Program Number and Name: 129 EPR Bags Film - MF													
Year	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	
Present Value													
Program Benefits	\$ -	\$ 1,067	\$ 2,875	\$ 7,332	\$ 16,648	\$ 31,316	\$ 45,506	\$ 54,289	\$ 57,568	\$ 58,196	\$ 58,170	\$ 58,721	
Program Cost	\$ -	\$ 50,554	\$ 50,554	\$ 50,554	\$ 50,554	\$ 20,836	\$ 20,836	\$ 20,836	\$ 20,836	\$ 20,836	\$ 20,836	\$ 20,836	
Net Benefits	\$ -	\$ (49,487)	\$ (47,679)	\$ (43,222)	\$ (33,906)	\$ 10,481	\$ 24,670	\$ 33,453	\$ 36,733	\$ 37,361	\$ 37,334	\$ 37,885	
Tons avoided through recycling	-	8	21	54	123	232	340	409	437	445	448	453	
Program Number and Name: 131 Serv Ware - Berk													
Year	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	
Present Value													
Program Benefits	\$ -	\$ 6,311	\$ 14,765	\$ 29,770	\$ 48,809	\$ 64,918	\$ 74,254	\$ 78,590	\$ 80,251	\$ 80,699	\$ 80,903	\$ 81,212	
Program Cost	\$ -	\$ -	\$ 27,962	\$ 25,069	\$ 19,918	\$ 13,296	\$ 7,566	\$ (13,932)	\$ (15,684)	\$ (16,524)	\$ (16,936)	\$ (17,224)	
Net Benefits	\$ 0	\$ 6,311	(\$13,197)	\$4,701	\$28,891	\$51,622	\$66,688	\$92,521	\$95,934	\$97,223	\$97,838	\$98,435	
Tons avoided through recycling	-	52	124	250	413	554	639	682	702	713	720	724	
Program Number and Name: 142 Paint Prod Stew - Com													
Year	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	
Present Value													
Program Benefits	\$ -	\$ 3,052	\$ 8,157	\$ 20,619	\$ 46,852	\$ 87,075	\$ 126,408	\$ 151,740	\$ 163,694	\$ 168,166	\$ 169,936	\$ 170,772	
Program Cost	\$ 0	\$ 29,418	\$ 29,418	\$ 29,418	\$ 29,418	\$ 29,418	\$ 0	\$ 0	\$ 0	\$ 0	\$ 0	\$ 0	
Net Benefits	\$ 0	(\$26,365)	(\$21,261)	(\$8,799)	\$17,434	\$57,657	\$126,408	\$151,740	\$163,694	\$168,166	\$169,936	\$170,772	
Tons avoided through recycling	-	22	59	151	345	646	944	1,142	1,243	1,287	1,309	1,318	

Summary: Construction and Demolition Debris Tons Per Year, Status Quo (All Materials)

Year	Recycle Rate	Total Material	Total Disposed	Total Diverted	Beneficial Uses	ABC BAN	Facility Certification	C&D Priv Rec
		-	-	-	90	92	94	99
2007	49.28%	415,801	201,156	214,645	9,738	-	19,996	184,911
2008	50.59%	397,052	181,241	215,811	14,961	-	7,464	193,387
2009	56.40%	288,551	115,446	173,105	10,362	-	9,146	153,596
2010	61.88%	288,957	98,309	190,648	11,854	-	10,235	168,559
2011	63.18%	359,390	118,216	241,174	14,125	-	33,721	193,328
2012	60.24%	371,962	129,383	242,579	18,519	40,168	23,168	160,723
2013	60.84%	386,200	127,040	259,160	24,178	55,548	31,708	147,725
2014	65.40%	485,242	128,024	357,218	39,887	67,756	37,710	211,865
2015	63.99%	437,883	117,343	320,541	40,336	81,860	40,912	157,433
2016	63.80%	532,126	146,139	385,987	46,509	89,182	39,576	210,721
2017	66.57%	514,858	125,074	389,784	47,029	89,216	33,291	220,249
2018	63.90%	504,325	133,332	370,993	48,728	82,708	33,410	206,147
2019	63.90%	487,431	128,862	358,569	47,096	79,938	32,293	199,243
2020	63.90%	462,018	122,134	339,884	44,641	75,771	30,614	188,858
2021	63.91%	501,923	132,656	369,267	48,499	82,317	33,272	205,179
2022	63.92%	469,208	123,940	345,269	45,343	76,956	31,139	191,830
2023	63.96%	449,417	118,532	330,885	43,445	73,722	29,919	183,800
2024	64.06%	487,841	128,144	359,697	47,200	80,058	32,745	199,694
2025	64.31%	540,956	140,595	400,361	52,456	88,872	37,079	221,954
2026	64.93%	547,906	138,745	409,162	53,419	90,252	39,409	226,082
2027	66.17%	559,780	134,186	425,594	55,193	92,711	44,007	233,683
2028	67.98%	569,196	125,176	444,019	57,089	95,043	50,079	241,809
2029	69.66%	571,737	115,133	456,604	58,315	96,224	55,018	247,047
2030	70.69%	571,046	108,500	462,546	58,874	96,587	57,675	249,410

Summary: Construction and Demolition Debris Tons Per Year, Status Quo (Without Concrete)

Year	Recycle Rate w/o Concrete	Total Material	Total Disposed	Total Diverted	Beneficial Uses	ABC BAN	Facility Certification	C&D Priv Rec
		-	-	-	90	92	94	99
2007	20.18%	231,093	184,455	46,638	9,738	-	16,414	20,486
2008	19.42%	206,236	166,193	40,043	14,961	-	4,504	20,579
2009	29.92%	151,062	105,861	45,201	10,362	-	5,284	29,554
2010	31.56%	131,709	90,147	41,562	11,854	-	5,748	23,959
2011	40.60%	182,491	108,401	74,089	14,125	-	22,448	37,516
2012	33.65%	178,814	118,641	60,173	18,519	-	14,428	27,226
2013	39.11%	191,307	116,493	74,814	24,178	-	21,551	29,085
2014	44.47%	211,391	117,394	93,996	39,887	-	30,773	23,336
2015	47.75%	205,947	107,600	98,347	40,336	-	35,525	22,487
2016	42.33%	232,356	134,005	98,351	46,509	-	33,670	18,171
2017	44.97%	208,395	114,690	93,705	47,029	-	27,318	19,358
2018	43.83%	220,217	123,705	96,511	48,728	-	27,873	19,911
2019	43.83%	212,840	119,559	93,281	47,096	-	26,941	19,245
2020	43.83%	201,743	113,318	88,425	44,641	-	25,540	18,244
2021	43.84%	219,168	123,085	96,083	48,499	-	27,757	19,827
2022	43.87%	204,883	115,009	89,874	45,343	-	25,976	18,555
2023	43.94%	196,241	110,019	86,222	43,445	-	24,954	17,823
2024	44.13%	213,019	119,024	93,996	47,200	-	27,300	19,495
2025	44.62%	236,212	130,826	105,386	52,456	-	30,884	22,046
2026	45.80%	239,247	129,676	109,571	53,419	-	32,769	23,383
2027	48.22%	244,431	126,573	117,858	55,193	-	36,546	26,119
2028	51.82%	248,543	119,741	128,802	57,089	-	41,702	30,011
2029	55.28%	249,653	111,644	138,008	58,315	-	46,135	33,558
2030	57.45%	249,351	106,111	143,240	58,874	-	48,669	35,697

Summary: Construction and Demolition Debris, Status Quo

Summary of Recycling Program Impacts (in tons per year)

Modeled waste composition data for 2023

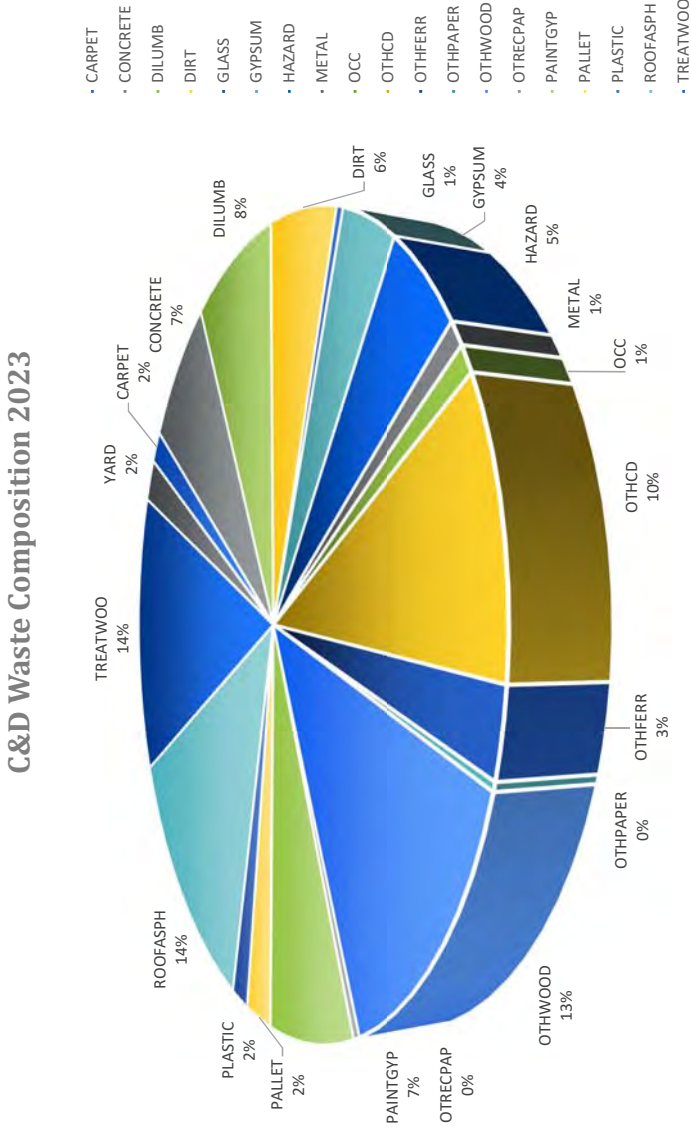
Material C&D	Total Disposed a	Total Generated d = a + b + c	Total Beneficial Uses b	Total Recycled c	Percent Recycled c/d
Carpet	1,794	2,175	-	381	17.5%
Rock/Concrete/Brick/Ceramic & Porcelain	8,513	253,176	-	244,663	96.6%
Dimension lumber	9,180	57,686	43,445	5,061	8.8%
Sand/Soil/Dirt	6,742	6,747	-	5	0.1%
Glass	612	612	-	-	0.0%
Clean Gypsum Board	4,949	25,781	-	20,832	80.8%
Hazardous & Other	5,850	5,850	-	-	0.0%
Metal	1,186	13,465	-	12,279	91.2%
Corrugated Kraft (OCC)	1,250	1,250	-	-	0.0%
Other C&D	11,351	12,478	-	1,126	9.0%
Other ferrous	3,442	3,446	-	4	0.1%
Other Paper	376	376	-	0	0.1%
Other recyclable wood	15,134	15,150	-	16	0.1%
Other Recyclable Paper	540	540	-	0	0.1%
Painted/Demolition Gypsum	8,427	8,429	-	3	0.0%
Pallets & crates	2,700	2,703	-	3	0.1%
Plastic	1,789	1,790	-	1	0.1%
Roofing (asphalt & comp)	16,239	16,975	-	737	4.3%
Treated and contaminated wood	16,087	18,416	-	2,329	12.6%
Yard waste & other organics	2,370	2,370	-	-	0.0%
Total	118,532	449,417	43,445	287,440	64.0%

Summary: Construction and Demolition Debris, Status Quo
Summary Of Recycling Program Impacts (in tons per year)
Modeled waste composition data for 2023

Material C&D	C&D		Facility			
	Priv	Rec	Certificat	Beneficia	ABC	BAN
Carpet	380		1	-	-	381
Rock/Concrete/Brick/Ceramic & Porcelain	165,977		4,965	-	73,722	244,663
Dimension lumber	569		4,492	43,445	-	48,505
Sand/Soil/Dirt	-		5	-	-	5
Glass	-		-	-	-	-
Clean Gypsum Board	7,972		12,861	-	-	20,832
Hazardous & Other	-		-	-	-	-
Metal	4,719		7,560	-	-	12,279
Corrugated Kraft (OCC)	-		-	-	-	-
Other C&D	1,120		6	-	-	1,126
Other ferrous	1		2	-	-	4
Other Paper	-		0	-	-	0
Other recyclable wood	6		10	-	-	16
Other Recyclable Paper	-		0	-	-	0
Painted/Demolition Gypsum	-		3	-	-	3
Pallets & crates	1		2	-	-	3
Plastic	-		1	-	-	1
Roofing (asphalt & comp)	726		11	-	-	737
Treated and contaminated wood	2,329		-	-	-	2,329
Yard waste & other organics	-		-	-	-	-
	183,800		29,919	43,445	73,722	330,885

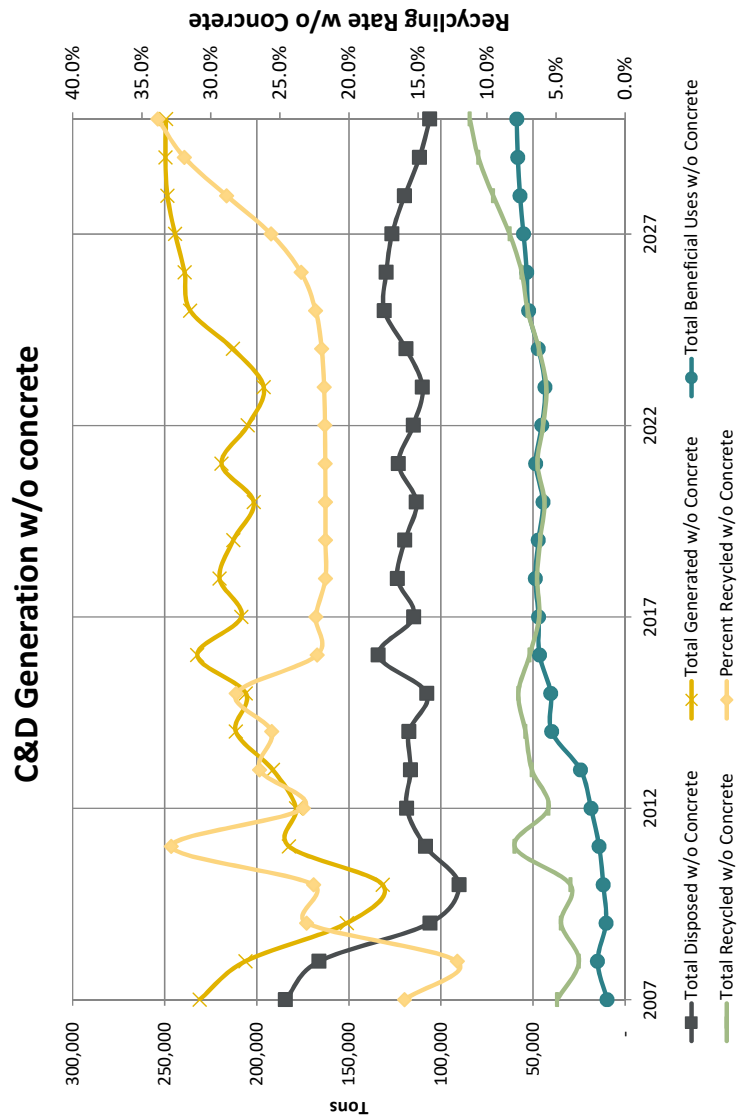
Summary: Construction and Demolition Debris, Status Quo
Summary Of Recycling Program Impacts (in tons per year)
Modeled waste composition data for 2023

Year	Total		Total		Percent Recycled
	Disposed	Generated	Beneficial Uses	Recycled	
2007	201,156	415,801	9,738	204,907	49.3%
2008	181,241	397,052	14,961	200,851	50.6%
2009	115,446	288,551	10,362	162,742	56.4%
2010	98,309	288,957	11,854	178,794	61.9%
2011	118,216	359,390	14,125	227,049	63.2%
2012	129,383	371,962	18,519	224,060	60.2%
2013	127,040	386,200	24,178	234,982	60.8%
2014	128,024	485,242	39,887	317,331	65.4%
2015	117,343	437,883	40,336	280,205	64.0%
2016	146,139	532,126	46,509	339,478	63.8%
2017	125,074	514,858	47,029	342,755	66.6%
2018	133,332	504,325	48,728	322,265	63.9%
2019	128,862	487,431	47,096	311,473	63.9%
2020	122,134	462,018	44,641	295,243	63.9%
2021	132,656	501,923	48,499	320,768	63.9%
2022	123,940	469,208	45,343	299,925	63.9%
2023	118,532	449,417	43,445	287,440	64.0%
2024	128,144	487,841	47,200	312,498	64.1%
2025	140,595	540,956	52,456	347,905	64.3%
2026	138,745	547,906	53,419	355,743	64.9%
2027	134,186	559,780	55,193	370,400	66.2%
2028	125,176	569,196	57,089	386,930	68.0%
2029	115,133	571,737	58,315	398,289	69.7%
2030	108,500	571,046	58,874	403,672	70.7%



Summary: Construction and Demolition Debris, Status Quo
Summary Of Recycling Program Impacts (in tons per year)

Modeled waste composition data for 2023									
Year	Total Disposed		Total Generated		Total Beneficial		Total Recycled		Percent Recycled w/o Concrete
	Concrete	w/o	Concrete	w/o	Concrete	Uses w/o	Concrete	w/o	
2007	184,455		231,093		9,738		36,900		16.0%
2008	166,193		206,236		14,961		25,082		12.2%
2009	105,861		151,062		10,362		34,838		23.1%
2010	90,147		131,709		11,854		29,708		22.6%
2011	108,401		182,491		14,125		59,964		32.9%
2012	118,641		178,814		18,519		41,654		23.3%
2013	116,493		191,307		24,178		50,636		26.5%
2014	117,394		211,391		39,887		54,109		25.6%
2015	107,600		205,947		40,336		58,012		28.2%
2016	134,005		232,356		46,509		51,842		22.3%
2017	114,690		208,395		47,029		46,676		22.4%
2018	123,705		220,217		48,728		47,783		21.7%
2019	119,559		212,840		47,096		46,185		21.7%
2020	113,318		201,743		44,641		43,784		21.7%
2021	123,085		219,168		48,499		47,584		21.7%
2022	115,009		204,883		45,343		44,531		21.7%
2023	110,019		196,241		43,445		42,777		21.8%
2024	119,024		213,019		47,200		46,796		22.0%
2025	130,826		236,212		52,456		52,931		22.4%
2026	129,676		239,247		53,419		56,152		23.5%
2027	126,573		244,431		55,193		62,665		25.6%
2028	119,741		248,543		57,089		71,713		28.9%
2029	111,644		249,653		58,315		79,693		31.9%
2030	106,111		249,351		58,874		84,366		33.8%



Summary: Construction and Demolition Debris, Status Quo
Summary of Recycling Program Benefits and Costs
All costs in 2019 dollars

Total		Present Value	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Year													
Program Benefits		\$182,193,712	\$12,467,667	\$13,753,415	\$13,258,666	\$13,278,419	\$15,022,547	\$17,082,551	\$17,499,791	\$17,948,390	\$18,250,445	\$18,293,370	\$18,224,969
Program Cost		\$230,879	\$40,000	\$25,000	\$20,000	\$35,000	\$20,000	\$20,000	\$35,000	\$20,000	\$20,000	\$35,000	\$20,000
Net Benefits		\$181,962,833	\$12,427,667	\$13,728,415	\$13,238,666	\$13,243,419	\$15,002,547	\$17,062,551	\$17,464,791	\$17,928,390	\$18,230,445	\$18,258,370	\$18,204,969
Tons avoided through recycling		107,480	118,564	114,299	114,469	129,505	147,263	150,860	154,727	157,331	157,701	157,112	

Program Number and Name: 92 ABC BAN

Year	Present Value	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Program Benefits	\$112,216,823.09	\$ 8,777,258	\$ 9,515,549	\$ 8,856,805	\$ 8,426,637	\$ 9,087,265	\$ 10,039,340	\$ 10,166,345	\$ 10,426,798	\$ 10,703,128	\$ 10,911,547	\$ 11,059,642
Program Cost	\$55,453.25	\$ 10,000	\$ 10,000	\$ 5,000	\$ 5,000	\$ 5,000	\$ 5,000	\$ 5,000	\$ 5,000	\$ 5,000	\$ 5,000	\$ 5,000
Net Benefits	\$112,161,369.83	\$ 8,767,258	\$ 9,505,549	\$ 8,851,805	\$ 8,421,637	\$ 9,082,265	\$ 10,034,340	\$ 10,161,345	\$ 10,421,798	\$ 10,698,128	\$ 10,906,547	\$ 11,054,642
Tons avoided through recycling		75,666	82,031	76,352	72,643	78,338	86,546	87,641	89,886	92,268	94,065	95,342

Program Number and Name: 94 Facility Certification

Year	Present Value	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Program Benefits	\$69,976,888.87	\$ 3,690,409	\$ 4,237,865	\$ 4,401,860	\$ 4,851,783	\$ 5,935,282	\$ 7,043,211	\$ 7,333,446	\$ 7,521,592	\$ 7,547,317	\$ 7,381,823	\$ 7,165,326
Program Cost	\$175,426.04	\$ 30,000	\$ 15,000	\$ 15,000	\$ 30,000	\$ 15,000	\$ 15,000	\$ 30,000	\$ 15,000	\$ 15,000	\$ 30,000	\$ 15,000
Net Benefits	\$69,801,462.82	\$ 3,660,409	\$ 4,222,865	\$ 4,386,860	\$ 4,821,783	\$ 5,920,282	\$ 7,028,211	\$ 7,303,446	\$ 7,506,592	\$ 7,532,317	\$ 7,351,823	\$ 7,150,326
Tons avoided through recycling		31,814	36,533	37,947	41,826	51,166	60,717	63,219	64,841	65,063	63,636	61,770

Seattle's 2022 Solid Waste Plan Update
Appendix E - Recycling Potential Assessment Model and Environmental Benefit Analysis

Summary: Construction and Demolition Debris Tons Per Year, Recommended New Programs (All Materials)

Year	Recycle Rate	Total Material	Total Disposed	Total Diverted	Bans beyond ABC	Education & Outreach	Monitoring & Enforcement	Expand Recycling Market	Salvage Assessment	Deconstruction Requirement Single Family	Beneficial Uses	ABC BAN	Facility Certification	C&D Priv Rec
2007	51.6%	415,801	201,156	214,645	-	-	-	-	-	-	9,738	-	19,996	184,911
2008	54.4%	397,052	181,241	215,811	-	-	-	-	-	-	14,961	-	7,464	193,387
2009	60.0%	288,551	115,446	173,105	-	-	-	-	-	-	10,362	-	9,146	153,596
2010	66.0%	288,957	98,309	190,648	-	-	-	-	-	-	11,854	-	10,235	168,559
2011	67.1%	359,390	118,216	241,174	-	-	-	-	-	-	14,125	-	33,721	193,328
2012	65.2%	371,962	129,383	242,579	-	-	-	-	-	-	18,519	40,168	23,168	160,723
2013	67.1%	386,200	127,040	259,160	-	-	-	-	-	-	24,178	55,548	31,708	147,725
2014	73.6%	485,242	128,024	357,218	-	-	-	-	-	-	39,887	67,756	37,710	211,865
2015	73.2%	437,883	117,343	320,541	-	-	-	-	-	-	40,336	81,860	40,912	157,433
2016	72.5%	532,126	146,139	385,987	-	-	-	-	-	-	46,509	89,182	39,576	210,721
2017	75.71%	514,858	125,074	389,784	-	-	-	-	-	-	47,029	89,216	33,291	220,249
2018	73.56%	504,325	133,332	370,993	-	-	-	-	-	-	48,728	82,709	33,410	206,146
2019	73.56%	487,431	128,862	358,569	-	-	-	-	-	-	47,096	79,939	32,293	199,241
2020	74.17%	462,018	119,336	342,683	36	317	2,247	1	16	908	44,540	75,612	30,552	188,454
2021	74.76%	501,923	126,700	375,223	102	838	4,525	2	46	2,226	48,249	81,929	33,119	204,185
2022	75.50%	469,208	114,972	354,236	238	1,709	6,154	6	114	3,869	44,899	76,291	30,869	190,088
2023	76.25%	449,417	106,713	342,704	532	2,963	7,055	16	273	5,418	42,792	72,824	29,525	181,305
2024	76.97%	487,841	112,308	375,534	1,212	4,610	8,206	46	668	7,086	46,261	79,005	32,191	196,247
2025	77.69%	540,956	120,555	420,401	2,366	6,011	9,220	135	1,377	8,497	51,172	87,986	36,349	217,287
2026	78.55%	547,906	117,170	430,736	3,353	6,280	9,095	348	2,038	8,873	51,908	90,289	38,612	219,940
2027	79.77%	559,780	112,418	447,361	3,895	6,008	8,633	839	2,508	9,169	53,503	94,828	43,287	224,692
2028	81.35%	569,196	104,394	464,801	3,926	5,282	7,753	1,744	2,758	9,363	55,278	100,497	49,707	228,492
2029	82.80%	571,737	95,406	476,331	3,676	4,473	6,792	2,949	2,856	9,419	56,440	105,043	55,198	229,485
2030	83.67%	571,046	89,208	481,838	3,426	3,932	6,142	4,039	2,885	9,413	56,970	107,568	58,306	229,156
2031	84.07%	568,729	85,896	482,833	3,272	3,656	5,806	4,699	2,885	9,377	57,026	108,398	59,521	228,191
2032	84.23%	566,844	84,387	482,457	3,197	3,537	5,657	5,002	2,880	9,347	56,954	108,557	59,906	227,419
2033	84.29%	566,883	83,920	482,963	3,172	3,495	5,607	5,132	2,882	9,348	57,003	108,763	60,132	227,428
2034	84.31%	569,115	84,072	485,043	3,175	3,494	5,610	5,202	2,894	9,385	57,245	109,266	60,451	228,321
2035	84.32%	572,469	84,502	487,967	3,190	3,508	5,636	5,251	2,911	9,440	57,588	109,937	60,838	229,666
2036	84.32%	576,367	85,052	491,315	3,211	3,530	5,672	5,294	2,931	9,504	57,983	110,696	61,264	231,229
2037	84.33%	579,795	85,549	494,246	3,229	3,550	5,705	5,328	2,949	9,561	58,329	111,358	61,633	232,604
2038	84.33%	581,646	85,819	495,827	3,240	3,561	5,723	5,346	2,958	9,591	58,515	111,715	61,831	233,347
2039	84.33%	581,862	85,849	496,013	3,241	3,562	5,725	5,348	2,959	9,595	58,537	111,757	61,855	233,434
2040	84.33%	581,588	85,809	495,780	3,239	3,561	5,722	5,346	2,958	9,590	58,509	111,705	61,826	233,324

Summary: Construction and Demolition Debris Tons Per Year, Recommended New Programs (Without Concrete)

Year	Recycle Rate w/o Concrete	Total Material	Total Disposed	Total Diverted	Bans beyond ABC	Education & Outreach & WDR	Monitoring & Enforcement	Expand Recycling Market	Salvage Assessment	Deconstruction Requirement Single Family	Beneficial Uses	ABC BAN	Facility Certification	C&D Priv Rec
2007	16.7%	231,093	184,455	46,638	-	-	-	-	-	-	9,738	-	16,414	20,486
2008	13.1%	206,236	166,193	40,043	-	-	-	-	-	-	14,961	-	4,504	20,579
2009	24.8%	151,062	105,861	45,201	-	-	-	-	-	-	10,362	-	5,284	29,554
2010	24.8%	131,709	90,147	41,562	-	-	-	-	-	-	11,854	-	5,748	23,959
2011	35.6%	182,491	108,401	74,089	-	-	-	-	-	-	14,125	-	22,448	37,516
2012	26.0%	178,814	118,641	60,173	-	-	-	-	-	-	18,519	-	14,428	27,226
2013	30.3%	191,307	116,493	74,814	-	-	-	-	-	-	24,178	-	21,551	29,085
2014	31.5%	211,391	117,394	93,996	-	-	-	-	-	-	39,887	-	30,773	23,336
2015	35.0%	205,947	107,600	98,347	-	-	-	-	-	-	40,336	-	35,525	22,487
2016	27.9%	232,356	134,005	98,351	-	-	-	-	-	-	46,509	-	33,670	18,171
2017	28.9%	208,395	114,690	93,705	-	-	-	-	-	-	47,029	-	27,318	19,358
2018	27.9%	220,217	123,705	96,511	-	-	-	-	-	-	48,728	-	27,873	19,911
2019	27.9%	212,840	119,559	93,281	-	-	-	-	-	-	47,096	-	26,941	19,245
2020	29.4%	201,743	110,946	90,798	36	245	1,912	1	16	348	44,540	-	25,488	18,212
2021	30.9%	219,168	118,039	101,129	102	649	3,850	2	46	853	48,249	-	27,630	19,748
2022	32.9%	204,883	107,419	97,464	238	1,324	5,237	6	114	1,482	44,899	-	25,750	18,413
2023	34.8%	196,241	100,014	96,227	532	2,301	6,006	15	273	2,076	42,792	-	24,620	17,611
2024	36.7%	213,019	105,544	107,475	1,212	3,585	6,992	45	668	2,714	46,261	-	26,816	19,182
2025	38.6%	236,212	113,542	122,670	2,366	4,689	7,874	132	1,377	3,255	51,172	-	30,209	21,597
2026	40.9%	239,247	110,691	128,556	3,353	4,939	7,815	341	2,038	3,399	51,908	-	31,944	22,819
2027	44.0%	244,431	106,861	137,571	3,895	4,815	7,522	822	2,508	3,513	53,503	-	35,566	25,427
2028	48.1%	248,543	100,234	148,309	3,926	4,376	6,918	1,716	2,758	3,587	55,278	-	40,569	29,181
2029	52.1%	249,653	92,580	157,073	3,676	3,854	6,224	2,914	2,856	3,609	56,440	-	44,889	32,612
2030	54.7%	249,351	87,190	162,161	3,426	3,489	5,737	4,001	2,885	3,606	56,970	-	47,362	34,683
2031	56.0%	248,339	84,251	164,088	3,272	3,296	5,475	4,662	2,885	3,592	57,026	-	48,337	35,543
2032	56.5%	247,516	82,894	164,622	3,197	3,209	5,357	4,965	2,880	3,581	56,954	-	48,646	35,833
2033	56.7%	247,533	82,482	165,051	3,172	3,180	5,318	5,096	2,882	3,581	57,003	-	48,828	35,991
2034	56.8%	248,508	82,649	165,859	3,175	3,181	5,324	5,166	2,894	3,595	57,245	-	49,087	36,191
2035	56.8%	249,972	83,078	166,895	3,190	3,196	5,350	5,215	2,911	3,616	57,588	-	49,401	36,426
2036	56.8%	251,674	83,622	168,053	3,211	3,216	5,384	5,257	2,931	3,641	57,983	-	49,747	36,683
2037	56.8%	253,171	84,111	169,060	3,229	3,234	5,416	5,291	2,949	3,663	58,329	-	50,046	36,904
2038	56.8%	253,979	84,376	169,603	3,240	3,245	5,433	5,309	2,958	3,674	58,515	-	50,207	37,023
2039	56.8%	254,074	84,407	169,667	3,241	3,246	5,434	5,311	2,959	3,676	58,537	-	50,226	37,037
2040	56.8%	253,954	84,367	169,588	3,239	3,244	5,432	5,309	2,958	3,674	58,509	-	50,203	37,020

Summary: Construction and Demolition Debris, Recommended New Programs

Summary Of Recycling Program Impacts (in tons per year)

Modeled waste composition data for 2028

Material C&D	Total Disposed		Total Generated		Total Beneficial Uses		Total Recycled c	Percent Recycled c/d
	a	1	d = a + b + c	3	b	2		
Carpet	1,902		2,709		-		808	29.8%
Rock/Concrete/Brick/Ceramic & Porcelain	5,558		315,348		-		309,791	98.2%
Dimension lumber	5,969		71,851		53,503		12,379	17.2%
Sand/Soil/Dirt	7,391		8,404		-		1,013	12.1%
Glass	763		763		-		-	0.0%
Clean Gypsum Board	5,210		32,112		-		26,902	83.8%
Hazardous & Other	7,230		7,287		-		57	0.8%
Metal	820		16,771		-		15,952	95.1%
Corrugated Kraft (OCC)	1,557		1,557		-		-	0.0%
Other C&D	11,141		15,542		-		4,400	28.3%
Other ferrous	3,135		4,292		-		1,157	27.0%
Other Paper	409		469		-		60	12.8%
Other recyclable wood	14,193		18,870		-		4,677	24.8%
Other Recyclable Paper	591		673		-		81	12.1%
Painted/Demolition Gypsum	10,094		10,499		-		405	3.9%
Pallets & crates	2,250		3,367		-		1,117	33.2%
Plastic	1,835		2,230		-		395	17.7%
Roofing (asphalt & comp)	11,728		21,144		-		9,416	44.5%
Treated and contaminated wood	17,691		22,939		-		5,247	22.9%
Yard waste & other organics	2,952		2,952		-		-	0.0%
Total	112,418		559,780		53,503		393,858	70.4%

Summary: Construction and Demolition Debris, Recommended New Programs

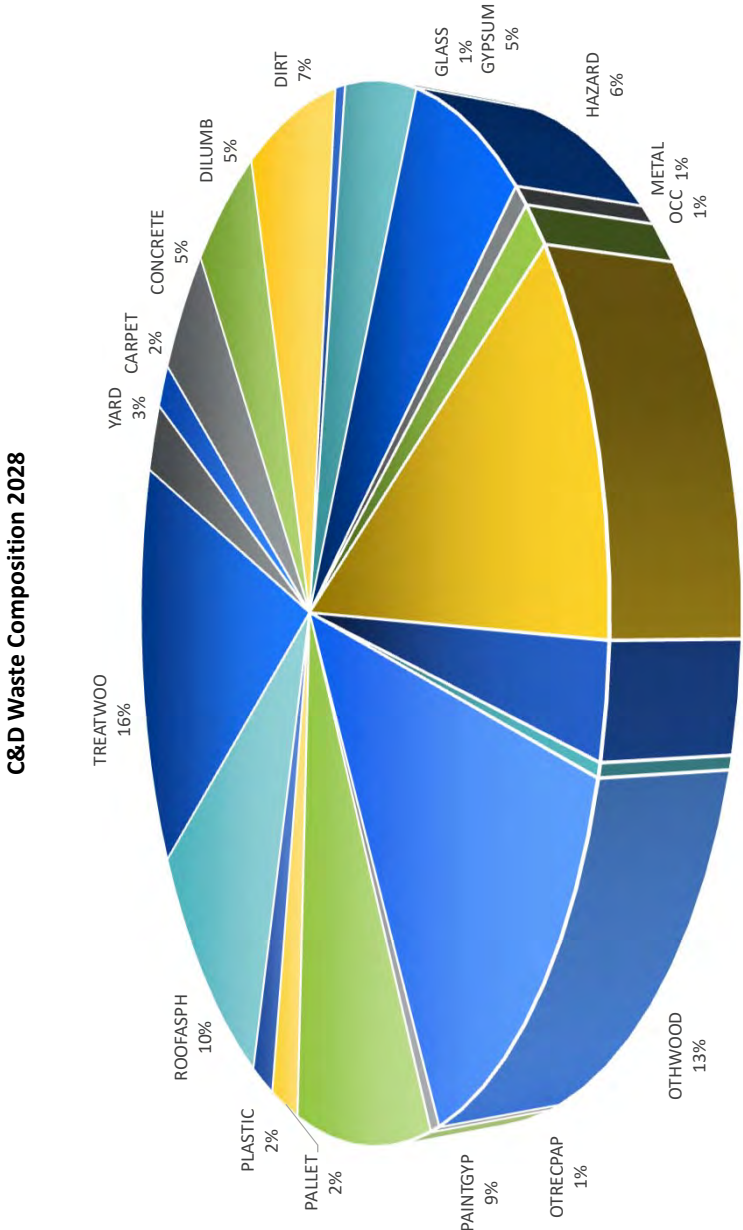
Summary Of Recycling Program Impacts (in tons per year)

Modeled waste composition data for 2028

Material C&D	Deconstruction																
	C&D	Priv	Rec	Facility Certification		Beneficial Uses		ABC BAN		Require ment		Expanded Recycling		Monitoring & Enforcement		Education & Outreach beyond WDR ABC	
				99	94	90	92	75	74	73	72	71	70				
														Grand	Total		
Carpet	622	44	-	-	48	-	-	-	94	-	-	-	-	808			
Rock/Concrete/Brick/Ceramic & Porcelain	199,265	7,721	-	94,828	5,656	-	17	1,110	1,193	-	-	-	309,791				
Dimension Lumber	1,164	6,775	53,503	-	1,301	899	157	1,131	951	-	-	-	65,882				
Sand/Soil/Dirt	-	250	-	-	147	-	-	617	-	-	-	-	1,013				
Glass	-	-	-	-	-	-	-	-	-	-	-	-	-				
Clean Gypsum Board	8,056	17,634	-	-	452	-	-	656	104	-	-	-	26,902				
Hazardous & Other	-	-	-	-	-	57	-	-	-	-	-	-	57				
Metal	5,642	9,202	-	-	304	517	-	155	131	-	-	-	15,952				
Corrugated Kraft (OCC)	-	-	-	-	-	-	-	-	-	-	-	-	-				
Other C&D	3,393	259	-	-	194	-	-	333	221	-	-	-	4,400				
Other ferrous	54	117	-	-	75	54	-	439	419	-	-	-	1,157				
Other Paper	-	13	-	-	5	-	-	42	-	-	-	-	60				
Other recyclable wood	288	461	-	-	330	236	251	1,901	1,210	-	-	-	4,677				
Other Recyclable Paper	-	21	-	-	11	-	-	49	-	-	-	-	81				
Painted/Demolition Gypsum	-	134	-	-	133	-	-	139	-	-	-	-	405				
Pallets & crates	52	87	-	-	61	-	60	436	419	-	-	-	1,117				
Plastic	-	49	-	-	31	29	-	100	40	-	-	-	395				
Roofing (asphalt & comp)	1,668	518	-	-	377	-	354	1,430	1,319	3,749	-	-	9,416				
Treated and contaminated wood	4,487	-	-	-	45	715	-	-	-	-	-	-	5,247				
Yard waste & other organics	-	-	-	-	-	-	-	-	-	-	-	-	-				
	224,692	43,287	53,503	94,828	9,169	2,508	839	8,633	6,008	3,895			447,361				

Summary: Construction and Demolition Debris, Recommended New Programs
Summary Of Recycling Program Impacts (in tons per year)
Modeled waste composition data for 2028

Year	Total Disposed	Total Generated	Total Beneficial Uses	Total Recycled	Percent Recycled
2007	201,156	415,801	9,738	204,907	49.3%
2008	181,241	397,052	14,961	200,851	50.6%
2009	115,446	288,551	10,362	162,742	56.4%
2010	98,309	288,957	11,854	178,794	61.9%
2011	118,216	359,390	14,125	227,049	63.2%
2012	129,383	371,962	18,519	224,060	60.2%
2013	127,040	386,200	24,178	234,982	60.8%
2014	128,024	485,242	39,887	317,331	65.4%
2015	117,343	437,883	40,336	280,205	64.0%
2016	146,139	532,126	46,509	339,478	63.8%
2017	125,074	514,858	47,029	342,755	66.6%
2018	133,332	504,325	48,728	322,265	63.9%
2019	128,862	487,431	47,096	311,473	63.9%
2020	119,336	462,018	44,540	298,143	64.5%
2021	126,700	501,923	48,249	326,974	65.1%
2022	114,972	469,208	44,899	309,337	65.9%
2023	106,713	449,417	42,792	299,912	66.7%
2024	112,308	487,841	46,261	329,272	67.5%
2025	120,555	540,956	51,172	369,229	68.3%
2026	117,170	547,906	51,908	378,828	69.1%
2027	112,418	559,780	53,503	393,858	70.4%
2028	104,394	569,196	55,278	409,523	71.9%
2029	95,406	571,737	56,440	419,891	73.4%
2030	89,208	571,046	56,970	424,868	74.4%
2031	85,896	568,729	57,026	425,807	74.9%
2032	84,387	566,844	56,954	425,502	75.1%
2033	83,920	566,883	57,003	425,960	75.1%
2034	84,072	569,115	57,245	427,798	75.2%
2035	84,502	572,469	57,588	430,379	75.2%
2036	85,052	576,367	57,983	433,332	75.2%
2037	85,549	579,795	58,329	435,917	75.2%
2038	85,819	581,646	58,515	437,312	75.2%
2039	85,849	581,862	58,537	437,476	75.2%
2040	85,809	581,588	58,509	437,270	75.2%

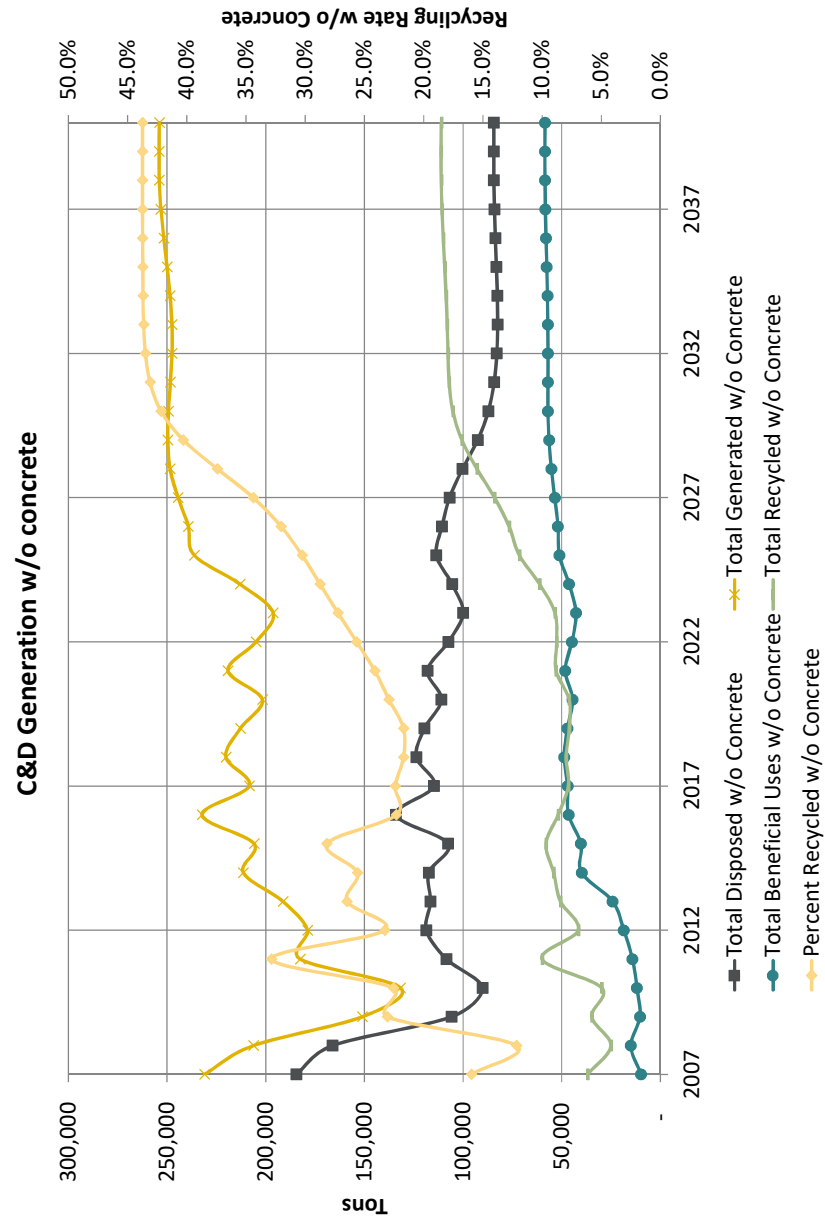


Summary: Construction and Demolition Debris, Recommended New Programs

Summary Of Recycling Program Impacts (in tons per year)

Modeled waste composition data for 2028

Year	Disposed w/o Concrete	Total Generated w/o Concrete	Total Beneficial Uses w/o Concrete	Total Recycled w/o Concrete	Percent Recycled Concrete
2007	184,455	231,093	9,738	36,900	16.0%
2008	166,193	206,236	14,961	25,082	12.2%
2009	105,861	131,062	10,362	34,838	23.1%
2010	90,147	131,709	11,854	29,708	22.6%
2011	108,401	182,491	14,125	59,964	32.9%
2012	118,641	178,814	18,519	41,654	23.3%
2013	116,493	191,307	24,178	50,636	26.5%
2014	117,394	211,391	39,887	54,109	25.6%
2015	107,600	205,947	40,336	58,012	28.2%
2016	134,005	232,356	46,509	51,842	22.3%
2017	114,690	208,395	47,029	46,676	22.4%
2018	123,705	220,217	48,728	47,783	21.7%
2019	119,559	212,840	47,096	46,185	21.7%
2020	110,946	201,743	44,540	46,258	22.9%
2021	118,039	219,168	48,249	52,881	24.1%
2022	107,419	204,883	44,899	52,565	25.7%
2023	100,014	196,241	42,792	53,435	27.2%
2024	105,544	213,019	46,261	61,214	28.7%
2025	113,542	236,212	51,172	71,498	30.3%
2026	110,691	239,247	51,908	76,648	32.0%
2027	106,861	244,431	53,503	84,068	34.4%
2028	100,234	248,543	55,278	93,030	37.4%
2029	92,580	249,653	56,440	100,633	40.3%
2030	87,190	249,351	56,970	105,191	42.2%
2031	84,251	248,339	57,026	107,062	43.1%
2032	82,894	247,516	56,954	107,668	43.5%
2033	82,482	247,533	57,003	108,048	43.6%
2034	82,649	248,508	57,245	108,614	43.7%
2035	83,078	249,972	57,588	109,306	43.7%
2036	83,622	251,674	57,983	110,070	43.7%
2037	84,111	253,171	58,329	110,732	43.7%
2038	84,376	253,979	58,515	111,088	43.7%
2039	84,407	254,074	58,537	111,130	43.7%
2040	84,367	253,954	58,509	111,078	43.7%



Summary: Construction and Demolition Debris, Recommended New Programs
Summary of Recycling Program Benefits and Costs

All costs in 2019 dollars

Total													
Year	Present Value	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	
Program Benefits	\$22,429,704	\$424,676	\$925,155	\$1,438,398	\$1,920,918	\$2,557,873	\$3,209,535	\$3,456,642	\$3,547,519	\$3,491,070	\$3,391,234	\$3,346,940	
Program Cost	\$10,623,534	\$246,200	\$703,966	\$1,165,157	\$1,451,262	\$1,384,225	\$1,434,596	\$1,489,596	\$1,215,711	\$1,215,711	\$1,270,711	\$1,275,711	
Net Benefits	\$11,806,170	\$178,476	\$221,189	\$273,242	\$469,656	\$1,173,648	\$1,774,939	\$1,967,046	\$2,331,808	\$2,275,359	\$2,120,523	\$2,071,229	
Tons avoided through recycling	176,796	2,618	5,517	8,227	10,855	14,789	19,243	21,462	22,721	23,206	23,695	24,463	
Net Benefits per Ton	\$66.78												
Program Number and Name: 70 Bans beyond ABC													
Year	Present Value	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	
Program Benefits	\$2,041,953.49	\$ 4,384	\$ 12,239	\$ 28,340	\$ 62,871	\$ 141,983	\$ 275,125	\$ 386,479	\$ 444,944	\$ 444,661	\$ 413,312	\$ 384,336	
Program Cost	\$2,310,927.54	\$ 43,055	\$ 129,997	\$ 355,084	\$ 392,121	\$ 361,102	\$ 343,047	\$ 368,047	\$ 184,162	\$ 184,162	\$ 209,162	\$ 184,162	
Net Benefits	(\$268,974.05)	(\$38,671)	(\$117,758)	(\$326,744)	(\$329,249)	(\$219,120)	(\$67,922)	\$18,432	\$260,782	\$260,498	\$204,150	\$200,174	
Tons avoided through recycling	22,763	36	102	238	532	1,212	2,366	3,353	3,895	3,926	3,676	3,426	
Net Benefits per Ton	(\$11.82)												
Program Number and Name: 71 Education & Outreach & WDR													
Year	Present Value	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	
Program Benefits	\$3,961,571.51	\$ 38,170	\$ 100,212	\$ 203,295	\$ 350,118	\$ 540,244	\$ 698,817	\$ 723,899	\$ 686,413	\$ 598,188	\$ 502,827	\$ 441,016	
Program Cost	\$1,519,019.43	\$ 36,018	\$ 101,017	\$ 71,017	\$ 194,995	\$ 194,995	\$ 224,995	\$ 224,995	\$ 194,995	\$ 194,995	\$ 194,995	\$ 224,995	
Net Benefits	\$2,442,552.08	\$ 2,152	\$ (805)	\$ 132,278	\$ 155,123	\$ 345,248	\$ 473,822	\$ 498,903	\$ 491,418	\$ 403,193	\$ 307,832	\$ 216,021	
Tons avoided through recycling	42,422	317	838	1,709	2,963	4,610	6,011	6,280	6,008	5,282	4,473	3,932	
Net Benefits per Ton	\$57.58												
Program Number and Name: 72 Monitoring & Enforcement													
Year	Present Value	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	
Program Benefits	\$7,280,430.80	\$ 270,697	\$ 540,820	\$ 732,189	\$ 833,596	\$ 961,644	\$ 1,071,951	\$ 1,048,435	\$ 986,258	\$ 878,050	\$ 763,535	\$ 689,009	
Program Cost	\$3,135,982.66	\$ 88,980	\$ 268,327	\$ 291,289	\$ 382,768	\$ 382,768	\$ 412,768	\$ 412,768	\$ 382,768	\$ 382,768	\$ 382,768	\$ 412,768	
Net Benefits	\$4,144,448.14	\$ 181,716	\$ 272,493	\$ 440,900	\$ 450,827	\$ 578,876	\$ 659,182	\$ 635,666	\$ 603,490	\$ 495,282	\$ 380,767	\$ 276,241	
Tons avoided through recycling	75,822	2,247	4,525	6,154	7,055	8,206	9,220	9,095	8,633	7,753	6,792	6,142	
Net Benefits per Ton	\$54.66												

Summary: Construction and Demolition Debris, Recommended New Programs
Summary of Recycling Program Benefits and Costs
All costs in 2019 dollars

Program Number and Name: 73 Expand Recycling Market		2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Year	Present Value											
Program Benefits	\$854,142.13	\$ 99	\$ 289	\$ 726	\$ 1,862	\$ 5,381	\$ 15,667	\$ 40,166	\$ 95,849	\$ 197,487	\$ 331,576	\$ 453,044
Program Cost	\$2,807,179.50	\$ 48,055	\$ 132,404	\$ 351,473	\$ 397,121	\$ 361,102	\$ 343,047	\$ 373,047	\$ 343,047	\$ 343,047	\$ 373,047	\$ 343,047
Net Benefits	(\$1,953,037.37)	(\$47,956)	(\$132,115)	(\$350,747)	(\$395,258)	(\$355,721)	(\$327,380)	(\$332,881)	(\$247,198)	(\$145,561)	(\$41,471)	\$109,997
Tons avoided through recycling	10,125	1	2	6	16	46	135	348	839	1,744	2,949	4,039
Net Benefits per Ton	(\$192.89)											

Program Number and Name: 74 Salvage Assessment		2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Year	Present Value											
Program Benefits	\$1,378,966.91	\$ 1,917	\$ 5,541	\$ 13,555	\$ 32,309	\$ 78,317	\$ 160,038	\$ 234,891	\$ 286,516	\$ 312,316	\$ 321,029	\$ 323,605
Program Cost	\$365,034.29	\$ -	\$ 24,073	\$ 36,110	\$ 48,147	\$ 48,147	\$ 48,147	\$ 48,147	\$ 48,147	\$ 48,147	\$ 48,147	\$ 48,147
Net Benefits	\$1,013,932.62	\$ 1,917	\$ (18,532)	\$ (22,555)	\$ (15,838)	\$ 30,170	\$ 111,891	\$ 186,744	\$ 238,369	\$ 264,169	\$ 272,882	\$ 275,458
Tons avoided through recycling	15,538	16	46	114	273	668	1,377	2,038	2,508	2,758	2,856	2,885
Net Benefits per Ton	\$65.25											

Program Number and Name: 75 Deconstruction Requirement Single Family		2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Year	Present Value											
Program Benefits	\$6,912,638.78	\$ 109,410	\$ 266,054	\$ 460,294	\$ 640,162	\$ 830,305	\$ 987,937	\$ 1,022,772	\$ 1,047,537	\$ 1,060,369	\$ 1,058,954	\$ 1,055,929
Program Cost	\$485,390.44	\$ 30,092	\$ 48,147	\$ 60,184	\$ 36,110	\$ 36,110	\$ 62,591	\$ 62,591	\$ 62,591	\$ 62,591	\$ 62,591	\$ 62,591
Net Benefits	\$6,427,248.34	\$ 79,318	\$ 217,907	\$ 400,110	\$ 604,051	\$ 794,195	\$ 925,346	\$ 960,181	\$ 984,946	\$ 997,778	\$ 996,363	\$ 993,338
Tons avoided through recycling	74,241	908	2,226	3,869	5,418	7,086	8,497	8,873	9,169	9,363	9,419	9,413
Net Benefits per Ton	\$86.57											



APPENDIX

F

Economics of Residential Recycling in Seattle

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Appendix F Economics of Residential Recycling in Seattle

Jeffrey Morris, Ph.D. Economist, Sound Resource Management Group, Inc., prepared October 2019

Edited by Luis Hillon and Stephanie Schwenger, Seattle Public

Overview

During the fallout of China's implementation of economic and environmental policies on recyclables imports in 2018, Seattle Public Utilities (SPU) commissioned Sound Resource Management Group to conduct an economic analysis of the benefits and costs of residential recycling and composting in Seattle. This appendix presents the report of findings from that analysis, which demonstrates that the City's recycling and composting, "diversion," programs create net financial and environmental benefits.

The report begins with a summary of the findings from the three elements of economic analysis, which, in the sustainability industry, are often referred to as the "three Es of recycling:" economy, environment, and equity:

- 1** Economy, or financial costs of recycling compared with financial costs of garbage disposal avoided by recycling.
- 2** Environment, or costs of pollution and other externalized costs caused by solid waste management activities and facilities associated with recycling and recycled-content production, compared with those types of costs associated with garbage disposal and virgin-content production that are avoided by recycling.
- 3** Equity, or social costs of inequities associated with recycling that exacerbate racial, gender, ethnic, religious, class, economic or other societal disparities, compared with those types of social costs associated with garbage disposal that are avoided by recycling.

The report continues by showing how Seattle's zero waste-focused solid waste programs and policies have, over time, resulted in decreased waste generation and disposal. Against this

backdrop, the report provides detailed results of the financial and environmental benefits and costs of residential recycling and composting in the City. The analysis does not quantify the social benefits and costs of residential recycling and composting but discusses potential options for considering these costs.

Note that analysis generally covers the 12-year period 2007–2018 and that all dollar figures in this report are in constant 2018 dollars unless otherwise stated.

Summary of Findings

Separate collection, processing, and remanufacturing or composting of single-family and multifamily household recyclables and compostable food and yard waste reduce financial costs for households by avoiding the costs to collect, transfer, haul, and dispose of these materials as garbage. During 2007 through 2018, savings averaged \$1.85 per month per household, and \$23.62 per ton of residential garbage, recycling, and food and yard waste. These cost savings account for the residential recycling and food and yard waste diversion program costs. Even in 2018, with its difficult disruptions in markets for recycled materials, net cost savings amounted to \$0.46 per household per month and \$6.77 per ton of collected residential discards. Net financial cost savings during 2007–2018 totaled \$78.2 million. Of these cost savings, household recycling accounted for 78% and household food and yard waste composting for 22%.

Seattle's residential recycling and food and yard waste diversion programs also provide global environmental benefits. Recyclable and food and yard waste materials that end up in the garbage cannot be used in the production of other products, meaning virgin materials must be used. Garbage collection and disposal with its associated production of virgin-content products and packaging materials, as well as petrochemical-based fertilizers and pesticides, has a large environmental footprint. Much of this footprint is caused by pollution from extracting and refining global ecosystem raw material and energy resources to feed virgin-content manufacturing. In contrast, recovered materials for manufacturing recycled-content products and composted soil amendments from food and yard waste substantially lower the need for virgin raw material and energy resources.

After accounting for the environmental costs of recycling and food and yard waste diversion programs themselves, environmental net cost savings from avoided garbage disposal and virgin-content production averaged \$349 per ton of residential collected discards and totaled \$1.2 billion during 2007–2018. If the monetary value of net environmental benefits had been paid to SPU residential rate payers, the average household's monthly cost for solid waste

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collection services would have been \$26.78 lower per month during the twelve-year period that just ended in 2018.

Table F.1 and Figure F.1 display financial and environmental benefits on average and over time. Increasing contaminants, especially in recycling; higher fees for food and yard waste; and an increasing proportion of glass and decreasing proportion of newspapers in recycled materials are the major causes of slight downtrends in both per household and per ton net avoided cost savings. Despite these challenges and the current challenge, at the time of the writing (2019), from low recycling market prices, Seattle's recycling and food and yard waste diversion programs continue to pay dividends to rate payers, global public health, and the environment.

Table F.1 Seattle Residential Net Avoided Disposal Cost Savings

Seattle Residential Net Avoided Disposal Cost Savings				
Avoided Disposal Cost Component	Per Ton of Collected Discards		Per Household Per Month	
	2018	12-yr Avg	2018	12-yr Avg
Financial	\$7	\$23	\$0.46	\$1.85
Environmental	\$346	\$349	\$23.78	\$26.87
Total	\$353	\$372	\$24.24	\$28.72

Figure F.1 Financial Plus Environmental Cost Savings of Residential Recycling and Food and Yard Waste (Organics) Collections

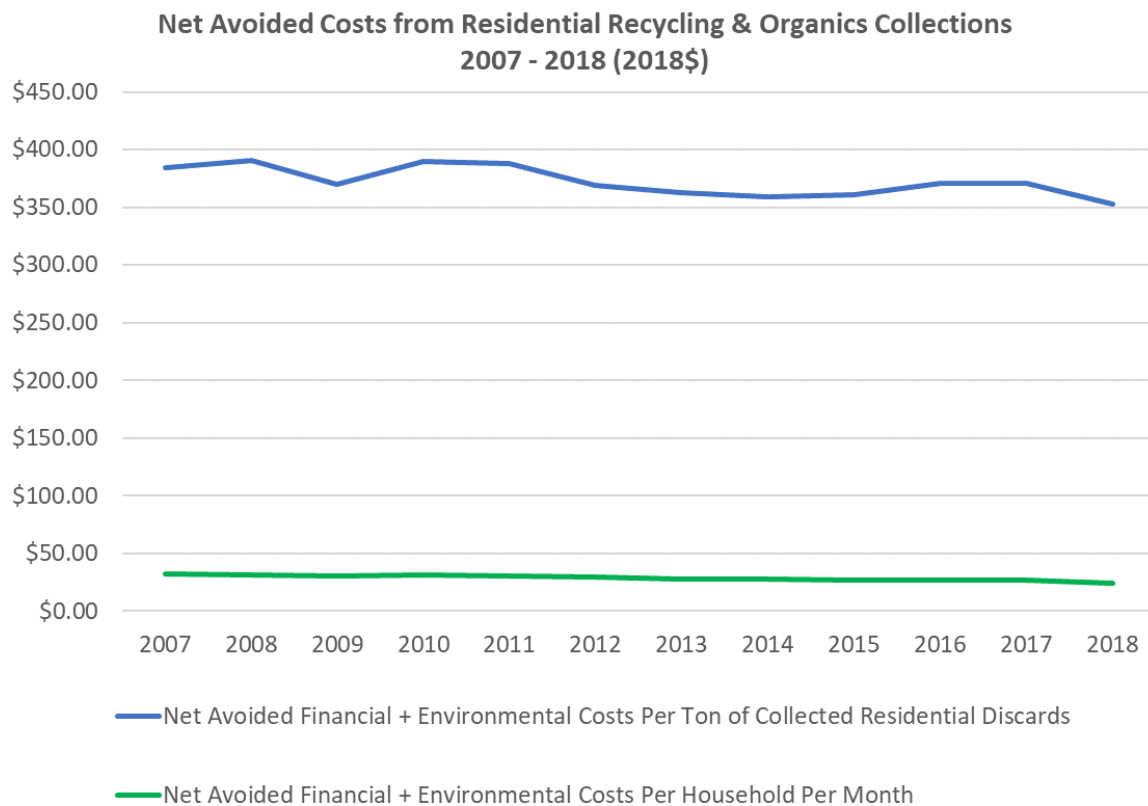


Figure F.2 portrays effects on residential garbage disposal from programs that in total have been cost-effective at diverting residential discards. Disposal quantities per residential household per weekday (the days when residential discards collections occur) declined 61% from a 1977 average of 6.2 pounds to 2.4 pounds by 2018. In the past 10 years, residential waste generation has also trended down. Results portrayed by Figure F.1 and Figure F.2 are discussed in greater detail in the following sections of this report.

Figure F.2 Seattle Residential (Single-Family and Multifamily) Collected Waste Generation and Disposal per Household per Weekday 1977–2018

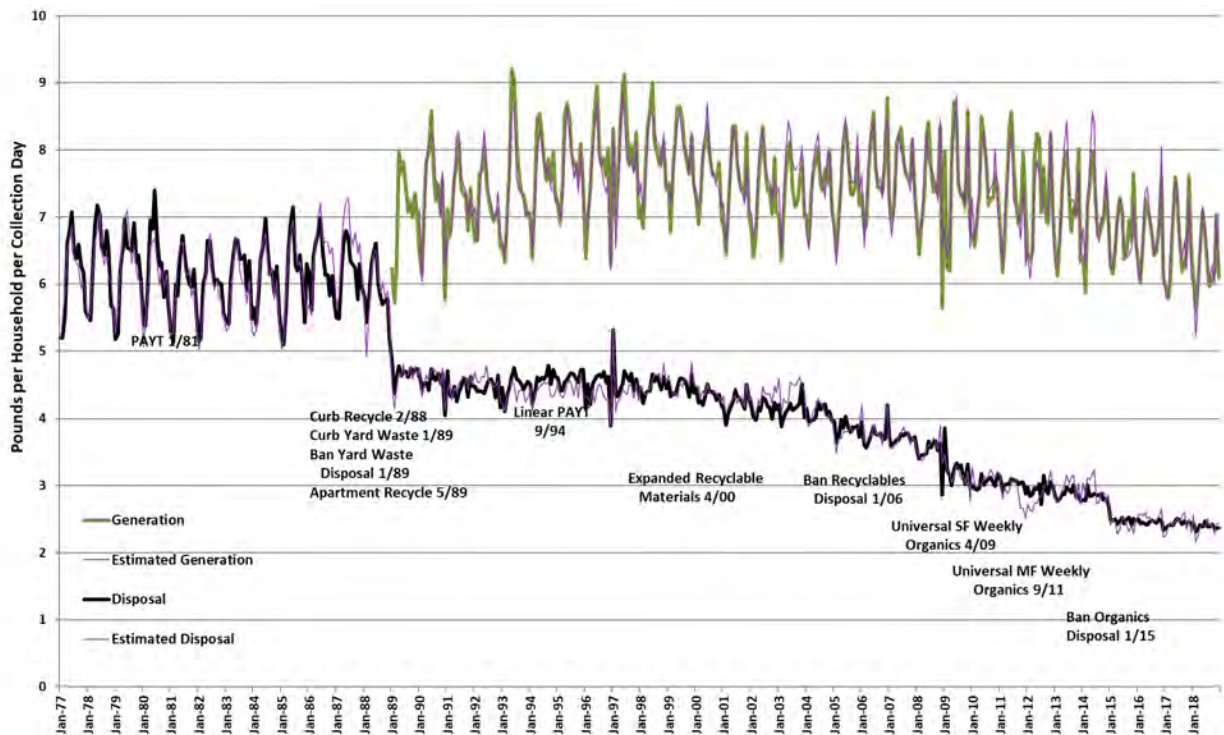


Chart acronyms: Pay-as-you-through (PAYT), single-family (SF), multifamily (MF)

Trends in and Factors Influencing Generation and Disposal Trends

Over the past 40 years, Seattle implemented innovative solid waste management programs and regulations to divert materials from disposal to recycling and composting. Through diversion, these otherwise disposed materials become resources for manufacturing recycled-content products or for improving the quality and sustainable productivity of soils. At the same time, Seattle aimed to make diversion financially cost-effective and environmentally beneficial.

Residential Sectors

Figure F.3 shows the success among Seattle's residential households, including both single-family and multifamily in diverting discarded solid waste materials from garbage collection to recycling and food and yard waste collection. Disposal per household per weekday (the days

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when residential solid waste collections occur) declined from an annual average of 6.2 pounds per household per collection day in 1977 to 2.4 pounds by 2018, a decrease of 61%.

Furthermore, the graph shows that the combined amount of solid waste discards that households set out for recycling, food and yard waste, and garbage collections has recently trended downward. Because most residential solid waste discards are managed through City of Seattle contracted collections, this downtrend may also indicate, at least in part, some success in reducing overall residential waste generation.

Figure F.3 Seattle Residential Collected Waste Generation and Disposal per Household per Weekday 1977–2018

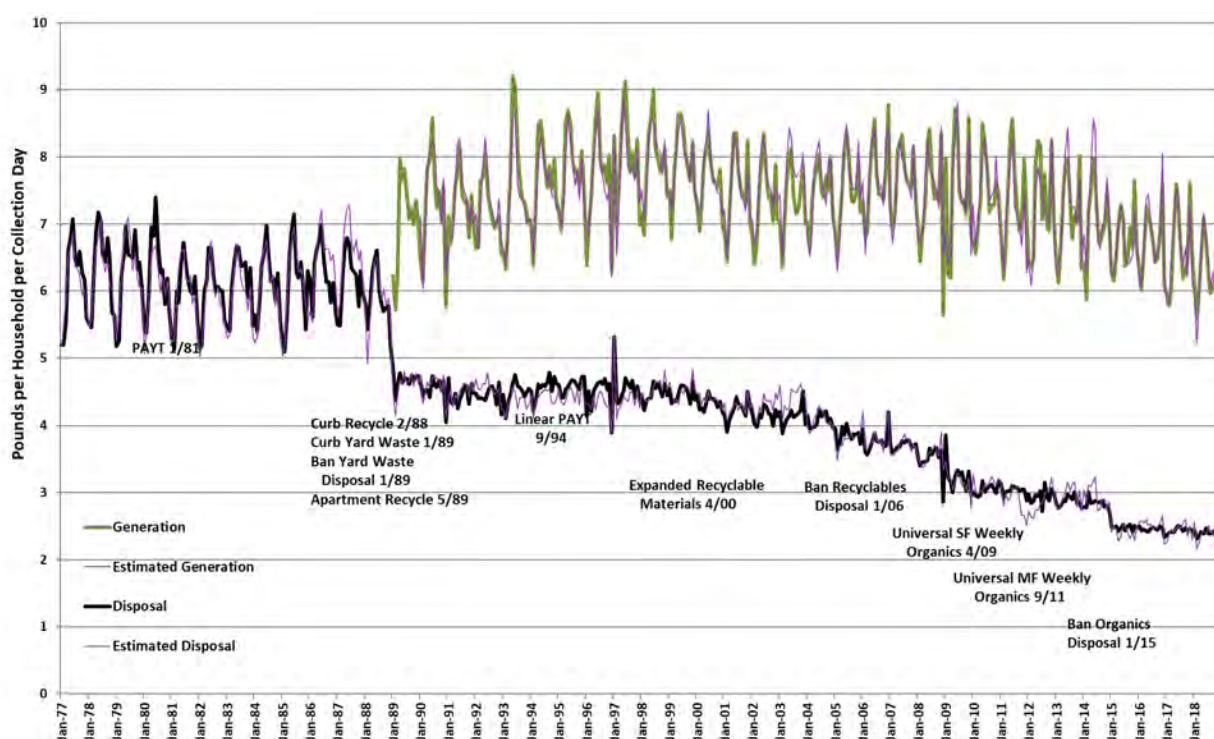


Chart acronyms: Pay-as-you-through (PAYR), single-family (SF), multifamily (MF)

The heavy black disposal line on Figure F.3 shows average garbage collection pounds per residential household per weekday in each month from January 1977 through December 2018. The text boxes below that line name some of the programs and regulations implemented by Seattle during those years, some of which are associated with substantial drops in disposal per household.

The light purple disposal line represents fitted values from an econometrically estimated multiple regression equation that identifies statistically significant factors explaining cycles and

trends in residential garbage disposal. Significant factors include programs, such as curbside collection, regulations such as disposal bans, weather and other seasonal influences, and economic variables, such as income and garbage collection fees. Some of these statistically significant factors are shown in the text boxes in Figure F.3.

Rules and Regulations

During 1988–1989, the introduction of curbside collections for recyclables and yard waste from single-family households, the ban on putting yard waste in the garbage, and the introduction of onsite collection of recyclables from apartment buildings resulted in large drops in per household disposal. The yard waste disposal ban and curbside collection of yard waste for composting also caused a related large decrease in seasonal variability of the amount of solid waste materials that remained in garbage. Expansion of material types collected for recycling, a ban on putting recyclables in the garbage, universal single-family and multifamily food and yard waste composting subscription mandates, and a ban on putting food and compostable paper in the garbage, all contributed to the continuing decline in disposal per household over the years since recycling and yard waste collections were introduced.

Pay-as-you-throw (PAYT) Garbage Rate Structure

Garbage collection fees, also called collection rates, also had a statistically significant impact on garbage collection pounds, although the quantitative impact is not easily visible on the graph. The size of that impact depends on the availability of convenient opportunities to divert recycling and food and yard waste. The diversion impact from collection fees also is affected by the extent to which garbage collection fees increase as a household's garbage disposal quantities increase.

Before January 1981, households with curbside garbage collection all paid the same garbage collection fee regardless of how much garbage they set out for collection, so they faced no financial impacts for disposing of more garbage. In January 1981, Seattle began charging differential fees related to the size of a household's subscribed garbage cart. At that time, weekly collection cost \$6.40 per month for a 32-gallon cart, \$7.90 for a 64-gallon cart, and \$9.40 for a 96-gallon cart. The PAYT acronym on Figure F.3 stands for "pay as you throw" to indicate that a household that throws out more, pays more. In this case "more" is measured by the volumetric size of the garbage cart used by a household.

After 1981, as collection fees increased, the additional charges for larger garbage carts increased even more, reaching essentially linear levels in September 1994. Linear means that the cost to double the size of a household's garbage cart also doubles the collection fee.

Beginning September 1994, collection fees were \$16.10 for weekly collection of garbage placed in a 32-gallon can or cart, \$32.15 for a 64-gallon cart, and \$48.25 for a 96-gallon cart.

Interestingly, econometric analysis shows that PAYT did not have a statistically significant effect on disposal weight until households began to have access to recycling and yard waste collections that were equally as convenient as curbside garbage collection. Before the introduction of curbside recycling and yard waste collections in 1988–1989, households had to self-haul recyclable materials they wanted to divert from disposal to one of the privately-operated recycling drop-off centers scattered rather sparsely around the city. Households wanting to keep yard waste and other food and yard waste out of the garbage had to compost those materials in their backyards.

Without convenient recycling and food and yard waste collection, PAYT was not particularly effective at reducing disposal weights. Yet, according to some analysts, PAYT did reduce the volume of garbage set out for curbside collection. The means for this volume reduction – stomping on the garbage in the garbage container size for which the household paid – became well-known in media stories as the “Seattle Stomp.” While stomping reduced volume, it had a negligible effect on the weight of garbage disposal.

Other Factors

The heavy green line on Figure F.3 is the monthly average for combined pounds of garbage, recycling, and food and yard waste discarded each week on collection day by the average household (single-family plus multifamily) in Seattle. Possible causes for the recent decline in household waste generation include changes in the composition of household discards, decreases in the weight of materials used for packaging products, cessation of print publication of one of Seattle's two major newspapers in 2009, and recent increases in the proportion of multifamily versus single-family households in Seattle (where the average multifamily household is typically smaller than the average single-family household).

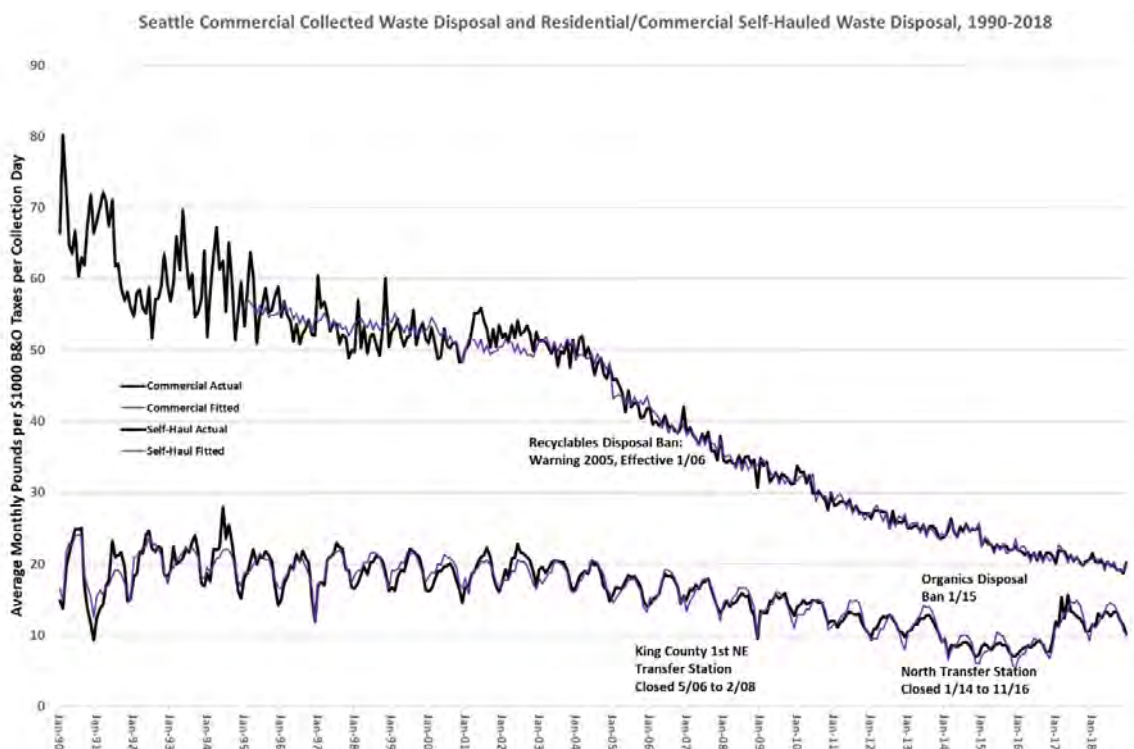
As with the disposal line, the light purple line represents fitted values from econometric multiple regression analysis. Unlike the disposal line, however, the light purple line represents combined fitted values for four regression equations related to:

- 1 Garbage collected curbside from mainly single-family households in cans or carts and collected on site from multifamily apartment building dumpsters
- 2 Recyclables collected curbside from mainly single-family households in bins or carts
- 3 Recyclables collected on site in dumpsters from multifamily households in larger apartment buildings
- 4 Food and yard waste collected curbside in carts from both single-family and multifamily households

Commercial and Self-Haul Sectors

Figure F.4 shows garbage disposal trends for commercial and self-haul garbage. For these two customer sectors, Figure F.4 shows average monthly garbage disposal pounds per day per \$1,000 of business and occupation (B&O) tax obligations. Here, the days for commercial customers are commercial garbage collection days, which includes weekends for some commercial customers. Days for transfer station customers are days that transfer stations are open for self-haul customers. These two sectors have their pounds per day normalized by monthly B&O taxes, which is a regularly reported measure of business activity in Seattle.

Figure F.4 Seattle Monthly Commercial Collected Waste Disposal and Self-Haul Waste Disposal per \$1000 of Business and Occupation Taxes per Day 1990–2018



B&O taxes are the normalization measure rather than number of businesses for two reasons:

- 1 Businesses vary greatly in size compared with the much smaller variation in number of occupants in residential households. Hence, garbage disposal per average business is not a particularly meaningful comparative measure for business enterprises.

- 2 Business waste generation and disposal trends and cycles over time are driven in large part by economic activity in Seattle. Holding overall business activity constant while searching for additional drivers of disposal per collection day makes it easier to more accurately measure the influence of Seattle-instituted programs and regulations, weather, seasonality, and economic variables other than aggregate business activity.

Figure F.4 shows Seattle's success at reducing the rate of commercial garbage disposal over the recent 30-year period. Seattle has also had some success at reducing the disposal rate for self-haul garbage. However, success in self-haul garbage disposal has been moderated by the availability of nearby transfer facilities operated by King County. The effects of Seattle's effort are affected by differences between Seattle and King County transfer station tip fees, disposal bans, ban enforcement, as well as changes in those differences over time. Moreover, analysis of self-haul disposal quantities at Seattle transfer facilities is confounded by the closure for renovation of King County's Shoreline Transfer Station during May 2006 to February 2008 and of Seattle's North Transfer Station from January 2014 to November 2016.

Heavy black lines on Figure F.4 show actual garbage disposal, and lighter purple lines are for econometrically fitted disposal equations. The lower actual and fitted lines are for self-haul garbage. A few of the statistically significant drivers of each sector's garbage disposal quantities are shown in text boxes below each set of lines. Certain collection fees are also significant drivers of garbage disposal for commercial businesses and self-haulers of garbage. In addition, tip fees at Seattle compared with King County transfer stations are significant for self-haul garbage disposal at Seattle transfer stations. Note that implementation of Seattle's ban on putting recyclables in residential, commercial, or self-haul garbage coincided with King County's closure of its Shoreline Transfer Station for renovation. Based on econometric analysis, some customers of the Shoreline Transfer Station apparently used Seattle's North Transfer Station until it re-opened, moderating the influence of the recycling ban on self-haul garbage disposed at Seattle transfer stations.

Given Seattle's success at reducing garbage disposal, what are the financial and environmental benefits and costs associated with reductions in garbage disposal and increases in recycling and composting? Has Seattle succeeded in making diversion financially cost-effective and environmentally beneficial? The following two sections focus on a quantitative evaluation of the financial and environmental cost and benefit facets of the economics of recycling.

The residential sector provides the detailed data for these quantitative results. Virtually all residentially generated garbage, food and yard waste and recycling discards are handled via City-managed private contractors and the two City-owned transfer stations. Recycled or composted commercial wastes are largely handled directly by the private sector. Wastes self-haul to City transfer stations can come from outside of Seattle. In addition, self-haul discards

are not accurately identifiable as residential versus commercial in origin. As a result, the residential sector provides more accessible, complete, and accurately identified data on Seattle-generated waste quantities and their financial costs and benefits than other sectors.

Financial Benefits and Costs of Residential Recycling and Composting

Seattle offers curbside garbage, food and yard waste, and recycling collection services to single-family households and to some multifamily households. The proportion of total households receiving curbside versus onsite collection services varies greatly among the three discards streams. For 2018, the split ranged from 100% of households (single-family + multifamily) having curbside food and yard waste collection access to 54% of households receiving curbside versus onsite garbage collection. In 2018, 68% of households received curbside recycling collection. The remaining portion of multifamily households, mostly larger apartment building dwellers, received onsite garbage and recyclables collection in 2018. These splits also are reasonably representative of other years in the analysis, 2007 through 2018.

Seattle contracts for collection of garbage, food and yard waste, and recycling; processing of collected recyclables; composting of collected food and yard waste; and rail-haul and landfill disposal of garbage. It also contracts for some portions of the haul of garbage from transfer stations to the rail head and of food and yard waste from transfer stations to composting facilities. In all these contracts, a substantial portion, in some cases 100%, of contracted charges for services are calculated per ton of material handled. This means that when recycling or food and yard waste tonnages increase and garbage tonnages decrease, the City pays more for diversion and less for garbage handling. These garbage savings are included in calculations of diversion program cost effectiveness.

Table F.2 shows average and variable costs in 2018 for managing discards collected in each discards stream. Costs are separated into solid waste management activities that are carried out on materials discarded by households into each stream. For collection, the figures represent the weighted average for curbside and onsite collections. Variable costs, sometimes also called marginal costs, represent how costs would vary at the margin when something else varies by a small amount. For example, while the average cost of managing recycling is \$235 per ton overall, the cost of managing one extra ton of recycling is \$118.

One of the financial benefits of diversion programs is that one ton of discards diverted from garbage to recycling or composting reduces garbage collection, transfer, hauling and disposal costs by their variable costs per ton. These costs for garbage are avoided when material

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discards are diverted to recycling or composting. Hence, the terminology “avoided costs” or “avoided garbage disposal costs.”

As indicated in Table F.2, both variable and average costs per ton for recycling and composting were lower than for garbage in 2018. This finding for recycling is especially significant because 2018 was a year when prices paid for processed recyclables by recycled-content paper mills, glass manufacturers, recycled plastics re-manufacturers, and other recycled materials end-users were particularly low. Seattle receives a market credit from its contracted recyclables processor that offsets a portion of the costs of processing. That credit was \$51 per ton in 2018, down from over \$85 per ton in 2017.

Table F.2 2018 Average and Variable Costs for Management of Residential Discards

Residential Discards Stream	2018 Variable Cost Per Ton	2018 Average Cost Per Ton	Variable % of Average
Garbage			
Collection	\$81	\$225	36%
Transfer	\$3	\$11	27%
Short Haul	\$6	\$6	95%
Long-Haul & Disposal	\$42	\$42	100%
Garbage Total	\$131	\$284	46%
Organics			
Collection	\$66	\$186	35%
Transfer	\$3	\$11	30%
Hauling	\$17	\$18	94%
Composting	\$42	\$42	100%
Organics Total	\$128	\$257	50%
Recycling			
Collection	\$73	\$190	39%
Processing	\$96	\$96	100%
Market Credit	(\$51)	(\$51)	100%
Recycling Total	\$118	\$235	50%

Recycling

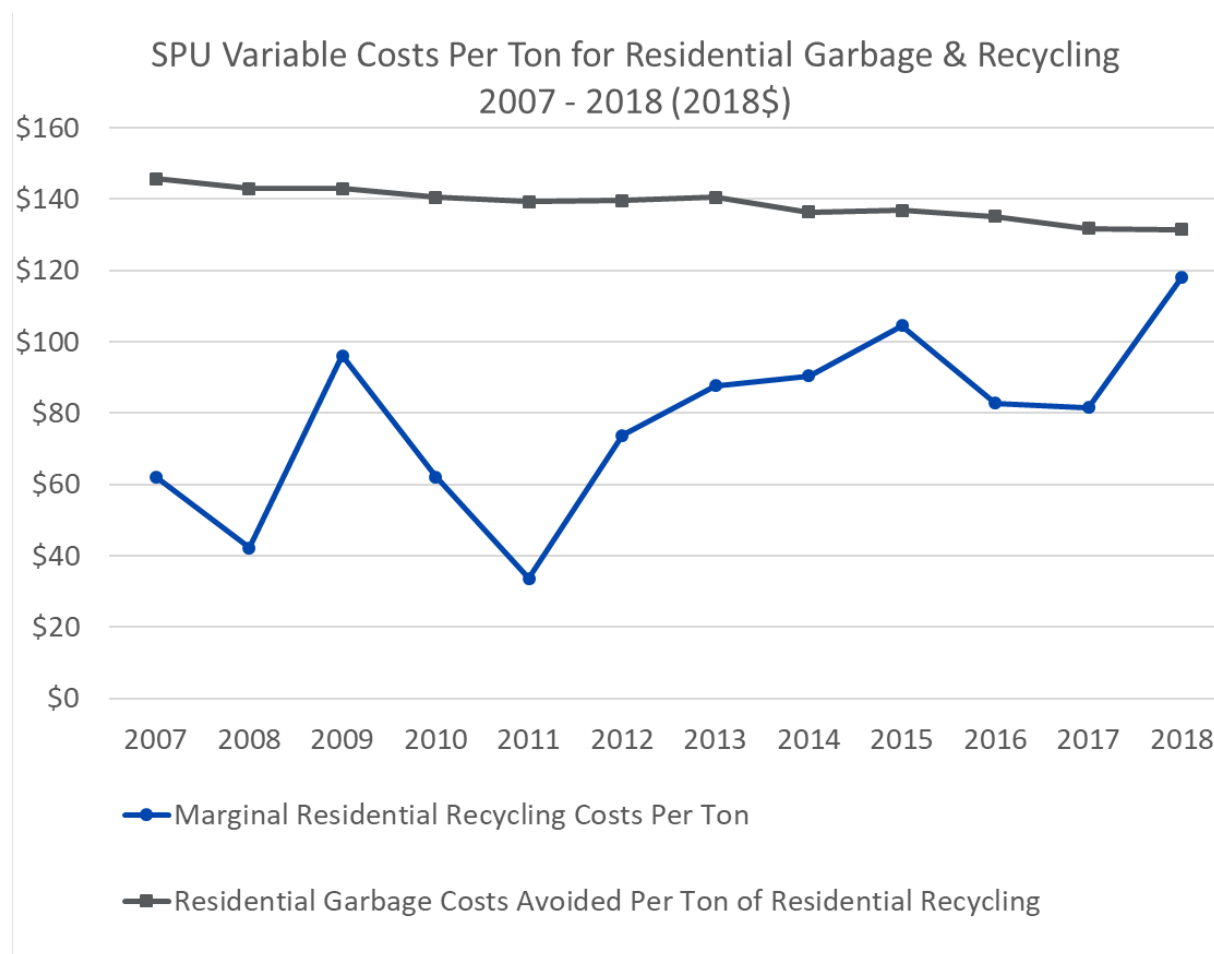
Figure F.5 shows SPU residential garbage and recycling variable costs per ton in 2018\$ for each year from 2007 through 2018. Avoided residential garbage disposal costs have been higher than residential recycling marginal costs for this 12-year period. In addition, 2018 is an anomalous year during this period, because of the depressed markets for recycled materials. In eight of

these 12 years when recycling markets prices were strong, garbage costs avoided by recycling exceeded recycling marginal costs by over \$50 per ton. In the other three years when recycling markets were less robust (but still better than in 2018), residential recycling was less costly than garbage by at least \$32 per ton. In 2018, recycling profitability was just \$13 per ton.

One way to evaluate the cost savings per ton of solid waste diverted to residential recycling in 2007–2018 is to sum the per-ton differences between avoided residential garbage disposal costs and residential marginal recycling costs. That sum is \$728 (2018\$). Another way to assess the cost savings is to calculate the net present value in 2007 of this 12-year diversion of a ton of garbage into residential recycling. At a discount rate of 2.5%, that 2007 present value in 2018 dollars (2018\$) is \$639. In 2019, this same stream of cost savings from one ton per year of residential recycling during the years 2019 through 2030 would also be worth \$639 in 2018 dollars at 2.5% interest.

From 2007 through 2018, residential recycling in total diverted more than a million tons, thus avoiding the greater costs of residential garbage by a net savings amounting to \$61.1 million. In 2007, this would have represented a net present value at 2.5% discount rate of \$53.6 million (2018\$). These savings from recycling reduced the average monthly cost of a customer's garbage bill by \$1.45 every month during the 12 years beginning 2007 and continuing through 2018.

Figure F.5 Residential Recycling Marginal Cost and Avoided Garbage Cost Per Ton 2007–2018 (2018\$)



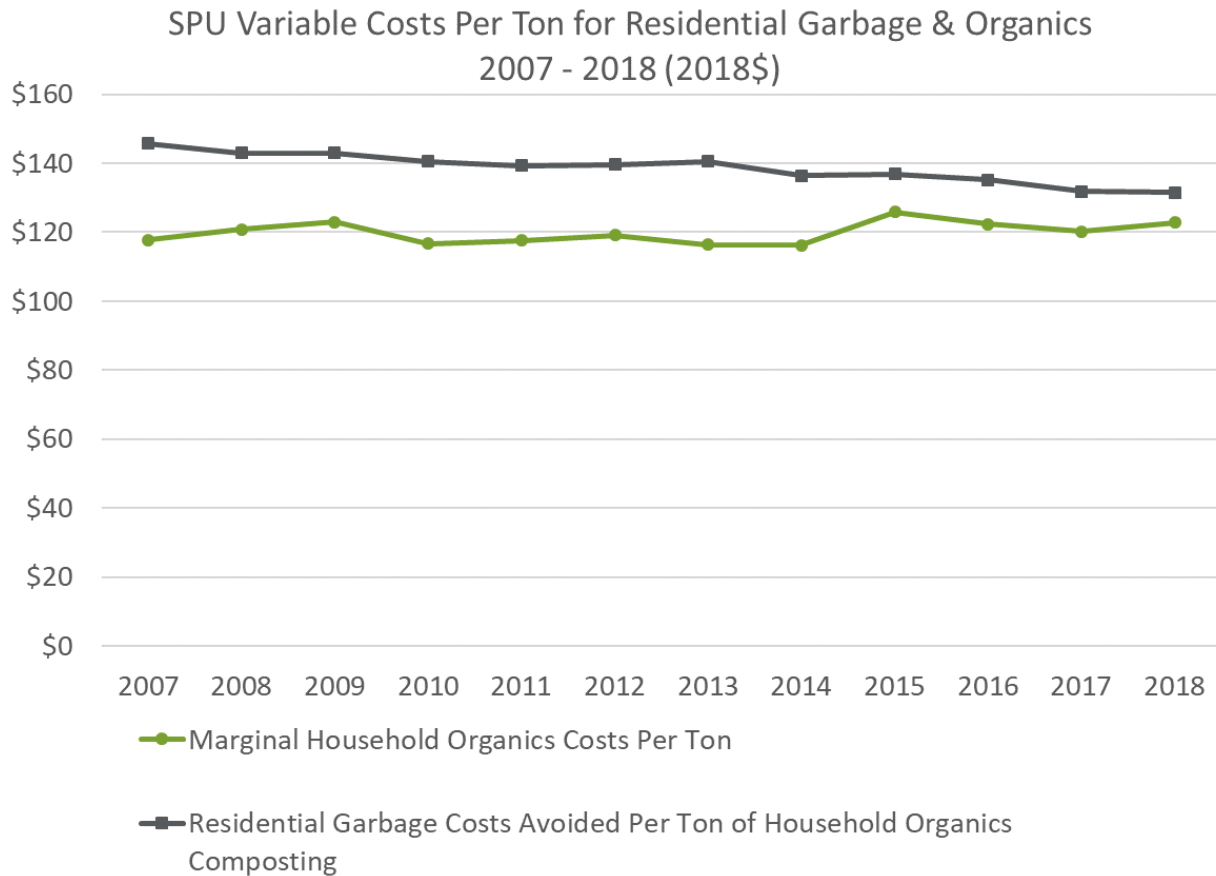
Food and Yard Waste

Figure F.6 shows SPU's curbside garbage and household food and yard waste composting variable costs per ton for the period 2007 through 2018. Avoided garbage disposal costs have been higher than household food and yard waste composting marginal costs throughout the past 12 years. However, the profitability margin has narrowed in the past five years primarily due to an increase in food and yard waste composting costs. In addition, avoided garbage costs have fallen slightly as garbage collection and rail-haul landfilling costs have decreased recently.

Cost savings per ton diverted to household food and yard waste composting (net of food and yard waste collection, transfer, haul and food and yard waste costs) in 2007–2018 amounted to \$225 (2018\$). The net present value in 2007 of this 12-year diversion of a ton of garbage into household food and yard waste was \$197 (2018\$). In 2019 this same stream of cost savings

from one ton per year of composting household food and yard waste during the years 2019 through 2030 would also have a net present value of \$197 in 2018 dollars. Furthermore, net household food and yard waste management financial costs savings reduced the average food and yard waste subscriber's monthly bill during the years 2007 through 2018 by \$0.89 (2018\$).

Figure F.6 Household Food and Yard Waste (Organics) Marginal Cost and Avoided Curbside Garbage Cost Per Ton 2007–2018 (2018\$)



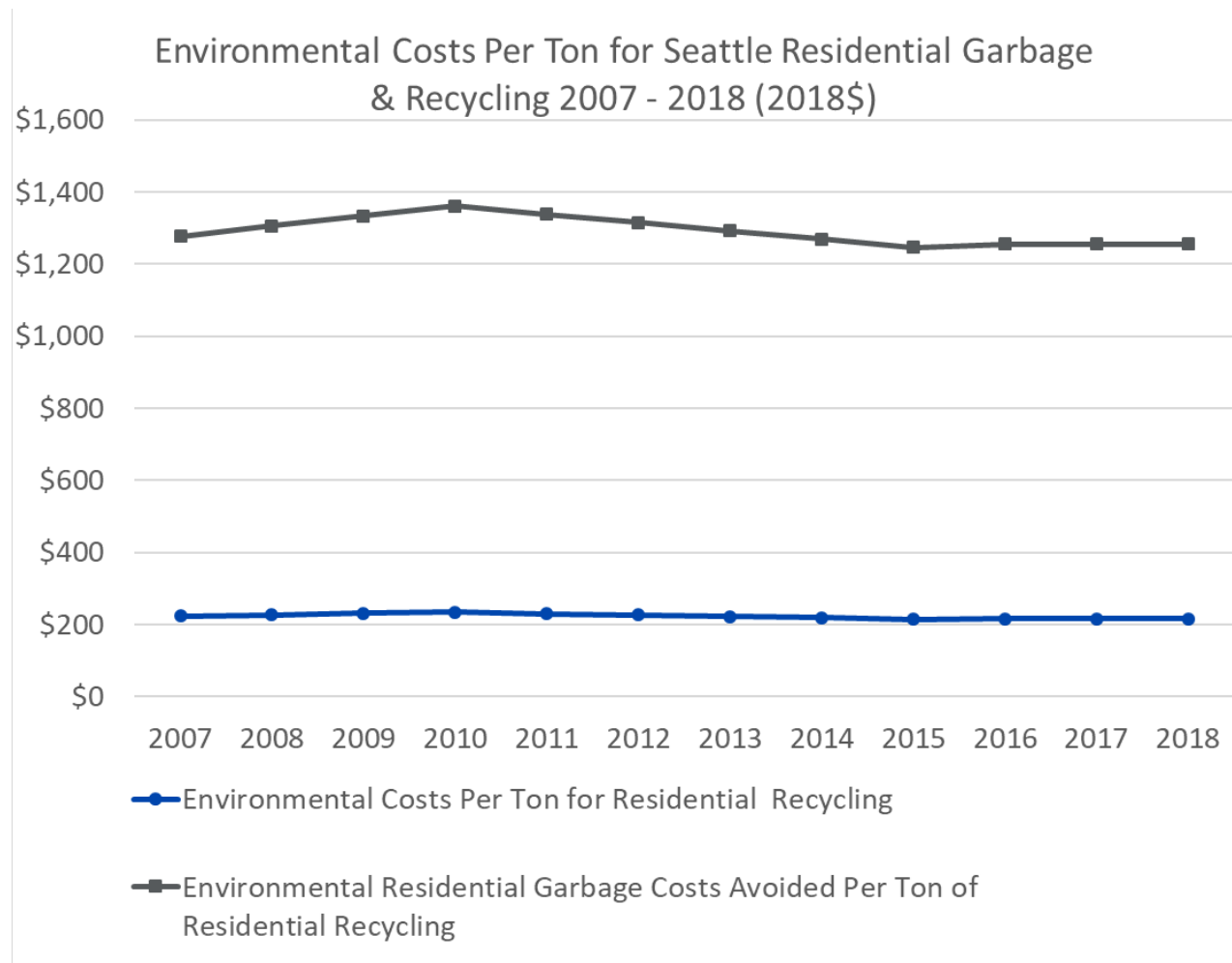
Environmental Benefits and Costs of Residential Recycling and Food and Yard Waste

Recycling

This section describes environmental costs and benefits of recycling calculated using MEBCalc (Measuring Environmental Benefits Calculator), described in Appendix E, *Recycling Potential Assessment Model and Environmental Benefits Analysis*.¹ Figure F.7 shows life cycle environmental costs for residential garbage and recycling per recycled ton in 2018\$ for 2007–2018, according to the MEBCalc analysis. Garbage disposal environmental costs avoided by recycling were substantially higher than residential recycling environmental costs throughout the past 12 years. Environmental damage costs savings from recycling averaged \$1,069 per ton during 2007–2018, avoiding the greater environmental cost of garbage disposal and saving a net \$1.1 billion in environmental damage costs. If this global public health and environmental benefit were all paid to Seattle households, it would be equivalent to reducing monthly garbage bills by \$25 (2018\$) every month for 12 years.

¹ The development of life cycle analysis, life cycle environmental impacts monetization, and references for data and methodologies used in Sound Resource Management Group's tool Measuring Environmental Benefits Calculator (MEBCalc) are discussed in Appendix E, *Recycling Potential Assessment Model and Environmental Benefits Analysis*.

Figure F.7 Residential Recycling Environmental Cost and Avoided Garbage Cost Per Ton 2007–2018 (2018\$)



Garbage disposal environmental costs avoided by recycling in Seattle declined somewhat between 2007 and 2018, in part for three reasons:

- Contaminants thrown into recycling collection carts and dumpsters by Seattle households increased dramatically. In 2007, contaminants, on average, accounted for about 2% of the total weight recycled by households. By 2015, contamination averaged 10.5%. Collecting contaminants in recycling containers does not avoid garbage life cycle environmental costs, especially the upstream environmental costs of virgin-content material and product resource extraction and manufacturing.

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- Glass in the recycling stream increased as a percentage of total weight from about 18% in 2007 to 26% by 2015. Glass has a lower virgin-content environmental cost than other materials, such as paper, plastics, and metals. Hence, the average virgin-content materials production component of avoided garbage environmental costs per ton decreases when the relative amount of glass increases.
- One of Seattle's two mainstream newspapers ceased print publication in March 2009. This also reduced avoided garbage environmental costs, on average.

The decline in avoided garbage disposal environmental costs was somewhat reduced by increased diversion of metals, especially aluminum cans, beginning in 2010. Aluminum cans have much higher than average avoided environmental impacts from virgin-content manufacturing.

Decreased environmental costs of recycling offset some of the decline in avoided garbage environmental costs. Environmental costs of recycling dropped slightly mainly because of the increased proportion of glass in recycling carts and dumpsters. This decreased the average upstream environmental cost of recycled-content materials and products. As is true for virgin-content glass containers compared with virgin-content paper, plastics and metal products, recycled-content glass containers have a smaller environmental footprint than the average recycled-content product manufactured from other materials in the recycled discards stream.

Table F.3 shows residential recycling composition estimated from recycling stream sorts in 2005, 2010, and 2015 of recyclables collected curbside from single-family residences and smaller apartment buildings, as well as onsite from larger apartment buildings. For this study, recycling composition in the years between composition studies is based on linear interpolation during years between the waste composition studies.

Table F.3 Estimated Residential Recycling Composition Based on Studies of Curbside and Apartment Recycling Collections

Recycled Materials	Estimated Residential Recycling Stream Composition		
	2005	2010	2015
Cardboard	15.8%	17.8%	16.4%
Newsprint	33.0%	19.5%	13.9%
Mixed Paper	27.0%	32.2%	25.6%
PET	1.0%	2.0%	2.1%
HDPE	0.8%	1.1%	1.5%
PP	0.2%	0.6%	0.5%
LDPE	0.4%	0.6%	0.9%
Glass	18.2%	17.7%	26.1%
Aluminum	0.5%	0.9%	0.9%
Tin Cans	0.8%	1.2%	1.1%
Other Ferrous Scrap	0.3%	0.4%	0.4%
Contaminants	2.1%	5.9%	10.5%
Total	100.0%	100.0%	100.0%

Table F.4 shows the changes over time in the composition of commingled materials collected for residential recycling that affected environmental costs of recycling and avoided garbage disposal. Table F.4 also shows the net effects on residential recycling's environmental benefits. Environmental costs of contamination in materials collected are allocated proportionately to the actual recyclables collected. Given this assumption, one might expect benefits of recycling to decline for all nine environmental impacts as contamination rates increase. However, climate change, human health, and water eutrophication impacts all increased between 2005 and 2010. One driving force was the decline in newspaper recycling that followed the closure of the *Seattle Post Intelligencer* in 2009. Fewer newspapers printed meant fewer newspapers to recycle. Recycling newspapers has a lower net environmental benefit than the average recycled material. A decline in newspaper recycling, all other things constant, increases recycling's net environmental benefits per ton of commingled material.

For climate change, an additional driver is that the costs of carbon dioxide emissions increase as the time approaches when the environmental impacts of climate change will begin to increase, perhaps precipitously. This is reflected in the social costs of carbon estimates by the U.S. Interagency Working Group on the Social Cost of Carbon (IWGSCC) as detailed in Appendix E, *Recycling Potential Assessment Model and Environmental Benefits Analysis*.

Table F.4 Residential Recycling Net Environmental Benefits, Recycling Costs and Avoided Garbage Disposal Costs

Environmental Impacts	Environmental Benefits and Costs of Residential Recycling Per Commingled Ton Collected								
	2005			2010			2015		
	Net Recycling Benefit	Avoided Garbage Cost	Recycling Cost	Net Recycling Benefit	Avoided Garbage Cost	Recycling Cost	Net Recycling Benefit	Avoided Garbage Cost	Recycling Cost
	(a = b - c)	(b)	(c)	(a = b - c)	(b)	(c)	(a = b - c)	(b)	(c)
Climate Change	\$101	\$166	\$65	\$109	\$176	\$67	\$100	\$166	\$66
Human Health									
Respiratory	\$525	\$622	\$97	\$590	\$711	\$121	\$562	\$674	\$112
Toxicity	\$37	\$61	\$24	\$38	\$58	\$20	\$33	\$49	\$16
Carcinogenicity	\$5	\$9	\$4	\$5	\$12	\$7	\$5	\$12	\$7
Water Eutrophication	\$324	\$334	\$10	\$375	\$383	\$8	\$326	\$333	\$7
Acidification	\$7	\$18	\$11	\$4	\$10	\$6	\$1	\$3	\$2
Ecosystems Toxicity	<\$1	<\$1	<\$1	<\$1	<\$1	<\$1	<\$1	<\$1	<\$1
Ozone Depletion	<\$1	<\$1	<\$1	<\$1	<\$1	<\$1	<\$1	<\$1	<\$1
Smog Formation	\$5	\$11	\$6	\$5	\$11	\$6	\$5	\$9	\$5
Total	\$1,005	\$1,222	\$217	\$1,126	\$1,361	\$235	\$1,032	\$1,247	\$215

The final important conclusion from examining recycling's environmental benefits and costs is that upstream costs account for a major portion of total environmental costs for both recycling and disposal. For example, in 2015, the distribution of recycling's life cycle environmental costs was:

- 79% from upstream recycled-content production
- 14% from contaminants management, including the upstream portion of their garbage disposal life cycle
- 5% from MRF processing
- 1% from hauling processed recyclables from the MRF to recycled-content product manufacturers
- 1% for collection from single-family and multifamily households

For avoided garbage disposal, the distribution of environmental costs in 2015 was:

- 97% for avoided upstream manufacturing of virgin-content materials
- 2% for avoided landfilling
- Much less than 1% for avoided garbage collection and avoided hauling of garbage to Columbia Ridge landfill

For net environmental costs of recycling, the upstream recycled-content versus virgin-content manufacturing mainly determines the net footprint for recycling. At the same time, collection and hauling of recyclables and garbage have significant local environmental impacts. Processing recycling by sorting them into individual material types in the material recovery facility also affects the local environment, especially for workers in the facility itself. However, recycling

solid waste materials provides its greatest benefits to regional, national, and global environments by avoiding the extraction and refining of virgin resources and use of those resources for virgin-content product and material manufacturing.

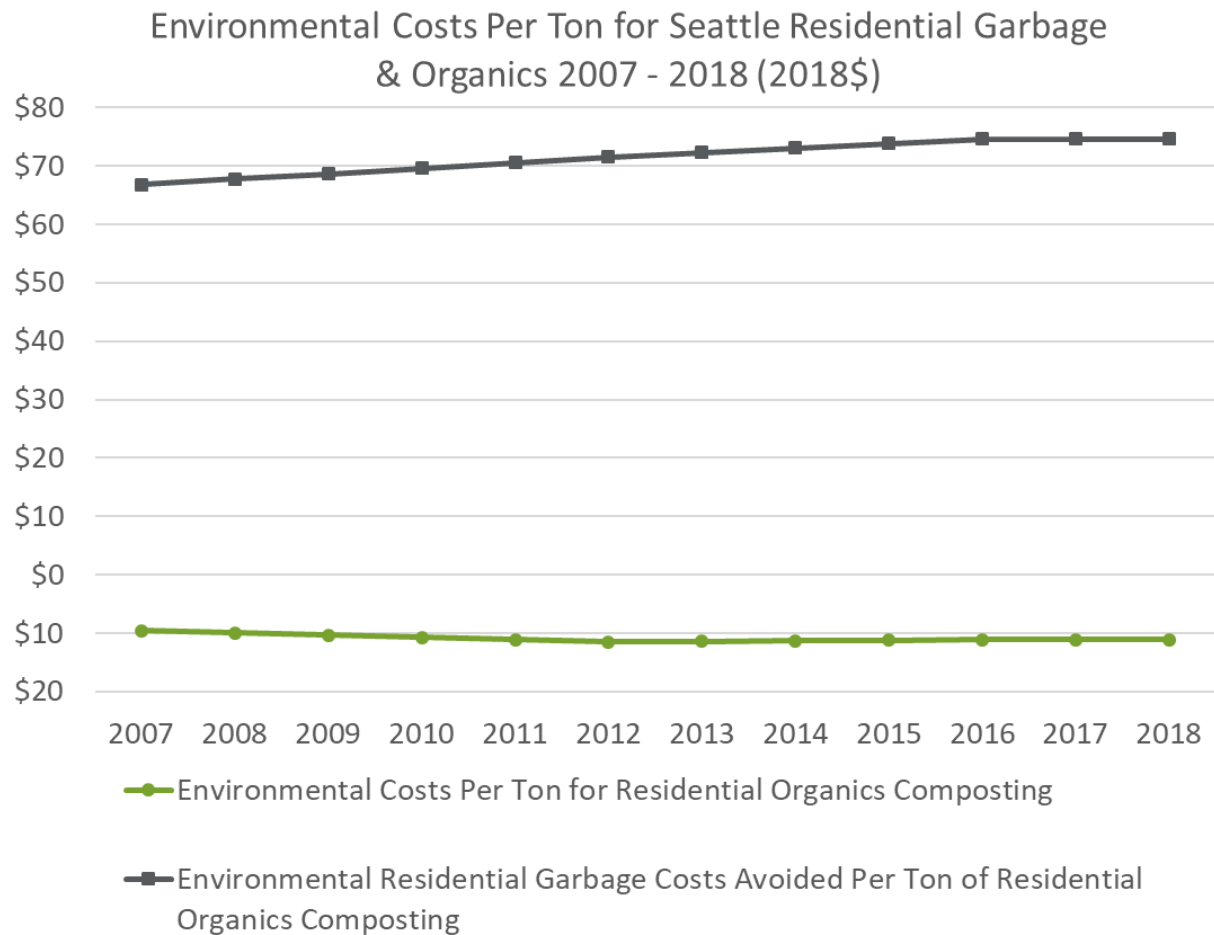
In addition, environmental impacts of recycled-content manufacturing are most often a fraction of the environmental impacts of virgin-content production, which disrupt ecosystems to obtain resources. Examining residential recycling in Seattle in 2015, for example, shows that upstream recycled-content product and material manufacturing environmental costs were just 16% of what environmental costs would have been if the same quantities of products and materials were manufactured from virgin ecosystem resources.

Composting

Figure F.8 displays residential garbage and household food and yard waste life cycle environmental costs per ton in 2018\$ for 2007–2018. Avoided residential garbage disposal environmental costs have been higher than household food and yard waste environmental costs throughout the past 12 years. Collecting and composting food and yard waste had a beneficial environmental impact of \$11 per ton without even taking avoided garbage disposal impacts into account. This is due to soil carbon storage and above-ground biomass enhancement benefits from applying compost to garden and agricultural soils. The monetary value of these climate benefits from composting exceeds the monetary costs for all nine environmental damage categories from impacts of collection and composting operations themselves. The avoidance of synthetic fertilizer and pesticides production, which is the equivalent of virgin-content production in the case of compost, as well as avoidance of garbage collection and landfill emissions, provide additional benefits for composting averaging \$71 per ton, as shown by the top line on Figure F.8.

Environmental damage costs savings from food and yard waste composting averaged \$82 (2018\$) per ton during 2007–2018. Household food and yard waste composting avoided the greater environmental cost of garbage disposal, saving a net \$78.1 million in environmental damage costs. If this global public health and environmental benefit were all paid to Seattle subscribers for curbside food and yard waste collection, it would reduce their monthly collection bills by \$4 (2018\$) for 12 years.

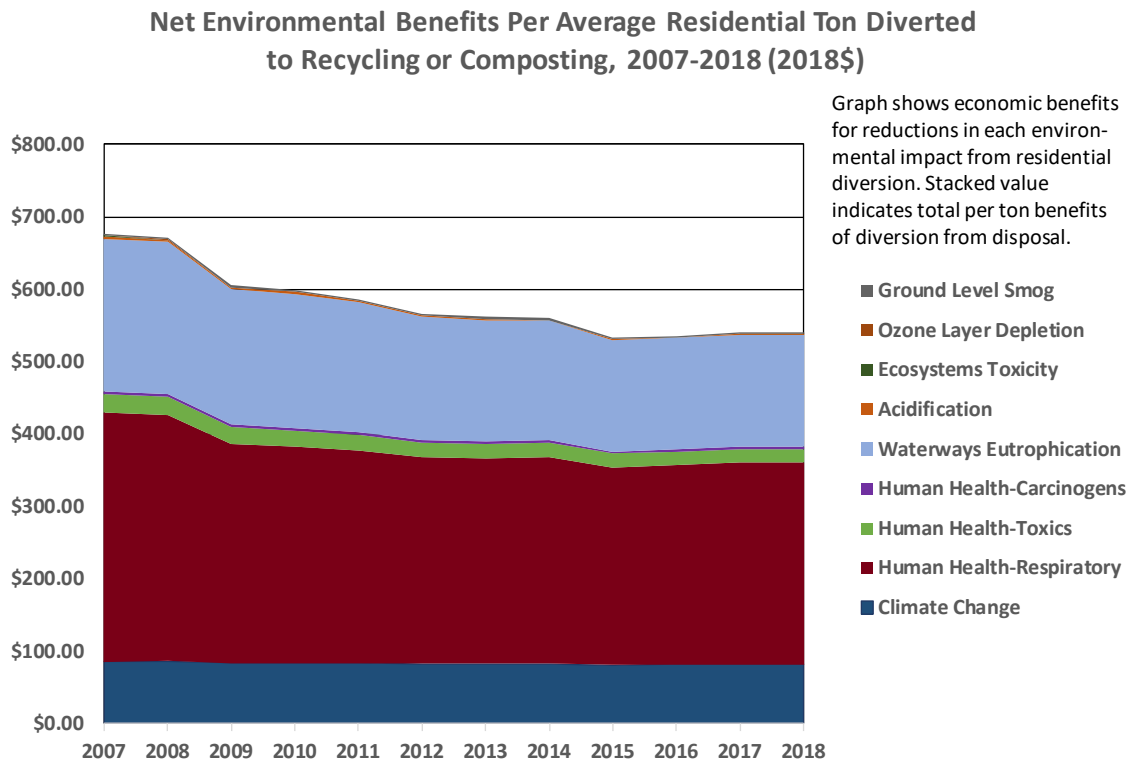
Figure F.8 Residential Food and Yard Waste (Organics) Environmental Cost and Avoided Garbage Cost Per Ton 2007–2018 (2018\$)



Environmental Cost Savings Details

Figure F.9 shows weighted average net environmental cost savings per ton diverted by residential recycling and food and yard waste composting for each of nine environmental impacts evaluated by the MEBCalc tool over the 12-year period 2007 through 2018. Benefits are stacked so that the line across the top of the stack measures benefits in total from all nine.

Figure F.9 Residential Diversion Program Environmental Cost Savings Per Ton Details 2007–2018 (2018\$)



Benefits through reductions in potential human health respiratory mortality and morbidity, waterways eutrophication, and climate change predominate. Smaller benefits result from reductions in human health toxicity and from even smaller human health carcinogenic impact reductions. Emissions reductions per ton of recycling and of food and yard waste for the remaining four environmental impacts (1) acid rain, (2) ecosystems toxicity, (3) ozone layer depletion, and (4) ground level smog formation are relatively insubstantial.

The net environmental benefits of recycling are substantially larger on a per ton basis than are food and yard waste composting's benefits. For food and yard waste, the big three benefits, in order, are from (1) climate change, (2) human health respiratory, and (3) human health toxicity

Appendix F – Economics of Residential Recycling in Seattle

reductions. Climate change accounts for up to 75% of total food and yard waste composting's benefits compared with about 10% for recycling. On the other hand, human respiratory impact reductions account for over 50% of recycling's benefits versus about 15% for food and yard waste. Furthermore, food and yard waste diversion has net environmental costs rather than benefits for waterways eutrophication due to ammonia, nitrogen oxides, and phosphates emissions from composting operations. These eutrophying damage costs are relatively small compared with the environmental benefits of composting for the other eight impacts. In the graphs shown for Figure F.9 and Figure F.10, the eutrophication damage costs from food and yard waste composting are overwhelmed by the eutrophication benefits from recycling.

The decline in total net environmental benefits per ton during 2007 through 2018 shown on the graph in Figure F.9 occurred due to:

- Increased contamination in collected recyclables
- The closing of the Seattle Post Intelligencer newspaper
- Relative increases in the amount of glass recycling, and
- Much faster growth of food and yard waste compared to recyclables diversion over the period (combined with the lower net benefits from food and yard waste versus recyclables diversion)

Growth in tonnage diverted offset most of the decline in per ton environmental benefits during the 2007 through 2018 period, as shown by total environmental benefits from residential recycling and food and yard waste diversion on the graph in Figure F.10.

Figure F.10 Residential Diversion Program Total Environmental Cost Savings Details 2007–2018 (2018\$)

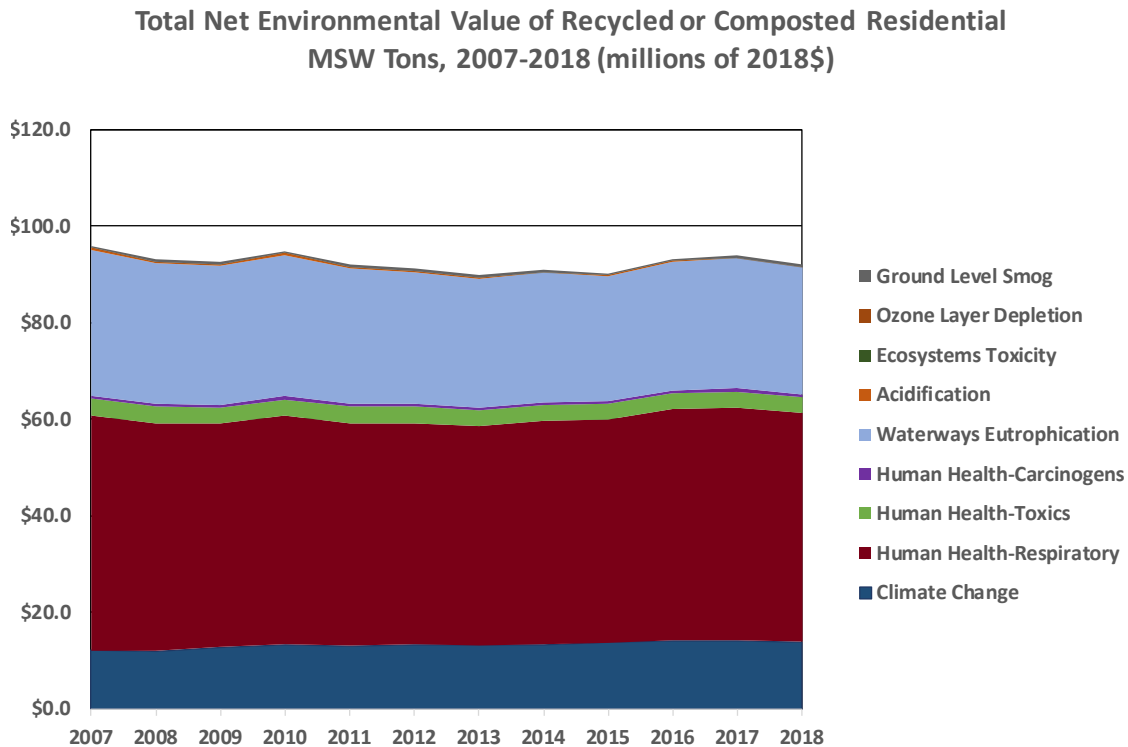


Chart note: MSW in this chart refers to solid waste.

Social Benefits and Costs of Residential Recycling and Food and Yard Waste Composting

This report does not quantitatively evaluate the social costs of the economics of recycling. The comparative impacts of diversion versus disposal on social inequities among Seattle households has not been well-researched, although there are certainly inequities among Seattle households. However, whether diversion programs, collection practices, and processing facilities have greater or lesser effects on such inequities than disposal programs, collection practices, and garbage handling facilities has not been studied.

Transfer station operations create social impacts, such as collection truck and self-haul vehicle traffic. However, whether these negative effects are more associated with handling garbage versus handling food and yard waste and recyclables is unknown. Seattle's transfer stations handle substantial quantities of both garbage and diverted food and yard waste, as well as

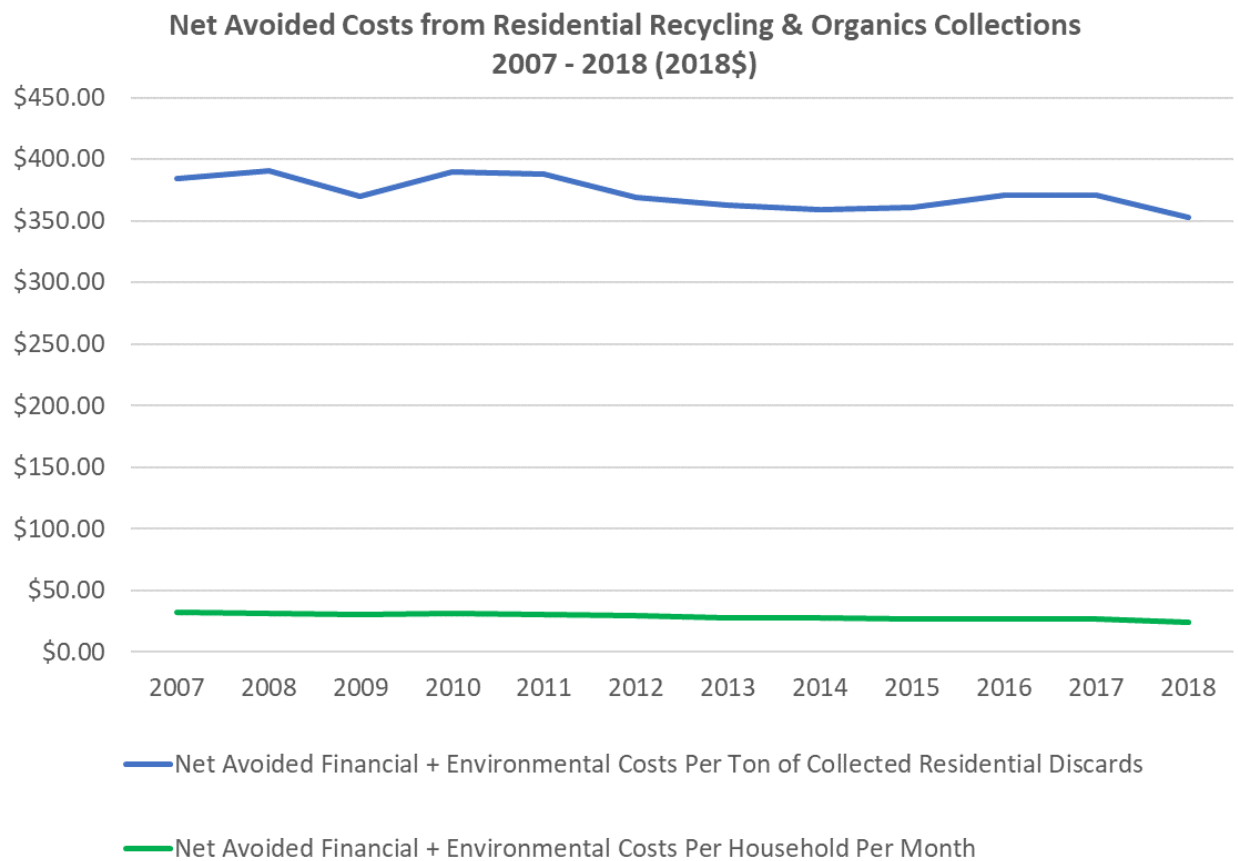
some quantities of diverted recyclables, which suggest that there may not be too much difference in between diversion and disposal in terms of social impacts from the transfer stations.

Food and yard waste composting and garbage landfiling facilities are located outside of Seattle and do not cause disparate social impacts on Seattle residents. The environmental life cycle assessment of diversion versus disposal detailed in this report addresses the potential global public health impacts from composting and landfiling. Seattle's contracted composting and garbage landfiling facilities may have additional impacts on regional or global social inequities. Such potential effects are not analyzed here.

Total Financial and Environmental Cost Savings of Recycling and Food and Yard Waste Collection

Figure F.11 depicts net financial and environmental cost savings per household per month and per ton of collected residential discards (garbage + recycling + food and yard waste) through SPU residential recycling and food and yard waste collection programs for 2007–2018. The chart demonstrates the success of SPU programs at diverting residential discards from disposal to financially less costly and environmentally preferable uses, either as recovered materials for manufacturing recycled-content products or as soil amendments composted from household food and yard waste. This diversion saved \$1.2 billion (2018\$) over the 12 years from 2007 through 2018. Those savings averaged \$372 per ton of residential wastes generated for collection and \$29 per month per household.

Figure F.11 Residential Diversion Program Financial Plus Environmental Cost Savings 2007–2018 (2018\$)



Increasing contaminants (especially in the recycling discards stream), increases in composting fees, and an increasing proportion of glass and decreasing proportion of newspapers in recycled materials are the major causes of the downtrends in both per household and per ton net avoided cost savings. Despite these challenges, and the challenge of low recycling market prices at the time of this writing (2018), Seattle's recycling and composting diversion programs continue to pay generous dividends to SPU solid waste collection rate payers, global public health, and the global environment. In 2018, these programs avoided financial and environmental garbage disposal costs of \$353 per ton of residential discards generated for collection, which amounts to avoided costs of \$24 per household per month.



APPENDIX

G

State Environmental Protection Act (SEPA) Documents



Date: May 6, 2022

To: Stephanie Schwenger
Solid Waste Planning and Program Management

From: Ingrid Wertz
Lead SEPA Responsible Official

RE: SEPA Closeout: Seattle's 2022 Solid Waste Plan Update

Ingrid Wertz

Digitally signed by Ingrid
Wertz
Date: 2022.05.06
08:09:08 -07'00'

This memorandum documents the completion of the State Environmental Policy Act (SEPA) process for the Determination of Non-Significance (DNS).

The DNS was issued on April 11, 2022. The DNS and SEPA Environmental Checklist were posted to the Washington Department of Ecology SEPA Record Submittal (SRS) Portal, and the DNS was recorded as entry #202201664 in the State SEPA Register.

The DNS was published in the *Daily Journal of Commerce* in the April 11, 2022 edition, recorded in the Seattle Department of Construction and Inspections "Portal" as Record Number 000452-22PN, and listed in the Public Notices Summary.

The comment period ended on April 25, 2022. There were no comments.

The appeal period ended on May 2, 2022. There were no appeals.

The SEPA process was completed on May 6, 2022 and the project is authorized to proceed, contingent on any other required permits and approvals.



Seattle's 2022 Solid Waste Plan Update SEPA Determination of Non-Significance (DNS)

Description of Proposal

Seattle Public Utilities (SPU) has prepared the Preliminary Draft *2022 Solid Waste Plan Update: Moving Upstream to Zero Waste* ("2022 Plan Update"), the latest long-range plan directing SPU's management of solid waste. The 2022 Plan Update amends the 2011 Solid Waste Plan Revision, *Picking Up the Pace Toward Zero Waste*. "The Plan satisfies a state requirement to maintain a coordinated, comprehensive solid waste management plan in a current and applicable condition (RCW 70.75)."

The *2022 Plan Update* guides how Seattle will manage and finance its solid waste services and facilities over the next 6 years, and projects system management needs over 20 years. The *2022 Plan Update*:

- Highlights historic solid waste trends, including progress toward goals, and details solid waste system projections
- Describes how Seattle advances waste prevention and diversion from landfill through policy, customer outreach and education, investments in the circular economy, and enforcement of solid waste rules, regulations, and contracts
- Describes the solid waste system and how Seattle provides essential waste collection, recycling, composting, and disposal services to 1.4 million people in the City
- Recommends 39 actions for Seattle to continue innovating in solid waste management
- Suggests creating new goals consistent with Seattle's growing emphasis on reducing waste at the source

The *2022 Plan Update* does not detail the specific solid waste activities that would be undertaken, but rather, discusses the City's management goals related to solid waste management and the types of activities necessary to achieve those goals in a safe and economical way. More specifically, the *2022 Plan Update* describes how the City would manage the City's solid waste by preventing waste, increasing recycling and composting, and improving services over the next 20 years. Plan implementation would require future evaluation and development of programs and capital improvement projects designed to address SPU's identified solid waste issues and needs.

Before it can be implemented, the *2022 Plan Update* must be adopted by the Seattle City Council and then approved by the Washington State Department of Ecology. Adoption and approval of the *2022 Plan Update* is considered a non-project action under SEPA.

Proponent

Seattle Public Utilities
Seattle Municipal Tower Suite 4900
P.O. Box 34018
Seattle, WA 98124-4018

Location of Proposal

The planning area for the *2022 Plan Update* includes all areas within the municipal limits of the City of Seattle, King County, Washington, including about 82 square miles of land populated by about 745,000 people. SPU owns and operates two major solid waste transfer facilities, the North and South Transfer Stations located at 1350 North 34th Street (zip code 98103) and 130 South Kenyon Street (zip code

98108), respectively; and the North and South Household Hazardous Waste facilities at 12500 Stone Way North (zip code 98133) and 8105 Fifth Avenue South (zip code 98108), respectively. Non-recyclable solid waste from the recycling and disposal stations is transported to privately owned intermodal facilities, where it is loaded onto railcars and transported to the Columbia Ridge Regional Landfill in Arlington, Oregon. Recyclable materials are transported to or picked up by private recycling business. Compostable materials are transported to Lenz Enterprises or Cedar Grove Composting, both private composting businesses.

Lead Agency

Seattle Public Utilities, the lead agency for this proposal, has determined that it does not have a probable significant adverse impact on the environment. An environmental impact statement (EIS) is not required under RCW 43.21C.030(2)(c). This decision was made after review of a completed environmental checklist and other information on file with the lead agency. This information is available to the public on request.

This Determination of Non-Significance (DNS) is issued under WAC 197-11-340(2); the lead agency will not act on this proposal for fourteen (14) days from the issuance date below.

A copy of the environmental checklist is available online at:

<http://www.seattle.gov/utilities/neighborhood-projects/construction-impacts>

A copy of the 2022 Solid Waste Plan Update is available online at:

<https://www.seattle.gov/utilities/about/plans/solid-waste>

Public and Agency Comments

Comments on this DNS must be submitted by April 25, 2022 and must be sent by email to:

Ingrid Wertz, SEPA Responsible Official
Seattle Public Utilities
ingrid.wertz@seattle.gov

Signature: _____

Ingrid Wertz

Digitally signed by Ingrid
Wertz
Date: 2022.05.06
08:09:08 -07'00'

Ingrid Wertz

Issue Date: April 11, 2022

Appeals

Appeals of this DNS must be accompanied by an \$85 filing fee and must be filed by 5:00 p.m. on May 2, 2022. Please see the Office of the Hearing Examiner web site for Temporary Operating Rules During COVID-19: <http://www.seattle.gov/hearing-examiner>



APPENDIX

H

Seattle Solid Waste Advisory Committee (SWAC) Participation in Planning



May 30th, 2022

State of Washington
Department of Ecology

RE: Documentation of Seattle SWAC involvement in development of 2022 Solid Waste Plan Update: Moving Upstream to Zero Waste

To the State of Washington Department of Ecology:

The Seattle Solid Waste Advisory Committee (SWAC) offers this letter as documentation of its involvement in the development process of the *2022 Solid Waste Plan Update: Moving Upstream to Zero Waste* (2022 Plan Update).

The SWAC has had continual and significant involvement in the development and support of this plan update throughout the process of its creation. Our involvement began in 2018, with SPU providing an overview of the following: the update process and schedule; the anticipated updates that would be in the plan; how the Environmental Justice and Service Equity (EJSE) Team would be working with all involved parties to apply a racial equity lens and toolkit to the process; and the development of a strategy for public involvement.

Once the update process was underway, SWAC was continually kept up-to-date on the progress by SPU, and had the opportunity to discuss and comment on many key elements, such as the following:

- Work on the plan in partnership with the Community Connections (CC) program, including key takeaways from conversations with CC partner organizations.
- Work on the plan in partnership with solid waste industry stakeholders.
- The Contamination Reduction and Outreach Plan.
- The individual recommendations of the 2022 Plan Update, and the process for their development.
- The plan for public outreach and comment gathering.

Additionally, at two different points within the process of the 2022 Plan Update (middle and end), the SWAC took up the work of reading and discussing the entire plan as a group. SWAC members were assigned two to three chapters to read individually, and then came together to educate their peer committee members and discuss, question, and comment on as a group.

Finally, SWAC members contributed to the public outreach campaign through the use of their own social media, professional, and citizen networks, as well as by submitting public comments of their own.

More details of SWAC involvement can be found within the SWAC's monthly meeting minutes, as well as in the attached document: "SWAC Involvement in 2022 Solid Waste Plan Update: Moving Upstream to Zero Waste 2018-present". The meeting minutes are available at SPU's SWAC web page at: <https://www.seattle.gov/utilities/protecting-our-environment/volunteer/solid-waste-advisory-committee>.

In its future work, as expressed by its [charter](#), the SWAC will continue to utilize and engage with this new planning document, which SWAC recognizes as a comprehensive, modern, and valuable update to the City's guiding Solid Waste Plan. The members of the SWAC are very grateful for all of the hard work invested by SPU in the creation of this document, as well as in assisting us to fully and regularly stay involved in the process.

Respectfully, SWAC Officers:

Joel Dashnaw, Co-Chair



Brie Kuhn, Co-Chair

Brie Kuhn

Brie Kuhn (Jun 14, 2022 07:51 PDT)

Celine Fujikawa, Secretary



Celine Fujikawa (Jun 14, 2022 08:23 PDT)

SWAC Involvement in 2022 Solid Waste Plan Update: Moving Upstream to Zero Waste | 2018–present

This document details the involvement of Seattle Public Utilities' Solid Waste Advisory Committee (SWAC) in the *2022 Solid Waste Plan Update: Moving Upstream to Zero Waste (2022 Plan Update)*. In 2018, SPU started drafting what was intended to be the *2019 Solid Waste Plan Amendment* to the *2011 Solid Waste Plan Revision: Picking Up the Pace Toward Zero Waste (2011 Plan Revision)*. However, the *2019 Solid Waste Plan Amendment* was not completed, due to impacts of COVID-19 and other mitigating factors. The current version of Seattle's plan is the *2022 Plan Update*. For clarity, the summary below refers to the various versions of the plan simply as the *2022 Plan Update*.

SWAC Meeting	Presenter	Notes	Content Shared
June 2018 (6/6/18)	Cascadia Consulting Group (Heather Levy)	Provided a preview and sense of the process, scope, scale, and timing of the project	Notes and slides
September 2018 (9/5/18)	David Hare & Michael Davis	Shared how SPU's Environmental Justice and Service Equity Division was actively working with David Hare and the consultant team to apply a racial equity lens, including conducting a Racial Equity Toolkit and developing a public involvement strategy for the <i>2022 Plan Update</i>	Notes
October 2018 (10/3/18)	David Hare & Cascadia Consulting Group (Heather Levy)	- Gave overview of anticipated updates contained in the <i>2022 Plan Update</i> - Provided update about project structure and schedule	Notes
November 2018 (11/3/18)	Cascadia Consulting Group (Heather Levy & Jessica Branom-Zwick)	Surveyed SWAC about their topics of greatest interest for deeper discussion in future meetings	Notes

SWAC Meeting	Presenter	Notes	Content Shared
December 2018 (12/5/18)	David Hare & Cascadia Consulting Group (Jessica Branom-Zwick & Andrea Lai)	- Reviewed results of November survey of SWAC members - Discussed top two topics selected by SWAC in November survey: (1) goals & metrics and (2) waste prevention	 December 2018 CSWMPA SWAC Pres  December 2018 SWAC Notes.pdf
April 2019 (4/3/19)	David Hare & Katie Lynd	- Outlined the timeline for SWAC involvement - Discussed the plan for communications and public involvement - Conducted an interactive exercise to prioritize communication tactics for public review (results attached)	Notes  April 2019 CSWMPA SWAC Comms Tactic
June 2019 (6/5/19)	David Hare, Sam Keller, Cascadia Consulting Group (Jessica Branom-Zwick)	- Gave overview of work on <i>2022 Plan Update</i> in partnership with SPU's Community Connections Program, including key takeaways from conversations with Community Connections partner organizations - Provided overview of findings from interviews with solid waste industry stakeholders - Discussed program alternatives being considered for recommendations	Notes  June 2019 CSWMPA SWAC Presentation.
September 2019 (9/4/19)	Katie Lynd & Cascadia Consulting Group (Jessica Branom-Zwick)	- Talked about public comment process and survey topics - Gave overview of process for developing program recommendations - Walked through individual recommendations	Notes  September 2019 CSWMPA SWAC Pre:
October 2019 (10/2/19)	SWAC Members (Dirk Wassink & Alessandra Pistoia)	SWAC Chair, Dirk Wassink, and Vice-Chair, Alessandra Pistoia, led SWAC members through a series of breakout group discussions on portions of the <i>2022 Plan Update</i> to evaluate the recommendations it contained	Notes

SWAC Meeting	Presenter	Notes	Content Shared
November 2019 (11/6/19)	Socorro Medina	- Explained reasons for postponing the public comment period and provided update on status of the document and obtaining the necessary approvals to proceed - SWAC members continued discussing their comments regarding the <i>2022 Plan Update</i>	Notes  SPU CSWMPA 2019 Stakeholder Engagem
January 2020 (1/7/20)	Susan Fife-Ferris	Provided update on internal SPU and public review process for <i>2022 Plan Update</i>	Notes
March 2020 (3/4/2020)	Socorro Medina	- Gave an overview of the <i>2022 Plan Update</i> and held question and answer session about plan contents with SWAC - Received SWAC feedback and questions to address in the <i>2022 Plan Update</i>	Notes
August 2020 (8/5/20)	Susan Fife-Ferris	Provided update that SPU received approval to move forward with the <i>2022 Plan Update</i>	Notes
November 2020 (11/4/20)	Susan Fife-Ferris	Briefed SWAC on the Contamination Reduction & Outreach Program (CROP), a new requirement that SPU must prepare by July 1, 2021 and incorporate into the <i>2022 Plan Update</i>	Notes
December 2020 (12/2/20)	Susan Fife-Ferris	- Briefed SWAC that on guidance from Ecology that SPU must prepare a “revision” rather than an “amendment,” as originally planned - Explained factors leading to delays in updating the <i>2011 Plan Revision</i> - Described why preparing a “revision” requires more time to complete than an “amendment”	Notes
January 2021 (1/6/2021)	Susan Fife-Ferris	Updated SWAC on new timeline for a revision of the <i>2011 Plan Revision</i>	Notes
February 2021 (2/3/21)	Socorro Medina & Becca Fong	- Led a presentation on the Contamination Reduction and Outreach Plan (CROP), including outlining the contents of the CROP and the timeline for completing it by July 1, 2021 - Determined that SWAC would provide feedback on the draft CROP at the March or April 2021 SWAC meeting	Notes
April 2021 (4/7/21)	Stephanie Schwenger	Reviewed status of the <i>2022 Plan Update</i> and outlined key upcoming project milestones	Notes

SWAC Meeting	Presenter	Notes	Content Shared
May 2021 (5/5/21)	Socorro Medina	- Presented on the CROP, which concerns how to improve the quality of traditional recyclable materials, including: - Current strategies for contamination reduction - Future strategies for contamination reduction - Next steps and timeline	Notes
September 2021 (9/1/21)	Stephanie Schwenger	Shared a <i>2022 Plan Update</i> presentation that provided a high-level refresher and next steps for the SWAC's involvement	Notes
October 2021 (10/6/21)	Stephanie Schwenger	- Provided a "Chapter Summaries" document to SWAC members that distilled the contents and recommendations of 10 chapters in the <i>2022 Plan Update</i> to six pages - Discussed the status of the <i>2022 Plan Update</i> and encouraged SWAC members to provide feedback and questions - SWAC officers discussed the best way to support SPU in providing feedback to the <i>2022 Plan Update</i> at their next meeting - SWAC members expressed preference to split into groups and divide the chapters among the groups to provide review and feedback	Notes
November 2021 (11/3/21)	Katie Lynd	Presented on parameters of SWAC's review of the draft <i>2022 Plan Update</i>, explained why SWAC reviews the <i>2022 Plan Update</i> before the general public, and outlined the timeline and next steps of SWAC's review of the <i>2022 Plan Update</i>	Notes
December 2021 (12/1/21)	Katie Lynd	- Shared a presentation to discuss SWAC's involvement in strategy and tactics for the public comment period of the <i>2022 Plan Update</i>, covering the following topics: - Proposed public comment survey topics - Outreach strategy - Connecting with diverse communities	Notes
January 2022 (1/5/22)	SWAC Members	- Provided summaries of the <i>2022 Plan Update</i> chapters they were assigned and shared their feedback with the <i>2022 Plan Update</i> project manager, Stephanie Schwenger - SPU encouraged all SWAC members to read the executive summary and answered questions from SWAC members about the content they read in the draft <i>2022 Plan Update</i> chapters	Notes
February 2022 (2/2/22)	Stephanie Schwenger	Updated SWAC on the status of the <i>2022 Plan Update</i>	Notes

SWAC Meeting	Presenter	Notes	Content Shared
March 2022 (3/2/22)	Katie Lynd	- Briefed SWAC on the public comment period, including process steps and timeline - Offered opportunity for SWAC to review the public comment materials by March 11, 2022	Notes
May 2022 (5/4/22)	SWAC Members	Discussed Ecology's requirement for evidence of SWAC participation in the development of the <i>2022 Plan Update</i> and suggested options for documenting their involvement	Notes
May 2022 (5/30/22)	SWAC Members	Provided a letter summarizing SWAC's involvement in the development of the <i>2022 Plan Update</i>	(see above)
June 2022 (6/1/2022)	Katie Lynd & Stephanie Schwenger	Briefed SWAC on the results of the <i>2022 Plan Update</i> public comment period, including a summary of comments received	Notes
October 2022 (10/5/22)	Quinn Apuzzo	- Notified SWAC that Ecology had completed its review of the <i>2022 Plan Update</i> and determined it to be compliant with RCW requirements for comprehensive plans - Explained that SPU was reviewing Ecology's comments and working to create a final version of the <i>2022 Plan Update</i> and accompanying resolution for City Council adoption at the beginning of 2023	Notes



APPENDIX



Washington State Department of Agriculture Compliance Letter



STATE OF WASHINGTON

DEPARTMENT OF AGRICULTURE

Division of Plant Protection

P.O. Box 42560 • Olympia, Washington 98504-2560 • (360) 902-1800

July 19th, 2022

Stephanie Schwenger, MPA
Solid and Hazardous Waste Lead Planner
City of Seattle

Diana Wadley
Regional Planner and Grant Manager
Northwest Regional Office
WA State Dept. of Ecology

Dear Stephanie Schwenger and Diana Wadley:

After reviewing the City of Seattle's Preliminary Draft Comprehensive Solid Waste Management Plan (Plan), our agency does not see any current conflicting compliance issues related to the apple maggot quarantine, as prescribed in Chapter 16-470 WAC.

Thank you for providing our agency with the opportunity to comment on the City of Seattle's Plan. RCW 70A.205.060 requires the Washington State Department of Agriculture to review preliminary draft solid waste management plans for any increased risk of introducing a quarantine plant pest or disease into a pest free area.

Sincerely,

Amy Clow
Quarantine and Rules Coordinator
WSDA Plant Protection Division

cc:
Greg Haubrich, WSDA Pest Program Manager



APPENDIX

J

City Council Resolution of Adoption

This section is forthcoming after City Council Adoption.

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**Seattle
Public
Utilities**



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