



Investment and Innovation grants

Pilot evaluation report

March 2021

oregonmetro.gov/investmentandinnovation



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I&I grant recipients

Thank you to all Investment and Innovation grant recipients for their efforts to reduce waste and advance racial equity in the region, and for sharing the results used in this evaluation.

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EXECUTIVE SUMMARY

Investing in private sector efforts to reduce waste and advance racial equity

The Metro Council initiated the Investment and Innovation (I&I) program in 2018 as a three-year pilot. The program catalyzes efforts of private companies and nonprofit organizations to advance waste prevention, reuse, recycling and energy recovery in the greater Portland area, while fostering economic opportunities and other benefits for communities of color and other historically marginalized communities.

Activities associated with making and using products significantly impact the environment and public health throughout product life cycles, from material extraction to production, use and end-of-life management. These harms include increased greenhouse gas emissions that drive climate change and emissions of toxic particulates—impacts which disproportionately burden communities of color. At the same time, reducing impacts of products provides opportunities to benefit underserved communities through job creation, professional advancement opportunities, and expanded services, among other benefits.

Over the course of the pilot Metro awarded over \$8.7 million in grants, which leveraged more than \$18 million in additional private investments in the projects. An evaluation of the pilot completed in spring 2021 examined how well the program is meeting the Metro Council’s original objectives and the environmental and equity goals of the 2030 Regional Waste Plan.

Evaluating impacts: An outcomes-based approach

The evaluation utilized an outcomes-based approach to address the following questions: *What were the cumulative impacts of these public investments? How well did the Investment and Innovation program meet its goals and align with the Regional Waste Plan?*

The environmental and health impacts described in the report include quantitative assessments of avoided greenhouse gas and particulate emissions, among other metrics. For racial equity, impacts assessed include new jobs, professional advancement opportunities, workforce equity assessments, and expanded services that directly benefit underserved populations.

Investment & Innovation program desired outcomes

Environmental and human health

Preserve and expand the region’s capacity to reduce the environmental and human health impacts of products at any stage of the product life cycle, with particular emphasis on the end-of-life stage through waste prevention, reuse, recycling, composting and producing energy from waste.

Racial equity

Increase economic benefits for historically marginalized communities in regional system.

Increase positive benefits and reduce negative impacts for communities of color or other historically marginalized groups.

Increase capacity of organizations in the solid waste system to advance racial equity.

The report also describes outcomes that are qualitative in nature to tell a more complete story of program impact. Three case studies highlight how Investment and Innovation grants to material recovery facilities provided seed money to enable those companies to risk investing in emerging technology and infrastructure upgrades to recover more materials and improve the quality of end products for market. Another case study describes grant-funded training and capacity support for BIPOC-owned and employed contractors, enabling them to compete for jobs in Portland's growing deconstruction industry that salvages building materials for reuse.

The evaluation also examined several key process-related aspects of the program:

- How effectively the program reached potential applicants to solicit proposals;
- How effectively the grant review committees functioned in developing funding recommendations; and
- Whether the internal (Metro) resources available to administer the program were sufficient.

Throughout the report, key lessons learned are highlighted with recommendations for improving the program, should it continue beyond the pilot phase.

The future of the Investment and Innovation program

This report provides accountability for the program work to date, and provides Metro decision-makers with information to help them determine whether to continue the Investment and Innovation program. The last section of the report explores whether there is continuing need for the program and outlines several options for the future of the program for consideration.

INTRODUCTION

Purpose of the Investment and Innovation pilot

The Metro Council initiated the Investment and Innovation (I&I) program in 2018 as a three-year pilot to invest in private companies and nonprofit organizations to create, expand, preserve and broaden efforts that advance waste prevention, reuse, recycling and energy recovery in the greater Portland area, and to help foster economic opportunities and other benefits for communities of color and other historically marginalized communities. The I&I program helps Metro achieve the overarching objectives of the 2030 Regional Waste Plan by reducing the environmental impacts of materials throughout their life cycle and advancing racial equity.

Purpose of the I&I pilot evaluation

The I&I pilot evaluation assesses to what extent the program is meeting its environmental and racial equity objectives and the goals of the Regional Waste Plan. It provides transparency and accountability for the work to date. It summarizes key lessons learned to shape potential future iterations of the grant program, as well as other Metro grant programs.

The evaluation informs an assessment of whether the I&I program costs, in both funding and staff resources, are proportionate to the outcomes. It identifies whether there is a continuing value for Metro to invest public dollars into private sector waste reduction efforts, and if so, options for continuing the program beyond the pilot phase.

A note about evaluation timing

The I&I pilot has not been fully implemented, as grants awarded in 2019 and 2020 are still underway. Some of the projects will not be fully implemented until the end of 2021, with three years of post-grant monitoring of capital grants running until 2024. Appendix 1 includes a detailed timeline of major milestones of the pilot, from the first budget request in 2017 through full implementation of all projects in 2024.

The pilot evaluation was conducted in advance of full implementation of all projects to provide the Waste Prevention and Environmental Services department and the Metro Council with information needed to make an informed decision as to whether to designate funds to the program in the FY21-22 budget cycle.

Accordingly, this report distinguishes between **actual** outcomes for completed grants and **anticipated** outcomes for grants still underway.

INVESTMENT AND INNOVATION OVERVIEW

The I&I program includes two overarching goals consistent with the Metro Council's original direction and the 2030 Regional Waste Plan:

- Reduce environmental impacts throughout the product life cycle, with particular attention to reducing both the amount and toxicity of waste produced in the Metro region; and
- Advance racial equity for historically marginalized communities by sharing benefits and reducing burdens of the region's garbage and recycling system.

The I&I pilot funded two types of grants to **for-profit businesses** and **nonprofit organizations** in the greater Portland region. **Program grants** ranged from \$10,000 to \$75,000 and supported personnel, operations and equipment associated with new or expanded programming. **Capital grants** ranged from \$50,000 to \$750,000 and supported larger investments in equipment or facility infrastructure. Both grant types required a written proposal and review by committees using published evaluation criteria. Capital grant recipients were required to provide a minimum 100 percent match (cash) to the grant; program grant recipients were required to provide a minimum 20 percent match (cash or in-kind).¹

The committees' funding recommendations were approved by the Waste Prevention and Environmental Services Director and the Metro Chief Operating Officer, and were reviewed by the Metro Council before becoming final.

In Year 1 (2018), Metro awarded 14 grants totaling \$2,453,247 out of an available \$3 million for both grant types. Adjustments to grant budgets during contracting resulted in the following final grant awards: Nine capital grants totaling \$2,176,444 and five program grants totaling \$224,626. All 2018 grants are complete.

In Year 2 (2019), Metro awarded 17 grants totaling \$6,117,919 out of an available \$6 million for both grant types

¹ The 20 percent match requirement was waived for nonprofit organizations in 2020 to reduce a potential barrier during the COVID-19 pandemic.

2018 grants (Detail in Appendix 2)

Allwood Recyclers: \$272,149

New aerated compost system for improved yard debris processing

City of Roses Disposal & Recycling: \$500,000

Infrastructure and equipment upgrades to increase volume and type of dry waste recovery

Denton Plastics: \$193,097

New equipment to process new streams of plastic materials

Earth Advantage: \$50,000

Targeted capacity-building for BIPOC-owned and employed deconstruction firms

Eco-School Network: \$25,580

Training for parent leaders to implement waste reduction projects in 20 schools

Free Geek: \$50,000

Staff and equipment to collect and process more electronics for reuse or recycling

Habitat for Humanity Portland Metro East: \$49,046

Staff and equipment to expand donation pickup services of products for reuse

Interstate Trucking Academy: \$40,000

Outreach and staff to expand BIPOC-focused training program for careers as garbage and recycling truck drivers

Oregon Food Bank: \$115,990

Staff and equipment to expand food rescue and distribution services into new areas of region

Pioneer Recycling Services: \$284,429

New equipment (recycling sorting robots) to process materials with increased speed and better quality for end markets

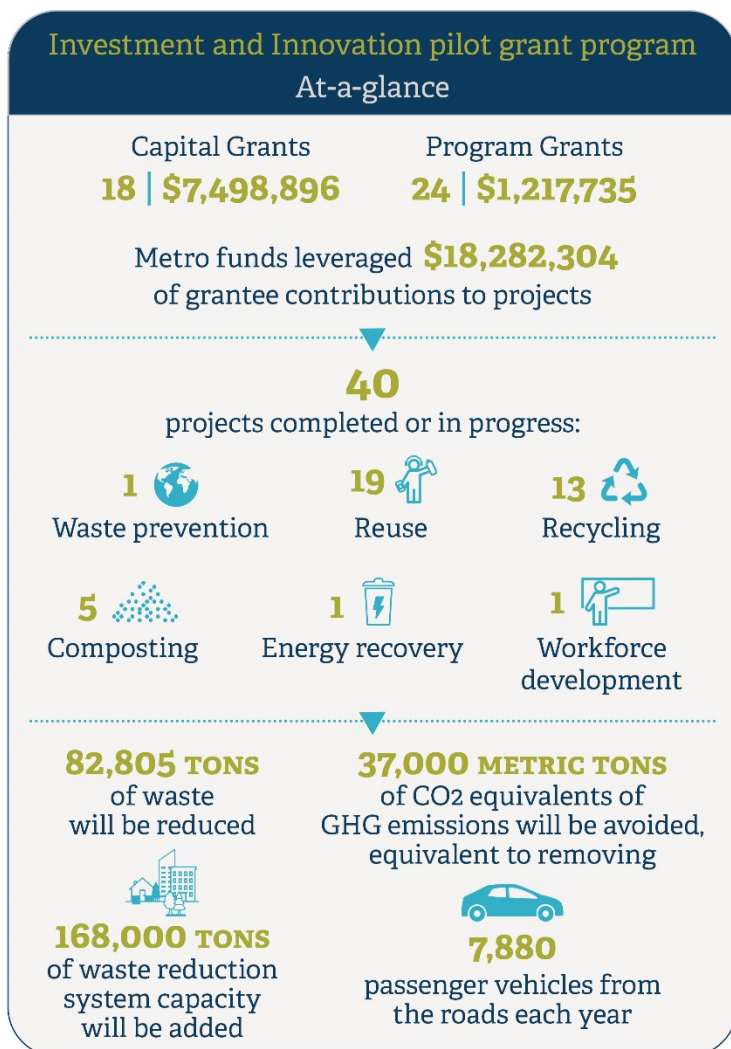
Pride Recycling Company: \$500,000

Infrastructure improvements to expand processing capacity for commercial food waste, dry waste and yard debris

(with additional funds added to accommodate the overage). Adjustments to grant budgets during contracting resulted in the following final grant awards: Nine capital grants totaling \$5,331,448, and eight program grants totaling \$520,423. At the time of this report, these grants are underway and in various stages of completion. The COVID-19 pandemic caused delays of one to six months for most of the grants.

In Year 3 (2020), the program was significantly reduced due to the impacts of the COVID-19 pandemic on Metro’s budget. Up to \$500,000 was available for program grants. Metro awarded eleven grants totaling \$472,686. These grants were recently contracted and projects are just starting.

A description of each grant and the status of the projects is in Appendix 2.



Urban Gleaners: \$103,779

New equipment, facility upgrades and staff to expand food waste recovery and test a “closed loop” delivery program

Wisewood Energy: \$50,000

Feasibility assessment of biomass heat systems at five businesses as replicable clean energy alternatives to disposing waste wood

2019 grants (Detail in Appendix 2)

City of Roses Disposal & Recycling: \$311,500

Infrastructure and equipment upgrades to increase dry waste recovery and improve working conditions

Denton Plastics: \$684,496

New equipment to recycle additional new streams of plastic materials

Environmental Fibers Int'l: \$310,000

New equipment to enable recycling of residual materials that would otherwise be disposed

GreenWay Recycling: \$712,500

New equipment and infrastructure improvements for increased dry waste recovery

Grimm’s Fuel Company: \$710,000

Modernization of compost system to aerated static piles to increase yard debris recycling capacity and reduce odors

Lovett Deconstruction: \$66,316

New equipment and training for additional deconstruction team, with focus on hiring and supporting a diverse workforce

Pioneer Recycling Services: \$712,500

Install optical sorters to remove contaminants and improve quality of recycled paper bales

THEORY OF CHANGE AND LOGIC MODEL

The following Theory of Change and Logic Model for the I&I program illustrate why the program was initiated and how it is expected to advance the work of the Regional Waste Plan.

Problem statement

The products used and consumed in the greater Portland area significantly impact the environment and public health throughout their life cycles from material extraction to production, use and end-of-life management. In the United States, the manufacturing, distribution and sale of products is carried out primarily by the private sector, and in our region, the prevention, reuse and recycling of products at the end of their lives is a mixed responsibility of the public and private sectors. Throughout the years, businesses and nonprofit organizations had approached Metro seeking public funding for their ideas for advancing waste reduction efforts through new innovations, processes, programs or capital projects. Prior to the I&I program, Metro did not have an active mechanism through which to financially support these new ideas and technologies.

Additionally, impacts from the ways products are used, consumed and discarded—including from solid waste facilities and delivery services—have disproportionately burdened communities of color. These communities have also historically been excluded from the economic benefits generated by the garbage and recycling system, which totals more than \$537 million each year in jobs and other economic impacts.² The [2030 Regional Waste Plan](#) highlights the need to allocate resources in ways that benefit communities of color and other historically marginalized communities, including eliminating barriers to services and employment.

Response

The Investment and Innovation program encourages private businesses and nonprofit organizations to expand and innovate in the ways they approach and

² 2030 Regional Waste Plan, p.25.

ReBuilding Center: \$75,000

Improvements to processing systems and new staff for salvage and resale of reusable building materials

Recology Oregon Compost: \$712,500

New equipment and infrastructure improvements at Aumsville facility to expand processing capacity for residential and commercial food scraps and yard debris

Recology Oregon Compost: \$712,500

New equipment and infrastructure improvements at North Plains facility to expand processing capacity for residential food scraps and yard debris

Repair PDX: \$31,689

Development and execution of repair skills programming and apprenticeships, in partnerships with schools and community organizations

Salvage Works: \$58,772

New equipment to expand custom furniture wood shop that transforms reclaimed lumber into high-quality furniture

University of Portland: \$74,774

Installation of intelligent robotic platforms on collection vehicles to quantify the composition and contamination of residential curbside recycling

Urban Gleaners: \$73,872

Staff to expand operation to repurpose discarded food into nutritious meals for families in need

Urban Gypsum: \$465,452

New equipment to process recycled drywall into pellets for reuse as agricultural and industrial products

Urban Gypsum: \$75,000

Hire a Spanish and English-speaking specialist to increase supply of recovered drywall from construction sites for processing for reuse

invest in reducing the impacts of waste on public health and the environment. I&I grants help fill the gaps in financing necessary for stabilizing and strengthening the existing system and for starting or expanding services within the region that have financial or technological risks. The grants also support efforts of community organizations to launch new initiatives or expand existing ones to prevent waste and to develop opportunities for repair, reuse and redistribution of discarded useful materials.

The I&I program also supports Metro's efforts to advance racial equity by generating benefits from the garbage and recycling system for communities of color or other historically underserved communities. These benefits include economic opportunities such as quality jobs, career advancement, and contract and business opportunities, equitable provision of programs and services, and increased participation in the garbage and recycling system.

The cumulative effect of projects supported by I&I grants will contribute to the private sector's capacity to reduce the environmental and health impacts of discarded materials in the Metro region, while generating positive benefits or reducing burdens for communities of color.

The following logic model demonstrates the connections between program inputs, goals, activities, outputs and outcomes.

2020 grants (Detail in Appendix 2)

City Repair: \$24,420

Develop process and demonstration projects to divert usable construction waste from architectural prototypes

Community Cycling Center: \$49,288

Expand reuse and recycling of used bicycles and parts, and support for internship program

Community Development Corporation of Oregon: \$47,250

Expand capacity of BIPOC-owned businesses to produce and market culturally-relevant food products from excess food

Cracked Pots: \$37,442

Equity training and staff for recovering materials at transfer station for resale

Free Geek: \$43,819

Up to 22 collection events to recover discarded electronics for reuse or recycling

Hygiene For All: \$50,000

Launch a pilot clothing and bedding exchange for people experiencing homelessness to keep the textiles from becoming waste

James' Neighborhood Recycling Service: \$49,417

Expand collection program for non-curb-side plastics by holding additional community collection events in underserved areas

Professional Business Development Group: \$50,000

Incentivize reuse practices of BIPOC and women contractors in partnership with ReBuilding Center

Re-Use Consulting: \$48,000

Training and capacity support for BIPOC and women deconstruction contractors

ROSE Community Development: \$23,200

Pilot program for composting food scraps for communities of color at multifamily sites

Salvage Works: \$49,525

Expand production of rustic wall paneling made from reclaimed fencing materials

Figure 1. Investment and Innovation pilot grant program logic model

Logic model

Overview: Metro awarded 42 grants totaling over \$8.7 million in 2018, 2019 and 2020 to nonprofits and businesses to strengthen local efforts to reduce the amount and toxicity of waste through reuse, recycling, composting or energy creation from discarded materials and advance racial equity in the Metro region.



EVALUATION METHODOLOGY

The evaluation focused on both I&I program outcomes and process. Understanding how well the program achieved its environmental and racial equity objectives and how well it has been implemented will inform the Waste Prevention and Environmental Services and the Metro Council in determining whether to continue the grants. It will also guide staff in how to improve future programming.

Evaluation questions

Five questions are addressed in this evaluation:

Outcome evaluation:

1. What impact did the I&I program have on progress toward reducing waste and improving environmental and health impacts of products?
2. What impact did the program have on progress toward racial equity?

Process evaluation:

3. Were outreach to potential applicants and the process of selecting the grants effective?
4. Were the internal resources (inputs) provided adequate to implement the program?

Future planning:

5. Is there still a need for Metro to invest in private sector waste reduction efforts through the I&I program? If so, should the program continue with its current scope or have revised areas of emphasis?

The data collection methods used to address the evaluation questions are summarized in the table below.

Table 1. Evaluation questions and methods

Evaluation question	Methods
1. Impact on environment and health	<ul style="list-style-type: none"> • Actual impacts from grant reports (<i>for completed projects</i>) • Anticipated impacts from grant proposals (<i>for projects in progress</i>) • Case studies (interviews with grantees)
2. Impact on racial equity	<ul style="list-style-type: none"> • Actual impacts from grant reports (<i>for completed projects</i>) • Anticipated impacts from grant proposals (<i>for projects in progress</i>) • Case studies (interviews with grantees)
3. Effectiveness of outreach and selecting grants	<ul style="list-style-type: none"> • Assessment of outreach methods and solicitation responses • Committee member survey responses and interviews with some committee members • Interviews with Metro staff involved in committee review
4. Adequacy of internal resources	<ul style="list-style-type: none"> • Year 1 and Year 2 process evaluation reports • Interviews with Office of Metro Attorney, Finance and Regulatory Services and subject matter expert staff

Evaluation question	Methods
5. Continuing need for the I&I program (with or without a revised focus)	<ul style="list-style-type: none"> • Interviews with Metro subject matter experts • Survey of external interested parties

Data collection overview

This section outlines the data gathering processes and sources used in the evaluation. Detail about the data collection tools (grant report questions, case study interview questions, and interested parties survey questions) is in Appendix 3.

Grant reports and proposals

In addition to quarterly progress reports, grantees are required to provide a final report at the end of the grant when project implementation is complete. The final report includes a summary of all work completed, project costs (both grant funds and total project costs), and data to support specific project environmental and equity metrics that are tailored to each grant. I&I program staff review the final report responses and follow up with grantees with clarifying questions to fully understand the project impacts. The final report questions are in Appendix 3.

A total of 12 final reports and supplemental information for the completed 2018 grants were analyzed to extract output and outcome data for each grant.

Final reports are not available for the seventeen 2019 and eleven 2020 grants because those projects are not yet complete. I&I staff used the scopes of work from the grant proposals to quantify the anticipated environmental and racial equity impacts of those grants, with follow-up questions to the grantees to update or refine the estimates where needed.

Grantee interviews/case studies

A third-party consultant (Evaluation Into Action) interviewed five grant recipients to develop case studies to provide a more comprehensive story of some of the I&I grants. These grants were selected for case studies to demonstrate a range of approaches to the racial equity and environmental goals of the I&I program. The interviews provided input on the benefits to the grantees' businesses and operations, successes and challenges, and whether there is a continued need for the I&I program.

The five case studies in this report are:

1. City of Roses Disposal Services
2. Denton Plastics
3. Earth Advantage
4. Environmental Fibers International
5. Pioneer Recycling Services

Evaluation Into Action conducted the interviews in October and November 2020. The interview questions are in Appendix 3.

Process evaluation reports and interviews with Metro staff and committee members

In the first two years of the pilot, program staff completed process evaluations of the prior grant cycles to capture lessons learned to be used to improve subsequent cycles. These assessments included informal surveys and interviews of grant review committee members on the effectiveness of the grant review process. Findings from those prior process evaluations informed the responses to this evaluation's questions 3 and 4 (effectiveness of outreach and selecting grants, and adequacy of internal resources).

The evaluation team solicited additional input for this evaluation from Metro staff supporting the program from the Office of Metro Attorney, Finance and Regulatory Services, and staff involved with the program across the WPES department.

Survey of external interested parties

The evaluation team administered a survey to 195 people external to Metro that are on the I&I program's interested parties list, primarily to inform evaluation question 5 (continued opportunities for investing in private sector waste reduction efforts). The list includes representatives of private companies, government agencies, universities, nonprofit organizations and individuals not otherwise affiliated who intersect with the work of the WPES department or have been identified (or self-identified) as interested in the I&I program. Where possible, duplicate representatives from the same entity were removed to ensure a more even distribution of possible respondents. All I&I grant applicants and recipients received the survey.

The survey was intentionally brief to encourage responses, and focused on whether the I&I program can continue to add value to the region, and if so, if it should be kept broad or refined in some way (with options provided).

A total of 42 people completed the survey, yielding a response rate of 22 percent, typical of this type of survey. The survey questions are in Appendix 3.

EVALUATION RESULTS

The data revealed insights into the five evaluation questions. This section outlines outputs and outcomes for each evaluation question, including findings and recommendations.

In general, an **output** defines the quantity of something produced by program activities—essentially “bean counting.” Examples include number of equipment upgrades or outreach events. An **outcome** is a change statement—it defines what is expected to change as a result of implementing the new equipment or outreach events. Outcomes define the difference the activity made. Together, outputs and outcomes provide a comprehensive picture of both program implementation and impact.

Grant outputs

The logic model on page 10 defines specific outputs for I&I program activities. The tables on the following pages synthesize the main outputs across all grants to demonstrate the diversity of program activities that occurred or are occurring over the pilot. There are two tables to distinguish between projects that have been completed (2018 grants) and the anticipated outputs for the projects still in progress (2019 and 2020 grants).

Table 2: Outputs from completed projects (2018 grants)





















OUTPUT	RESULTS	EXAMPLES
 Equipment upgrades	<p>Seven grantees upgraded equipment, ranging from 1 to 8 upgrades per grantee.</p> <p>Grantees purchased 17 pieces of equipment total.</p>	<p>Denton Plastics purchased a new continuous melt filter to efficiently process materials with higher degrees of contamination.</p> <p>Urban Gleaners purchased a walk-in refrigerator, freezer and a refrigerated van in order to rescue and distribute more edible food.</p>
 Facility upgrades	<p>Four grantees upgraded their facilities.</p>	<p>Pride Recycling Company completed two building expansions onsite for a total increase of 8,000 square feet.</p>
 Outreach events	<p>Four grantees held outreach events or activities, ranging from 3 to 19 outreach events each.</p>	<p>Interstate Trucking Academy hosted two presentations from solid waste firms with information about working in the garbage and recycling industry.</p>
 Participants reached	<p>Three grantees estimate that they reached over 80,000 total participants at outreach and education events.</p>	<p>Eco-School Network trained 45 parent volunteers and reached over 25,000 student participants.</p>
 Process improvements	<p>Seven grantees implemented process improvements at their facilities or in their programs.</p>	<p>Free Geek implemented 5S organization systems and Lean process improvements to increase efficiency in their electronics reuse and recycling programs.</p>
 COBID firms hired	<p>One grantee hired 3 COBID-certified firms for construction and electrical work.</p>	<p>City of Roses Disposal & Recycling spent over \$285,000 in grant and matching funds with COBID-certified firms.</p>
 Participants in skills training	<p>Two grantees provided skill building training.</p> <p>One grantee trained 21 individual participants and another trained five deconstruction firms.</p>	<p>Earth Advantage provided over 240 hours of deconstruction training to 5 firms and helped 3 firms meet the requirements to become certified by City of Portland for deconstruction</p>
 New partnerships	<p>Five grantees developed new partnerships, ranging from 1 to 24 partnerships per grantee.</p> <p>A total of 58 new partnerships were formed by grantees.</p>	<p>Earth Advantage partnered with five firms to deliver skill building training and consultation for a total of 240 hours.</p> <p>Oregon Food Bank developed 6 new grocery store donation partners, 8 new distribution partners and created 10 new free food markets.</p> <p>Eco-School Network built partnerships with 16 new Title 1 schools to participate in their waste prevention programs.</p>
 New jobs	<p>Three grantees created a total of sixteen new jobs.</p> <p>Three of the new jobs were paid for directly with grant funds.</p>	<p>Free Geek hired two receiving and recycling associates.</p> <p>City of Roses added 13 new jobs as an indirect result of their 2018 grant. The company expects to add 7 to 10 more jobs after completing their 2019 grant project.</p>
 Programs expanded	<p>Five grantees expanded their programs or service delivery.</p>	<p>Habitat for Humanity Portland Metro East expanded its donation pickup service into Gresham, Portland and Beaverton, and increased sales at its Gresham ReStore location.</p>
 Participants in racial equity training	<p>One grantee provided racial equity training to 12 participants.</p>	<p>Oregon Food Bank held a full-day training for its 12 Fresh Alliance program drivers.</p>

Table 3: Anticipated outputs of projects in progress (2019 and 2020 grants)

OUTPUT	RESULTS	EXAMPLES
 Equipment upgrades	<p>Sixteen grantees plan to upgrade equipment.</p>	<p>Salvage Works purchased equipment that will enable the company to expand its product line and use a wider range of reclaimed lumber.</p>
 Facility upgrades	<p>Seven grantees plan to upgrade their facilities.</p>	<p>Recology Oregon Compost will install aerated static pile mass bed composting systems at their Aumsville and North Plains facilities, increasing their capacity to process organic material.</p>
 Outreach events	<p>Eight grantees will hold virtual and in-person outreach and education events.</p>	<p>Repair PDX will host repair skill workshops and “Repair Café” events in addition to partnering with local nonprofits and public schools to teach youth sewing and technology repair skills.</p>
 Participants reached	<p>One grantee will conduct a variety of virtual and in-person outreach and education events.</p>	<p>Repair PDX will report participant data upon grant project completion.</p>
 Process improvements	<p>Seventeen grantees plan to improve processes at their facilities or in their programs.</p>	<p>University of Portland will pilot new technology to detect contamination and gather composition data for curbside recycling at the point of collection.</p>
 COBID firms hired	<p>Five grantees anticipate hiring COBID firms to complete their grant-funded projects.</p>	<p>Pioneer Recycling Services plans to hire a COBID-certified firm to complete installation work for the equipment upgrade.</p>
 Participants in skills training	<p>Seven grantees anticipate providing skill building training to employees or program participants.</p>	<p>Lovett Deconstruction will train a new crew of four employees to perform whole house deconstruction projects as well as deconstruction for large remodel projects.</p>
 New jobs	<p>Fifteen grantees anticipate creating a total of at least 23 new jobs.</p> <p>Nine of the new jobs will be paid for directly with grant funds.</p>	<p>ReBuilding Center hired two salvage specialists to conduct product research, merchandising, pricing, lumber processing and customer assistance.</p>
 New partnerships	<p>Six grantees will form new partnerships as part of their grant project.</p>	<p>Urban Gleaners plans to expand their food rescue program to an evening “second shift” in order to work with new donation partners and recipients.</p>
 Programs expanded	<p>Five grantees anticipate expanding their programs or service delivery.</p>	<p>Repair PDX plans to increase its outreach and culturally responsive services to reach diverse audiences, including youth experiencing homelessness.</p>
 Participants in racial equity training	<p>Seven grantees plan to provide racial equity training to staff.</p> <p>Four grantees plan to seek DEI consulting services to improve organizational equity practices.</p>	<p>Urban Gypsum plans to hire a consultant to perform an equity assessment and make recommendations to improve DEI policies and practices at their business.</p>

The above tables illustrate what the grantees did that is countable. The following sections address the impact these outputs are having on the environment, human health and racial equity, addressing the first two evaluation questions:

1. What impact did the program have on progress toward reducing waste and improving environmental and health impacts of products?
2. What impact did the program have on progress toward racial equity?

Environmental and human health impacts (evaluation question 1)

Ensuring that current and future generations enjoy clean air, water and land is a core value in the Regional Waste Plan.³ Many of the products we purchase, use and throw away have negative impacts on the environment and human health. These harms can occur at any stage in a product's life cycle, from the use of toxic chemicals to extract raw materials and manufacture goods, to release of emissions during transportation to market and disposal at the end of life. Products used by residents and businesses in the greater Portland area are responsible for 35 percent of the region's greenhouse gas emissions.⁴ Some products are also associated with emissions of fine particulates and carcinogens that are harmful to environmental and human health.

The I&I grant program's desired environmental and health outcomes are to preserve and expand the region's capacity to reduce the impacts of products at any stage of the life cycle, with particular emphasis on the end-of-life stage through waste prevention, reuse, recycling, composting and producing energy from waste.

The specific environmental and health outcomes of each grant are summarized in Appendix 5. The I&I grants with the most direct environmental and health impacts have been related to waste prevention and reuse (including reuse of products such as edible food, furniture, and electronics), and increased recycling from grant-funded equipment, infrastructure upgrades and process improvements.

The evaluation produced the following key findings:

Finding 1.1: The grants are advancing progress toward reducing impacts to the environment and human health.

Specifically, the grants are advancing the following Regional Waste Plan goals and actions:

Goal 8: Increase the reuse, repair and donation of materials and consumer products.

A total of 20 of the grants (approximately \$1.1 million of the \$8.7 million in overall funding) funded projects to provide more opportunities for people to reuse and repair products, or to donate reusable products instead of throwing them away. Extending the useful life of products decreases environmental and health impacts by preventing or delaying the purchase of new items and disposal of the used items, and all of the associated life cycle impacts.

Specific actions under Goal 8 in the RWP that are being advanced by grant-funded projects are listed below, with examples for each.

Action 8.1 Support efforts to recover and distribute surplus edible food.

An important subset of reuse projects are grants focused on food waste. Preventing food waste or reusing, composting or producing energy from it, is a high priority because when disposed in a

³ 2030 Regional Waste Plan, p. 44.

⁴ 2030 Regional Waste Plan, p. 5.

landfill food scraps become a significant emitter of greenhouse gases by generating methane. Projects that rescue and redistribute edible food have an important co-benefit of providing nutritious food to individuals in need, a significant percentage of whom are families of color.

Example: In 2019, grant funds provided Urban Gleaners with a refrigerated van and additional staffing, enabling this nonprofit organization to rescue more than 1 million additional pounds of nutritious, edible surplus food from local businesses and deliver it to food pantries and meal sites – a 19 percent increase over the prior year. The grant funded an experimental partnership with Door Dash to test a “closed loop” pilot, through which food would be rescued more efficiently through partnership with drivers already on the road. Urban Gleaners was awarded a second I&I grant to hire additional staff for a second shift to scale up its food rescue and redistribution operation.



Photo courtesy of Urban Gleaners

Action 8.2 Implement strategies to increase the salvage of building materials for reuse.

Deconstruction of buildings and selective salvage are highly effective strategies for reducing resource use and the greenhouse gas footprint from construction. Every building contains materials that can be removed or reduced during a remodel or complete removal. Deconstruction’s careful and slower hand removal of materials also reduces the neighborhood release of asbestos and lead from older buildings when compared with traditional “crunch-n-dump” demolition with heavy equipment. The combined output of the Metro region’s deconstruction contractors and used building material retailers, coupled with the City of Portland’s deconstruction requirements, have helped make building with used materials a mainstream activity.

Example: City Repair was awarded a grant in 2020 to develop a process and five demonstration projects to divert usable construction waste (mock-ups of building projects that are normally destined for landfill) in order to provide homes for people without them. The work will be done in partnership with community housing organizations. The lessons learned from the project will be incorporated into a training module for architects, contractors, builders, developers and reuse advocates to expand the network of people diverting additional mock-ups on an ongoing basis.

Example: Lovett Deconstruction is scaling up the company's deconstruction services with a new crew to deconstruct more homes every year, diverting thousands of cubic yards of materials from entering the waste stream. Lovett's expansion will create four new jobs, and the company has committed as part of the grant to leveraging its partnerships with community organizations to recruit and hire a diverse workforce and implement diversity and equity training for all staff.

Action 8.5 Invest in neighborhood-scale reuse and repair services and infrastructure

Reuse organizations are a key player in the regional garbage and recycling system. Hundreds of organizations in the greater Portland area are helping residents, businesses, schools and others extend the life of products by repairing and redistributing them. I&I grants are supporting reuse organizations to expand their collection and redistribution efforts into underserved areas, optimize processes, and develop new partnerships and programming.

Example: Free Geek, one of the few organizations focused on finding the best uses for discarded electronics, used its grant awarded in 2018 to hire new staff and purchase equipment to implement process improvements developed with Lean PDX. This enabled Free Geek to collect more donated electronic items and process them more quickly for reuse. This added capacity was especially necessary during the COVID-19 pandemic, when Free Geek experienced a surge in demand for low or no-cost computers for remote learning and work. Free Geek was awarded a 2020 I&I grant to host additional community collection events, focused on underserved communities, to bring in more items for reuse and recycling.



Photo courtesy of Angela Holm and Free Geek

Goal 15: Improve the systems for recovering recyclables, food scraps and yard debris to make them resilient to changing markets and evolving community needs

Recyclables are commodities that are sold to national and international markets. Recent upheavals in markets revealed significant need to both stabilize and modernize the Metro region’s recycling system. Much of the work in which Metro is engaged to address this is in the policy arena. However, I&I’s contribution is reflected in the grant program’s name, which includes both “investments” (equipment and facility upgrades to stabilize the system) and “innovations” (proofs-of-concept technology and approaches new to the region). The I&I grant program has funded both to help provide resilience and fill gaps to support more substantial system-wide modernization in coming years.

The grants funded through the pilot align with two strategies identified in the Regional Waste Plan to build a resilient system: Building capacity to process yard debris and food scraps locally, and investing in improvements at facilities that receive and sort recyclables.

Example: Grimm’s Fuel Company is modernizing its compost system to reduce odors and increase yard debris recycling capacity in order to continue to provide high quality, reasonably priced services to the region.

Example: Pioneer Recycling Services and Environmental Fibers International are implementing three innovative capital projects involving new technology to recover more materials and improve the quality of these commodities for recycling end markets. *(See case studies on pages 26 and 27)*



Photo courtesy of Pioneer Recycling Services

Example: Pride Recycling Company expanded the floor space in its transfer station to enable it to accept and transfer mixed residential yard debris and food waste, commercial food waste, and an increased amount of construction debris and other “dry” waste. The investments in food waste capacity will allow for better and more cost-effective services to residents and businesses in that portion of the region, and build resiliency into the system by adding a facility to the very small number of existing options.

Goal 9: Increase knowledge among community members about garbage, recycling and reuse services.

The I&I program funded several initiatives focused on waste reduction education and behavior change.

Example: A 2020 grant awarded to ROSE Community Development Corporation will support a pilot project to add food scrap bins and educational workshops on preventing food waste to residents in several of ROSE’s affordable housing communities, in partnership with community based organizations. This project will expand access to home composting for primarily BIPOC families. Rose CDC has committed to developing a case study summarizing the results of the project to inform local governments and other multifamily properties that may be considering implementing composting.

Example: Eco-School Network was awarded a grant in 2018 to train and support a cohort of parent leaders in 20 schools to assess current practices of managing cafeteria waste, and implement unique parent and student-led waste reduction initiatives. The cumulative impact of the projects resulted in more than 120 tons of avoided waste through prevention, reuse and recycling. Even more significantly, the projects built awareness and excitement for waste reduction among students, parents and teachers, which will have ongoing benefits beyond the grant.

Finding 1.2: The grants have prevented greenhouse gases and other harmful emissions, and those avoided emissions will grow as all projects are fully implemented.

The grants are contributing to reductions in harmful emissions from the use and disposal of products. Detail on the environmental and health impacts for the individual grants is in Appendix 5, which includes total dollar values of avoided emissions of nine impact categories, including climate change, acidification, carcinogens and particulates.

The impact summaries in Appendix 5 include avoided greenhouse gas (GHG) emissions for each grant, in metric tons, dollars and equivalent passenger vehicles and miles driven. **In sum, the completed projects resulted in a net GHG savings of 11,303 metric tons of CO₂ equivalents. For projects still in progress, anticipated GHG savings are 25,787 metric tons.** These impacts are primarily from waste prevention and recycling improvement projects.⁵

The case studies at the end of this section illustrate three grants that are on track to achieve significant environmental and health impacts through projects already implemented and/or in progress.

Finding 1.3: Consistent with the original intent of the program, the I&I grants focused primarily on “downstream” activities related to end-of life management through improvements to recycling, composting and reuse/ repair systems. The program did not address interventions in “upstream” stages of product life cycles such as design and manufacture.

Each stage of the product life cycle creates impacts on the environment. This includes “upstream” activities related to extraction of raw materials, manufacture, transportation and use of products, as

⁵ To be conservative, these numbers represent the lower range of the estimated emissions reductions. Not every grant is included; grants are excluded for projects that will not result in an increase of material recovery or where any environmental or health impacts could not be directly tied to the project.

well as “downstream” activities that focus on relative impacts at the end of useful life associated from reuse, recycling, composting and energy recovery.

The Regional Waste Plan utilizes a life cycle framework for informing the actions that Metro and local governments will take to reduce the impacts from making, using and discarding products.⁶ Interventions are possible at any stage in the product’s life cycle. For example, careful design that reduces virgin material use and reuses materials can reduce a product’s overall impacts.⁷

In alignment with the Regional Waste Plan, the I&I grant program encouraged proposals to address environmental and health impacts at any stage of product life cycles. However, from its inception Metro recognized that the I&I program would primarily be a tool to advance Regional Waste Plan goals related to downstream impacts. The majority of proposals Metro received during the pilot related to end-of-life management: recycling, composting and reuse/repair (including food waste rescue and redistribution). A couple of the program grants focused on waste prevention, such as Eco-School Network’s work to implement projects across schools to reduce cafeteria waste. Metro did not award any grants focused on reducing environmental or health impacts in the design, manufacture or purchasing of products (several of these types of proposals were received, but were not well-developed and not recommended for funding by the grant review committees).

This finding is not surprising. Policy approaches at the state, multi-state or national level are most likely to drive changes in raw material extraction, design and manufacturing processes. For the I&I program to contribute to reducing environmental and health impacts at the earlier stages of the product life cycle, the program would need a more focused effort to seek out potential applicants with smaller scale manufacturing businesses or integrated manufacturing and wholesale/retail operations. Research would be needed to better determine where these opportunities exist. There is no realistic scenario under which Metro would have enough funding to influence design and manufacturing processes at larger companies.

Finding 1.4: Energy recovery from waste was not a significant aspect of the pilot.

Energy recovery from waste is the conversion of discarded materials into usable heat, electricity or fuel through a variety of processes, including combustion, gasification, pyrolysis, anaerobic digestion and landfill gas recovery. Energy recovery is generally one of the least favored options for managing waste in terms of environmental benefits.⁸

Though energy recovery is included in the I&I grant program objectives it was not a significant part of the pilot. The grant program received a few of this type of proposal, and awarded only a single grant for an energy-from-waste project (for a feasibility study for small-scale boilers in several businesses across the region).

⁶ 2030 Regional Waste Plan, p. 11.

⁷ https://www.epa.gov/sites/production/files/2015-08/documents/sustainable_materials_management_the_road_ahead.pdf.

⁸ <https://www.oregon.gov/deq/FilterDocs/2050-SWHierarchy.pdf>.

Grantee Case Study: Denton Plastics

Family-owned and operated Denton Plastics has been recycling plastics in the Metro region for over 35 years, processing a broad spectrum of plastics. The company produces virgin and recycled content compounds and plastic resins, transforming waste into useful products and revenue.

Denton is one of a few companies in the greater Portland region that takes in materials from material recovery facilities and turns them into feedstock for other companies to transform into usable products. The company accepts waste plastics, cleans and sorts them, then grinds them into pellets or flakes. These end products are sent to other companies that manufacture them into new products such as plastic shampoo bottles.

Denton had not previously received a grant prior to applying for Investment and Innovation funding. Nicole Janssen, Denton's President, learned about the program through her involvement with Metro and DEQ over the years. She saw this as a great opportunity to expand into the residential post-consumer market, while reducing the risk presented from extreme fluctuations in the plastics markets that have been occurring in recent years.

Denton received two Investment and Innovation grants, both expanding the company's capacity to recycle existing materials more efficiently, as well as to process new types of materials.

Denton used its 2018 Investment and Innovation grant to purchase a piece of equipment called a "continuous melt filter" that enables processing of plastics contaminated with dry materials such as dirt or staples. The company already had one filter for its first extrusion line and knew that a second filter would significantly expand processing of more material in less time, and produce higher quality end products. It was not financially viable for the company to purchase a second filter without Metro's grant supporting half the cost.

"The [2018] grant enabled us to get a second extrusion line a lot sooner than we had planned which, in turn, doubled the amount of those types of materials we could put through our line."

Nicole Janssen, Denton Plastics

Denton received a second Investment and Innovation grant in 2019 to install an "Eco-Line," a series of pieces of equipment that will enable the company to receive, clean and process plastics contaminated with wet waste such as food, agricultural contaminants and labels. This proof-of-concept project will be the first plastics washing line in the region focused on post-consumer products. The COVID-19 pandemic has delayed this project, which is now scheduled for implementation in 2021.

In addition to bolstering the company's capacity, the grant projects benefit the region as a whole. By increasing both the types and amounts of plastic that Denton is able to process, these materials can be kept locally rather than transported out of state or overseas. ***"The biggest impact is that all of those materials were going overseas or out of state. The carbon footprint is hugely impacted by keeping those in state,"*** says Janssen.

Increased recycling also reduces the use of oil for creating new materials. As Janssen explains, ***"The more we can turn into recycled material and have people use the better, because it has less impact than using virgin material."***

Grantee Case Study: Pioneer Recycling Services

Pioneer Recycling Services operates a Material Recovery Facility (MRF) in Clackamas County. This facility utilizes an integrated sort system that processes residential and commercial commingled recyclables, as well as cardboard and several types of paper.

Investment and Innovation grants provided an opportunity for Pioneer to invest in rapidly evolving technology new to the Metro region. Pioneer received grants in 2018 and 2019 to share in the cost of proof-of-concept projects that involved adopting new technologies to test their application and effectiveness in improving sort processes and producing higher-grade bales of product for market. Investing in new and largely untested technology presents a significant financial risk for a company.

“Grant funding reduced the risk of engaging with new technology, which made it worth going forward.” Dave Claugus, Chief Operating Officer, Pioneer Recycling Services

In 2018, Pioneer purchased and installed two sorting robots for use on the container line. The application and effectiveness of robot sorters is largely untested, as there are only about 20 in use nationwide, and none are in the Metro region. Staff had no prior experience working with robots, so the learning curve was steep. Overall, the project found that the robots could sort commingled materials with similar speed and quality to what can be accomplished by human sorting, and could sort some materials a little better, but was not a “magic solution” to all sorting challenges.

The bigger impact from this project came from Pioneer volunteering to share its results and key learnings with direct competitors in greater Portland. Sharing the results from the use of first-generation robots can help other businesses determine whether to invest in this technology, and, as Claugus explains, can ***“start to move everybody forward in terms of improving or increasing the capabilities of our processing systems.”***

Pioneer’s 2019 grant-funded project was also a major investment in a new technology application. The company installed optical sorters on existing sort lines to remove contaminants (plastic, metal and trash) and produce higher-quality paper bales than human sorters can produce. If successful, this project will improve the marketability of paper by meeting stringent quality specifications.

The COVID-19 pandemic delayed this project by about two months. At the time of this case study report, the new equipment had been installed and has just begun operating. As with its 2018 grant, Pioneer has committed to sharing the results of the project with direct competitors.

This case study illustrates how grant funds can be used to promote the adoption of new, cutting-edge technology within the regional waste system. Metro’s financial support, combined with Pioneer’s substantial investments in new technology and willingness share the results with its competitors, encourages innovation that benefits both recyclers and the Metro region as a whole.

Grantee Case Study: Environmental Fibers International

Environmental Fibers International (EFI) Recycling is one of the region's largest material recovery facilities, processing multiple types of recyclable paper for sale to paper mills.

In 2019, EFI was awarded an Investment and Innovation grant for new equipment to enable them to capture the small remainders from the recycling stream that are currently sent to landfills. In a commingled system like in greater Portland, screens are used to separate materials. This screening process creates "unders," or residuals, which are the very small pieces that remain after sorting. Examples of unders include bits of shredded paper, small paper scraps, plastic pieces and small metals.

In Oregon, there is currently no process for capturing this material, particularly because there is minimal return on investment for doing so. For years, EFI had been considering ways in which it could effectively collect these materials for recycling, but the significant costs and research required were prohibitive. An Investment and Innovation grant provided the opportunity for EFI to move forward with an innovative design of a system that could capture and recycle unders.

"This Metro grant is the first significant monies that have been available to make it worth going after projects. The costs for developing this equipment—because there are always more research costs when it's the first one—are more expensive, and there's the risk of not knowing if it will work out. That shared risk [with Metro] really helped to motivate us to go for it." Jeff Murray, Director of Business Development, EFI

The COVID-19 pandemic resulted in a pause in the project because EFI had to redirect all efforts toward running its existing business safely. On the upside, this pause became an opportunity for its entire staff to come together to do more in-depth research into the challenge of capturing unders and to refine the original design plans for increased efficiencies.

The project is back on track and scheduled to be fully implemented in late 2021. EFI projects that the new technology will enable more than 65 percent of the unders to be recycled instead of ending up in landfills, which is not only an environmental benefit, but reduces the significant costs EFI currently incurs to dispose of these materials.

Due to the costs and risks involved, investments in proof-of concept projects like the one undertaken by EFI would not be possible without funding partnerships such as Metro's Investment and Innovation program.

"Without cost sharing, the margins are so slim that the returns on investment are prohibitive. The grant program to do the cost sharing is allowing us and others to move forward where the decision to move forward would not have even been considered without the grant." Mark Samuel, Plant Manager, EFI

Racial equity impacts (evaluation question 2)

Metro’s Strategic Plan to Advance Racial Equity Diversity and Inclusion emphasizes allocating resources in ways that advance racial equity.⁹ Goal 2 of the Regional Waste Plan further directs Metro to “Utilize grant programs to invest in businesses and nonprofit organizations to strengthen regional efforts around reducing waste, making better use of the waste that is produced and helping foster economic opportunities for communities of color and others who have historically been left out of the garbage and recycling system.”

The I&I program is supporting implementation of Goal 2 by:

- Increasing economic benefits for historically marginalized communities in the regional garbage and recycling system
- Increasing positive benefits and reducing negative impacts for communities of color or other historically marginalized groups
- Increasing the capacity of businesses and organizations to advance racial equity.

The specific racial equity outcomes of each grant are summarized in Appendix 6.

The evaluation produced the following key findings:

Finding 2.1: The I&I program is advancing specific Regional Waste Plan goals and actions related to racial equity.

To varying degrees, most of the grants demonstrated equity impacts (or, for grants still in progress, are anticipated to once the projects are fully implemented), as summarized in Appendix 6. Two Regional Waste Plan actions in particular are being advanced by I&I grant funding:

RWP Action 2.3 (directs Metro to use grant programs to increase the share of solid waste spending that goes to locally owned, BIPOC-owned and women-owned businesses and community organizations).

Over the course of the pilot, Metro awarded approximately \$867,000 in grants to a Black-owned material recovery facility (City of Roses, featured in the case study on page 35). Additionally, Metro

Racial equity: Race can no longer be used to predict life outcomes and outcomes for all groups are improved.

Strategic Plan to Advance Racial Equity, Diversity and Inclusion, Metro 2016

“Oregon has a deep and painful history of racial inequity going back to its founding and we obviously are nowhere near overcoming that. It’s extreme in the building trades, based on my own experience working for a small contractor and being on sites that are not bastions of diversity, so I think there’s a really long way to go in that regard.”

Jordan Jordan, Senior Consultant, Earth Advantage (I&I grant recipient)

⁹ Metro Strategic Plan to Advance Racial Equity, Diversity and Inclusion, June 2016, Goal E, p. 45.

awarded a total of \$464,000 to six community organizations that primarily serve communities of color or other historically marginalized groups.

Example: Hygiene For All received a grant in 2020 to launch a pilot program to enable people experiencing homelessness to trade soiled clothing and bedding for clean items through a clothing and bedding exchange. St. Andrew's Presbyterian Church volunteers will retrieve dirty items, launder them offsite, and return clean items to a hub where paid houseless ambassadors will promote their reuse among peers. This program will prevent approximately 600 to 1,200 pounds of bedding and other goods from being added to the waste stream each week. The grant will demonstrate the environmental, human health and equity benefits of facilitating houseless residents' reuse of clothing that would otherwise be discarded.

RWP Action 8.1 (support efforts to ensure that surplus edible food is made available to individuals experiencing hunger, rather than being discarded as waste).

I&I grants awarded to Urban Gleaners (2018 and 2019, described on page 19) and Oregon Food Bank (2018) are directly benefitting communities of color, which disproportionately experience a lack of access to nutritious, affordable food. According to Urban Gleaners, over 65 percent of their program participants identify as people of color, and many do not speak or read English. The 2018 grants to Oregon Food Bank and Urban Gleaners contributed to approximately 500,000 meals provided to families in need to date, and the 2019 grant to Urban Gleaners that is still underway is supporting additional rescue and redistribution of surplus food.

Other racial equity outcomes that align with the Regional Waste Plan and Metro's Strategic Plan to Advance Racial Equity, Diversity and Inclusion include:

New opportunities to participate in the garbage and recycling system, including workforce development and career pathways.

Grant funds are generating new jobs, capacity building and professional advancement opportunities in the solid waste industry. Reporting requirements for grantees include information on the demographics and benefits offered to new hires.

Example: As described in more detail in the case study on page 35, the City of Roses Disposal & Recycling's facility improvements funded by a 2019 grant will result in an estimated 7 to 10 new jobs. This is in addition to the 13 new jobs associated with the 2018 grant. City of Roses actively recruits from underserved communities for its jobs and professional advancement opportunities.



Photo courtesy of City of Roses Disposal & Recycling

Example: Earth Advantage and Re-Use Consulting received grants in 2018 and 2020 to provide support and additional training to grow the capacity of BIPOC-owned and women-owned deconstruction contractors to be more competitive in securing deconstruction jobs in the Metro region. (This effort is featured in the case study on page 36).



Photo courtesy of Earth Advantage

Example: Community Cycling Center's 2020 grant includes expanding its internship program to intentionally recruit from communities of color to provide paid opportunities for developing transferrable and essential workplace skills through bicycle reuse and repair services.

New partnerships to expand service delivery to historically marginalized communities.

Multiple grants have been awarded to expand opportunities for accessing repair and reuse products, services and education, neighborhood collection events for hard-to-recycle materials, and school-based education on waste prevention.

Example: With its grant awarded in 2019, Repair PDX is developing new community partnerships with local public schools and community organizations such as the ReBuilding Center to focus repair skills trainings and apprenticeships on underserved communities, including teaching sewing and technology repair to resilient youth experiencing homelessness.

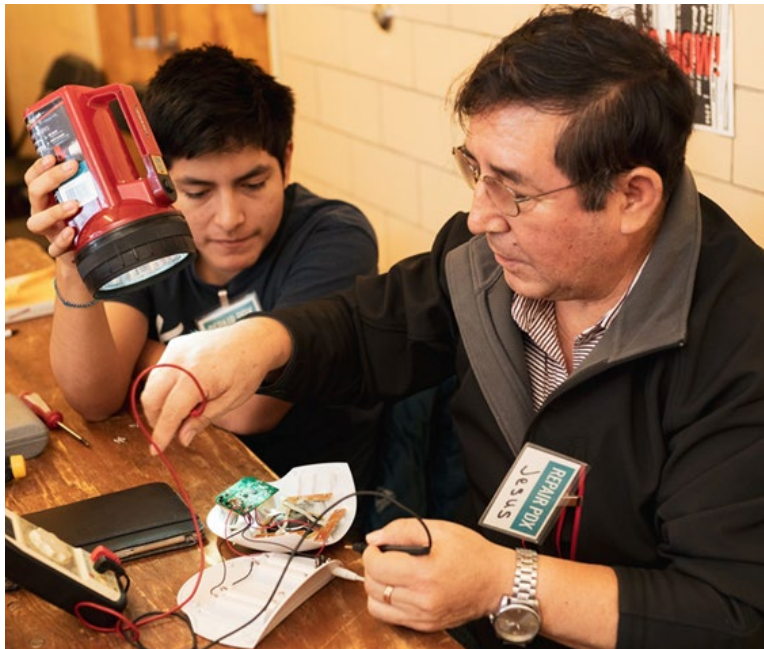


Photo courtesy of Jesus and Jesse Fonseca and Repair PDX

Example: James' Neighborhood Recycling Service will use its 2020 grant to expand its collection program for plastics that are not recycled at home or work, and will hold at least two collection events per month during the grant period. It is developing partnerships with organizations such as Trash for Peace and the Latino Master Recycler group Promotores Ambientales to provide services directly to communities of color and secure locations for the collection events in underserved neighborhoods.

Efforts to advance equity, including new diversity/inclusion policies and equity trainings, and businesses and organizations

Several grants include activities and evaluation metrics aimed at building capacity of grant recipients to advance racial equity. These include direct contracts with equity consultants for equity

assessments, and development of organizational policies and procedures that support diverse workforces and equitable work environments.

Example: GreenWay Recycling and Urban Gypsum were awarded grants in 2019 that include working with Constructing Hope on racial equity assessments of organizational practices. Another grantee, Urban Gleaners, is undergoing a process in collaboration with Resolutions NW to be more culturally responsive to the diverse populations experiencing food insecurity that it serves. It has created an Ambassador Board that includes people of color as their founding members who will apply an equity lens to operations and outreach.

Two case studies at the end of this section highlight a capital grant and a program grant with particularly strong equity outcomes.

Finding 2.2: Applicant responses to the I&I program's equity objectives and criteria varied significantly, with nonprofit applicants generally demonstrating stronger equity outcomes than private companies applying for capital grants.

Each year of the pilot, program staff made concerted efforts to support grantees in developing and implementing activities to advance racial equity. After the first year, the I&I program developed more resources for applicants to think through potential and anticipated equity outcomes of their grant project ideas. These included a list of prompts and examples to help applicants identify ways to incorporate equity into their projects and organizational practices. I&I staff offered one-on-one time with all applicants to identify opportunities to incorporate advancing racial equity into grant proposals and final scopes of work.

This additional support resulted in an improvement in the quality of responses relating to equity in subsequent grant cycles, though the extent to which racial equity was a significant element of projects still varied widely. I&I applicants ranged in their understanding and implementation of racial equity principles in their work. In general, equity was a more focused priority in nonprofit grant applications, and less so in for-profit capital grant applications (with a few notable exceptions). Some applicants did not understand what Metro meant by equity in the context of the I&I program and why it matters, and on the other end of the spectrum, some applicants already had equity as a core part of their missions and practices. Many fell somewhere in the middle.

Some of the applicants, particularly for capital grants, have a long way to go to operationalizing racial equity. However, the I&I grants helped build greater awareness of racial equity, particularly among providers of recycling services. This is consistent with one of the RWP guiding principles¹⁰ and the spirit of **RWP Action 11.1**, which is intended to develop the equity literacy of Metro and its public and private sector partners. For example, a recipient of two I&I capital grants reported to I&I

¹⁰ 2030 Regional Waste Plan p. 45. "Committing to building a greater awareness of equity among providers of garbage and recycling services."

staff that the grants encouraged the company's leadership to explore what racial equity means specifically for its business and what it can do to advance equity. As a start, the company committed to hiring COVID-certified contractors for the electrical installation for the grant-funded equipment. This grantee expressed appreciation to Metro for inspiring its internal equity inquiry.

As an area for improvement for future I&I grants, the program should further identify and develop opportunities for the program to advance racial equity specifically within the private sector (particularly for capital grants). Metro's Racial Equity Framework provides a process for applying an equity lens to decisions, implementation plans and accountability measures, and this tool should be used to further refine equity outcomes and evaluation metrics.

Finding 2.3: The grant review committees invested significant effort in applying the program's racial equity objectives and criteria to proposals, and proposed racial equity outcomes were major components of funding recommendations.

Committee deliberations centered racial equity outcomes, though at some points members struggled with how to apply the equity criteria across different projects and applicant types. (The grant review criteria are in Appendix 7). In the first year, the community members on the committee took a larger role in advocating for racial equity in deliberations than government and business representatives. Seeing that dynamic, I&I staff spent more time in orienting the committee on Metro's racial equity strategy and how the I&I program seeks to advance the equity goals of the Regional Waste Plan. Subsequently, all committee members became more engaged in meaningful deliberations in applying the equity criteria to each proposal.

Looking forward, opportunities exist for I&I staff to work with other grant programs at Metro to develop shared trainings for committee members to develop a deeper understanding of Metro's racial equity strategy and approaches.

Finding 2.4: The program conducted outreach to organizations beyond those working in the reuse, recycling and garbage sectors, but more could be done to encourage applications from organizations directly serving communities of color or other underserved communities.

I&I staff identified and reached out to organizations beyond the traditional players in the reuse, recycling and garbage sectors or that already work with Metro in other capacities. Particularly in the third year of the pilot, I&I staff made a special effort to leverage relationships held by other Metro staff and by local government partners to target outreach to organizations serving communities of color. As a result, the program awarded grants to organizations directly serving communities of color, including Rose Community Development, Corporation, Hygiene For All and Professional Business Development Group. Through open communication during the application and award process, these grants are building new relationships and trust.

In the future, additional work would need to be done to create the conditions for more organizations focused directly on improving conditions for underserved communities to apply for an I&I grant. Developing good grants that center racial equity takes time and intentionality, and a focus on building and developing relationships—especially when seeking to connect with organizations and businesses with which Metro does not have pre-existing relationships. Those efforts require dedicated and consistent staff capacity, and program staff struggled with capacity throughout the pilot. I&I staff has identified a number of specific steps for encouraging new applicants and removing barriers to participation should the program continue.

Grantee Case Study: City of Roses Disposal & Recycling

City of Roses Disposal & Recycling (COR) is a family-owned materials recovery facility that primarily handles construction and demolition debris.

As a Black-owned business, one of the very few in the field of waste management, access to capital presents a significant challenge for innovation and expansion. CEO Alando Simpson explains, ***“One of the biggest barriers to financing as BIPOC contractors or businesses, specifically Black-owned businesses, is that we don’t get the same treatment as other folks when it comes to capital. And being a unicorn in this industry isn’t looked at so well either, which leads to multiple barriers.”***

A grant to COR to improve its facility in Northeast Portland furthered the Investment and Innovation goal of fostering economic opportunities for historically marginalized communities. By removing the barriers to financing, a 2018 grant provided seed money to enable COR to make substantial infrastructure expansions and updates to its facility in east Portland. These included the addition of designated areas for secondary processing, as well as storage, mechanics and specialty processing areas. COR also made environmental improvements to the site including asbestos removal and stormwater modifications to protect adjacent wetlands. Simpson explains, ***“We’ve been working to make sure that we’re good stewards of the environment while we’re operating in this community as a waste facility.”***

The completed improvements resulted in increased processing capacity, which has attracted additional companies to bring materials to COR for recycling. As a result of the project, incoming dry waste increased by 29 percent, with a 58 percent recycling rate.

COR’s business expansion associated with the 2018 I&I grant resulted in job growth as well, yielding 13 new living wage jobs with benefits. New hires included both primary and auxiliary jobs, such as mechanics, welders and administrative staff. As a registered benefit corporation (B-corp), COR has a history of expressing diversity, equity and inclusion values in hiring, employment and management practices. For example, COR regularly provides jobs and professional advancement opportunities for underserved employees who are re-entering the workforce after a period of incarceration, substance abuse recovery, or prolonged unemployment.

Simpson describes how Metro’s Investment and Innovation grant program supports these initiatives: ***“There was alignment in looking at how innovative approaches in the waste industry could be a catalyst and have broader and bigger impacts for underserved communities and populations.”***

COR received a second capital grant in 2019 to install an elevated sort line to replace the existing floor sort process, which will increase dry waste recovery and improve working conditions. COVID-19 delayed the project, and the project is currently in the design phase. A critical piece of design is ensuring COR can safely operate the new line during the pandemic.

Through leveraging Metro funds with its own investments, COR demonstrated its commitment to turn waste into valuable commodities, which yielded community-wide benefits by improving an industrial site, reducing the amount of materials going to landfills, and creating jobs and revenue in underserved communities that need them the most.

Grantee Case Study: Earth Advantage

Earth Advantage is a nonprofit organization that works with partners across the region to advance building industry practices toward greater sustainability. One of Earth Advantage's primary approaches is developing and providing training to industry professionals, including connecting disadvantaged communities with career opportunities in the building trades and sustainability initiatives.

An Investment and Innovation grant enabled Earth Advantage, in partnership with Re-Use Consulting and the Portland Metropolitan Home Builders Association, to provide targeted capacity-building services to BIPOC-owned and employed deconstruction firms to help them participate in the economic benefits of the local deconstruction industry.

Publicly-funded initiatives like I&I encourage diversification of the contractor base within the building trades and equitable hiring practices—those are really important steps for addressing what remain deep inequities. Jordan Jordan, Senior Consultant, Earth Advantage

Deconstruction and selective salvage are effective strategies for reducing environmental impacts from construction projects. Instead of demolishing buildings and tossing materials into a landfill, deconstruction firms are trained to pull buildings apart piece by piece to assess what materials are valuable for reuse, such as lumber and fixtures. In addition to maximizing sustainable reuse, deconstruction's careful hand removal of materials reduces the release into neighborhoods of asbestos and lead from older buildings when compared with traditional demolition practices with heavy equipment.

The City of Portland adopted an ordinance that requires deconstruction when a building built before 1940 is completely removed. This ordinance has resulted in over 300 deconstruction projects since 2016. However, while the region's deconstruction projects are increasing, BIPOC-owned and employed firms have struggled to compete for these jobs.

In response, Earth Advantage expanded its training programs to grow the capacity of diverse contractors to participate in the deconstruction industry. It provided focused support to five new entrants to deconstruction. Of those, four were BIPOC-owned and the fifth has a strong commitment to providing job opportunities to those with employment challenges. As Jordan shares, ***"We saw a really clear opportunity to not only advance in a meaningful way the local deconstruction contractor base, but to do so in a way that creates opportunities for women-owned firms, BIPOC-owned firms, and firms owned and representing folks that are traditionally underrepresented in the building trades."***

Grant funding allowed Earth Advantage and project partners to provide technical support for the training participants to earn City of Portland deconstruction contractor certification. In addition, Earth Advantage provided participants with on-the-job training on competitive bidding, efficient project and materials management, and preparing commercial and residential tenant spaces for remodel. As a result, these firms can now successfully compete for deconstruction projects, which provide direct economic benefits along with the environmental benefits associated with keeping building materials available for reuse.

PROCESS EVALUATION

The evaluation explored two aspects of I&I program implementation: (1) outreach to potential applicants and the effectiveness of the grant review committees, and (2) the resources allocated to administer the program. The project team used the following data to develop the findings related to these evaluation questions: the outreach efforts made over the three-year pilot and solicitation responses (grant applications), interviews with Metro staff and review committee members, and case study interviews with grant recipients.

Effectiveness of outreach and grant selection (evaluation question 3)

Finding 3.1: The I&I program was effective in soliciting applications, and additional opportunities exist for improving outreach.

Each grant cycle, the total dollar value of the grant applications exceeded available funding, and the applicant pool grew over time as awareness of the grant program spread. Over the course of the pilot, Metro received 146 proposals totaling approximately \$30.5 million for the \$9.5 million available (though not all of the received proposals were well aligned with the program or well developed).

To promote the program and solicit proposals, I&I staff initially focused outreach on waste-related businesses (e.g., material recovery facilities, compost facilities, small businesses in the deconstruction sector), as well as nonprofit organizations involved in waste prevention and reuse/repair. By the third year of the pilot, the I&I program “interested parties” list had grown to 706 individuals. These include representatives of businesses, organizations, and local and state government agencies. In addition to mass outreach to the interested parties list, the pilot promoted program details through the I&I program website,¹¹ in Metro News stories and on Metro’s social media platforms. Each grant cycle, I&I staff provided multiple voluntary information sessions for potential applicants to learn about the program and ask questions.

In addition, during each funding round I&I staff conducted targeted direct outreach to nonprofit organizations to grow awareness of the program and offer opportunities to discuss proposal concepts. These time-intensive efforts were limited due to staff capacity.

More can be done to continue to bring in new applicants—both companies that could have the next great idea for innovations in waste reduction or making better use of discarded materials, and organizations serving communities of color to expand opportunities and access to services. This outreach takes time, sustained effort and technical support, so it would require dedicated staff capacity.

¹¹ <https://www.oregonmetro.gov/tools-partners/grants-and-resources/investment-and-innovation-grants>.

An assessment of who did not apply is beyond the scope and capacity of this evaluation, but would be worth conducting if the I&I program is to continue.

Finding 3.2: The grant award criteria were appropriately broad for the pilot phase, but should be further refined if the program continues.

The grant award criteria provided the framework against which reviewers evaluated proposals. The criteria focused on environmental and equity impacts, project planning and readiness, and applicant capability. With each grant cycle the program team further refined the criteria based on lessons learned from the previous grant cycle. The grant review committee members applied the criteria while independently reviewing proposals and then refined the funding recommendations in group deliberations. The most recent version of the capital grant criteria (2019) and program grant criteria (2020) are in Appendix 7.

Having broad grant criteria was especially useful for the pilot phase, as it enabled Metro to see a range of ways that applicants proposed meeting the program’s waste reduction and equity goals. If the program continues beyond the pilot phase, further refinements of the criteria will be necessary to reflect the specific environmental and equity outcomes targeted by the program. This could include adjusting the weighting of criteria to further clarify for applicants and reviewers the relative importance of each criterion.

Finding 3.3: The grant review committees and teams served an essential purpose and functioned as intended, but all review bodies should include community representatives.

Over the pilot, five separate bodies developed the funding recommendations:

- Year 1 (2018): A single review committee for *both capital and program grants*
- Year 2 (2019): A grant review committee + one technical work group for *capital grants*
A grant review team (all internal) for *program grants*
- Year 3 (2020): A grant review team (mostly internal) for *program grants*
(No capital grants in 2020)

These review bodies all functioned as intended, and each was critical for selecting the grants. Members evaluated proposals against the grant criteria and applied their individual expertise to develop funding recommendations.

The capital committees included representatives from government, a non-solid waste business, community, a Metro Councilor and I&I program staff. The external members were invited by program staff (after soliciting recommendations from colleagues in WPES). Members needed to have at least a basic understanding of the garbage and recycling system and racial equity principles.

In accordance with WPES equity principles, the non-governmental representatives were compensated for their committee work. For capital grants in the year 2 cycle, staff convened a separate technical work group to bring extra subject matter expertise to proposals that fell within that year's recycling infrastructure improvements focus area. This work group consisted of local government representatives and was tasked with providing recommendations to the main committee. The committee reported that the technical work group's input on more complex projects provided them with the required context to feel confident in making funding recommendations.

I&I staff observed that the grant review bodies reviewed and scored proposals effectively, asked thoughtful questions and wrestled with difficult decisions to arrive at funding recommendations—all but two of which were accepted by WPES leadership over three years. At the proposal review meetings, the members were enthusiastic and respectful in their discussions, challenged each other, and seemed to avoid "groupthink." In post-process surveys, committee members reported they understood the I&I program goals and objectives, and found the proposal review process to be effective for determining final funding recommendations. The committee found the meetings to be well facilitated and inclusive.

The evaluation revealed an area for improvement for future I&I cycles: The program grant review teams in years 2 and 3 included minimal community involvement due to limits on staff capacity. In year 2, I&I staff could not adequately facilitate two external committees (program and capital grants) plus a technical work group supporting capital grant review. However, equity best practices include having diverse community members involved in funding decisions to ensure the intended outcomes truly benefit the community. To bring some community perspective into the process of awarding the program grants, I&I staff invited several external organizations and government partners to help shape the grant criteria. In year 3, a community member with strong expertise in equity served on the program grant review team.

If the I&I program is to continue, all proposal review bodies should include community members. The program should consider offering committee membership by application to broaden the voices at the table beyond individuals with existing relationships with Metro. Balancing the need for technical expertise in the garbage and recycling system and community representation will be an ongoing challenge, but the second year experiment with a technical work group advising the larger committee provided a strong model for how to support committee members with varied levels of technical expertise.

Adequacy of inputs to implement the program (evaluation question 4)

The I&I pilot program varied significantly in annual grant budgets, from \$3 million in the first year, to \$6 million in the second year and \$500,000 in the third year. The lack of consistency in the program budget and basic program structure (i.e. maximum grant sizes and proposal types) was a strain on internal resources as staff needed to make significant changes to program materials and processes each year of the pilot. The program demonstrated adaptability and continuous improvement based on lessons learned from each prior grant cycle.

Finding 4.1: The amount of personnel resources allocated to the I&I program were inadequate, particularly at the peak funding level of \$6 million in year 2.

The data in Table 4 below reflects the personnel allocated to the I&I program at its peak during the second year of the pilot. Some of these inputs proved to be inadequate for a grant program of I&I’s size and complexity.

Table 4. Personnel time spent on I&I in 2019 (peak program size)

Program need	Department staff input	Time spent on program (approximately)	Adequate?
Program management	WPES	1.0 FTE Senior Solid Waste Planner	Yes
Program management support	WPES	0.5 FTE “on loan”	Yes (but temporary support)
Subject matter expert input	WPES	Program Director = 204 hours	Yes
	WPES	Senior Solid Waste Planner = 109 hours	Yes
	WPES	Other staff = 30 hours	Yes
Review of financial materials in proposals	FRS*	Financial Analyst = 20 hours	Yes
Review of grant agreements and legal advice	OMA**	Senior Attorney = 95 hours	Yes
Program administration	WPES	0.25 FTE Administrative Specialist III (Jan. to Oct. 2019); increased to 0.75 FTE (Nov. to Dec. 2019)	No
Contract and payment processing	FRS	Assistant Management Analyst=30 hours; Senior Management Analyst=40	No
News stories and communication materials development	Communications	Senior Content Strategist = 10 hours	No

*Finance and Regulatory Services

**Office of Metro Attorney

Several key factors contribute to the need for additional capacity for the program: (1) The program became more demanding after the first year, with existing grants with 12- to 24-month terms to be managed on top of new grant review/award cycles; (2) the capital grants in particular are complex and require significant due diligence, both at the application stage and over the life of the grants; and (3) for the program's equity goals to be realized, staff needs adequate time and focused attention to develop specific equity outcomes and supporting tools, and to develop and nurture relationships with community organizations.

During the pilot the program strained to effectively handle the following ongoing priority needs:

- Comprehensive review and input by Metro staff subject matter experts on program focus areas, program exclusions and review criteria;
- Recruitment, onboarding and support of external review committee members, particularly from the community;
- Due diligence review of complex capital grant proposals to help assess the reasonableness and completeness of funding requests, project plans and budgets;
- Development of more granular scopes of work and performance measures for each grant that align with Regional Waste Plan indicators;
- Compliance monitoring of grants and financial records (including site visits of all grants);
- Ongoing outreach and relationship-building to better serve communities of color with the program;
- Ongoing program evaluation and adaptive management;
- FRS processing of contracts, contract amendments and invoices, and completing end-of-year reconciliation of budgets to expenses.

A minimum of three full-time staff would be needed to effectively administer the I&I grant program if it were continue as a multi-year program with an annual budget of \$6 million and in a format similar to the pilot period. This would include an overall program manager who would also serve as lead on the capital grants, a lead for the program grants, and a program assistant to support both capital and program grant solicitations and ongoing grant management.

If the program were to continue at the \$3 million per year funding level, it would require a minimum of two full-time staff (program manager and program assistant). Under either funding scenario, the program would require the continuing participation of WPES subject matter experts.

Finding 4.2: The materials and services resources allocated to the program were adequate; however, more effective contact/relationship and grant management tools should be explored.

Table 5 below summarizes the materials and services used by the program at its peak demand in 2019. These include software to manage contacts and grants (applications, invoices, reports, etc.), stipends and miscellaneous costs for proposal review meetings, and third-party review of capital grant applicants' financial health. These inputs were generally adequate.

Table 5. Materials and services for I&I in 2019

Program need	Input	Cost	Adequate?
Financial reviews of capital grants	CPA firm	\$5,200	Yes
Grant management software	ZoomGrants license	\$4,400	Yes
Stipends for grant review committee community members	Stipends for 4 members	\$12,000	Yes
Grant review committee meeting costs	Food/beverage	\$500	Yes
Contact database	Smartsheet license	\$348	Yes
TOTAL		\$22,448	

While reasonable in cost, the contact/relationship software (Smartsheet) and grant management software (ZoomGrants). Smartsheet is an ineffective way to track and map contacts and communications related to the program. A customer relationship management (CRM) tool would be a far more effective tool for managing the program's relationships and interactions. The 2021-22 proposed WPES budget includes funding for a CRM tool that would serve as a pilot for all of Metro.

ZoomGrants is the primary grant management software used across Metro for grant programs. It proved to be adequate for the I&I application phase and post-award invoicing and reporting. However, it is not a comprehensive grant management tool and demonstrated significant shortcomings throughout the pilot. The program would benefit from a grant management tool that offers project management functions to track engagements with grant recipients and automate task reminders.

Finding 4.3: The I&I program would benefit from additional support from agency-wide services, particularly the Communications department and central Diversity, Equity and Inclusion program.

Metro's Communications department and Diversity, Equity and Inclusions program provided support to I&I at various points during the pilot. For Communications, this included reviewing website updates and news stories drafted by I&I staff (during year 1, Communications was more involved in helping plan and conduct internal and external communications; that level of support ended after the first year of the pilot because of other demands on Communications staff time). The DEI program provided consultative input as needs arose, such as by advising on specific grant evaluation criteria pertaining to racial equity.

The I&I program would be able to more significantly advance program objectives by having more consistent and ongoing support from these two teams, particularly given the substantial ongoing communications needs and racial equity goals:

- Key areas for Communications involvement: assistance with annual planning for effectively marketing the program, development of stories to promote grant successes, and transcreation of materials into non-English languages.
- Key areas for Diversity, Equity and Inclusion program involvement: assistance in developing equity tools and trainings for applicants and grantees (in conjunction with other Metro grant programs), ongoing evaluation and refinement of the program's DEI requirements and criteria, and identification of ways that the program can be more accessible and inclusive.

SUMMARY SUCCESSES AND CHALLENGES

The evaluation revealed a number of successes and challenges of the I&I pilot. Many are noted in the findings above and the most significant are summarized below.

Primary successes

1. Advancement of Regional Waste Plan goals

The I&I program is advancing environmental and health goals of the Regional Waste Plan by:

- Fostering the implementation of new or expanded repair and reuse programs, edible food rescue and donation, and salvage and resale of construction materials. [Goal 8]
- Increasing knowledge among community members and encouraging behavior change to reduce waste through hands-on education and outreach. [Goal 9]
- Strengthening and expanding the systems for recovering recyclables, food scraps and yard debris to make them resilient to changing markets and evolving community needs. [Goal 15]

Additionally, the I&I program is advancing the Regional Waste Plan's equity principles by funding:

- Local BIPOC-owned and women-owned businesses and community organizations.
- Efforts to expand the amount of surplus edible food that is recovered and donated to food-insecure residents of the greater Portland area.
- New opportunities to participate in the garbage and recycling system, such as workforce development and career pathways.
- New partnerships to expand service delivery to historically marginalized communities.
- Organizational efforts to advance equity, including new diversity/inclusion policies and equity trainings.

2. Using public funding to leverage private investment

At full implementation, the grants will leverage over \$18 million in grantee contributions to the projects. Case study interviews and grant reports reveal that for some of the grants—particularly large capital investments—the projects would not have been possible without the I&I grants. This is especially true for expensive projects with new technology or experimental applications, and is also true for new and expanded programming of nonprofit organizations.

3. Improved relationships

The I&I grants provided a vehicle through which to build trust between Metro and a range of businesses and nonprofit organizations working on reducing waste.

The following quotes from case study interviews illustrate the good will built through the I&I program:

- “It felt like it was something new, creative, transformative, outside-the-box compared to most government-issued grant programs.”
- “The markets have been very strange over the last 5-8 years when it comes to recycling and the overseas market, and we’re obviously domestic, so that’s what really sparked my interest. Metro really reaching out to me and explaining more about what these programs could do when they were starting to form it, which, in turn, made me apply for the grant in the first place.”
- “The grant is the difference to allow you to jump in and get started sooner rather than later.”
- “Everything worked out well because everyone was willing to work together to make it happen.”
- “[I&I staff] moved [Metro] to help us save \$30,000. It was an outstanding example of their performance and their organization’s willingness to actively help our project be successful.”

Primary challenges

Several major challenges emerged during the I&I pilot program:

1. Tension between waste reduction and equity goals

Because the grants are solid waste fund dollars, the projects must demonstrate a reduction in waste or strategies for making better use of waste. At the same time, the program sought to advance racial equity, and both goals were elevated as core to successful proposals. However, with some projects—particularly those focused on capital investments in equipment and site improvements—it was challenging for applicants and Metro to identify significant equity components.

2. Inadequate program management resources

As noted in detail above, throughout the pilot the program was under-resourced for its size and complexity. This was especially true when the program launched very quickly in Year 1 and then when it grew from a \$3 million to \$6 million in Year 2.

3. COVID-19 pandemic

The third year of the pilot presented a new and unforeseeable challenge: a global pandemic. COVID-19 hit shortly after the award of the 2019 grants and impacted the ability of almost all of those grantees to implement projects as planned. The projects have experienced delays and many grants have required extensions, with some of the larger 2019 capital grants now scheduled for completion into 2022.

Opportunities for future impact (evaluation question 5)

The final evaluation question informs whether there is a continuing need for Metro to invest in private sector waste reduction efforts and, if so, whether the program should continue with its broad scope or be more narrowly tailored.

Interviews of select grant recipients and survey responses shed light on whether various program stakeholders think the Investment and Innovation program should continue. All five of the grant recipients interviewed for case studies for this evaluation strongly support continuing the program, with specific suggestions for improvement. Their comments included:

- “I think it is a really good use of public dollars to advance those stated priorities that Metro set.”
- “With the new Oregon plan for recycling initiatives, I’m hoping we’re going to get new legislation next year, and if we do, some of that money will be coming through in some way, and needs to be distributed. I suggested that some of it needs to go through this program. . . You’ve got to have a proven program to start off with and this one seems like a good one.”
- “This is one of the best things Metro has done for the industry to help make improvements.”

The survey yielded 42 responses from representatives of private companies, government agencies, nonprofit organizations and individuals not otherwise affiliated, but who intersect with the work of Metro’s WPES department or self-identified as interested in the I&I program.

Ninety-three percent of respondents that say the program adds value and should continue. Some survey respondents provided optional, open-ended feedback at the end of the survey. The majority of comments were positive, including:

- “I think this is a great program and should continue to support efforts to reduce waste and provide opportunities for community groups to better our communities.”
- “The wide reach of the grant allows for creativity, new ways of solving existing problems that one may normally not think of.”
- “I applied for the grant this year. I think the program is important to our community in terms of the environment and providing job opportunities. As a culture we have to change our consumption habits if we want to continue to thrive. I think the program helps support a new approach to waste management, consumerism, etc. Thank you for the opportunity!”
- “Keep up the great work!”

Survey respondents had several suggestions for programmatic changes, including:

- “There is so much need in the nonprofit community, where community benefit (as opposed to profit) is the mission. For-profits have significantly higher access to capital - focusing on nonprofits, especially those that reduce impacts for BIPOC communities and/or focus on upstream results, would multiply the impact of your funding.”
- “Let’s also be looking for key infrastructure investments outside recycling, such as composting systems, food waste, etc. Still plenty of low-hanging fruit type of investment to make. We have a dearth of capital funding.”
- “I would also like to suggest not funding projects from the same agency/business/nonprofit if they have already received such a grant in the past. Spread the love!”
- “I also wish there were criteria giving points for research combined with implementation (applied research), rather than capital equipment purchases and implementation only. This would definitely enhance the innovation component of the grant. Currently, it seems primarily an investment grant. Focusing upstream would be a great step forward. Downstream focus should be on building up the local remanufacturing infrastructure, processing, recycling, repairing, and manufacturing recycled goods locally.”
- “Include higher education institutions as eligible applicants and include a focus on applied research.”

OPTIONS FOR THE INVESTMENT AND INNOVATION PROGRAM

Based on the information provided in the pilot evaluation, Metro staff has identified five options for consideration by Council. These are not presented in order of preference or recommendation.

1. Continue the I&I program with its current scope to allow for a broad range of eligible projects and a balance of environmental and equity impacts.
2. Continue the program, and prioritize projects with highest racial equity benefits over those with environmental benefits.
3. Continue the program, and prioritize projects with highest environmental benefits.
4. Continue the program, and prioritize recycling infrastructure projects.
5. Discontinue the program, if Council determines that either the pilot demonstrates that: (a) outcomes are not proportionate to the program costs; (b) that program resources should be allocated to other Regional Waste Plan actions; or (c) to reduce overall WPES costs.

If the Metro Council opts to continue the program, options for program focus are described in more detail below.

Option 1: Continue the I&I program with its current scope to allow for a broad range of eligible projects and a balance of environmental and equity impacts.

The I&I pilot was broadly scoped, enabling funding of a range of project types from large capital infrastructure improvements to training of BIPOC deconstruction contractors and waste prevention projects at schools. As noted above, each project also weighed, and resulted in, different levels of environmental and equity impacts.

Of the 93 percent of survey respondents that think the I&I program adds value and should continue, 64 percent think it should continue with its current broad scope. This is largely the “status quo” option of continuing with the current program framework but implementing additional measures to improve both outcomes and process as described throughout this report.

Option 2: Continue the program, and prioritize projects with highest racial equity benefits over those with environmental benefits.

The I&I pilot had equity as a co-equal goal with environmental and health impacts, but projects varied in the degree to which equity was a primary focus. Some of the large capital projects had no direct equity impacts, but were funded because of their substantial environmental and health impacts or benefits to the waste system. Other grants—particularly the program grants—had direct and substantial equity impacts in the form of resources to BIPOC-owned/serving businesses and organizations, expanded access to services, job creation and training opportunities.

The program could require that all projects demonstrate direct, significant equity outcomes to receive an I&I grant. **Per statutory guidelines, all grants under this option would still need to**

be related to the Metro’s work to manage waste and address product life cycle impacts.¹² The challenge will be to define what direct, significant equity outcomes would mean across different types of projects, and for businesses and organizations that are in different places in their equity journey. Specific indicators should be identified that would qualify a project for funding, tailored to type of applicant and type of project.

Option 3: Continue the program, and prioritize projects with highest environmental benefits.

This approach would prioritize the environment and human health goal of the I&I program. Under this scenario, racial equity would still be a core goal of the I&I program as a whole, but projects with strong environmental impacts would not need to demonstrate significant direct equity impacts.

To focus on environmental and health impacts, it will be valuable to solicit projects that address these impacts earlier in the product life cycle. As noted earlier in this evaluation, there are some inherent parameters on Metro’s ability to be effective at this, so we should expect that many projects will still address end-of-life (reuse, repair, recycling, composting, energy recovery, including anaerobic digestion).

Option 4: Continue the program, and prioritize recycling infrastructure projects.

There continues to be need for investments in stabilizing and updating private recycling and composting facilities, particularly in advance of potential statewide changes to modernize the recycling system that will take years to fully implement.¹³ These investments could include projects to produce:

- Higher quality recyclables that could meet specifications of a broader range of domestic, North American and international markets;
- New or expanded local end markets;
- New collection options for materials that are not collected at homes and businesses.

Next steps

After engaging stakeholders including the Metro Committee to Advance Racial Equity and Regional Waste Advisory Committee for input on the evaluation and options for the future of the I&I program, staff will present to the Metro Council in late spring 2021. The Council will provide direction to the WPES department on the future of the Investment and Innovation program and, if it is to continue beyond the pilot, on program priorities.

¹² ORS 459.335. Use of fees collected by the metropolitan service district.

¹³ Information on the Recycling Steering Committee’s process to develop a concept for modernizing Oregon’s recycling system can be found here <https://www.oregon.gov/deq/recycling/Pages/Recycling-Steering-Committee-Resources.aspx>.

APPENDIX 2: DESCRIPTION OF GRANTS AWARDED BY YEAR

Investment and Innovation grants awarded in 2018 (Year 1)

Grant recipient bold = multiple awards received over pilot *= M/WBE company or community organization	Project title <i>Project description</i>	Project category	Grant award	Additional funds leveraged	% Grant spent / Project status	
						Grey = grant closed Green = grant open
Allwood Recyclers	Compost facility improvements <i>New aerated compost system for improved yard debris processing</i>	Compost	\$272,149	\$355,399	100%	Delayed due to pandemic; completed Jan. 2021
City of Roses Disposal & Recycling*	Materials recovery facility relocation and expansion <i>Infrastructure and equipment upgrades to increase volume and type of dry waste recovery</i>	Recycling	\$500,000	\$524,668	100%	Completed Feb. 2020
Denton Plastics	Continuous melt filter <i>New equipment to process new streams of plastic materials with higher degree of contamination</i>	Recycling	\$193,097	\$191,699	100%	Completed Jan. 2020
Earth Advantage	Overcoming barriers in deconstruction <i>Targeted capacity-building for minority owned and employed deconstruction firms</i>	Reuse	\$50,000	\$10,026	100%	Completed Jan. 2020
Eco-School Network	Waste reduction in schools <i>Training for parent leaders to implement waste reduction projects in 20 schools</i>	Prevention	\$25,580	\$69,980	100%	Completed Jan. 2020
Free Geek	Electronics recycling program support <i>Staff and equipment to collect and process more electronics for reuse or recycling</i>	Reuse and recycling	\$50,000	\$581,500	100%	Completed Jan. 2020
Habitat for Humanity Portland Metro East	Increasing the waste prevention capacity of Habitat's ReStores <i>Staff and equipment to expand donation pickup services of products for reuse</i>	Reuse	\$49,046	\$48,128	100%	Completed Jan. 2020
Interstate Trucking Academy	Waste industry diversification enterprise <i>Outreach and staff to expand training program for careers as garbage and recycling truck drivers</i>	Job training	\$140,000	\$23,244	29%	Program portion completed Jan. 2020 Capital portion of grant (\$100,000) was terminated due to grantee decision not to purchase garbage training truck

Northwest Deconstruction Services	Truck and racks for re-use <i>New equipment to improve efficiency of transporting salvaged materials from major deconstruction projects</i>	Reuse	\$67,000	\$0	0%	Grant was terminated due to grantee non-performance
Oregon Food Bank*	Food recovery program expansion <i>Staff and equipment to expand food rescue and distribution services into new areas of region</i>	Reuse	\$115,990	\$748,010	100%	Completed Jan. 2020
Pioneer Recycling Services	Recycling sorting robots <i>New equipment to process materials with increased speed and better quality for end markets</i>	Recycling	\$284,429	\$281,547	100%	Completed June 2020
Pride Recycling Company	Recycling transfer station expansion <i>Infrastructure improvements to expand processing capacity for dry waste, yard debris and commercial food waste</i>	Recycling	\$500,000	\$1,236,500	100%	Completed July 2020
Urban Gleaners*	Food recovery expansion and engagement project <i>New equipment, facility upgrades and staff to expand food waste recovery and test a "closed loop" delivery program</i>	Reuse	\$103,779	\$92,311	100%	Completed Jan. 2020
Wisewood Energy	Building the waste wood-to-energy ecosystem in Portland <i>Feasibility assessment of biomass heat systems at five businesses as replicable clean energy alternatives to disposing waste wood</i>	Waste to energy	\$50,000	\$53,525	100%	Completed Jan. 2020

Investment and Innovation grants awarded in 2019 (Year 2)

Grant recipient Bold = multiple awards received over pilot *= M/WBE company or community organization	Project title <i>Project description</i>	Project category	Grant award	Additional funds leveraged	% Grant spent / Project status Grey = grant closed Green = grant open	
City of Roses Disposal & Recycling*	Building capacity for new wood waste markets <i>New staff and supplies to create and expand commercial-scale markets for wood waste</i>	Reuse	\$65,000	\$7,709	19%	Project partially completed, then grantee ended it for overall business reasons. The staff managing the project started a new company to continue the project; Metro is investigating whether it can re-contract the remainder of the grant with the new company to complete the work.
City of Roses Disposal & Recycling*	Materials recovery facility expansion (Phase 2) <i>Infrastructure and equipment upgrades to increase dry waste recovery and improve working conditions</i>	Recycling	\$302,504	\$302,504	0%	Project delayed due to pandemic. Currently finalizing updated processing line plans with equipment manufacturers and brokers. Grant end date is currently 7/31/21, but may need to be extended to end of 2021.
Denton Plastics	Single stream eco-line <i>New equipment to recycle additional new streams of plastic materials</i>	Recycling	\$684,496	\$954,952	0%	Equipment delays due to COVID-19. Grantee currently working with equipment companies in Germany to develop updated installation timeline. Likely will need grant extension to 5/31/2022 to complete project.
Environmental Fibers International	Unders recovery <i>New equipment to enable recycling of residual materials that would otherwise be disposed</i>	Recycling	\$310,000	\$310,000	0%	Grantee experienced significant delays due to pandemic, which provided opportunity to rethink processing system design. In Dec. 2020 grantee provided Metro new designs that would be more efficient and result in increased material recovery. Project scheduled to be completed by August 2021.
GreenWay Recycling	Advanced material recovery system <i>New equipment and infrastructure improvements for increased dry waste recovery</i>	Recycling	\$712,500	\$3,386,384	90%	Equipment has been purchased; new system will be fully operational by Nov. 2021.

Grant recipient Bold = multiple awards received over pilot * = M/WBE company or community organization	Project title <i>Project description</i>	Project category	Grant award	Additional funds leveraged	% Grant spent / Project status Grey = grant closed Green = grant open	
Grimm's Fuel Company	ASP modernization <i>Modernization of compost system to aerated static piles to increase yard debris recycling capacity and reduce odors</i>	Compost	\$710,000	\$2,957,469	31%	New system nearly completed, and began operations in Sept. 2020. Grantee currently installing a biofilter for advanced odor control. Grant end date is 6/30/2021.
Lovett Deconstruction	Full house deconstruction training program <i>New equipment and training for additional deconstruction team, with focus on hiring and supporting a diverse workforce</i>	Reuse	\$66,316	\$16,579	100%	Project fully completed. Final report is due Mar. 2021.
Pioneer Recycling Services	Optical sorting of mixed paper <i>Install optical sorters to remove contaminants and improve quality of recycled paper bales</i>	Recycling	\$712,500	\$1,887,500	90%	Equipment installed and operational in Oct. 2020
ReBuilding Center	Equity and efficiency in reuse operations <i>Improvements to processing systems and hire new staff for salvage and resale of reusable building materials</i>	Reuse	\$75,000	\$8,039	100%	Grant was amended in response to pandemic to support grantee operations (allowable use of grant funds based on RBC's core mission) through 2020. Grantee reports it plans to complete the originally-proposed project in coming months now that RBC is stabilized and recovering from pandemic impacts.
Recology Oregon Compost	Aumsville facility expansion <i>New equipment and infrastructure improvements at Aumsville facility to expand processing capacity for residential and commercial food scraps and yard debris</i>	Compost	\$712,500	\$1,153,500	66%	Project is in its final phases. Final report will be submitted in Mar. 2021.
Recology Oregon Compost	North Plains facility expansion <i>New equipment and infrastructure improvements at North Plains facility to expand processing capacity for residential food scraps and yard debris</i>	Compost	\$712,500	\$2,205,500	6%	Design complete and permitting is in progress. Project scheduled to be complete by Jan. 2022.

Investment and Innovation grants awarded in 2019 (Year 2)

Grant recipient Bold = multiple awards received over pilot *= M/WBE company or community organization	Project title <i>Project description</i>	Project category	Grant award	Additional funds leveraged	% Grant spent / Project status Grey = grant closed Green = grant open	
Repair PDX	Repair education programming and outreach <i>Development and execution of repair skills programming and apprenticeships, in partnerships with schools and community organizations</i>	Reuse	\$31,689	\$9,129	30%	Project experienced significant delays due to pandemic. Grantee adapting by developing online options and partnerships, and grant will likely be extended through June 2022 to allow for full implementation.
Salvage Works	Wood shop expansion <i>New equipment to expand custom furniture wood shop that transforms reclaimed lumber into high-quality furniture</i>	Reuse	\$58,772	\$14,516	99%	Project experienced delays due to pandemic, but is nearly complete. Equipment installed and operational. Final report due Mar. 2021.
University of Portland	Intelligent curbside recycling <i>Installation of intelligent robotic platforms on collection vehicles to quantify the composition and contamination of residential curbside recycling</i>	Recycling	\$74,774	\$76,346	9%	Project experiencing pandemic-related delays from limited access to university facilities. Significant work has been done on designing and testing prototypes. Extension of grant will be needed; staff is working with UP to update project schedule.
Urban Gleaners*	Second shift food rescue initiative <i>Staff to expand operation to repurpose discarded food into nutritious meals for families in need</i>	Reuse	\$73,872	\$24,690	49%	Project on track despite pandemic-related challenges. Project will be complete July 2021.
Urban Gypsum	Pelletizing system for drywall waste reduction <i>New equipment to process recycled drywall into pellets for reuse as agricultural and industrial products</i>	Reuse	\$465,452	\$465,452	67%	Equipment has been installed, and new process testing is underway. Project will be complete Aug. 2021.
Urban Gypsum	Waste reduction specialist <i>Hire a Spanish and English-speaking specialist to increase supply of recovered drywall from construction sites for processing for reuse</i>	Reuse	\$75,000	\$16,200	0%	Delays in hiring new staff as a result of pandemic. Will need grant extension; working with grantee to determine new schedule.

Grant recipient Bold = multiple awards received over pilot * = M/WBE company or community organization	Project title <i>Project description</i>	Project category	Grant award	Additional funds leveraged	% Grant spent / Project Status Grey = grant closed Green = grant open	
City Repair	Useful waste initiative <i>Develop process and demonstration projects to divert usable construction waste from architectural prototypes</i>	Reuse	\$24,420	\$2,000	0%	Project started Feb. 2021
Community Cycling Center	Reusing and recycling salvaged bicycles and parts <i>Expand reuse and recycling of used bicycles and parts, and support for internship program</i>	Reuse and recycling	\$49,288	\$25,500	0%	Project started Feb. 2021
Community Development Corporation of Oregon*	East County food rescue shuttle <i>Expand capacity of BIPOC-owned businesses to produce and market culturally-relevant food products from excess food</i>	Reuse	\$47,250	\$35,000	0%	Project started Feb. 2021
Cracked Pots	Integrating equity in Cracked Pots' mission and operations <i>Equity training and staff for recovering materials at transfer station for resale</i>	Reuse	\$37,442	\$0	0%	Project started Feb. 2021
Free Geek	Electronic waste collection and recycling <i>Up to 22 collection events to recover discarded electronics for reuse or recycling</i>	Reuse and recycling	\$43,819	\$45,250	0%	Project started Feb. 2021
Hygiene For All*	Clothing and bedding exchange <i>Launch a pilot clothing and bedding exchange for people experiencing homelessness to keep the textiles from becoming waste</i>	Reuse	\$50,000	\$68,477	0%	Project started Feb. 2021
James' Neighborhood Recycling Service	Expanding neighborhood collection events <i>Expand collection program for non-curb-side plastics by holding additional community collection events in underserved neighborhoods</i>	Recycling	\$49,417	\$47,430	0%	Project started Feb. 2021
Professional Business Development Group*	Building a culture of reuse for underrepresented contractors <i>Incentivize reuse practices of BIPOC and women contractors in partnership with ReBuilding Center</i>	Reuse	\$50,000	\$0	0%	Project started Feb. 2021

Investment and Innovation grants awarded in 2020 (Year 3)

Grant recipient Bold = multiple awards received over pilot *= M/WBE company or community organization	Project title <i>Project description</i>	Project category	Grant award	Additional funds leveraged	% Grant spent / Project Status Grey = grant closed Green = grant open	
Re-Use Consulting	Building up an industry that takes down buildings <i>Training and support to expand capacity of BIPOC and women deconstruction contractors</i>	Reuse	\$48,000	\$24,000	0%	Project started Feb. 2021
ROSE Community Development*	Multifamily composting initiative <i>Pilot program for composting food scraps for communities of color at multifamily sites</i>	Compost	\$23,200	\$0	0%	Project started Feb. 2021
Salvage Works	Expansion of high-demand product made from reclaimed fencing <i>Expand production of rustic wall paneling made from reclaimed fencing materials</i>	Reuse	\$49,525	\$21,640	0%	Project started Feb. 2021

APPENDIX 3: EVALUATION METHODOLOGY DETAIL

Final grant report questions

Metro requires that each grantee provide a final report when its project is complete. The final report includes a summary of all work completed, project expenditures (from grant funds and grantee's matching funds), and data to support the specific environmental and equity metrics that are tailored to each grant project. I&I program staff reviews the final report and follows up with grantees with clarifying questions to fully understand the project impacts.

The final report questions are:

1. Describe whether and how the project delivered on its intended impacts to the waste stream, environment, human health and/or community, as described in your proposal and grant scope of work.
2. If applicable, describe (1) the annual quantity of material processed using grant-funded equipment or infrastructure improvements and the source of this feedstock, and (2) the demand for your products and interested markets/consumers.
3. Describe how this project has directly advanced diversity, equity and inclusion outcomes. Be as specific as possible as to how the project generated positive benefits for communities of color or other historically underrepresented groups.
4. Did your project utilize the services of a Certification Office for Business Inclusion and Diversity (COBID)-certified contractor(s)? If so, please list.
5. How will the benefits achieved through the project continue beyond the grant term?
6. If applicable, do you anticipate your annual quantity of material processed using grant-funded equipment or infrastructure improvements changing in the next few years? If yes, please describe.
7. If applicable, do you anticipate your end market commitments or marketing and distribution strategy for the products produced with grant-funded equipment or infrastructure improvements changing over the next few years? If yes, please describe.
8. Provide the final total actual expenditures for the grant project, including both Metro funds and additional resources.
9. Was any work described in the grant scope of work not completed? If yes, describe whether, how and when that remaining work will be completed. If this grant is part of a larger project that is ongoing, describe the path to completing the larger project

Grantee interviews/case studies

A third-party consultant (Evaluation Into Action) interviewed five grantees to develop case studies to provide a more comprehensive story of some of the I&I grants. These grants were selected to demonstrate a range of approaches to respond to the racial equity and environmental goals of the

I&I program. The interviews provided input on the benefits to the grantees' businesses and operations, successes and challenges, and whether there is a continued need for the I&I program.

The interview questions are listed below:

Interview introduction

Thank you for agreeing to answer a few questions regarding your participation in the Investment and Innovation pilot grant program. We want to better understand the impact this program had on your organization/business as well as the community.

Please note that this interview will be recorded to ensure technical accuracy and the recording shared with Metro grant program staff. If there is any part of this conversation you would like to keep confidential (i.e., not shared with Metro), you may request to stop recording at any time.

Interview questions

1. What made you decide to apply for this grant?
2. What impact did it have on your organization/business?
3. Because of the funds received, what impact do you think this had on our community? (Community can be open-ended to however the grantee defines it.)
4. Has this grant opportunity had any impact on your [organization/business] practices with regard to racial equity? (One example could be implementing new hiring practices or policies)
5. How was the process of applying for the grant? Would you suggest any improvements to the application process?
6. Do you see a need for the I&I program to continue as it is currently structured, with a focus on for-profit and nonprofit waste reduction initiatives and racial equity actions?

If so, would you suggest any changes to it?

If not, why not?

Process evaluation reports (years 1 and 2)

In the first two years of the pilot, program staff completed process evaluations of the prior grant cycles to capture lessons learned and identify improvements to be made to subsequent cycles. These process evaluation reports are on file in WPES.

Survey of external interested parties

The evaluation team administered a survey to 195 people external to Metro that are on the I&I program interested parties list. The survey was intentionally brief to encourage responses, and

focused on whether the I&I program can continue to add value to the region, and if so, whether it should be kept broad in scope or refined in some way (with options provided).

The survey questions are listed below:

Survey introduction

Thank you for participating in a short survey to help determine whether there is a need for the Investment and Innovation grant program to continue beyond the pilot phase.

The I&I program was launched in 2018 to stimulate investment by for-profit businesses and nonprofit organizations involved in reducing waste through prevention, repairing, reusing, recycling, composting or making energy from the stuff that is discarded in the greater Portland area.

The main goal of the program is to strengthen local efforts to reduce waste, make better use of the waste that is produced, and help foster economic opportunities for people who have historically been left out of the benefits of the garbage and recycling system, particularly communities of color. The program funds programs and projects that reduce waste through reuse, repair, recycling composting or waste-to-energy projects.

To date, the pilot has funded \$8.2 million in capital and program grants, with a final grant cycle currently underway that will award up to an additional \$500,000 in program grants in December. For a list of grants made, see the [program website](#).

Please complete the questions below:

Survey questions

1. Do you believe that Metro's Investment and Innovation funding can continue to add value to the region's nonprofit and for-profit waste reduction efforts? Yes/No

[A "Yes" answer continues on to question 2. A "No" answer skips ahead to question 3.]

2. If you responded yes, please indicate whether and how you think the program should focus its priorities:
 - a. **Keep the program broad in scope** to allow for a wide range of projects that reduce waste through prevention, repair, reuse, recycling, composting or energy from waste.
 - b. **Narrow the program's scope** by prioritizing certain types of projects (options will be listed on next page.)

["A" skips ahead to question 3. "B" continues on to the rest of question 2.]

B. If you think the program should be more narrowly focused, please rank these options from your highest priority (1) to lowest priority (4):

- **Upstream projects**
Prioritize "upstream" projects. These could include use of less toxic materials in production, or preventing waste by using less packaging or reuse/repair efforts.

(This is in contrast to “downstream” projects that focus on managing discarded waste through recycling, composting or energy from waste.)

- **Environmental impact**
Prioritize projects focused on specific products with the highest environmental impact across their life cycles (including extraction, design, manufacture, transport, use, disposal), such as food and textiles.
- **Underserved communities**
Prioritize projects that provide direct economic benefit or increased access to waste services for underserved individuals and communities, even if they have lower waste stream or environmental impacts.
- **Recycling infrastructure**
Focus investment on improvements to the recycling infrastructure (buildings and equipment) that would result in:
 - Higher quality recyclables that have more demand from end markets to make new products;
 - New or expanded local end markets for the region's recyclables; and/or
 - New collection options for materials that are not collected at homes and businesses

3. Are you responding as a:
 - a. For-profit business
 - b. Nonprofit organization
 - c. Government
 - d. Private individual
 - e. Other (specify)_____
4. Have you applied for an Investment and Innovation grant? Yes/No
5. If yes, have you received an Investment and Innovation grant? Yes/No
6. [Optional] Additional comments: _____

APPENDIX 4: ESTIMATES OF ENVIRONMENTAL AND HEALTH BENEFITS

Investment and Innovation pilot grant program

2018-2020 grants: Estimates of environmental and health benefits, including greenhouse gas emissions reductions

Methodology

To estimate the environmental and health benefits of Investment and Innovation (I&I) grant projects, grantees provided information to Metro on the expected, estimated or actual amounts of materials recovered for recycling or reuse. For those with additional recovery that could be directly attributed to the grants, Metro used that information as inputs in two main modeling tools that estimate the environmental and human health benefits of recycling or reusing materials: MEBCalc and the methodology and data in the Oregon Department of Environmental Quality (DEQ) report *Deconstruction vs. Demolition: An evaluation of carbon and energy impacts from deconstructed homes in the City of Portland for calculating the impact* (2019).¹

For most calculations, Metro used MEBCalc, a modeling tool for computing the environmental footprint of different material types typically collected in municipal solid waste systems, such as paper, plastics, metals and yard debris.² MEBCalc allows users to model the management of specific amounts of materials under different methods, including disposal at landfills, recycling and composting. The tool provides estimates for nine categories of environmental and human health impacts: climate change, public health (respiratory disease, cancer, and toxicity), ecosystem toxicity, eutrophication, and acid rain. MEBCalc estimates the impacts of discarded materials at the end of their useful life, and also provides estimates of the “upstream” impacts associated with extracting and processing raw materials to make those materials, as well as with manufacturing and distributing them for sale to consumers. The tool does not model the pollution emissions generated when consumers use the products made from those materials, such as the pollution from driving cars made of metal, plastic and other materials.

For grant projects involving salvage of construction materials, Metro used the methodology and emissions factors developed by DEQ in the 2019 report cited above. Metro used this approach because MEBCalc has limited options for estimating the environmental and health benefits of salvaging construction materials, and DEQ’s methodology and data were developed using information from actual deconstruction projects in the Portland area. At the same time, the DEQ approach is limited to estimating the avoided greenhouse gas emissions, compared to the nine environmental and health impacts covered in MEBCalc.

Metro used a series of simplifying assumptions to be able to estimate the impact of different projects. For example, plastic resin types such as polypropylene or polystyrene (Styrofoam) are not modeled in MEBCalc. In this case, Metro modeled the impact of recycling these plastic materials as if they were high density polyethylene (HDPE) plastic, which is the plastic category in MEBCalc with the lowest environmental and health benefits per ton recycled.

Another type of assumption in these calculations involves the use of average weights and emissions factors. These assumptions are necessary because individual products and materials vary in terms of weight and environmental and health impacts. Laptop computers, for example, differ in weight depending on the model and year made. The companies that make these computers also use different manufacturing processes and raw materials that result in varying levels of pollution emissions. To calculate the impacts of recycling or reusing a large number of laptops, the modeling applies an average laptop weight and pollution emissions.

¹ Last accessed online on 10/27/2020 at: <https://www.oregon.gov/deq/FilterDocs/DeconstructionReport.pdf>.

² Sound Resource Management, Measuring Environmental Benefits Calculator. Online at: <https://srmginc.com/mebcalc/>

Caveats

- The estimates for grant projects awarded in 2018 reflect **actual outcomes** from those projects, as reported by grantees. For 2019 and 2020 grants, the estimates are based on **anticipated outcomes**, given that the projects have not been fully implemented.
- This analysis does not include all of the I&I grants awarded during the pilot. It only includes those for which the environmental and health impacts could be directly attributed to grant funding. Some grants funded additional capacity or operational improvements that would not directly increase material recovery, but build the system's operational resilience or mitigate impacts from the facility.
- The results obtained by Metro and summarized in this report are subject to a high degree of uncertainty due to a variety of factors, including the simplifying assumptions behind the modeling tools used and the need to estimate quantities based on assumptions about the composition of recovered materials and their likely end market destinations. Nevertheless, they are useful for communicating the nature and general scale of project impacts.
- Metro took steps to mitigate this uncertainty, including:
 - Using conservative assumptions to avoid overestimating the environmental benefits of grant projects;
 - Excluding from the analysis any recovered amounts for which no reasonable estimate or assumption could be made;
 - Rounding results to reflect the fact that the estimates lack precision. The results were rounded to the nearest ten for figures between 100 and less than 1,000; to the nearest hundred for figures greater than 1,000 and less than 1 million; and to the nearest hundred for figures of 1 million or more.
- The estimates of climate impacts from MEBCalc include emissions of both biogenic and fossil carbon compounds, but biogenic and fossil carbon storage in landfills is not counted as an offset to landfill emissions. Other carbon accounting methodologies may treat biogenic carbon emissions and carbon storage in landfills differently and produce significantly different results.

Based on U.S. Environmental Protection Agency (EPA) information, biogenic carbon dioxide emissions are those related to the natural carbon cycle, as well as those resulting from the combustion, harvest, digestion, fermentation, decomposition or processing of biologically based materials. Sources of biogenic carbon dioxide emissions include:

- Carbon dioxide emitted with the combustion of biogas collected from landfills, wastewater treatment facilities or manure management processes;
- Carbon dioxide emissions from the combustion (in incinerators, for example) of the biological fraction of municipal solid waste or biosolids;
- Carbon dioxide emitted with the combustion of biological material including forest-derived and agriculture-derived feedstocks, such as biofuels like ethanol and biodiesel and when wood waste is used as hog fuel.

CITY OF ROSES DISPOSAL & RECYCLING

Materials recovery facility relocation and expansion (2018 grant)

Project outcome

35 tons of reused wood

Estimated benefits

Reusing 35 tons of wood would result in net environmental benefits valued at \$61,900 per year. The benefits are the net avoided costs to society from the life cycle emissions of various harmful pollutants associated with making wood products. The pollutants considered include greenhouse emissions, fine particulate matter and toxic chemicals.

Focusing only on greenhouse gas emissions, the project's outcome is estimated to avoid 41 metric tons of carbon dioxide equivalents (CO₂e). This portion of the total environmental benefits is valued at \$8,700 per year.

The environmental benefits are equivalent to avoiding the greenhouse gas emissions from driving 9 passenger vehicles for one year. The benefits are also equivalent to avoiding the greenhouse gas emissions from driving 101,300 miles in an average passenger vehicle, or the equivalent of 16 round trips between Portland, Oregon and Portland, Maine.

Benefits	Amount
Total value of environmental benefits	\$61,900
Avoided GHG emissions (in metric tons)	41
Avoided GHG emissions (in \$)	\$8,700
Equivalent passenger vehicles driven for one year	9
Equivalent miles driven by an average passenger vehicle	101,300
Equivalent trips from Portland, OR to Portland, ME	16

Technical notes

MEBCalc calculates net avoided emissions as the difference between the emissions generated from sending a given amount of material to a landfill (base scenario) and the emissions from recovering the same amount of material through methods such as recycling and composting – or in this case, reuse. However, the outcome from this project is recovering wood from the alternative option of using it for hog fuel, not landfilling. Therefore, the estimated environmental benefit calculations are based on comparing the avoided emissions from recovering wood for reuse (alternative scenario), against recovering wood for use as hog fuel (base scenario).

The base scenario assumes that the recovered wood would be used as hog fuel in industrial boilers to substitute for natural gas since that is the most common application in the Pacific Northwest, based on industry sources. When clean wood substitutes for natural gas as fuel in an industrial process instead of landfilling, the result is a net increase in the emission of most pollutant categories (the exception is ozone depletion). In other words, landfilling wood is a better alternative than using it as a replacement for natural gas in industrial boilers. This implies that if the scenario for this grant compared wood reuse against landfilling, the net environmental benefits shown in the table above would be lower.

The main assumptions used as inputs in the two scenarios developed in MEBCalc for this calculation are summarized in the following table:

	Base: Wood to hog fuel substituting natural gas	Outcome: Wood recovered for reuse
Recovery amount: Wood Waste (tons)	35	35
Recovery method/sector: Construction and Demolition	100%	100%
Processing Residue Rates: Wood processing facilities	0%	0%
Allocation of Materials to End Markets:		
Clean wood to industrial fuel substituting for natural gas	100%	0%
Clean wood to reuse	0%	100%
Distance and mode to markets: Truck	20 miles (100%)	20 miles (100%)
Route Collection - Diesel Trucks	100%	100%

DENTON PLASTICS

Continuous melt filter (2018 grant)

Project outcome

Recycling of 2,800 tons of plastic

Estimated benefits

Based on the information provided by the grantee on the amounts and types of plastic material recovered, processing 2,800 tons of plastic material of different types would result in net environmental benefits valued at \$1.6 million. The benefits are the net avoided costs to society from the life cycle emissions of various harmful pollutants associated with making plastic products out of virgin, rather than recycled, resin. The pollutants considered include greenhouse emissions, fine particulate matter and toxic chemicals.

Focusing only on greenhouse gas emissions, the project's outcome is estimated to avoid 3,700 metric tons of carbon dioxide equivalents (CO₂e) per year. These benefits are valued at \$791,000. The benefits are equivalent to avoiding the greenhouse gas emissions from driving 800 passenger vehicles for one year. The benefits are also equivalent to the avoided greenhouse gas emissions from driving 9.2 million miles in an average passenger vehicle, or the equivalent of 1,500 round trips between Portland, Oregon and Portland, Maine.

Benefits	Amount
Total value of environmental benefits	\$1.6 million
Avoided GHG emissions (in metric tons)	3,700
Avoided GHG emissions (in \$)	\$791,000
Equivalent passenger vehicles driven for one year	800
Equivalent miles driven by an average passenger vehicle	9.2 million
Equivalent trips from Portland, OR to Portland, ME	1,500

Technical notes

For this calculation, Metro used the information provided by the grantee on the estimated new amounts and types of plastic material that the grantee was able to recover for recycling as a result of the grant. The grantee reported detailed data on the various plastic resin types they were able to recover. Unfortunately, modeling tools such as MEBCalc cannot accommodate the full variety of plastic materials in the waste stream. Therefore, for each of the material categories reported by the grantee that do not match the three plastic categories available in MEBCalc, Metro assumed the material was high density polyethylene (HDPE) plastic as a conservative assumption, since the HDPE category in MEBCalc yields the lowest environmental benefit values per ton. The distribution of recycled plastic material by MEBCalc category used for this scenario is (in tons):

MEBCalc category	Tons
HDPE	2,480
LDPE Film	320
Total	2,800

Metro assumed 100% of the material was collected from commercial generators since the grantee reported the new plastic recyclable material tied to this project was collected from nurseries. The calculation also assumes a distance to market of 30 miles by diesel truck as a rough estimate of the average distance travelled from the collection point to Denton Plastics. Metro also assumed a 0% processing residue rate. Although this is an unrealistic assumption, it simplifies the analysis and shows the estimated environmental benefit of the amount of recycled plastic reported by the grantee without subtracting any residual amounts that could not be recycled and instead, disposed at a landfill.

The main assumptions used as inputs in the two scenarios for this calculation are summarized in the following table:

	Scenario I: HDPE	Scenario II: LDPE Film
Recovery amount: HDPE plastic (tons)	2,480	0
Recovery amount: LDPE film plastic (tons)	0	320
Recovery method/sector: Multifamily/Commercial	100%	100%
Processing Residue Rates: Commingled MRFs – non-glass	0%	0%
Distance and mode to markets: Truck	30 miles (100%)	30 miles (100%)
Route Collection - Diesel Trucks	100%	100%

OREGON FOOD BANK

Food recovery program expansion (2018 grant)

Project outcome

Rescue and use of 252 tons of food

Estimated benefits

The environmental benefit of food rescue activities stem from collecting food that would have otherwise been discarded and entered the waste stream, and providing the food to people who live with food insecurity. By preventing food from entering the waste stream, food rescue activities help avoid the emissions from disposing food at landfills. The consumption of rescued food by people with food insecurity may also reduce the need for them to purchase new food items. However, as the US Environmental Protection Agency (EPA) emphasizes in its guidance on modeling the benefits of food donation:

“Many of those who consume donated food may not have a secure source for food. There is a high level of uncertainty around how food-insecure people access food and nutrition, and the extent to which donated food will offset the generation of food from another source.”³

Due to this uncertainty, Metro followed the EPA’s guidance and produced two estimates. The low-end estimate includes only the avoided landfill emissions associated with disposing 252 tons of food. The high-end estimate includes both the avoided landfill emissions and the upstream emissions from avoided food production, assuming the amount of food collected and provided to people with food insecurity completely replaces new food production by the same amount. The latter assumption represents a theoretical upper limit, rather than a likely scenario.

The table below summarizes the estimated environmental benefits from 252 tons of rescued food:

Benefits	Low	High
Value of total environmental benefits	\$29,800	\$59,800
Avoided GHG emissions (in metric tons)	140	230
Value of avoided GHG emissions	\$29,000	\$48,400
Equivalent passenger vehicles driven for one year	30	50
Equivalent miles driven by an average passenger vehicle	338,000	565,200
Equivalent trips from Portland, OR to Portland, ME	50	90

The total value of the environmental benefits is estimated to be between \$29,800 and \$59,800. The benefits are the net avoided costs to society from the life cycle emissions of various harmful pollutants associated with food production. The pollutants considered include greenhouse gases, sulfur dioxide and toxic chemicals.

Focusing only on greenhouse gas emissions, the project’s outcome is estimated to avoid between 140 and 230 metric tons of carbon dioxide equivalents (CO₂e) per year. The value of the benefits is estimated to be between \$29,000 and \$48,400. The environmental benefits are equivalent to avoiding the greenhouse gas emissions from driving between 30 and 50 passenger vehicles for one year. The benefits are also equivalent to avoiding the emissions from driving between 338,000 and 565,200 miles in an average passenger vehicle, or the equivalent of between 50 and 90 round trips between Portland, Oregon and Portland, Maine.

³ US Environmental Protection Agency (EPA), Modeling Food Donation Benefits in EPA’s Waste Reduction Model. Last accessed on 10/29/2020 at: <https://www.epa.gov/warm/guidance-how-use-materials-and-management-pathways-not-found-waste-reduction-model-warm>.

Technical notes

Metro followed the EPA’s guidance referenced earlier to produce low-end and high-end estimates of the environmental benefit of 252 tons of rescued food. Both estimates are based on a scenario in which the amounts of food are collected from commercial waste generators and transported in diesel trucks to a landfill located 110 miles away. The alternative scenario in which food is collected by the grantee in the Metro region assumes the food is transported in diesel trucks for a total of 20 miles.

Metro assumed a 0% processing residue rate, which implies no portion of the 252 tons of rescued food reported by the grantee are food losses due to, for example, spoilage during the collection and repackaging process. The EPA provides an estimate of food losses based of 3%, but Metro opted to assume a 0% rate to simplify the analysis, given that food rescue requires custom modeling in MEBCalc.

For the high-end estimate, Metro assumed the amount of rescued food would completely offset the demand for new food items. Although this is an unrealistic assumption, it is important to note that the estimate is low compared to the estimates obtained from the EPA’s Waste Reduction Model (WARM). As shown below, both MEBCalc and WARM produce similar results for the low-end scenario, which includes only avoided emissions from landfilling. The high-end estimate includes upstream emissions from avoided food production, which are almost 10 times higher in WARM, compared to MEBCalc. Metro has not determined why the two models differ significantly when it comes to upstream emissions from food production.

Comparing MEBCalc and WARM model results of modeling 252 tons of rescued food

Results are in metric tons of carbon dioxide equivalent (CO₂e)

	Low	High
MEBCalc	136.23	227.79
WARM	136.08	1,028.16

The main assumptions used as inputs for this calculation are summarized in the following table:

	Scenario I: Food Rescue
Recovery amount: Food scraps (tons)	252
Recovery method/sector: Multifamily/Commercial	100%
Processing Residue Rates	0%
Distance and mode to markets: Truck	20 miles (100%)
Route Collection - Diesel Trucks	100%

PIONEER RECYCLING SERVICES

Recycling sorting robots (2018 grant)

Project outcome

Recycling of 50 tons of #5 polypropylene plastic

Estimated benefits

This recovery activity yields net environmental benefits valued at \$25,800. The benefits are the net avoided costs to society from the life cycle emissions of various harmful pollutants associated with making plastic products. The pollutants considered include greenhouse emissions, fine particulate matter and toxic chemicals.

Focusing only on greenhouse gas emissions, the project's outcome is estimated to avoid 62 metric tons of carbon dioxide equivalents (CO₂e) per year. These benefits are valued at \$13,000. The benefits are equivalent to avoiding the greenhouse gas emissions from driving 13 passenger vehicles for one year. The benefits are also equivalent to the avoided greenhouse gas emissions from driving 153,000 miles in an average passenger vehicle, or the equivalent of 24 round trips between Portland, Oregon and Portland, Maine.

Benefits	Amount
Total value of environmental benefits	\$25,800
Avoided GHG emissions (in metric tons)	62
Avoided GHG emissions (in \$)	\$13,000
Equivalent passenger vehicles driven for one year	13
Equivalent miles driven by an average passenger vehicle	153,000
Equivalent trips from Portland, OR to Portland, ME	24

Technical notes

For this calculation, Metro estimated the environmental benefits of recycling 50 tons of plastic material. Polypropylene is not a material category modeled in MEBCalc. To address this issue, Metro compared the greenhouse gas emissions factors for the eight plastics categories available in the US Environmental Protection Agency's Waste Reduction Model (WARM) and identified high density polyethylene (HDPE) as the closest category to polypropylene.⁴ HDPE is also the plastic category in MEBCalc that yields the lowest total environmental benefit value per ton of material recycled. Therefore, the calculation for this project's outcome is modeled as the recycling of 50 tons of HDPE plastic material.

Metro also assumed that the plastics processed by the grantee for this project come from curbside collection from single-family, multifamily and commercial generators in the Metro region. Due to the lack of data on the generation of recyclable plastic material by sector for the Metro region, Metro made the simplifying assumption that 50% was collected from single-family truck routes and 50% from mixed multifamily and commercial truck routes. In MEBCalc, curbside collection from single-family homes results in higher amounts of emitted pollutants per ton collected than collection from multifamily and commercial customers. However, the difference is less than 1%.

⁴ US Environmental Protection Agency (EPA). Documentation for Greenhouse Gas Emissions and Energy Factors Used in the Waste Reduction Model (WARM): Containers, Packaging, and Non-Durable Good Materials Chapters (May 2019). Last accessed online on 11/10/2020 at: https://www.epa.gov/sites/production/files/2019-06/documents/warm_v15_containers_packaging_non-durable_goods.pdf.

The main assumptions used as inputs in the scenario developed in MEBCalc for this calculation are summarized in the following table:

Scenario I: Plastics recycling	
Recovery amount: HDPE (tons)	50
Recovery method/sector:	
Single Family	50%
Multifamily/Commercial	50%
Processing Residue Rate: Commingled MRFs – non-glass	0%
Distance and mode to markets: Truck	20 miles (100%)
Route Collection - Diesel Trucks	100%

URBAN GLEANERS

Food recovery expansion and engagement project (2018 grant)

Project outcome

95.4 tons of rescued food

Estimated benefits

The environmental benefit of food rescue activities stem from collecting food that would have otherwise been discarded and entered the waste stream, and providing the food to people who live with food insecurity. By preventing food from entering the waste stream, food rescue activities help avoid the emissions from disposing food at landfills. The consumption of rescued food by people with food insecurity may also reduce the need for them to purchase new food items. However, as the US Environmental Protection Agency (EPA) emphasizes in its guidance on modeling the benefits of food donation:

“Many of those who consume donated food may not have a secure source for food. There is a high level of uncertainty around how food-insecure people access food and nutrition, and the extent to which donated food will offset the generation of food from another source.”⁵

Due to this uncertainty, Metro followed the EPA’s guidance and produced two estimates. The low-end estimate includes only the avoided landfill emissions associated with disposing 95.4 tons of food. The high-end estimate includes both the avoided landfill emissions and the upstream emissions from avoided food production, assuming the amount of food collected and provided to people with food insecurity completely replaces new food production by the same amount. The latter assumption is unrealistic given the extent of food insecurity in Oregon and represents a theoretical upper limit, rather than a likely scenario.

The table below summarizes the estimated environmental benefits from 95.4 tons of rescued food:

Benefits	Low	High
Value of total environmental benefits	\$11,300	\$22,600
Avoided GHG emissions (in metric tons)	52	86
Value of avoided GHG emissions	\$11,000	\$18,300
Equivalent passenger vehicles driven for one year	11	19
Equivalent miles driven by an average passenger vehicle	128,000	214,000
Equivalent trips from Portland, OR to Portland, ME	20	34

The total value of the environmental benefits is estimated to be between \$11,300 and \$22,600. The benefits are the net avoided costs to society from the life cycle emissions of various harmful pollutants associated with food production. The pollutants considered include greenhouse gases, sulfur dioxide and toxic chemicals.

Focusing only on greenhouse gas emissions, the project’s outcome is estimated to avoid between 52 and 86 metric tons of carbon dioxide equivalents (CO₂e). The estimated value of these benefits is between \$11,000 and \$18,300. The environmental benefits are equivalent to avoiding the greenhouse gas emissions from driving between 11 and 19 passenger vehicles for one year. The benefits are also equivalent to avoiding the emissions from driving between 128,000 and 214,000 miles in an average passenger vehicle, or the equivalent of between 20 and 34 round trips between Portland, Oregon and Portland, Maine.

⁵ US Environmental Protection Agency (EPA), Modeling Food Donation Benefits in EPA’s Waste Reduction Model. Last accessed on 10/29/2020 at: <https://www.epa.gov/warm/guidance-how-use-materials-and-management-pathways-not-found-waste-reduction-model-warm>.

Technical notes

Metro followed the EPA’s guidance referenced earlier to produce low-end and high-end estimates of the environmental benefit of 95.4 tons of rescued food. Both estimates are based on a scenario in which the amounts of food are collected from commercial waste generators and transported in diesel trucks to a landfill located 110 miles away. The alternative scenario in which food is collected by the grantee in the Metro region assumes the food is transported in diesel trucks for a total of 20 miles.

Metro assumed a 0% processing residue rate, which implies no portion of the 95.4 tons of rescued food reported by the grantee are food losses due to, for example, spoilage during the collection and repackaging process. The EPA provides an estimate of food losses based of 3%, but Metro opted to assume a 0% rate to simplify the analysis, given that food rescue requires custom modeling in MEBCalc.

For the high-end estimate, Metro assumed the amount of rescued food would completely offset the demand for new food items. Although this is an unrealistic assumption, it is important to note that the estimate is low compared to the estimates obtained from the EPA’s Waste Reduction Model (WARM). As shown below, both MEBCalc and WARM produce similar results for the low-end scenario, which includes only avoided emissions from landfilling. The high-end estimate includes upstream emissions from avoided food production, which are almost 10 times higher in WARM, compared to MEBCalc. Metro has not determined why the two models differ significantly when it comes to upstream emissions from food production.

Comparing MEBCalc and WARM model results of modeling 95.4 tons of rescued food

Results are in metric tons of carbon dioxide equivalent (CO₂e)

	Low	High
MEBCalc	51.57	86.23
WARM	51.52	389.23

The main assumptions used as inputs in the scenario developed in MEBCalc for this calculation are summarized in the following table:

Scenario I: Food Rescue	
Recovery amount: Food scraps (tons)	95.4
Recovery method/sector: Multifamily/Commercial	100%
Processing Residue Rates	0%
Distance and mode to markets: Truck	20 miles (100%)
Route Collection - Diesel Trucks	100%

EARTH ADVANTAGE

Overcoming barriers in deconstruction (2018 grant)

Project Outcome

Reuse of 30 tons of building material salvaged from deconstruction projects (single-family homes and accessory structures) not subject to the City of Portland’s deconstruction ordinance

Estimated benefits

Metro estimated the avoided greenhouse gas emissions from the salvage of 30 tons of building material for reuse based on Oregon Department of Environmental Quality (DEQ) data. The results show an estimated benefit from this project of 52 metric tons of avoided greenhouse gas emissions (carbon dioxide equivalents, CO₂e). The value of the benefits is estimated to be \$11,100 and is equivalent to avoiding the greenhouse gas emissions from driving 11 passenger vehicles for one year. The benefits are also equivalent to avoiding the emissions from driving a total of 129,600 miles in an average passenger vehicle, or the equivalent of 20 round trips between Portland, Oregon and Portland, Maine.

Benefits	Amounts
Avoided GHG emissions (in metric tons)	52
Avoided GHG emissions (in \$)	\$11,100
Equivalent passenger vehicles driven for one year	11
Equivalent miles driven by an average passenger vehicle	129,600
Equivalent trips from Portland, OR to Portland, ME	20

Technical Notes

Metro estimated the avoided greenhouse gas emissions from this project using the building material amounts provided by the grantee and the impact values documented in the Oregon DEQ 2019 report *Deconstruction vs. Demolition: An evaluation of carbon and energy impacts from deconstructed homes in the City of Portland for calculating the impact*.⁶

To estimate the amount of material salvaged by material category, Metro applied the composition of materials salvaged from the average home reported in the Oregon DEQ report (Figure 5, page 19). The DEQ report shows, for example, that more than 87% of the materials salvaged from the average residential deconstruction project in Portland is softwood lumber and 3.4% is plywood. The rest of the material categories represent around 1.1% of the total salvaged material or less.

Metro assumed a rate of 100% reuse for the salvaged materials reported by the grantee. This means that the calculation above excludes an estimate of the environmental impact of the residual waste generated from the grantee’s deconstruction projects. The impact of that residual waste may add or subtract to the overall benefit of those projects, depending on the final disposition of the residual materials (e.g., recycled, landfilled).

⁶ Oregon Department of Environmental Quality (2019). *Deconstruction vs. Demolition: An evaluation of carbon and energy impacts from deconstructed homes in the City of Portland for calculating the impact*. Last accessed online on 10/27/2020 at: <https://www.oregon.gov/deq/FilterDocs/DeconstructionReport.pdf>.

ECO-SCHOOL NETWORK

Waste reduction in schools (2018 grant)

Project outcome

Reduced 89.6 tons of waste in 49 schools

Estimated benefits

Metro estimates that the waste reduction efforts by the grantee resulted in 89.6 tons of materials that were collected for recycling or prevented from entering the waste stream through replacement with durable items like cups and cafeteria trays.

The results suggest the environmental benefit of the grantee's waste reduction activities yields net environmental benefits valued at \$39,900. The benefits are the net avoided costs to society from the life cycle emissions of various harmful pollutants associated with making a variety of products (see technical notes below for details). The pollutants considered include greenhouse emissions, fine particulate matter and toxic chemicals.

Focusing only on greenhouse gas emissions, the project's outcome is estimated to avoid 66 metric tons of carbon dioxide equivalents (CO₂e) per year. These benefits are valued at \$14,100. The benefits are equivalent to avoiding the greenhouse gas emissions from driving 14 passenger vehicles for one year. The benefits are also equivalent to the avoided greenhouse gas emissions from driving 164,500 miles in an average passenger vehicle, or the equivalent of 26 round trips between Portland, Oregon and Portland, Maine.

Benefits	Amount
Total value of environmental benefits	\$39,900
Avoided GHG emissions (in metric tons)	66
Avoided GHG emissions (in \$)	\$14,100
Equivalent passenger vehicles driven for one year	14
Equivalent miles driven by an average passenger vehicle	164,500
Equivalent trips from Portland, OR to Portland, ME	26

Technical notes

For this calculation, Metro used the information provided by the grantee, as well as information collected from various manufacturers and other sources about the weight of different products. Metro used the information to model the environmental impacts of the various waste reduction activities in MEBCalc. Each waste reduction activity was modeled as a separate scenario with the relevant set of assumptions and model inputs such as processing residue rates and estimated distance to end markets.

The table below summarizes the main results for the nine scenarios modeled in MEBCalc. For the prevention scenarios (2, 3, 5, 6, 7, 8), only the waste prevention activity itself was modeled. This means that results do not take into account the emissions associated with replacing the prevented materials. For example, replacing milk cartons through the installation of milk dispensers at schools reduces emissions of pollutants by lowering the consumption of milk cartons (and may reduce wasted milk), but the manufacturing and operation of milk dispensers also generates pollution. Over time, however, the emissions associated with milk dispensers are believed to be lower than those associated with disposable milk cartons.

Scenario	Amount of material (tons)	Total environmental benefits (\$2019)	Avoided GHG emissions (metric tons)	Avoided GHG emissions (\$2019)
1. Composted 127,075 pounds food waste at 15 schools	63.5	\$9,350	33	\$7,050
2. Avoided 734,230 plastic utensils at 18 schools (durables)	2.2	\$2,820	5	\$970
3. Avoided 149,090 milk cartons at 4 schools (milk dispensers)	1.8	\$5,870	4	\$790
4. Recycled 44,955 milk cartons per year at 3 schools	0.5	\$1,600	1	\$190
5. Avoided landfilling 3,111 gallons of milk by dumping milk at 4 schools	13.4	\$70	< 1	\$70
6. Avoided 97,070 paper trays at 2 schools (washable trays)	3.2	\$9,770	11	\$2,250
7. Avoided 167,794 disposable boats at 3 schools (compartmentalized trays)	1.9	\$5,790	6	\$1,330
8. Avoided 35,000 paper cups at 2 schools (water bottle filling stations) and 51,000 paper cups at 2 schools (durable cups)	1.0	\$2,950	3	\$680
9. Recycled 4,221 pounds of plastic film via TREX at 8 schools	2.1	\$1,720	4	\$760
All scenarios	89.6	\$39,940	66	\$14,090

Scenario 5 models the avoided emissions from students emptying milk containers prior to disposal. This activity is likely to avoid emissions – mainly greenhouse gases – by reducing the amount of milk sent to landfill. However, the results overestimate the environmental benefit of this activity because the scenario does not take into account the potential emissions generated at wastewater treatment facilities that result from emptying milk containers at schools.

The main assumptions used as inputs in the scenarios developed in MEBCalc for this calculation are summarized in the following tables:

	Scenario 1: Food waste composting	Scenario 2: Plastic utensil avoidance	Scenario 3: Milk carton avoidance	Scenario 4: Milk carton recycling	Scenario 5: Milk waste avoidance
Material category	Food scraps	PET	Mixed paper	Mixed paper	Food scraps
Recovery amount (tons)	63.54	2.16	1.78	0.54	13.4
Recovery method/sector					
Multifamily/Commercial	100%	100%	100%	100%	100%
Processing Residue Rates	5%	9%	9%	9%	n.a.
Composition of mixed paper					
Aseptic containers	n.a.	n.a.	100%	100%	n.a.
Distance and mode to markets					
Truck	72 miles (100%)	331 miles (48%)	287 miles (32%)	287 miles (32%)	n.a.
Ship/Barge		3,666 miles (52%)	7,000 miles (68%)	7,000 miles (68%)	n.a.
Route Collection - Diesel Trucks	100%	100%	100%	100%	100%

Scenario 6: Scenario 7: Scenario 8: Scenario 9:

	Paper tray avoidance	Disposable boats avoidance	Paper cup avoidance	Plastic film recycling
Material category	Mixed paper	Mixed paper	Mixed paper	LDPE Film
Recovery amount (tons)	3.24	1.92	0.98	2.11
Recovery method/sector				
Multifamily/Commercial	100%	100%	100%	100%
Processing Residue Rates	5%	5%	5%	0%
Composition of mixed paper				
OCC	48%	48%	48%	n.a.
ONP	24%	24%	24%	n.a.
Office Paper	20%	20%	20%	n.a.
Magazines & Third Class Mail	8%	8%	8%	n.a.
Distance and mode to markets				
Truck	287 miles (32%)	287 miles (32%)	287 miles (32%)	570 miles (100%)
Ship/Barge	7,000 miles (68%)	7,000 miles (68%)	7,000 miles (68%)	
Route Collection - Diesel Trucks	100%	100%	100%	100%

FREE GEEK

Electronics recycling program support (2018 grant)

Project outcome

Refurbishing of 15,126 computers and monitors (116 tons) for reuse

Estimated benefits

Metro estimates the 15,126 desktops, laptops and LCD monitors refurbished by the grantee amount to 116 tons of material collected from the public. Based on the information reported by the grantee, the breakdown of the items collected and refurbished is estimated to be:

Item	Units
Refurbished by Free Geek	
LCD monitors	1,477
Laptops	3,425
Desktops	1,746
Screened by grantee and sent to another refurbisher	
LCD monitors	7,932
Laptops	545
Total	15,125

The results indicate the grantee’s waste reduction activities yields estimated net environmental benefits valued at \$2.1 million. The benefits are the net avoided costs to society from the life cycle emissions of various harmful pollutants associated with manufacturing desktops, laptops and monitors. The pollutants considered include greenhouse emissions, fine particulate matter and toxic chemicals.

Focusing only on greenhouse gas emissions, the project’s outcome avoided an estimated 7,100 metric tons of carbon dioxide equivalents (CO₂e) per year. These estimated benefits are valued at \$1.5 million. The benefits are equivalent to avoiding the greenhouse gas emissions from driving 1,500 passenger vehicles for one year. The benefits are also equivalent to the avoided greenhouse gas emissions from driving 17.7 million miles in an average passenger vehicle, or the equivalent of 2,800 round trips between Portland, Oregon and Portland, Maine.

Benefits	Amount
Total value of environmental benefits	\$2.1 million
Avoided GHG emissions (in metric tons)	7,100
Avoided GHG emissions (in \$)	\$1.5 million
Equivalent passenger vehicles driven for one year	1,500
Equivalent miles driven by an average passenger vehicle	17.7 million
Equivalent trips from Portland, OR to Portland, ME	2,800

Technical notes

For this calculation, Metro used the information provided by the grantee to estimate the weight and types of electronic items refurbished for reuse. The main assumptions include: 100% drop off by the public as the collection method, a 10% processing residue rate, and transportation by truck to end markets of 30 miles. These and other assumptions used are summarized in the following table.

Scenario I:
Electronics
reuse

Recovery amount: Electronics (tons)	116
Recovery method/sector: Drop-off	100%
Processing Residue Rates:	10%
Allocation of Materials to End Markets: Electronics	
Desktops to reuse	17.3%
Laptops to reuse	21.9%
Monitors to reuse	60.8%
Distance and mode to markets: Truck	30 miles (100%)
Route Collection - Diesel Trucks	100%

CITY OF ROSES DISPOSAL & RECYCLING

Materials recovery facility expansion (2019 grant)

Project outcome

Reuse of 180 tons of wood per year

Estimated benefits

Recovering 180 tons of wood for reuse each year would result in net environmental benefits valued at \$318,000 per year. The benefits are the net avoided costs to society from the life cycle emissions of various harmful pollutants associated with making wood products. The pollutants considered include greenhouse emissions, fine particulate matter and toxic chemicals.

Focusing only on greenhouse gas emissions, the project's outcome is estimated to avoid 210 metric tons of carbon dioxide equivalents (CO₂e) per year. This portion of the total environmental benefits is valued at \$44,600 per year.

The environmental benefits are equivalent to avoiding the greenhouse gas emissions from driving 45 passenger vehicles for one year. The benefits are also equivalent to avoiding the greenhouse gas emissions from driving 521,000 miles in an average passenger vehicle, or the equivalent of 82 round trips between Portland, Oregon and Portland, Maine.

Benefits	Amount
Total value of environmental benefits	\$318,000
Avoided GHG emissions (in metric tons)	210
Avoided GHG emissions (in \$)	\$44,600
Equivalent passenger vehicles driven for one year	45
Equivalent miles driven by an average passenger vehicle	521,000
Equivalent trips from Portland, OR to Portland, ME	82

Technical notes

MEBCalc calculates net avoided emissions as the difference between the emissions generated from sending a given amount of material to a landfill (base scenario) and the emissions from recovering the same amount of material through methods such as recycling, composting or, in this case, reuse. However, the outcome from this project is recovering wood from the alternative option of using it for hog fuel, not landfilling. Therefore, the estimated environmental benefit calculations are based on comparing the avoided emissions from recovering wood for reuse (alternative scenario), against recovering wood for use as hog fuel (base scenario).

The base scenario assumes that the recovered wood would be used as hog fuel in industrial boilers to substitute for natural gas since that is the most common application in the Pacific Northwest, based on industry sources. When clean wood substitutes natural gas as fuel in an industrial process instead of landfilling, the result is a net increase in the emission of most pollutant categories (the exception is ozone depletion). In other words, landfilling wood is a better alternative than using it as a replacement for natural gas in industrial boilers. This implies that if the scenario for this grant compared wood reuse against landfilling, the net environmental benefits shown in the table above would be lower.

The main assumptions used as inputs in the two scenarios developed in MEBCalc for this calculation are summarized in the following table:

	Base: Wood to hog fuel substituting natural gas	Outcome: Wood recovered for reuse
Recovery amount: Wood Waste (tons)	180	180
Recovery method/sector: Construction and Demolition	100%	100%
Processing Residue Rates: Wood processing facilities	0%	0%
Allocation of Materials to End Markets:		
Clean wood to industrial fuel substituting for natural gas	100%	0%
Clean wood to reuse	0%	100%
Distance and mode to markets: Truck	20 miles (100%)	20 miles (100%)
Route Collection - Diesel Trucks	100%	100%

DENTON PLASTICS

Single stream eco-line (2019 grant)

Project outcome

Recycling of 4,680 to 6,210 tons of plastic per year

Estimated benefits

Metro estimates that processing between 4,680 and 6,210 tons per year of plastic material of different types is estimated to yield net environmental benefits with a total value between \$3.3 million and \$4.4 million per year. The benefits are the net avoided costs to society from the life cycle emissions of various harmful pollutants associated with making plastic products. The pollutants considered include greenhouse emissions, fine particulate matter and toxic chemicals.

Focusing only on greenhouse gas emissions, the project's outcome is estimated to avoid between 6,700 and 9,000 metric tons of carbon dioxide equivalents (CO₂e) per year. The value of the benefits is estimated to be between \$1.4 million and \$1.9 million per year. The benefits are equivalent to avoiding the greenhouse gas emissions from driving between 1,400 and 1,900 passenger vehicles for one year. The benefits are also equivalent to the avoided greenhouse gas emissions from driving between 16.8 million and 22.3 million miles in an average passenger vehicle, or the equivalent of between 2,600 and 3,500 round trips between Portland, Oregon and Portland, Maine.

Benefits	Low	High
Total value of environmental benefits	\$3.3 million	\$4.4 million
Avoided GHG emissions (in metric tons)	6,700	9,000
Avoided GHG emissions (in \$)	\$1.4 million	\$1.9 million
Equivalent passenger vehicles driven for one year	1,400	1,900
Equivalent miles driven by an average passenger vehicle	16.8 million	22.3 million
Equivalent trips from Portland, OR to Portland, ME	2,600	3,500

Technical notes

For this calculation, Metro used the range of recovered material amounts reported by the grantee to estimate a low (4,680 tons of plastic materials recycled) and a high (6,210 tons of plastic materials recycled) scenario.

The types of recycled plastic materials reported for this project and the sources of generation are unknown. For these reasons, Metro used 2018 data from the Oregon Department of Environmental Quality (DEQ) for the Metro region to estimate a distribution by material category for the amounts of recycled plastic materials reported for this project:

Material category	Metro region 2018		Low scenario	High Scenario
	tons	% total	tons	tons
Composite Plastic	1,055	5%	226	300
Plastic Film	4,474	20%	959	1,273
Plastic Other	4,708	22%	1,009	1,339
Rigid Plastic Cont.	11,592	53%	2,485	3,298
Total	21,829	100%	4,679	6,210

Because the plastic material categories used by DEQ do not match the categories available in MEBCalc, Metro converted the estimated tonnage distribution above for each scenario into MEBCalc categories. This conversion involves another set of assumptions about the resin types in the DEQ material categories:

DEQ category	MEBCalc category
Composite Plastic	100% HPDE
Plastic Film	100% LDPE Film
Plastic Other	100% HDPE
Rigid Plastic Cont.	50% PET / 50% HDPE

The resulting distribution of recycled plastic material by MEBCalc category used for each scenario is (in tons):

MEBCalc category	Low scenario	High scenario
PET	1,243	1,649
HDPE	2,478	3,288
LDPE Film	959	1,273
Total	4,679	6,210

Metro also assumed that the plastics processed by the grantee for this project come from curbside collection from single-family, multifamily and commercial generators in the Metro region. Due to the lack of data on the generation of recyclable plastic material by sector for the Metro region, Metro made the simplifying assumption that 50% was collected from single-family truck routes and 50% from mixed multifamily and commercial truck routes. In MEBCalc, curbside collection from single-family homes results in higher amounts of emitted pollutants per ton collected than curbside collection from multifamily and commercial customers. However, the difference is less than 1%.

The main assumptions used as inputs in the scenarios developed in MEBCalc for this calculation are summarized in the following table:

Material category	Low Scenario			High Scenario		
	PET	HDPE	LDPE Film	PET	HDPE	LDPE Film
Recovery amount (tons)	1,243	2,478	959	1,649	3,288	1,273
Recovery method/sector						
Single-family	50%	50%	50%	50%	50%	50%
Multifamily/Commercial	50%	50%	50%	50%	50%	50%
Processing Residue Rates	9%	9%	9%	9%	9%	9%
Distance and mode to markets						
Truck	30 miles (100%)	30 miles (100%)	30 miles (100%)	30 miles (100%)	30 miles (100%)	30 miles (100%)
Route Collection - Diesel Trucks	100%	100%	100%	100%	100%	100%

ENVIRONMENTAL FIBERS INTERNATIONAL

Unders recovery (2019 grant)

Project outcome

Recycling of 1,950 tons of material per year

Estimated benefits

Environmental Fibers International (EFI) provided Metro with its projected increase in recycling of various materials as a result of the grant. EFI's project is to install new equipment to recover the "unders" from its processing operations – the small material that falls through sort screens and is currently landfilled, such as shredded paper, small paper scraps and pieces of plastic, metal and glass.

The grantee provided a detailed breakdown of the projected increase in recovery by type of unders material (see technical notes section below). Metro used this information to estimate the environmental benefit from the project. Due to some uncertainty about the final use of certain materials and modeling assumptions, Metro modeled low and high scenarios to provide a range of results instead of a single estimate.

Based on the results, the total value of the project's net environmental benefits is estimated to be between \$2.4 million and \$3.1 million per year. The benefits are the net avoided costs to society from the life cycle emissions of various harmful pollutants associated with manufacturing a variety of materials. The pollutants considered include greenhouse emissions, fine particulate matter and toxic chemicals.

Focusing only on greenhouse gas emissions, the project's outcome is estimated to avoid between 2,400 and 2,900 metric tons of carbon dioxide equivalents (CO₂e) per year. The value of these benefits is estimated to be between \$513,700 and \$609,100 per year. The benefits are equivalent to avoiding the greenhouse gas emissions from driving between 520 and 620 passenger vehicles for one year. The benefits are also equivalent to the avoided greenhouse gas emissions from driving between 6 million and 7.1 million miles in an average passenger vehicle, or the equivalent of between 940 and 1,100 round trips between Portland, Oregon and Portland, Maine.

Benefits	Low	High
Total value of environmental benefits	\$2.4 million	\$3.1 million
Avoided GHG emissions (in metric tons)	2,400	2,900
Avoided GHG emissions (in \$)	\$513,700	\$609,100
Equivalent passenger vehicles driven for one year	520	620
Equivalent miles driven by an average passenger vehicle	6.0 million	7.1 million
Equivalent trips from Portland, OR to Portland, ME	940	1,100

Technical notes

For this calculation, Metro used the projected amounts of recovered material amounts reported by the grantee to estimate two scenarios (see table below), one offering a low-end estimate and the second one a high-end estimate. There are two differences in the scenarios. First, the high scenario assumes the amount of broken glass material the grantee is able to recover as a result of the grant is processed and used in making glass products. The low scenario assumes the recovered broken glass is disposed at a landfill or used as landfill aggregate and therefore is excluded from the calculations.

Second, the low scenario assumes all mixed containers are made of high density polyethylene (HDPE) plastic since this type of plastic yields the lowest environmental benefit per ton of recycled material in MEBCalc. The high scenario assumes all mixed containers are made of polyethylene (PET) plastic, which is the plastic category that yields the highest environmental benefits in MEBCalc.

Material category reported by grantee	Low scenario		High scenario	
	Estimated amount*	MEBCalc material category	Estimated amount*	
Mixed paper	433	Mixed paper	433	Mixed paper
Old Corrugated Cardboard (OCC)	217	OCC/Cardboard	217	OCC/Cardboard
Mixed containers	542	HDPE	542	PET
Ferrous metals	108	Other ferrous	108	Other ferrous
Broken glass	-	Glass containers	650	Glass containers
Total	1,300		1,950	

* These amounts correspond to annual estimates produced by Metro based on sample performance data provided by grantee.

To simplify the analysis, all calculations assume the material processed by the grantee is collected at the curb from single-family homes. The calculations also assume the trucks used to collect the material from single-family homes are fueled by diesel.

The main assumptions used as inputs in the scenarios developed in MEBCalc for this calculation are summarized in the following tables:

	Scenario I: Mixed paper	Scenario II: Cardboard	Scenario III: Mixed containers (low)
Material category	Mixed paper	OCC	HDPE
Recovery amount (tons)	433	217	542
Recovery method/sector			
Single-Family	100%	100%	100%
Processing Residue Rates	0%	0%	0%
Composition of mixed paper			
OCC	48%	n.a.	n.a.
ONP	24%	n.a.	n.a.
Office Paper	20%	n.a.	n.a.
Magazines & Third Class Mail	8%	n.a.	n.a.
Allocation of Materials to End Markets			
Glass containers to glass containers at Owens Illinois	n.a.	n.a.	n.a.
Distance and mode to markets			
Truck	287 miles (32%)	287 miles (32%)	331 miles (48%)
Ship/Barge	7,000 miles (68%)	7,000 miles (68%)	7,000 miles (52%)
Route Collection: Diesel Trucks	100%	100%	100%

	Scenario IV: Mixed containers (high)	Scenario V: Ferrous metals	Scenario VI: Broken glass
Material category	PET	Other Ferrous	Glass Containers
Recovery amount (tons)	542	108	650
Recovery method/sector			
Single-Family	100%	100%	100%
Processing Residue Rates	0%	0%	0%
Composition of mixed paper			
OCC	n.a.	n.a.	n.a.
ONP	n.a.	n.a.	n.a.
Office Paper	n.a.	n.a.	n.a.
Magazines & Third Class Mail	n.a.	n.a.	n.a.
Allocation of Materials to End Markets			
Glass containers to glass containers at Owens Illinois	n.a.	n.a.	100%
Distance and mode to markets			
Truck	331 miles (48%)	40 miles (92%)	20 miles (100%)
Ship/Barge	7,000 miles (52%)	7,000 miles (8%)	
Route Collection: Diesel Trucks	100%	100%	100%

GREENWAY RECYCLING

Advanced material recovery system (2019 grant)

Project outcome

Recovery of an estimated 5,822 tons per year of construction and demolition material

Estimated benefits

Greenway Recycling provided Metro with its projected increase in material recovery over a ten-year period that would be attributable to the grant project. The grantee provided a detailed breakdown of the projected increase in recovery by type of construction and demolition material (see technical notes section below). Metro used this information to estimate the environmental benefit from the project. Due to some uncertainty about the final use of certain materials and modeling assumptions, Metro modeled low and high scenarios to provide a range of results instead of a single estimate.

Based on the results, the total value of the project's net environmental benefits is estimated to be between \$2.1 million and \$3.9 million per year. The benefits are the net avoided costs to society from the life cycle emissions of various harmful pollutants associated with manufacturing a variety of construction materials. The pollutants considered include greenhouse emissions, fine particulate matter and toxic chemicals.

Focusing only on greenhouse gas emissions, the project's outcome is estimated to avoid between 2,500 and 3,000 metric tons of carbon dioxide equivalents (CO₂e) per year. The value of these benefits is estimated to be between \$525,400 and \$647,300 per year. The benefits are equivalent to avoiding the greenhouse gas emissions from driving between 530 and 660 passenger vehicles for one year. The benefits are also equivalent to the avoided greenhouse gas emissions from driving between 6.1 million and 7.6 million miles in an average passenger vehicle, or the equivalent of between 960 and 1,200 round trips between Portland, Oregon and Portland, Maine.

Benefits	Low	High
Total value of environmental benefits	\$2.1 million	\$3.9 million
Avoided GHG emissions (in metric tons)	2,500	3,000
Avoided GHG emissions (in \$)	\$525,400	\$647,300
Equivalent passenger vehicles driven for one year	530	660
Equivalent miles driven by an average passenger vehicle	6.1 million	7.6 million
Equivalent trips from Portland, OR to Portland, ME	960	1,200

Technical notes

For this calculation, Metro used the projected amounts of recovered material amounts reported by the grantee to estimate two scenarios (see table below), one offering a low-end estimate and the second one a high-end estimate. The main differences between the two scenarios are the way certain materials are modeled. For rigid plastics, since the composition of that category is unknown, the low scenario assumes the full amount (51 tons) is HDPE plastic, which is the rigid plastic recycling category in MEBCalc that yields the lowest environmental benefit per ton. The high scenario assumes the modeled amount is entirely composed of PET plastic, which is the rigid plastic recycling category that yields the highest environmental benefit.

In the case of roofing materials, the low scenario excludes the amount reported by the grantee under the assumption that the material collected is used as alternative daily cover in landfills. This use is not a material management pathway that can be modeled in MEBCalc. The high scenario assumes that the roofing materials are recycled and uses the Masonry/Asphalt/Concrete material category in MEBCalc as the closest available category.

Material	Tons per year	MEBCalc material category used	
		Low scenario	High scenario
Film Plastics	160	LDPE Film	LDPE Film
Rigid Plastics	51	HDPE	PET
Cardboard	600	OCC	OCC
Roofing	641	Not included*	Masonry/Asphalt/Concrete
Drywall	1,287	Gypsum Wallboard	Gypsum Wallboard
#2 Crushed Aggregate	993	Masonry/Asphalt/Concrete	Masonry/Asphalt/Concrete
Aluminum	26	Aluminum	Aluminum
Copper	8	Copper/Other Non-ferrous	Copper/Other Non-ferrous
Hogged Fuel	1,560	Wood Waste**	Not included***
#2 Unprepared Iron	496	Other Ferrous	Other Ferrous
Total	5,822		

- * Excluded. Under this scenario, the roofing material recovered is assumed to be used as alternative daily cover.
- ** Modeled as wood waste used as fuel in industrial boilers substituting for natural gas
- *** Excluded. Net emissions from using wood waste as fuel to substitute for natural gas are higher than the net emissions from disposing wood waste at landfills with systems to capture landfill gas to generate energy.

For hog fuel, the high scenario excludes the hog fuel tonnage amount. The MEBCalc model is based on results comparing different management strategies for wood in which the net emissions of pollutants from using wood waste as a substitute fuel for natural gas in industrial boilers (such as at paper mills) is higher than the net emissions from disposing wood waste at landfills equipped with systems to capture and convert landfill gas into energy.

The main assumptions used as inputs in the scenarios developed in MEBCalc for this calculation are summarized in the following tables:

	Scenario I: Film plastics	Scenario II: Rigid Plastics (low)	Scenario II: Rigid Plastics (high)	Scenario III: Cardboard	Scenario IV: Roofing	Scenario V: Drywall
Material category	LDPE Film	HDPE	PET	OCC	Masonry/ Asphalt/ Concrete	Gypsum Wallboard
Recovery amount (tons)	160	51	51	600	641	1,287
Recovery method/sector						
Construction and Demolition	100%	100%	100%	100%	100%	100%
Processing Residue Rates	0%	0%	0%	0%	0%	0%
Distance and mode to markets						
Truck	331 miles (48%)	331 miles (48%)	331 miles (48%)	287 miles (32%)	20 miles (100%)	20 miles (100%)
Ship/Barge	7,000 miles (52%)	7,000 miles (52%)	7,000 miles (52%)	7,000 miles (68%)		
Route Collection: Diesel Trucks	100%	100%	100%	100%	100%	100%

	Scenario VI: Crushed Aggregate	Scenario VI: Aluminum	Scenario VIII: Copper	Scenario IX: Hogg Fuel	Scenario X: #2 Unprepared Iron
Material category	Masonry/Asphalt/ Concrete	Aluminum	Copper	Wood Waste	Other Ferrrous
Recovery amount (tons)	993	26	8	1,560	496
Recovery method/sector					
Construction and Demolition	100%	100%	100%	100%	100%
Processing Residue Rates	0%	0%	0%	0%	0%
Distance and mode to markets					
Truck	20 miles (100%)	40 miles (92%)	40 miles (92%)	30 miles (100%)	40 miles (92%)
Ship/Barge		7,000 miles (8%)	7,000 miles (8%)		7,000 miles (8%)
Route Collection: Diesel Trucks	100%	100%	100%	100%	100%

URBAN GYPSUM

Pelletizing system for drywall waste reduction (2019 grant)

Project outcome

Recovery of 66,000 tons of drywall per year

Estimated benefits

Processing 66,000 tons per year of drywall for recycling would result in net environmental benefits valued at \$17.3 million per year. The benefits are the net avoided costs to society from the life cycle emissions of various harmful pollutants associated with making drywall products. The pollutants considered include greenhouse emissions, fine particulate matter and toxic chemicals.

Focusing only on greenhouse gas emissions, the project's outcome is estimated to avoid 12,600 metric tons of carbon dioxide equivalents (CO₂e) per year. The climate change benefits are valued at \$2.7 million per year. The benefits are equivalent to avoiding the greenhouse gas emissions from driving 2,700 passenger vehicles for one year. The results are also equivalent to avoiding the greenhouse gas emissions from driving between 31.1 million miles in an average passenger vehicle, or the equivalent of 4,900 round trips between Portland, Oregon and Portland, Maine.

Benefits	Amounts
Value of total environmental benefits	\$17.3 million
Avoided GHG emissions (in metric tons)	12,600
Avoided GHG emissions (in \$)	\$2.7 million
Equivalent passenger vehicles driven for one year	2,700
Equivalent miles driven by an average passenger vehicle	31.1 million
Equivalent trips from Portland, OR to Portland, ME	4,900

Technical notes

Metro used MEBCalc to estimate the environmental benefits of this project, assuming 100% of the 66,000 tons of drywall per year were collected as construction and demolition (C&D) material generated within the Metro region. In MEBCalc, collection of C&D material is slightly more efficient than curbside collection of waste generated by single-family homes, due to the larger quantities of material collected at each stop on C&D collection routes or the use of dedicated drop boxes for C&D waste.

The environmental benefit calculations also assume the process for recycling drywall/gypsum wallboard has a 0.5% processing residue rate. This rate implies that of the 66,000 tons of drywall processed for recycling, 330 tons are residual waste and are not actually recycled but sent to landfill. The assumed processing residue rate is significantly lower than those typically assumed for other recyclable materials. However, assuming a higher processing residue rate for drywall recycling does not significantly change the results. For example, assuming a 9% processing residue rate decreases the estimated value of the total environmental benefits by 1.1%, from \$17.3 million to \$17.1 million.

The main assumptions used as inputs in the scenarios developed in MEBCalc for this calculation are summarized in the following table:

Scenario I:
Drywall

Material category	Gypsum Wallboard
Recovery amount (tons)	66,000
Recovery method/sector	
Construction and Demolition	100%
Processing Residue Rates	0.5%
Distance and mode to markets	
Truck	30 miles (100%)
Route Collection: Diesel Trucks	100%

LOVETT DECONSTRUCTION

Full house deconstruction training program (2019 grant)

Project Outcome

Reuse of approximately 76 tons of materials salvaged from large remodeling projects not subject to the City of Portland's deconstruction ordinance

Estimated benefits

According to Metro estimates based on Oregon Department of Environmental Quality (DEQ) research, the avoided greenhouse gas emissions from the amount of materials salvaged by Lovett Deconstruction during this project are estimated to be 120 metric tons of carbon dioxide equivalents (CO₂e). The value of the benefits is estimated to be \$24,800 and is equivalent to avoiding the greenhouse gas emissions from driving 25 passenger vehicles for one year. The benefits are also equivalent to avoiding the emissions from driving a total of 290,000 miles in an average passenger vehicle, or the equivalent of 45 round trips between Portland, Oregon and Portland, Maine.

Benefits	Amounts
Avoided GHG emissions (in metric tons)	120
Avoided GHG emissions (in \$)	\$24,800
Equivalent passenger vehicles driven for one year	25
Equivalent miles driven by an average passenger vehicle	290,000
Equivalent trips from Portland, OR to Portland, ME	45

Technical Notes

Metro calculated the estimated carbon impact of salvaged materials reported by Lovett Deconstruction using the material amounts provided and the unit conversions and impact values documented in the Oregon DEQ's report: *Deconstruction vs. Demolition: An evaluation of carbon and energy impacts from deconstructed homes in the City of Portland for calculating the impact* (2019).⁷

Metro assumed a rate of 100% reuse for the salvaged materials reported by the grantee and followed the assumptions outlined in the DEQ report for all materials listed. Per these assumptions, Metro excluded certain categories of materials because of insufficient life cycle assessment data or information about the materials salvaged. These items included washers and dryers, refrigerators, microwaves, water heaters, shutters, drawers and shelving.

When the amount of a material reported by the grantee did not include a material type, Metro assumed equal percentages of the reported amount was made from each likely material type. For example, for the 26 sinks recorded, 13 were assumed ceramic and 13 were assumed steel. Similarly, when a material reported had different subcategories that were not specified (e.g., cabinet sizes), equal amounts of each subcategory were assumed.

Metro believes the estimated environmental benefit from this project is likely low compared to the actual value due to the use of conservative assumptions and the exclusion of some materials reported by Lovett for which Metro was unable to estimate avoided emissions.

⁷ Oregon Department of Environmental Quality (2019). *Deconstruction vs. Demolition: An evaluation of carbon and energy impacts from deconstructed homes in the City of Portland for calculating the impact*. Last accessed online on 10/27/2020 at: <https://www.oregon.gov/deq/FilterDocs/DeconstructionReport.pdf>.

SALVAGE WORKS

Wood shop expansion (2019 grant)

Project outcome

Reuse of 45 tons of lumber per year

Estimated benefits

Recovering 45 tons of wood for reuse per year would result in net environmental benefits valued at \$27,500 per year. The benefits are the net avoided costs to society from the life cycle emissions of various harmful pollutants associated with making wood products. The pollutants considered include greenhouse emissions, fine particulate matter and toxic chemicals.

Focusing only on greenhouse gas emissions, the project’s outcome is estimated to avoid 37 metric tons of carbon dioxide equivalents (CO₂e) per year, valued at \$7,800 annually. The environmental benefits are equivalent to avoiding the greenhouse gas emissions from driving 8 passenger vehicles for one year. The benefits are also equivalent to avoiding the emissions from driving a total of 91,000 miles in an average passenger vehicle, or the equivalent of 14 round trips between Portland, Oregon and Portland, Maine.

Benefits	Amounts
Value of total environmental benefits	\$27,500
Avoided GHG emissions (in metric tons)	37
Avoided GHG emissions (in \$)	\$7,800
Equivalent passenger vehicles driven for one year	8
Equivalent miles driven by an average passenger vehicle	91,000
Equivalent trips from Portland, OR to Portland, ME	14

Technical notes

Metro estimated the environmental benefits of this project assuming 100% of the 45 tons of lumber per year were collected as construction and demolition (C&D) material generated within the Metro region. In the MEBCalc model, collection of C&D material is slightly more efficient than curbside collection of waste generated by single-family homes, due to the larger quantities of material collected at each stop on C&D collection routes or the use of dedicated drop boxes for C&D waste.

Metro estimated the environmental benefits from this project as the difference between recovering 45 tons of lumber for reuse against the alternative scenario of disposing the same amount of material as landfill waste. Metro assumed 100% of the lumber was recovered for reuse, without any residual waste. The main assumptions used as inputs in the two scenarios developed in MEBCalc for this calculation are summarized in the following table:

	Outcome Scenario
Recovery amount: Wood Waste (tons)	450
Recovery method/sector: Construction and Demolition	100%
Processing Residue Rates: Wood processing facilities	0%
Allocation of Materials to End Markets:	
Clean wood to reuse	100%
Distance and mode to markets: Truck	20 miles (100%)
Route Collection - Diesel Trucks	100%

URBAN GLEANERS

Second shift food rescue initiative (2019 grant)

Project outcome

43.5 tons of rescued food

Estimated benefits

The environmental benefit of food rescue activities stems from collecting food that would have otherwise been discarded and entered the waste stream, and providing the food to people who live with food insecurity. By preventing food from entering the waste stream, food rescue activities help avoid the emissions from disposing food at landfills. The consumption of rescued food by people with food insecurity may also reduce the need for them to purchase new food items. However, as the US Environmental Protection Agency (EPA) emphasizes in its guidance on modeling the benefits of food donation:

“Many of those who consume donated food may not have a secure source for food. There is a high level of uncertainty around how food-insecure people access food and nutrition, and the extent to which donated food will offset the generation of food from another source.”⁸

Due to this uncertainty, Metro followed the EPA’s guidance and produced two estimates. The low-end estimate includes only the avoided landfill emissions associated with disposing 43.5 tons of food. The high-end estimate includes both the avoided landfill emissions and the upstream emissions from avoided food production, assuming the amount of food collected and provided to people with food insecurity completely replaces new food production by the same amount. The latter assumption represents a theoretical upper limit, rather than a likely scenario.

The table below summarizes the estimated environmental benefits from 43.5 tons of rescued food:

Benefits	Low	High
Value of total environmental benefits	\$5,100	\$10,300
Avoided GHG emissions (in metric tons)	24	39
Value of avoided GHG emissions	\$5,000	\$8,300
Equivalent passenger vehicles driven for one year	5	9
Equivalent miles driven by an average passenger vehicle	58,300	97,500
Equivalent trips from Portland, OR to Portland, ME	9	15

The total value of the environmental benefits is estimated to be between \$5,100 and \$10,300 per year. The benefits are the net avoided costs to society from the life cycle emissions of various harmful pollutants associated with food production. The pollutants considered include greenhouse gases, sulfur dioxide and toxic chemicals.

Focusing only on greenhouse gas emissions, the project’s outcome is estimated to avoid between 24 and 39 metric tons of carbon dioxide equivalents (CO₂e) per year. The value of the benefits is estimated to be between \$5,000 and \$8,300 per year. The environmental benefits are equivalent to avoiding the greenhouse gas emissions from driving between 5 and 9 passenger vehicles for one year. The benefits are also equivalent to avoiding the emissions from driving between 58,300 and 97,500 miles in an average passenger vehicle, or the equivalent of between 9 and 15 round trips between Portland, Oregon and Portland, Maine.

⁸ US Environmental Protection Agency (EPA), Modeling Food Donation Benefits in EPA’s Waste Reduction Model. Last accessed on 10/29/2020 at: <https://www.epa.gov/warm/guidance-how-use-materials-and-management-pathways-not-found-waste-reduction-model-warm>.

Technical notes

Metro followed the EPA’s guidance referenced earlier to produce low-end and high-end estimates of the environmental benefit of 43.5 tons of rescued food. Both estimates are based on a scenario in which the amounts of food are collected from commercial waste generators and transported to a landfill located 110 miles away in diesel trucks. The alternative scenario in which food is collected by the grantee in the Metro region assumes the food is transported in diesel trucks for a total of 20 miles.

Metro assumed a 0% processing residue rate, which implies no portion of the 43.5 tons of rescued food reported by the grantee is food loss due to, for example, spoilage during the collection and repackaging process. The EPA estimates food loss at 3%, but Metro opted to assume a 0% rate to simplify the analysis, given that food rescue requires custom modeling in MEBCalc.

For the high-end estimate, Metro assumed the amount of rescued food would completely offset the demand for new food items. Although this is an unrealistic assumption, it is important to note that the estimate is low compared to the estimates obtained from the EPA’s Waste Reduction Model (WARM). As shown below, both MEBCalc and WARM produce similar results for the low-end scenario, which includes only avoided emissions from landfilling. The high-end estimate, which includes upstream emissions from avoided food production, is almost 10 times higher in WARM than in MEBCalc. Metro has not determined why the two models differ significantly when it comes to upstream emissions from food production.

Comparing MEBCalc and WARM model results of modeling 43.5 tons of rescued food

Results are in metric tons of carbon dioxide equivalent (CO₂e)

	Low	High
MEBCalc	23.52	39.32
WARM	23.49	177.48

The main assumptions used as inputs in the scenario developed in MEBCalc for this calculation are summarized in the following table:

	Scenario I: Food Rescue
Recovery amount: Food scraps (tons)	43.5
Recovery method/sector: Multifamily/Commercial	100%
Processing Residue Rates	0%
Distance and mode to markets: Truck	20 miles (100%)
Route Collection - Diesel Trucks	100%

CITY REPAIR

Useful waste initiative (2020 grant)

Project Outcome

Reuse of 7.5 tons of building materials

Estimated benefits

Metro estimated the avoided greenhouse gas emissions from the potential salvage and reuse of 7.5 tons of building materials from the grantee's project to divert usable construction waste from mock-ups (small prototype structures of larger buildings) to provide homes for unhoused communities. The calculations are based on Oregon Department of Environmental Quality (DEQ) estimates of the avoided greenhouse gas emissions from reusing salvaged deconstruction materials.

The results show an estimated benefit from this project of 13 metric tons of avoided greenhouse gas emissions (carbon dioxide equivalents, CO₂e). The value of the benefits is estimated to be \$2,800 and is equivalent to avoiding the greenhouse gas emissions from driving 3 passenger vehicles for one year. The benefits are also equivalent to avoiding the emissions from driving a total of 32,400 miles in an average passenger vehicle, or the equivalent of 5 round trips between Portland, Oregon and Portland, Maine.

Benefits	Amounts
Avoided GHG emissions (in metric tons)	13
Avoided GHG emissions (in \$)	\$2,800
Equivalent passenger vehicles driven for one year	3
Equivalent miles driven by an average passenger vehicle	32,400
Equivalent trips from Portland, OR to Portland, ME	5

Technical Notes

Metro estimated the avoided greenhouse gas emissions from this project using the estimated building material amounts provided by the grantee and the impact values documented in the Oregon DEQ report: *Deconstruction vs. Demolition: An evaluation of carbon and energy impacts from deconstructed homes in the City of Portland for calculating the impact* (2019).⁹

To estimate the amount of material salvaged by material category, Metro applied the composition of materials salvaged from the average home reported in the Oregon DEQ report (Figure 5, page 19). The DEQ report shows, for example, that more than 87% of the materials salvaged from the average residential deconstruction project in Portland is softwood lumber and 3.4% is plywood. The rest of the material categories represent around 1.1% of the total salvaged material or less.

Metro assumed a rate of 100% reuse for the salvaged materials reported by the grantee. This means that the calculation above excludes an estimate of the environmental impact of the residual waste generated from the grantee's deconstruction projects. The impact of that residual waste may add or subtract to the overall benefit of those projects, depending on the final disposition of the residual materials (e.g., recycled, landfilled).

⁹ Oregon Department of Environmental Quality (2019). *Deconstruction vs. Demolition: An evaluation of carbon and energy impacts from deconstructed homes in the City of Portland for calculating the impact*. Last accessed online on 10/27/2020 at: <https://www.oregon.gov/deq/FilterDocs/DeconstructionReport.pdf>.

COMMUNITY CYCLING CENTER

Reusing and recycling salvaged bicycles and parts (2020 grant)

Project outcome

Reuse and recycling of approximately 5 tons of bicycle parts

Estimated benefits

The potential environmental benefits from this project will result from the grantee’s increased reuse and recycling of bicycle parts. Metro estimates the project may lead to an increase in recycling of 3.5 tons of steel and aluminum parts and reuse of 1.2 tons in salvaged parts that the grantee will use to repair bicycles and provide them for free to people who need them.

In terms of reuse, the environmental benefits from the grantee’s activities result from preventing bicycles and bicycle parts from entering the waste stream and thus avoiding the emissions from disposing those materials at landfills. The emissions generated from landfilling bicycles and bicycle parts are generally low since bicycles are made of materials that produce low landfill emissions, including steel, aluminum, rubber and plastic. The reuse of bicycles and bicycle parts may also lead to reduced emissions from the manufacturing of new bicycles to the extent that the grantee’s activities reduce the need for purchasing new bicycles.

Because there is uncertainty around the extent to which reused bicycles will offset the manufacturing of new bicycles, Metro produced two estimates of the potential environmental benefits of reuse, similar to the methodology used for food rescue activities. The low-end estimate includes only the potential avoided landfill emissions associated with disposing 1.2 tons of bicycle parts. The high-end estimate includes both the avoided landfill emissions and the upstream emissions from avoided bicycle production, assuming the repaired bicycles provided to the public by the grantee completely replace the manufacturing of new bicycles by the same amount.

The table below summarizes the estimated environmental benefits from recycling and reusing 4.7 tons of bicycle parts:

Benefits	Recycling	Reuse (LOW)	Reuse (HIGH)	Total (LOW)	Total (HIGH)
Value of total environmental benefits	\$7,700	< \$10	\$7,400	\$7,700	\$15,100
Avoided GHG emissions (in metric tons)	20	< 1	10	20	30
Value of avoided GHG emissions	\$5,000	< \$10	\$2,000	\$5,000	\$7,000
Equivalent passenger vehicles driven for one year	5	< 1	2	5	7
Equivalent miles driven by an average passenger vehicle	58,100	30	24,200	58,100	82,300
Equivalent trips from Portland, OR to Portland, ME	9	< 1	4	9	13

The total value of the environmental benefits is estimated to be between \$7,700 and \$15,100. The benefits are the net avoided costs to society from the life cycle emissions of various harmful pollutants associated with bicycle manufacturing. The pollutants considered include greenhouse gases, sulfur dioxide and toxic chemicals.

Focusing only on greenhouse gas emissions, the estimates show the project may avoid between 20 and 30 metric tons of carbon dioxide equivalents (CO₂e). The value of these benefits is estimated to be between \$5,000 and \$7,000. The environmental benefits are equivalent to avoiding the greenhouse gas emissions from driving between 5 and 7 passenger vehicles for one year. The benefits are also equivalent to avoiding the emissions from driving between 58,100 and 82,300 miles in an average passenger vehicle, or the equivalent of between 9 and 13 round trip between Portland, Oregon and Portland, Maine.

Technical notes

Metro estimated the environmental benefits of recycling the amounts of steel and aluminum anticipated by the grantee (see table below). For reuse activities, Metro used a similar approach to the one used for food rescue activities to produce low-end and high-end estimates of the environmental benefit salvaging bicycle parts. Based on the information provided by the grantee, the estimated amounts of materials used in the calculations are:

	Tons
Recycling	
Steel	1.5
Aluminum	2.0
Recycling total	3.5
Reuse	
Rubber tires	0.07
Aluminum	0.73
Steel	0.25
Plastic (HDPE)	0.11
Reuse total	1.16

The main assumptions used as inputs in the scenarios developed in MEBCalc for this calculation are summarized in the following table:

	Scenario I: Steel recycling	Scenario II: Aluminum recycling	Scenario III: Rubber parts reuse	Scenario IV: Aluminum parts reuse	Scenario V: Steel parts reuse	Scenario VI: Plastic parts reuse
Material category	Tinned Cans	Aluminum	Tires	Aluminum	Tinned Cans	HDPE
Recovery amount (tons)	1.5	2	0.07	0.73	0.25	0.11
Recovery method/sector:						
Construction and Demolition	100%	100%				
Drop-Off			100%	100%	100%	100%
Processing Residue Rates:	0%	0%	0%	0%	0%	0%
Distance and mode to markets						
Truck	40 miles (92%)	40 miles (92%)	30 miles (100%)	30 miles (100%)	30 miles (100%)	30 miles (100%)
Ship/Barge	7,000 miles (8%)	7,000 miles (8%)				

COMMUNITY DEVELOPMENT CORPORATION OF OREGON

East County food rescue shuttle (2020 grant)

Project outcome

2.5 tons of rescued food

Estimated benefits

The environmental benefit of food rescue activities is derived from collecting food that would have otherwise been discarded and entered the waste stream, and providing the food to people who live with food insecurity. By preventing food from entering the waste stream, food rescue activities help avoid the emissions from disposing food at landfills. The consumption of rescued food by people with food insecurity may also reduce the need for them to purchase new food items. However, as the US Environmental Protection Agency (EPA) emphasizes in its guidance on modeling the benefits of food donation:

“Many of those who consume donated food may not have a secure source for food. There is a high level of uncertainty around how food-insecure people access food and nutrition, and the extent to which donated food will offset the generation of food from another source.”¹⁰

Due to this uncertainty, Metro followed the EPA’s guidance and produced two estimates. The low-end estimate includes only the potential avoided landfill emissions associated with disposing 2.5 tons of food. The high-end estimate includes both the avoided landfill emissions and the upstream emissions from avoided food production, assuming the amount of food collected and provided to people with food insecurity completely replaces new food production by the same amount. The latter assumption represents a theoretical upper limit, rather than a likely scenario.

The table below summarizes the estimated environmental benefits from 2.5 tons of rescued food:

Benefits	Low	High
Value of total environmental benefits	\$300	\$600
Avoided GHG emissions (in metric tons)	1.4	2.3
Value of avoided GHG emissions	\$290	\$480
Equivalent passenger vehicles driven for one year	0.3	0.5
Equivalent miles driven by an average passenger vehicle	3,300	5,600
Equivalent trips from Portland, OR to Portland, ME	0.5	1

The total value of the environmental benefits is estimated to be between \$300 and \$600 per year. The benefits are the net avoided costs to society from the life cycle emissions of various harmful pollutants associated with food production. The pollutants considered include greenhouse gases, sulfur dioxide and toxic chemicals.

Focusing only on greenhouse gas emissions, the project’s outcome is estimated to avoid between 1.4 and 2.3 metric tons of carbon dioxide equivalents (CO₂e) per year. The value of these benefits is estimated to be between \$290 and \$480 per year. The environmental benefits are equivalent to avoiding the greenhouse gas emissions from driving less than 1 passenger vehicle for one year. The benefits are also equivalent to avoiding the emissions from driving between 3,300 and 5,600 miles in an average passenger vehicle, or the equivalent of between 0.5 and 1 round trip between Portland, Oregon and Portland, Maine.

¹⁰ US Environmental Protection Agency (EPA), Modeling Food Donation Benefits in EPA’s Waste Reduction Model. Last accessed on 10/29/2020 at: <https://www.epa.gov/warm/guidance-how-use-materials-and-management-pathways-not-found-waste-reduction-model-warm>.

Technical notes

Metro followed the EPA’s guidance referenced earlier to produce low-end and high-end estimates of the environmental benefit of 2.5 tons of rescued food. Both estimates are based on a scenario in which the amounts of food are collected from commercial waste generators and transported to a landfill located 110 miles away in diesel trucks. The alternative scenario in which food is collected by the grantee in the Metro region assumes the food is transported in diesel trucks for a total of 20 miles.

Metro assumed a 0% processing residue rate, which implies no portion of the 2.5 tons of rescued food reported by the grantee are food losses due to, for example, spoilage during the collection and repackaging process. The EPA estimates food loss at 3%, but Metro opted to assume a 0% rate to simplify the analysis, given that food rescue requires custom modeling in MEBCalc.

For the high-end estimate, Metro assumed the amount of rescued food would completely offset the demand for new food items. Although this is an unrealistic assumption, it is important to note that the estimate is low compared to the estimates obtained from the EPA’s Waste Reduction Model (WARM). As shown below, both MEBCalc and WARM produce similar results for the low-end scenario, which includes only avoided emissions from landfilling. The high-end estimate, which includes upstream emissions from avoided food production, is almost 10 times higher in WARM than in MEBCalc. Metro has not determined why the two models differ significantly when it comes to upstream emissions from food production.

Comparing MEBCalc and WARM model results of modeling 2.5 tons of rescued food

Results are in metric tons of carbon dioxide equivalent (CO₂e)

	Low	High
MEBCalc	1.35	2.26
WARM	1.35	10.2

The main assumptions used as inputs in the scenario developed in MEBCalc for this calculation are summarized in the following table:

	Scenario I: Food Rescue
Recovery amount: Food scraps (tons)	2.5
Recovery method/sector: Multifamily/Commercial	100%
Processing Residue Rates	0%
Distance and mode to markets: Truck	20 miles (100%)
Route Collection - Diesel Trucks	100%

CRACKED POTS, INC.

Integrating equity in Cracked Pots' mission and operations (2020 grant)

Project outcome

Reuse of approximately 12.4 tons of products and materials

Estimated benefits

The potential environmental and human health benefits from this project are expected to come from an increase in the amount of products and materials salvaged for reuse by the grantee from the Metro Central transfer station. The grantee estimates the project can result in an additional 26 tons of salvaged products and materials, including wood, metal, furniture, home décor items, art supplies, hardware and tools, and garden and outdoor items.

The tools available to estimate the environmental benefits from salvaging and reuse tend to focus on materials, instead of products. Given this limitation, Metro used sales data on the types of items the grantee regularly salvages and sells for reuse to estimate the potential environmental and human health benefits of 14.7 tons out of the 26 tons of materials the grantee expects to collect as a result of this grant.

The benefits from the grantee's reuse activities result from preventing products and materials from entering the waste stream and thus avoiding the emissions from disposing those materials at landfills. The reuse of those products and materials may also lead to reduced emissions from the manufacturing of new products to the extent that the grantee's activities reduce the need for purchasing new items.

Because there is uncertainty around the extent to which reused items offset the manufacturing of new products, Metro produced two estimates of the potential environmental benefits of reuse, similar to the methodology used for other reuse-related grants. Both estimates include the same estimated benefit of reusing wood calculated using MEBCalc. For metal items, MEBCalc does not have a reuse option. Therefore, Metro generated a low-end estimate by considering only the avoided landfill emissions associated with disposing metal products and materials. The high-end estimate includes both the avoided landfill emissions and the upstream emissions from avoided production of metal, assuming the reused items sold to the public completely replace the manufacturing of new products by the same amount.

The table below summarizes the estimated environmental benefits from reusing 14.7 tons of wood and metal items. These results should be treated with caution given that they do not reflect the full range of materials salvaged by the grantee for reuse and they have a high degree of uncertainty.

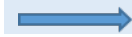
Benefits	Low	High
Value of total environmental benefits	\$4,700	\$20,500
Avoided GHG emissions (in metric tons)	6	20
Value of avoided GHG emissions	\$1,400	\$4,200
Equivalent passenger vehicles driven for one year	1	4
Equivalent miles driven by an average passenger vehicle	15,900	48,400
Equivalent trips from Portland, OR to Portland, ME	3	8

The total value of the environmental benefits is estimated to be between \$4,700 and \$20,500. The benefits are the net avoided costs to society from the life cycle emissions of various harmful pollutants associated with the manufacturing of wood and metal products. The pollutants considered include greenhouse gases, sulfur dioxide and toxic chemicals.

Focusing only on greenhouse gas emissions, the estimates show the project could avoid between 6 and 20 metric tons of carbon dioxide equivalents (CO₂e). The value of these benefits is estimated to be between \$1,400 and \$4,200. The environmental benefits are equivalent to avoiding the greenhouse gas emissions from driving between 1 and 4 passenger vehicles for one year. The benefits are also equivalent to avoiding the greenhouse gas emissions from driving between 15,900 and 48,400 miles in an average passenger vehicle, or the equivalent of between 3 and 8 round trip between Portland, Oregon and Portland, Maine.

Technical notes

Metro estimated the environmental benefits of 12.4 tons out of 22 tons of the products and materials the grantee expects to salvage as a result of the grant (see table below). Metro used sales data provided by the grantee to estimate the amounts of salvaged wood and metal items:

Category	% of total sales (2014-2019)		MEBCalc Category	Tons
Wood (Lumber)	7.1%		Wood	7.6
Wood (Doors/Windows Shutters/Drawers)	3.3%		Metal/Other	7.1
Metal	8.4%		Ferrous	
Furniture ^a	20.4%		Total	14.7
Boxes and containers ^a	4.3%			
Home décor ^a	12.9%			
Other ^b	43.6%			

^a Metro assumed 50% of items in this category were made of wood and 50% were made of metal, as a simplifying assumption.

^b Includes art supplies, hardware, tools, electrical, garden, outdoor, jewelry and other items.

The main assumptions used as inputs in the scenarios developed in MEBCalc for this calculation are summarized in the following table:

Material category	Scenario I:	Scenario II:
	Wood reuse	Metal
Recovery amount (tons)	Wood	Other Ferrous
	7.6	7.1
Recovery method/sector:		
Drop-Off	100%	100%
Processing Residue Rate:	0%	0%
Allocation to end markets:		
Clean wood to reuse	100%	n.a.
Distance and mode to markets		
Truck	10 miles (100%)	10 miles (100%)

FREE GEEK

Electronic waste collection and recycling (2020 grant)

Project outcome

20 tons of reused and recycled electronics

Estimated benefits

Metro estimated the potential environmental benefit of collecting 20 tons of electronic devices for reuse (32%) and recycling (68%) based on projections reported by the grantee. To estimate the composition of the projected recovery amounts, Metro used information provided by the grantee about the types of electronic equipment the organization typically collects from the public and how much of the material is reused and recycled (see technical notes below for more details).

The results indicate this project has a potential net environmental benefit valued at \$277,000. The benefits are the net avoided costs to society from the life cycle emissions of various harmful pollutants associated with manufacturing desktops, laptops and monitors. The pollutants considered include greenhouse emissions, fine particulate matter and toxic chemicals.

Focusing only on greenhouse gas emissions, the project's outcome avoided an estimated 760 metric tons of carbon dioxide equivalents (CO₂e) per year. These estimated benefits are valued at \$162,100. The benefits are equivalent to avoiding the greenhouse gas emissions from driving 165 passenger vehicles for one year. The benefits are also equivalent to the avoided greenhouse gas emissions from driving 1.9 million miles in an average passenger vehicle, or the equivalent of 2,800 round trips between Portland, Oregon and Portland, Maine.

Benefits	Amount
Total value of environmental benefits	\$277,000
Avoided GHG emissions (in metric tons)	760
Avoided GHG emissions (in \$)	\$162,100
Equivalent passenger vehicles driven for one year	165
Equivalent miles driven by an average passenger vehicle	1.9 million
Equivalent trips from Portland, OR to Portland, ME	300

Technical notes

For this calculation, Metro used the information provided by the grantee to estimate the weight and types of electronic items recovered for reuse or recycling. The main assumptions include: 100% drop off by the public as the collection method, a 10% processing residue rate, and transportation to end markets by truck for reuse (assumed 30 miles to be the average trip to Free Geek) and by ship (assumed 7,000 miles based on exports of electronic materials for recycling to Asian markets).

The final composition of the electronic materials used for this calculation is shown in the table below. The composition reflects the grantee's estimate that 32% of the items collected by Free Geek (by weight) are reused and that the grantee expects to collect an additional 2,000 laptop computers as a result of the grant.

MEBCalc does not have material categories for smartphones or printers. For smartphones, Metro assumed they have comparable life cycle environmental impacts to laptops given that the EPA's Waste Reduction Model (WARM) model lumps both into the portable electronic devices category. For printers, WARM's Monitors category was selected as the closest material category based on similar net greenhouse gas emissions avoided per ton recycled: 0.56 metric tons of CO₂e (MTCO₂e) per short ton recycled for hard-copy devices, which includes

printers, compared to 0.57 and 0.99 MTCO₂e per short ton recycled for cathode-ray tube (CRT) and flat-panel displays, respectively.¹¹

Item	Units	Weight (lbs)	Weight (lbs per unit)	Weight (short tons)	Weight (% total)
Desktops to reuse	426	6,390	15	3.20	16%
Desktops to recycling	905	13,579	15	6.79	34%
Laptops and smartphones to reuse	1,140	4,730	7	2.37	12%
Laptops and smartphones to recycling	2,423	10,051	7	5.03	25%
Monitors and printers to reuse	70	1,680	24	0.84	4%
Monitors and printers to recycling	149	3,570	24	1.79	9%
Total	5,113	40,000		20.00	100%

The main assumptions used as inputs in the scenario developed in MEBCalc for this calculation are summarized in the following table:

Outcome Scenario	
Recovery amount: Electronics (tons)	20
Recovery method/sector: Dropoff	100%
Processing Residue Rates:	0%
Allocation of Materials to End Markets:	
Electronics	
Desktops to reuse	16%
Desktops to recycling	33.9%
Laptops to reuse	11.8%
Laptops to recycling	25.1%
Monitors to reuse	4.2%
Monitors to recycling	8.9%
Distance and mode to markets:	
Truck	40 miles (32%)
Ship/Barge	7,000 miles (68%)
Route Collection - Diesel Trucks	100%

¹¹ US Environmental Protection Agency (EPA) (2020). Documentation for Greenhouse Gas Emission and Energy Factors Used in the Waste Reduction model (WARM), Electronics, November 2020. Accessed online at: https://www.epa.gov/sites/production/files/2020-12/documents/warm_electronics_v15_10-29-2020.pdf.

JAMES' NEIGHBORHOOD RECYCLING SERVICE

Expanding neighborhood collection events (2020 grant)

Project outcome

Recycling of 7.5 tons of plastic

Estimated benefits

Metro estimated the potential environmental benefit of recycling 7.5 tons of plastic materials of different types, as projected by the grantee for this project. The grant's potential environmental benefits are estimated to be around \$4,400. The benefits are the net avoided costs to society from the life cycle emissions of various harmful pollutants associated with making plastic products. The pollutants considered include greenhouse emissions, fine particulate matter and toxic chemicals.

Focusing only on greenhouse gas emissions, the project's outcome is estimated to avoid 10 metric tons of carbon dioxide equivalent (CO₂e) per year. The value of the benefits is estimated to be \$2,200. The benefits are equivalent to avoiding the greenhouse gas emissions from driving 2 passenger vehicles for one year. The benefits are also equivalent to the avoided greenhouse gas emissions from driving 25,600 miles in an average passenger vehicle, or the equivalent of 4 round trips between Portland, Oregon and Portland, Maine.

Benefits	Amounts
Total value of environmental benefits	\$4,400
Avoided GHG emissions (in metric tons)	10
Avoided GHG emissions (in \$)	\$2,200
Equivalent passenger vehicles driven for one year	2
Equivalent miles driven by an average passenger vehicle	25,600
Equivalent trips from Portland, OR to Portland, ME	4

Technical notes

For this calculation, Metro used the information provided by the grantee about the grantee's projected total amount of plastic material to be recovered as a result of the grant (7.5 tons) and historical data on different types of plastic materials collected by the grantee at events.

Material type (provided by grantee)	%	tons	MEBCalc category
#5PP: 71%	71%	5.3	HDPE
#2 LDPE: 13%	13%	1.0	LDPE Film
#4 HDPE: 4%	4%	0.3	HDPE
Styrofoam and #6 plastic: 12%	12%	0.9	HDPE
Total	100%	7.5	

Because some of the plastic resin types reported by the grantee do not match any of the three categories available in MEBCalc, Metro used the closest MEBCalc category in terms of the greenhouse gas emissions generated per ton of recycled material according to data from the US Environmental Protection Agency's Waste Reduction Model (WARM). For all categories reported by the grantee other than low density polyethylene (LDPE) plastic, Metro identified high density polyethylene (HDPE) as the closest category.¹² HDPE is also the plastic

¹² US Environmental Protection Agency (EPA). Documentation for Greenhouse Gas Emissions and Energy Factors Used in the Waste Reduction Model (WARM): Containers, Packaging, and Non-Durable Good Materials Chapters (May 2019). Last accessed online on 11/10/2020 at: https://www.epa.gov/sites/production/files/2019-06/documents/warm_v15_containers_packaging_non-durable_goods.pdf.

category in MEBCalc that yields the lowest total environmental benefit value per ton of material recycled. The resulting distribution of recycled plastic material by MEBCalc category used for each scenario is (in tons):

MEBCalc category	Tons
HDPE	6.5
LDPE Film	1.0
Total	7.5

Metro also assumed that the plastics collected by the grantee for this project are dropped off at collection events by people who live in the Metro region and that the material is then delivered to material recovery facilities and other processors before being sent by truck or ship to the companies that will use the recovered material to make new products, usually called end markets. The truck and ship distances used in this scenario are based on the average, estimated number of miles between Portland and different plastic end markets around the world based on data reported by recycling facilities to Metro for 2019. This and other major assumptions used as inputs in MEBCalc are summarized below:

Material category	Scenario I	Scenario II
	HDPE	LDPE Film
Recovery amount (tons)	6.5	1
Recovery method/sector: Drop-off	100%	100%
Processing Residue Rates: Commingled MRFs – non-glass	0%	0%
Distance and mode to markets		
Truck	331 miles (48%)	331 miles (48%)
Ship/Barge	7,000 miles (52%)	7,000 miles (52%)
Route Collection - Diesel Trucks	100%	100%

PROFESSIONAL BUSINESS DEVELOPMENT GROUP

Building a culture of reuse for underrepresented contractors (2020 grant)

Project Outcome

15 tons reused building materials

Estimated benefits

Metro estimated the avoided greenhouse gas emissions from the potential salvage and reuse of 15 tons of building materials from the grantee's project. The calculations are based on Oregon Department of Environmental Quality (DEQ) estimates of the avoided greenhouse gas emissions from reusing salvaged deconstruction materials.

The results show an estimated benefit from this project of 26 metric tons of avoided greenhouse gas emissions (carbon dioxide equivalents, CO₂e). The value of the benefits is estimated to be \$5,600 and is equivalent to avoiding the greenhouse gas emissions from driving 6 passenger vehicles for one year. The benefits are also equivalent to avoiding the emissions from driving a total of 64,800 miles in an average passenger vehicle, or the equivalent of 10 round trips between Portland, Oregon and Portland, Maine.

Benefits	Amounts
Avoided GHG emissions (in metric tons)	26
Avoided GHG emissions (in \$)	\$5,600
Equivalent passenger vehicles driven for one year	6
Equivalent miles driven by an average passenger vehicle	64,800
Equivalent trips from Portland, OR to Portland, ME	10

Technical Notes

Metro calculated the avoided greenhouse gas emissions from this project using the estimated building material amounts provided by the grantee and the impact values documented in the Oregon DEQ report *Deconstruction vs. Demolition: An evaluation of carbon and energy impacts from deconstructed homes in the City of Portland for calculating the impact* (2019).¹³

To estimate the amount of material salvaged by material category, Metro applied the composition of materials salvaged from the average home reported in the Oregon DEQ report (Figure 5, page 19). The DEQ report shows, for example, that more than 87% of the materials salvaged from the average residential deconstruction project in Portland is softwood lumber and 3.4% is plywood. The rest of the material categories represent around 1.1% of the total salvaged material or less.

Metro assumed a rate of 100% reuse for the salvaged materials reported by the grantee. This means that the calculation above excludes an estimate of the environmental impact of any residual waste generated from the grantee's deconstruction projects. The impact of that residual waste may add or subtract to the overall benefit of those projects, depending on the final disposition of the residual materials (e.g., recycled, landfilled).

¹³ Oregon Department of Environmental Quality (2019). *Deconstruction vs. Demolition: An evaluation of carbon and energy impacts from deconstructed homes in the City of Portland for calculating the impact*. Last accessed online on 10/27/2020 at: <https://www.oregon.gov/deq/FilterDocs/DeconstructionReport.pdf>.

RE-USE CONSULTING

Building up an industry that takes down buildings (2020 grant)

Project Outcome

200 to 250 tons of reused building materials

Estimated benefits

Metro estimated the avoided greenhouse gas emissions from the potential salvage and reuse of 200 to 250 tons of building materials from the grantee's project. The calculations are based on Oregon Department of Environmental Quality (DEQ) estimates of the avoided greenhouse gas emissions from reusing salvaged deconstruction materials.

The results show the potential benefits from this project are estimated to be between 350 and 440 metric tons of avoided greenhouse gas emissions (carbon dioxide equivalents, CO₂e). The value of the benefits is estimated to be between \$74,000 and \$92,500 and is equivalent to avoiding the greenhouse gas emissions from driving between 75 and 94 passenger vehicles for one year. The benefits are also equivalent to avoiding the emissions from driving a total of 864,100 and 1.1 million miles in an average passenger vehicle, or the equivalent of between 130 and 170 round trips between Portland, Oregon and Portland, Maine.

Benefits	Low	High
Avoided GHG emissions (in metric tons)	350	440
Avoided GHG emissions (in \$)	\$74,000	\$92,500
Equivalent passenger vehicles driven for one year	75	94
Equivalent miles driven by an average passenger vehicle	864,100	1.1 million
Equivalent trips from Portland, OR to Portland, ME	130	170

Technical Notes

Metro calculated the avoided greenhouse gas emissions from this project using the estimated building material amounts provided by the grantee and the impact values documented in the Oregon DEQ report: *Deconstruction vs. Demolition: An evaluation of carbon and energy impacts from deconstructed homes in the City of Portland for calculating the impact* (2019).¹⁴

To estimate the amount of material salvaged by material category, Metro applied the composition of materials salvaged from the average home reported in the Oregon DEQ report (Figure 5, page 19). The DEQ report shows, for example, that more than 87% of the materials salvaged from the average residential deconstruction project in Portland is softwood lumber and 3.4% is plywood. The rest of the material categories represent around 1.1% of the total salvaged material or less.

Metro assumed a rate of 100% reuse for the salvaged materials reported by the grantee. This means that the calculation above excludes an estimate of the environmental impact of any residual waste generated from the grantee's deconstruction projects. The impact of that residual waste may add or subtract to the overall benefit of those projects, depending on the final disposition of the residual materials (e.g., recycled, landfilled).

¹⁴ Oregon Department of Environmental Quality (2019). *Deconstruction vs. Demolition: An evaluation of carbon and energy impacts from deconstructed homes in the City of Portland for calculating the impact*. Last accessed online on 10/27/2020 at: <https://www.oregon.gov/deq/FilterDocs/DeconstructionReport.pdf>.

ROSE COMMUNITY DEVELOPMENT

Multifamily composting initiative (2020 grant)

Project outcome

12 tons of composted food waste

Estimated benefits

Metro estimated the potential environmental benefits of this project, which aims to increase the collection of food waste for composting at multifamily communities. The project is anticipated to increase composting of food waste by 12 tons and the estimated environmental benefits of this outcome are summarized in the following table.

Benefits	Amounts
Value of total environmental benefits	\$1,800
Avoided GHG emissions (in metric tons)	7
Value of avoided GHG emissions	\$1,400
Equivalent passenger vehicles driven for one year	1
Equivalent miles driven by an average passenger vehicle	16,200
Equivalent trips from Portland, OR to Portland, ME	3

The environmental benefits of composting 12 tons of food waste are estimated to have a total value of \$1,800. The benefits are the net avoided costs to society from the life cycle emissions of various harmful pollutants associated with food production. The pollutants considered include greenhouse gases, sulfur dioxide and toxic chemicals.

Focusing only on greenhouse gas emissions, the project's outcome is estimated to avoid 7 metric tons of carbon dioxide equivalents (CO₂e). The value of the climate change benefits is estimated to be \$1,400. The environmental benefits are equivalent to avoiding the greenhouse gas emissions from driving 1 passenger vehicles for one year. The benefits are also equivalent to avoiding the emissions from driving 16,200 miles in an average passenger vehicle, or the equivalent of 3 round trips between Portland, Oregon and Portland, Maine.

Technical notes

Metro estimated the environmental benefits of composting 12 tons of food waste. The scenario used for the calculation assumes the material is collected from the multifamily sector and transported 100 miles to a composting facility using diesel trucks. Metro also assumed the processing residue rate for the composting facility is zero percent in order to simplify the analysis. The main assumptions used as inputs for this calculation are summarized in the following table:

	Outcome Scenario
Recovery amount: Food scraps (tons)	12
Recovery method/sector: Multifamily/Commercial	100%
Processing Residue Rates	0%
Allocation to End Markets: Composting	100%
Distance and mode to markets: Truck	100 miles (100%)
Route Collection - Diesel Trucks	100%

SALVAGE WORKS

Expansion of high-demand product made from reclaimed fencing (2020 grant)

Project outcome

4 tons of reused fencing material

Estimated benefits

Metro estimated the potential environmental benefits of recovering 4 tons of wood for reuse as the anticipated outcome from this grant. The results suggest the net environmental benefits of this outcome would have a total value of \$2,500. The benefits are the net avoided costs to society from the life cycle emissions of various harmful pollutants associated with making wood products. The pollutants considered include greenhouse emissions, fine particulate matter and toxic chemicals.

Focusing only on greenhouse gas emissions, the project’s outcome is estimated to avoid 3 metric tons of carbon dioxide equivalents (CO₂e). These climate change benefits are valued at \$700. The environmental benefits are equivalent to avoiding the greenhouse gas emissions from driving 1 passenger vehicle for one year. The benefits are also equivalent to avoiding the emissions from driving a total of 8,000 miles in an average passenger vehicle, or the equivalent of about 1 round trip between Portland, Oregon and Portland, Maine.

Benefits	Amounts
Value of total environmental benefits	\$2,500
Avoided GHG emissions (in metric tons)	3
Avoided GHG emissions (in \$)	\$700
Equivalent passenger vehicles driven for one year	1
Equivalent miles driven by an average passenger vehicle	8,000
Equivalent trips from Portland, OR to Portland, ME	1

Technical notes

Metro estimated the environmental benefits of this project assuming 100% of the 4 tons of treated wood is collected as construction and demolition (C&D) material generated within the Metro region and transported an average of 30 miles from generators to the Salvage Works warehouse. In the MEBCalc model, collection of C&D material is slightly more efficient than curbside collection of waste generated by single-family homes, due to the larger quantities of material collected at each stop on C&D collection routes or the use of dedicated drop boxes for C&D waste.

Metro estimated the environmental benefits from this project as the difference between recovering 4 tons of lumber for reuse against the alternative scenario of disposing the same amount of material as landfill waste. The main assumptions used as inputs in the two scenarios for this calculation are summarized in the following table:

	Outcome Scenario
Recovery amount: Wood Waste (tons)	4
Recovery method/sector: Construction and Demolition	100%
Processing Residue Rates: Wood processing facilities	0%
Allocation of Materials to End Markets: Reuse	100%
Distance and mode to markets: Truck	20 miles (100%)
Route Collection - Diesel Trucks	100%

APPENDIX 5: ENVIRONMENTAL AND HEALTH OUTCOMES DETAIL

The I&I grant program’s desired environmental and health outcomes are to preserve and expand the region’s capacity to reduce the environmental and human health impacts of products at any stage of the lifecycle, with particular emphasis on the end-of-life stage through waste prevention, reuse, recycling, composting and producing energy from waste.

Prevention projects

Grant recipient	Project title (year)	Environmental and health outcomes	GHG impact*
Eco-School Network	<i>Waste reduction in schools (2018)</i>	<ul style="list-style-type: none"> 89.6 tons reduction in waste generated across 49 schools 	66

*Avoided greenhouse gas emissions (in metric tons of carbon dioxide equivalents).

Reuse projects

Grant recipient	Project title (year)	Environmental and health outcomes	GHG impact*
City Repair	<i>Useful waste initiative (2020)</i>	<ul style="list-style-type: none"> 7.5 tons of construction mock-ups reuse are anticipated 	13
Community Cycling Center	<i>Reusing and recycling salvaged bicycles and parts (2020)</i>	<ul style="list-style-type: none"> 90 additional reused bikes are anticipated 1,000 additional reused bike parts are anticipated 1.65 tons of increased steel and aluminum recovery are anticipated 	20 to 30
Community Development Corporation of Oregon	<i>East county food rescue shuttle (2020)</i>	<ul style="list-style-type: none"> 2.5 tons of rescued food are anticipated 	1.4 to 2.3
Cracked Pots	<i>Integrating equity in Cracked Pots’ mission and operations (2020)</i>	<ul style="list-style-type: none"> 12.4 tons of increased material recovery are anticipated 	6 to 20
Earth Advantage	<i>Overcoming barriers in deconstruction (2018)</i>	<ul style="list-style-type: none"> 30 tons of building materials recovered 3 new firms met City of Portland deconstruction contractor requirements 	52
Free Geek	<i>Electronics recycling program support (2018)</i>	<ul style="list-style-type: none"> 116 tons of refurbished electronics (15,126 computers and monitors) 4,607 laptops and computers produced for reuse (indirect outcomes) 	7,100
Free Geek	<i>Electronic waste collection and recycling (2020)</i>	<ul style="list-style-type: none"> 7.5 tons of electronics reuse are anticipated 30.5 tons of e-waste recovered for recycling are anticipated 	760

Habitat for Humanity Portland Metro East	<i>Increasing the waste prevention capacity of Habitat's ReStores (2018)</i>	<ul style="list-style-type: none"> • 197 tons increase in material recovery 	<i>Unable to calculate</i>
Hygiene for All	<i>Clothing and bedding exchange (2020)</i>	<ul style="list-style-type: none"> • 31.2 tons of textile reuse and recycling are anticipated 	<i>Unable to calculate</i>
Lovett Deconstruction	<i>Full house deconstruction training program (2019)</i>	<ul style="list-style-type: none"> • 76 tons of recovered building materials are anticipated 	120
Oregon Food Bank	<i>Food recovery program expansion (2018)</i>	<ul style="list-style-type: none"> • 252 tons increase in food rescue • Increased food rescue capacity of Fresh Alliance program 	140 to 230
Professional Business Development Group	<i>Building a culture of reuse for minority contractors (2020)</i>	<ul style="list-style-type: none"> • 15 tons of building materials are anticipated to be donated for reuse 	26
ReBuilding Center	<i>Equity and efficiency in reuse operations (2019)</i>	<ul style="list-style-type: none"> • Anticipates increase in quantity of material accepted and sold in its store 	<i>Unable to calculate</i>
Repair PDX	<i>Repair education programming and outreach (2019)</i>	<ul style="list-style-type: none"> • 26 tons of repaired products are anticipated 	<i>Unable to calculate</i>
Re-Use Consulting	<i>Building up an industry that takes down buildings (2020)</i>	<ul style="list-style-type: none"> • 200 to 250 tons of building materials are anticipated to be recovered for reuse and recycling 	350 to 440
Salvage Works	<i>Wood shop expansion (2019)</i>	<ul style="list-style-type: none"> • 45 tons of increased lumber rescue are anticipated 	37
Salvage Works	<i>Expansion of high-demand product made from reclaimed fencing (2020)</i>	<ul style="list-style-type: none"> • 4 tons increase anticipated in fencing material (treated wood) reuse 	3
Urban Gleaners	<i>Food recovery expansion and engagement project (2018)</i>	<ul style="list-style-type: none"> • 95.4 tons increase in rescued food • 2.5 tons of food rescued through pilot partnership with Door Dash 	52 to 86
Urban Gleaners	<i>Second shift food rescue initiative (2019)</i>	<ul style="list-style-type: none"> • 43.5 tons of increased food rescue are anticipated 	24 to 39

*Avoided greenhouse gas emissions (in metric tons of carbon dioxide equivalents).

Recycling projects

Grant recipient	Project title (year)	Environmental and health outcomes	GHG impact*
City of Roses Disposal & Recycling	<i>Materials recovery facility relocation and expansion (2018)</i>	<ul style="list-style-type: none"> 3,000 tons of increased dry waste recovery Increase in number of self-haul customers at COR 35 tons of wood recovered for new markets 	41
City of Roses Disposal & Recycling	<i>Materials recovery facility expansion phase 2 (2019)</i>	<ul style="list-style-type: none"> 3,000 tons of increased dry waste recovery are anticipated over prior year 180 tons of wood recovered for new markets 	210
Denton Plastics	<i>Continuous melt filter (2018)</i>	<ul style="list-style-type: none"> 2,800 tons of new material processed Increased efficiency and added ability to process new, more challenging materials 	3,700
Denton Plastics	<i>Single stream eco-line (2019)</i>	<ul style="list-style-type: none"> 4,680 to 6,240 tons of plastic will be processed on the new Eco-Line per year 	6,700 to 9,000
Environmental Fibers International	<i>Unders recovery (2019)</i>	<ul style="list-style-type: none"> 1,950 tons per year of unders (paper and containers) are anticipated 	2,400 to 2,900
GreenWay Recycling	<i>Advanced material recovery system (2019)</i>	<ul style="list-style-type: none"> Anticipates recovery rate increase from 41 percent to 56 percent 5,822 tons of increased dry waste recovery are anticipated during the grant period 	2,500 to 3,000
James' Neighborhood Recycling Service	<i>Expanding neighborhood collection events (2020)</i>	<ul style="list-style-type: none"> 7.5 tons of plastic recovery are anticipated 	10
Pioneer Recycling Services	<i>Recycling sorting robots (2018)</i>	<ul style="list-style-type: none"> 50 ton increase in plastic recovery Presented project results to MRF competitors 	62
Pioneer Recycling Services	<i>Optical sorting of mixed paper (2019)</i>	<ul style="list-style-type: none"> Anticipates a reduction in contamination in paper bales, improving material quality and its marketability 	None
Pride Recycling Company	<i>Recycling transfer station expansion (2018)</i>	<p>Increased facility capacity by:</p> <ul style="list-style-type: none"> 20,000 tons mixed yard debris/food and commercial food scraps (baseline = 0 tons) 20,000 tons yard debris (baseline = 0 tons) 15,000 tons dry waste (baseline = 45,000 tons) 	None
University of Portland	<i>Intelligent curbside recycling (2019)</i>	<ul style="list-style-type: none"> Project may improve contamination monitoring if the technology proves to be successful 	None

Urban Gypsum	<i>Pelletizing system for drywall waste reduction (2019 program + capital grant)</i>	<ul style="list-style-type: none"> 66,000 tons of drywall processing are anticipated per year 	12,600
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*Avoided greenhouse gas emissions (in metric tons of carbon dioxide equivalents).

Composting projects

Grant recipient	Project title (year)	Environmental and health outcomes	GHG impact*
Allwood Recyclers	<i>Compost facility improvements (2018)</i>	<ul style="list-style-type: none"> 30,000 tons of increased capacity for yard debris 	None
Grimm’s Fuel Company	<i>Compost facility improvements (2019)</i>	<ul style="list-style-type: none"> 34,000 tons of increased capacity for yard debris are anticipated (an increase of 50 to 60% over 2018 levels) 	None
Recology Aumsville	<i>Aumsville composting facility expansion (2019)</i>	<ul style="list-style-type: none"> 19,000 tons of increased commercial and residential food scraps capacity are anticipated 	None
Recology North Plains	<i>North Plains composting facility expansion (2019)</i>	<ul style="list-style-type: none"> 24,000 tons of increased residential yard debris and food scraps capacity are anticipated 	None
ROSE Community Development	<i>Multifamily composting initiative (2020)</i>	<ul style="list-style-type: none"> 11.9 tons of food scraps composting are anticipated 	7

*Avoided greenhouse gas emissions (in metric tons of carbon dioxide equivalents).

Energy-from-waste projects

Grant recipient	Project title (year)	Environmental and health outcomes	GHG impact
Wisewood Energy	<i>Building the waste wood-to-energy ecosystem in Portland (2018)</i>	<ul style="list-style-type: none"> Report findings could inform future decision-making about local system for recovering energy from wood waste 	None

Workforce development projects

Grant recipient	Project title (year)	Environmental and health outcomes	GHG impact
Interstate Trucking Academy	<i>Waste industry diversification enterprise (2018)</i>	<ul style="list-style-type: none"> No environmental outcomes 	None

APPENDIX 6: EQUITY OUTCOMES DETAIL

Investment and Innovation program desired equity outcomes:

1. Increase economic benefits for historically marginalized communities in regional system.
2. Increase positive benefits and reduce negative impacts for communities of color or other historically marginalized groups.
3. Increase capacity of organizations in the solid waste system to advance racial equity.

Equity outcomes of 2018 capital grants

Grant recipient	Project title (year)	Equity outcomes
Allwood Recyclers	<i>Compost facility improvements (2018)</i>	<ul style="list-style-type: none"> • No direct equity impacts
City of Roses Disposal & Recycling	<i>Materials recovery facility relocation and expansion (2018)</i>	<ul style="list-style-type: none"> • New entrant to system, BIPOC-owned • 3 COBID-certified firms hired (\$77,436 grant funds; \$207,794 match) • 13 new living wage jobs (indirect outcome)
Denton Plastics	<i>Continuous melt filter (2018)</i>	<ul style="list-style-type: none"> • No direct equity impacts
Oregon Food Bank	<i>Food recovery program expansion (2018)</i>	<ul style="list-style-type: none"> • Approximately 342,000 more meals served over prior year • Increased access to fresh produce for low-income families and non-English speakers • 12 drivers for Fresh Alliance program participated in all-day equity training
Pioneer Recycling Services	<i>Recycling sorting robots (2018)</i>	<ul style="list-style-type: none"> • No direct equity impacts
Pride Recycling Company	<i>Recycling transfer station expansion (2018)</i>	<ul style="list-style-type: none"> • No direct equity impacts
Urban Gleaners	<i>Food recovery expansion and engagement project (2018)</i>	<ul style="list-style-type: none"> • 158,625 more meals served over prior year (majority of those served to BIPOC communities)

Equity outcomes of 2018 program grants

Grant recipient	Project title (year)	Equity outcomes
Eco-School Network	<i>Waste reduction in schools (2018)</i>	<ul style="list-style-type: none"> • One third of parent leaders were people of color • Offered \$500 stipends and additional project funding to four Title 1 schools • Engaged 10 new Title 1 schools in fellowship program (16 total Title 1 schools in network)
Free Geek	<i>Electronics recycling program support (2018)</i>	<ul style="list-style-type: none"> • 1,365 computers were donated to individuals and nonprofit organizations (indirect impact)
Habitat for Humanity Portland Metro East	<i>Increasing the waste prevention capacity of Habitat's ReStores (2018)</i>	<ul style="list-style-type: none"> • Increased donations and sales at Gresham ReStore • Organization is engaged in DEI training and committed to promoting volunteer and staff openings among community-based organizations
Interstate Trucking Academy	<i>Waste industry diversification enterprise (2018)</i>	<ul style="list-style-type: none"> • 26 BIPOC students graduated from truck driving training program and obtained CDL • 8 graduates found jobs in the garbage and recycling industry • 6 outreach events engaged 120 people
Wisewood Energy	<i>Building the waste wood-to-energy ecosystem in Portland (2018)</i>	<ul style="list-style-type: none"> • No direct equity impacts

Anticipated equity outcomes of 2019 capital grants in progress

Grant recipient	Project title (year)	Equity outcomes
City of Roses Disposal & Recycling	<i>Materials recovery facility expansion phase 2 (2019)</i>	<ul style="list-style-type: none"> • 7 to 10 new living wage jobs to manage anticipated increase in materials processing (indirect outcome)
Denton Plastics	<i>Single stream eco-line (2019)</i>	<ul style="list-style-type: none"> • Professional development and DEI training for staff
Environmental Fibers International	<i>Unders recovery (2019)</i>	<ul style="list-style-type: none"> • Paid internships and scholarships • Professional development and DEI training for staff
GreenWay Recycling	<i>Advanced material recovery system (2019)</i>	<ul style="list-style-type: none"> • Improved working conditions for sorting staff (reduced noise, dust and potential hazards) • Plans to hire equity consultant
Grimm's Fuel Company	<i>Compost facility improvements (2019)</i>	<ul style="list-style-type: none"> • Plan to hire COBID-certified contractors • Maintain good relationship with surrounding community • Minimize negative impacts from project construction and composting operations • Professional development and DEI training for staff

Pioneer Recycling Services	<i>Optical sorting of mixed paper (2019)</i>	<ul style="list-style-type: none"> • COBID-certified contractor hired for sprinkler installation • Professional development and DEI training for staff
Recology Oregon Compost	<i>Aumsville composting facility expansion (2019)</i>	<ul style="list-style-type: none"> • Create new jobs associated with expanded processing capacity (indirect) • Minimize negative impacts from project construction and composting operations • Professional development and DEI training for staff
Recology Oregon Compost	<i>North Plains composting facility expansion (2019)</i>	<ul style="list-style-type: none"> • Create new jobs associated with expanded processing capacity (indirect) • Minimize negative impacts from project construction and composting operations • Professional development and DEI training for staff
Urban Gypsum	<i>Pelletizing system for drywall waste reduction (2019 program + capital grant)</i>	<ul style="list-style-type: none"> • 4 permanent full-time bilingual shift workers will be hired to operate and manage the equipment • New bilingual job created, hired through first source agreement with Prosper Portland • Equity consultation

Anticipated equity outcomes of 2019 and 2020 program grants in progress

Grant recipient	Project title (year)	Equity outcomes
City Repair	<i>Useful waste initiative (2020)</i>	<ul style="list-style-type: none"> • Living wage contract jobs with construction skill training for houseless individuals • Provides 3 new housing units for people experiencing homelessness • Equity training to all involved in the program
Community Cycling Center	<i>Reusing and recycling salvaged bicycles and parts (2020)</i>	<ul style="list-style-type: none"> • 4 to 6 paid internships with skills training for individuals that are underrepresented in the cycling industry • Free bicycles and low-cost bike parts for historically marginalized communities
Community Development Corporation of Oregon	<i>East county food rescue shuttle (2020)</i>	<ul style="list-style-type: none"> • Estimate generating \$20,000 of economic activity for immigrant/refugee and Black growers and producers in Rockwood • Better identify food insecurity in East Multnomah County and bridge gaps between growers/producers and markets • Reduce burden on farmers and producers – savings from not having to pay as much to transport food • BIPOC-led organization and project

Cracked Pots	<i>Integrating equity in Cracked Pots' mission and operations (2020)</i>	<ul style="list-style-type: none"> • 1 new job recruited from BIPOC communities • DEI consultant hired to advise on DEI work plan and provide DEI training to staff and volunteers • Building a community advisory committee • Focus on BIPOC and LGBTQ+ communities in future recruitments
Free Geek	<i>Electronic waste collection and recycling (2020)</i>	<ul style="list-style-type: none"> • 8 collection events in BIPOC or historically marginalized communities
Hygiene for All	<i>Clothing and bedding exchange (2020)</i>	<ul style="list-style-type: none"> • Job opportunities for houseless attendant-ambassadors to work in the hub • Provide clean clothing and bedding for houseless people who don't have access to laundry facilities
James' Neighborhood Recycling Service	<i>Expanding neighborhood collection events (2020)</i>	<ul style="list-style-type: none"> • 3 new jobs (driver and 2 sorters) • Neighborhood collection events in underserved communities
Lovett Deconstruction	<i>Full house deconstruction training program (2019)</i>	<ul style="list-style-type: none"> • 4 permanent jobs will be created with a focus on recruiting from BIPOC communities • Professional development and DEI training for staff
Professional Business Development Group	<i>Building a culture of reuse for underrepresented contractors (2020)</i>	<ul style="list-style-type: none"> • BIPOC and women subcontractors purchase materials from ReBuilding Center, reducing operating costs • Training for 30 participants to learn how to incorporate used materials into their projects
ReBuilding Center	<i>Equity and efficiency in reuse operations (2019)</i>	<ul style="list-style-type: none"> • 2 permanent jobs will be created with a focus on recruiting from BIPOC communities • Professional development and DEI training for staff • Formation of an equity committee
Repair PDX	<i>Repair education programming and outreach (2019)</i>	<ul style="list-style-type: none"> • Increase outreach to youth and diverse audiences • Culturally responsive services at repair events • New community partnerships
Re-Use Consulting	<i>Building up an industry that takes down buildings (2020)</i>	<ul style="list-style-type: none"> • Anticipates creation of 6 new jobs recruited from BIPOC communities • 6 BIPOC-owned and women-owned deconstruction businesses building skills in sales and marketing for used building materials • 10 to 12 deconstruction projects outside of City of Portland, reducing impacts associated with mechanical demolition for those communities
ROSE Community Development	<i>Multifamily composting initiative (2020)</i>	<ul style="list-style-type: none"> • Residents in multifamily housing gain access to composting service • Culturally responsive training in food waste reduction and composting for multifamily residents

Salvage Works	<i>Wood shop expansion (2019)</i>	<ul style="list-style-type: none"> • 2 new jobs recruited from BIPOC communities • COBID firms selected for materials and contracting • Professional development and DEI training for staff • Updated organizational DEI policies
Salvage Works	<i>Expansion of high-demand product made from reclaimed fencing (2020)</i>	<ul style="list-style-type: none"> • 1 new job opportunity (driver) recruited through NAYA and/or Benson High School • Half-day antiracist training for all Salvage Works staff (8+ staff)
University of Portland	<i>Intelligent curbside recycling (2019)</i>	<ul style="list-style-type: none"> • No direct equity impacts
Urban Gleaners	<i>Second shift food rescue initiative (2019)</i>	<ul style="list-style-type: none"> • Expanded services for food insecure (primarily BIPOC) families • Work with Resolutions NW on becoming more culturally responsive • Addition of an Ambassador Board

APPENDIX 7: GRANT REVIEW CRITERIA

Grant review committees reviewed proposals based on the following criteria. Scoring was intended to help the committees sort and assess proposals by quality, but did not solely determine the final funding recommendations, which resulted from committees’ group deliberations following the preliminary scoring by each member.

Capital grant evaluation criteria – 2019 awards

Possible points (max 63)		Criteria
<p>In addition to the impacts on waste stream and/or the environment and human health, I&I capital grant proposals will be reviewed and scored based on the criteria below. Scores will be impacted by the accuracy, clarity, completeness and reasonableness of each response. Within these criteria, each bullet point will be scored on a scale of 0-3 points:</p> <ul style="list-style-type: none"> • 0 points—Inadequate • 1 point—Barely adequate • 2 points—Adequate • 3 points—Excellent <p>Possible points for each section are displayed. Scoring is intended to help the grant review committee sort, assess and discuss proposals, but may not determine the final slate of recommendations. Final funding recommendations will be made through in-person deliberations.</p>		
6	Project description	<ul style="list-style-type: none"> • Includes clear, concise description of the project and what it intends to accomplish. • Identifies the unmet need(s) the project will directly address, specific to the product life cycle and waste prevention, reuse, recycling, composting or energy recovery infrastructure or markets in the Metro region, and why it’s important to the region.
12	Project impacts: Equity	<ul style="list-style-type: none"> • Describes positive impacts of the project on communities of color or other underrepresented groups. <i>(Multiply score of 0-3 by 4 to arrive at a total of up to 12 equity points.)</i>
12	Work plan and dependencies	<ul style="list-style-type: none"> • Provides complete descriptions and time estimates of the project activities, milestones and deliverables necessary to achieve the goals and objectives. • The work plan seems well-aligned with the scale of effort and timeframe necessary to achieve desired outcomes. • Provides information on <u>completed</u> tasks/dependencies that ensure the project will be ready to begin when the grant contract is executed and will be completed on time, including secured permits, approvals, feedstock agreements, market development, financing, material handling, etc.

	<ul style="list-style-type: none"> Provides information on <u>in-progress</u> tasks/dependencies that need to be completed before the grant-funded project begins, and a plan for their completion.
12	<p>Project budget</p> <ul style="list-style-type: none"> Describes all funding necessary to complete the proposed project, including grant and match amounts for all activities in the work plan. Describes the total project cost and how the grant request fits within the complete project financing strategy. The cost elements of the project appear to be complete, consistent with the work plan, and reasonable (i.e., the amount requested is proportional to the outcomes achieved). Includes supporting documentation including quotes, bids and estimate details.
9	<p>Applicant readiness and workforce culture</p> <ul style="list-style-type: none"> Demonstrates sufficient business planning, management experience and staff resources to ensure that the project is likely to succeed. Experience could include successful completion of past projects utilizing external funding. Demonstrates financial viability of the applicant organization or business such that there is a high likelihood that the project would be completed within the grant term. Demonstrates that the applicant organization or business is implementing or planning activities to advance diversity and equity in its work place.
6	<p>Continuation of impacts and evaluation</p> <ul style="list-style-type: none"> Describes evaluation methods that will be used to evaluate (measure) the impacts of the project and whether/how project goals and objectives are achieved and sustained. Demonstrates likelihood that the project impacts will be sustained after the grant is complete.
57	TOTAL POSSIBLE GENERAL EVALUATION CRITERIA POINTS
6 (automatic)	Bonus points for priority projects: Project strengthens and makes more resilient the recycling system that serves single-family and multifamily residents, and businesses; or the system for recovering commercial sector food waste.
63	TOTAL POSSIBLE SCORE (general evaluation criteria points + bonus points)

Program grant evaluation criteria – 2020 awards

	Possible points
<p>Waste stream, environmental, or health impacts</p> <ul style="list-style-type: none"> • Project will prevent waste, increase reuse/repair of products, increase recycling, increase composting or increase production of energy from materials that would otherwise go to landfill, and/or • Project will improve environmental and human health impacts of the products manufactured, consumed or disposed in the region. 	Up to 25 points
<p>Equity impacts</p> <ul style="list-style-type: none"> • Project will directly benefit or reduce negative impacts for people of color or other historically marginalized communities, and/or • Applicant organization or business is implementing or planning specific activities to advance diversity and equity in its work place. 	Up to 25 points
<p>Project plan and applicant capacity</p> <ul style="list-style-type: none"> • Proposal provides a thorough and complete description of the project plan, and the activities seem well thought out and adequate to achieve desired impacts. • Applicant appears to have the capacity to successfully complete the project, including identification of key people and partnerships, and descriptions of their roles and qualifications. 	Up to 20 points
<p>Project budget</p> <ul style="list-style-type: none"> • Project budget is complete, reasonable, and clearly demonstrates how the grant funds will be spent on the project. • Applicant identifies the total budget for the project, including additional sources of funding for the project. 	Up to 10 points
<p>Evaluation of impacts</p> <ul style="list-style-type: none"> • Proposal clearly describes how progress and impacts will be measured, including specific metrics related to waste reduction, environmental, and/or human health and equity impacts. 	Up to 10 points
TOTAL SCORE	Up to 90 points