**BEFORE THE METRO COUNCIL**

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|---|---|---|
| FOR THE PURPOSE OF DIRECTING THE METRO CHIEF OPERATING OFFICER TO ESTABLISH A SUSTAINABLE BUSINESS MODEL FOR METRO DEPARTMENTS AND FACILITIES AND TO UNDERTAKE RELATED DUTIES | ) | RESOLUTION NO. 03-3338<br><br>Introduced by Councilor Susan McLain |

WHEREAS, in ordaining the Metro Charter, the people of the Metro region established a regional government that undertakes, as its most important service, planning and policy making to preserve and enhance the quality of life and the environment for themselves and for future generations; and

WHEREAS, Metro Code 2.04.580 establishes recycling coordinating committees for Metro facilities that provide annual recycling plans and requires a procurement program for recycled-content products that provides a 10 percent price preference for recycled-content purchases and an annual report to the Metro Council on this activity; and

WHEREAS, Metro Executive Order 60 establishes an integrated pest management policy for Metro facilities to provide a quantifiable monitoring program that serves as a model for local governments and home owners; and

WHEREAS, in 1999 the Metro Executive Officer convened the Metro Environmental Action Team (ENACT) consisting of Metro employees from each department and MERC facility to evaluate different sustainability models and to meet with local governments and businesses to review their sustainability programs; and

WHEREAS, thereafter ENACT recommended providing $165,000 in funding for 33 projects that demonstrated the breadth of opportunities at Metro facilities and operations to make such facilities and operations more resource-efficient and to reduce environmental impacts; and

WHEREAS, ENACT also has provided training to more than 50 employees in the Natural Step sustainability model and specific applications of that model, including sustainable paving and construction practices, sustainable purchasing methods, use of methods of measuring environmental impacts of operations; and sustainable computer purchasing, use and recycling practices; and

WHEREAS, ENACT also has identified opportunities for reducing the environmental impact of the Metro information delivery by reducing information travel time, storage space and paper use; and

WHEREAS, ENACT also provided oversight of an 2001 environmental audit of Metro facilities' use of energy, including transportation, and water has identified cost-effective opportunities to increase savings and reduce environmental impacts in these areas; and

WHEREAS, the implementation of a coordinated sustainability business model for Metro departments that incorporates the recycling coordinating committee, includes Metro's integrated pest management policy and utilizes the Metro Environmental Action Team would help Metro's

internal business operations fulfill the mission of sustainability at Metro's own facilities and be a model to visitors, suppliers, service providers, contractors and employees; and

WHEREAS, Metro desires to work cooperatively with other Oregon governmental agencies and businesses that are integrating sustainability into their operations;

WHEREAS, sustainable purchasing efforts have become a priority for Oregon state and local governments and provide an opportunity for Metro to leverage its $90 million in annual purchases and an average of $30 million in annual contracts to support sustainable products and services; now therefore,

BE IT RESOLVED,

The Metro Council directs the Chief Operating Officer to:

(a) Direct creation of a Metro a sustainable business model that includes:

(i) A vision statement that provides that Metro business practices shall be sustainable by 2025;

(ii) A set of values to guide the development of Metro's sustainable strategies and actions that is consistent with the vision statement and with the conditions set forth in The Natural Step sustainability system ; and

(iii) A set of quantitative, aspirational goals that (A) is consistent with the vision statement and the set of values; (B) includes but is not limited to the goals set forth on Exhibit A; and (C) provides the direction and motivation for improvement in Metro's business practices toward sustainability and the means to measure progress toward sustainability.

(b) Utilize ENACT (i) to develop the sustainable business model set forth in sub-section (b); (ii) to implement such model; and (iii) to provide leadership; education; recommendations for projects; and co-ordination of Metro's recycling coordinating committees and integrated pest management policy.

(c) Implement a sustainable information management system that will maximize efficient use of paper and electronic management of information, which will reduce costs, staff time, resource consumption environmental impacts, while providing greater public access to information about Metro's activities; and

(d) Evaluate accounting mechanisms by which departments that make the capital investment in resource-efficient materials and services are able to receive operational savings even if those savings might accrue to another department; and

\\

(e) Report to the Metro Council annually by January 31 on progress made toward sustainability goals and program accomplishments for the previous fiscal year and provide a proposed work plan for the following fiscal year.

ADOPTED by the Metro Council this 22nd day of May 2003.

David Bragdon, Council President

Approved as to form:

Daniel B. Cooper, Metro Attorney

APPROUVÉ APPROVED METRO COUNCIL CONSEIL MÉTROPOLITAINE METRO

EXHIBIT A
Resolution 03-3338

## Metro Environmental Action Team (ENACT)
## Internal Sustainability Goals for Metro Facilities and Operations

GOAL 1: Zero net increase in carbon emissions

GOAL 2: Zero discharge of persistent bio-accumulative toxins.

GOAL 3: Zero waste disposed and incinerated.

GOAL 4: Fifty percent reduction in water consumption.

GOAL 5: Zero net loss of biodiversity and productive healthy habitat for forests and riparian areas.

**STAFF REPORT**

IN CONSIDERATION OF RESOLUTION NO. 03-3338 FOR THE PURPOSE OF DIRECTING THE CHIEF OPERATING OFFICER TO ESTABLISH A SUSTAINABLE BUSINESS MODEL FOR METRO DEPARTMENTS AND FACILITIES AND TO UNDERTAKE RELATED DUTIES

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Date: April 16, 2003

Prepared by: Steve Apotheker, Department of Solid Waste and Recycling, at the request of Councilor Susan McLain

**BACKGROUND**

In 1999, Councilor McLain requested that Solid Waste and Recycling (then Regional Environmental Management) evaluate broadening the current focus on recycling and buy recycled efforts at Metro facility operations and procurement to one of sustainability. In particular, Councilor McLain asked the department to evaluate the applicability of The Natural Step's sustainability framework that Oregon businesses were adopting. For the past three years, representatives from Metro departments have researched The Natural Step and other sustainability models, provided sustainability training to more than 50 employees and funded 33 demonstration projects that demonstrate numerous opportunities to build sustainability into our business practices.

This resolution, requested by Councilor McLain, would integrate a sustainability approach be integrated into Metro's business practices. It formally adopts The Natural Step as Metro's framework for developing sustainable actions and goals. The Natural Step is the most common sustainability framework being used by local governments and businesses in Oregon. This resolution also recognizes the role of the Environmental Action Team in developing a sustainable business model that includes existing activities in recycling, recycled product procurement and integrated pest management.

The resolution identifies several opportunities for Metro's sustainability effort. One important opportunity is to explore accounting mechanisms that would allow departments to retain operational savings from sustainability investments for future sustainability actions. Another opportunity is an agency-wide initiative to develop a sustainable information system that is more resource efficient and more timely for our citizens, customers and employees.

Adoption of this resolution would be consistent with widespread sustainability efforts by Oregon governments and businesses, including Governor Kulongoski's executive order to outline his commitment to sustainability initiatives.

This resolution will allow Metro to participate in new opportunities to leverage its purchasing power to increase market demand for sustainable products. The City of Portland and Multnomah County have developed a sustainable purchasing strategy that will focus on purchases in five key project areas. The Center for a New American Dream has initiated a national strategy to work with governments to define common sustainable product standards for targeted products, with janitorial products being their first effort. Lastly, a bill developed by Oregon state and local procurement officials would allow a competitive procurement of materials and services, so that environmental criteria other than recycled content can be considered.

Adoption of this resolution will make Metro's business practices more sustainable and would align them with the agency's mission "to preserve and enhance the quality of life and the environment for ourselves

and future generations." It would provide sustainability goals and a framework that give direction and destination for Metro's business operations. Past recycling, buy recycled and integrated pest management efforts at Metro facilities did not have clear goals against which to measure their progress.

## ANALYSIS/INFORMATION

### 1. Known Opposition

None.

### 2. Legal Antecedents

Metro Code 2.04.580 establishes recycling coordination committees for Metro facilities, provides for annual recycling plans and requires a procurement program for recycled-content products that allows up to a 10 percent price preference for recycled-content purchases and requires an annual report to the Metro Council on this activity. Metro Executive Order 60 establishes an integrated pest management policy for Metro facilities to provide a quantifiable monitoring program that serves as a model for local governments and homeowners.

### 3. Anticipated Effects

This resolution would assist Metro departments and facilities in integrating sustainability into their business practices, including work plans, budgets and capital project requests. It will allow development of a formal sustainability management plan at the facility level that includes goals, strategies and actions that are relevant to that facility's environmental impacts and financially feasible next steps. It defines the role of the Environmental Action Team (ENACT) to provide leadership and technical assistance in the agency's efforts to integrate sustainability in its business practices and to work more closely with other local governments and businesses that share a similar sustainability focus.

### 4. Budget Impacts

The Environmental Action Team is funded at $90,000 for FY 2002-03 in the Department of Solid Waste and Recycling budget. This resolution will establish policy for how the ENACT program is carried out, and is independent of whatever reasonable funding is provided for in the FY 2003-04 budget.

**BEFORE THE METRO COUNCIL**

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|---|---|---|
| FOR THE PURPOSE OF ADOPTING A DEFINITION OF SUSTAINABILITY TO DIRECT METRO'S INTERNAL OPERATIONS, PLANNING EFFORTS, AND ROLE AS A REGIONAL CONVENER | ) ) ) ) ) ) | RESOLUTION NO. 08-3931<br><br>Introduced by Councilors David Bragdon, Rod Park, and Rex Burkholder |

WHEREAS, the 2007 report of the Intergovernmental Panel on Climate Change concluded that "warming of the climate system is unequivocal," that "most of the observed increase in globally averaged temperatures since the mid-20th century is very likely due to the observed increase in anthropogenic greenhouse gas concentrations," and that the impacts of climate change are likely to be more drastic and immediate than was previously expected; and

WHEREAS, the State of Oregon's 2007 greenhouse gas reductions targets call for arresting the growth of greenhouse gas emissions by 2010, reducing emissions to at least 10 percent below 1990 levels by 2020, and reducing emissions to at least 75 percent below 1990 levels by 2050; and

WHEREAS, the cities of Portland, Beaverton, Gresham, Lake Oswego, Hillsboro, Milwaukie, and Oregon City, which together represent over 60 percent of the population under Metro's jurisdiction, have all signed onto the U.S. Mayor's Climate Protection Agreement, pledging to reduce their greenhouse gas emissions by 7 percent below 1990 levels by 2012; and

WHEREAS, a series of 2007 interviews conducted by Metro staff with staff and officials from city and county governments within the Portland area, including representatives of all the aforementioned cities, revealed a strong region-wide interest, and substantial progress on the part of some governments, in creating policies and programs to make internal operations more sustainable; and

WHEREAS, the same interviews also revealed a need for regional coordination and technical assistance in creating land-use plans, zoning and building codes, waste reduction programs, and public outreach programs to reduce energy and water use, single-occupant vehicle use, and waste generation; and

WHEREAS, in ordaining the Metro Charter, the people of the Metro region established a regional government that "undertakes, as its most important service, planning and policy making to preserve and enhance the quality of life and the environment for themselves and for future generations;" and

WHEREAS, sustainability considers the joint perspective of environmental, economic and community objectives, and

WHEREAS, the development of technologies and services to assist communities around the globe to become more sustainable and to respond to climate change will create opportunities for Oregon businesses to innovate and thrive; and

WHEREAS, Metro has the potential to reduce and/or sequester greenhouse gas emissions through its specific responsibilities for transportation planning, solid waste management, natural areas, and planning for long-term growth; and

WHEREAS, Metro has many existing programs, such as Transit-Oriented Development, the Green Streets Handbook, the Recycling Information Hotline, and Drive Less, Save More, that each reduce driving and waste generation in their own way but are not recognized for their sustainability functions nor coordinated to maximize mutual benefits; and

WHEREAS, in 2003 the Metro Council adopted Resolution 03-3338, "For the Purpose of Directing the Metro Chief Operating Officer to Establish a Sustainable Business Model for Metro Departments and Facilities and to Undertake Related Duties," adopted on March 22, 2003 authorizing the creation and implementation of a Metro sustainable business model; and

WHEREAS, Metro desires to work cooperatively with other governmental agencies and businesses to integrate sustainability into their operations; now therefore,

BE IT RESOLVED,

Sustainability, as defined in (1) below, shall be the guiding principle for all Metro policies and programs;

To achieve this, Metro shall:

1. Adopt the State of Oregon's definition of sustainability, as defined in ORS 184.421 (4), as the working definition that shall be used at Metro: "'Sustainability' means using, developing and protecting resources in a manner that enables people to meet current needs and provides that future generations can also meet future needs, from the joint perspective of environmental, economic and community objectives;"

2. Develop a regional climate change action plan to meet the State's greenhouse gas reductions targets and coordinate a regional approach to meeting the goals outlined in this plan;

3. Facilitate sharing of operational and planning practices that reduce waste generation; reduce consumption of energy, water, and other resources; save money; and strengthen economic development;

4. Implement stronger sustainable business practices within Metro;

5. Direct the Chief Operating Officer to coordinate existing and future Metro policies and programs toward meeting the definition of sustainability in sub-section (1), and to communicate Metro's policies and programs to the public in terms of how they address sustainability.

ADOPTED by the Metro Council this 3rd day of April 2008.

David Bragdon, Council President

Approved as to form:

Daniel B. Cooper, Metro Attorney

Officially Approved
Approvato Ufficialmente
METRO COUNCIL
Consiglio Metropolitano
Metro Council

**STAFF REPORT**

IN CONSIDERATION OF SUSTAINABILITY RESOLUTION NO. 08-3931, FOR THE PURPOSE OF ADOPTING A DEFINITION OF SUSTAINABILITY TO DIRECT METRO'S INTERNAL OPERATIONS, PLANNING EFFORTS, AND ROLE AS A REGIONAL CONVENER.

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Date: March 24th, 2008 Prepared by: Eliot Rose

## BACKGROUND

The majority of scientists agree that reductions in greenhouse gases of 60 to 80 percent below 1990 are necessary to stabilize climate change, and the State of Oregon's 2007 greenhouse gas reductions targets call for arresting the growth of greenhouse gas emissions by 2010, reducing emissions to 10 percent below 1990 levels by 2020, and reducing emissions to 75 percent below 1990 levels by 2050. Currently, governments in the Portland area are pursuing these targets with whatever resources they have. Their progress depends on local policy direction and resources: many have created sustainability departments and/or plans and taken steps to reduce energy use within their own operations; a few have created public outreach programs designed to reduce energy use on the part of businesses and residents; and fewer still have implemented long-term plans to promote energy and transportation efficiency. PGE and Portland's Office of Sustainable Development (OSD) informally provide technical assistance in some of these areas to other agencies in the region, but both have expressed the need for a more stable information-sharing body. Multnomah County and OSD are currently working on an update of their Local Action Plan on Global Warming, and both have asked Metro to help develop a consistent region-wide approach to reducing greenhouse gases.

As a regional government that "undertakes, as its most important service, planning and policy making to preserve and enhance the quality of life and the environment for themselves and for future generations," Metro has a responsibility not only to reduce resource consumption and waste generation in its own operations, but to facilitate the development of region-wide policies that accomplish these goals. In July, Councilor Rex Burkholder convened a meeting of staff and elected officials from around the region who had expressed interest in conducting greenhouse gas inventories and combating climate change locally. Those present agreed that the region could address sustainability more effectively and comprehensively through collaboration than through continuing to pursue it on an individual basis. In follow-up meetings, staff and policymakers from cities and counties in the Portland area emphasized the need for Metro to play a convening role in developing energy-efficiency and waste-reducing policies, planning methods, and outreach campaigns. Another common suggestion was for a workgroup made up of members from both the private and public sector to craft a long-term plan for the region to meet the State's greenhouse gas reduction targets, and then work backwards to develop interim goals for different sectors.

At the same time, there has also been an increased awareness within Metro for the need to refocus the agency's planning projects and operations around sustainability. Metro's council goals encourage increased access for all, efficient use of land, and protection of natural resources, and the agency has long pursued projects to create livable and affordable communities, make transportation more efficient, and preserve rural lands and wildlife habitat. These goals and policies are all vital to the overall goal of achieving economic, environmental, and social sustainability, but many of them date from an era when it was common practice to pursue such efforts on an individual basis rather than develop an integrated

approach to sustainability. As a result, Metro lacks methods to quantify, balance, and unify these different goals, identify internal and external opportunities for collaboration, and to communicate progress toward meeting these goals to either the public or to other agencies in the region, both of which are increasingly concerned with climate change and overuse of natural resources.

Furthermore, Metro's Environmental Action Team, ENACT, has no paid staff, only volunteers from other departments within the agency, making it difficult for the team to accomplish its mission. A 2007 report prepared for ENACT by AXIS Performance concluded, "In order to support all this work and to make future progress, Metro needs a full-time sustainability coordinator. Many municipalities in the area have sustainability coordinator positions and find that having someone dedicated to sustainability is crucial." These municipalities and counties include:

- Multnomah County, which has two sustainability managers (full FTEs devoted to sustainability) and sustainability liaisons (part-time devoted to sustainability) in each department, and they meet monthly to coordinate their efforts.
- Clackamas County, which has a full-time sustainability coordinator.
- Lake Oswego, which has a part time sustainability coordinator.
- Portland, which has full-time citywide sustainability managers and full-time sustainability coordinators in each bureau, and each bureau has to draft its own sustainability plan.

In response to the concerns of Metro's partners throughout the region, as well as to growing concern about climate change in the region and around the world, Councilors David Bragdon, Rex Burkholder, and Rod Park, with the help of council and departmental staff, have drafted a resolution to address the three sustainability-related issues outlined above:

- Metro's role as a convener in sustainability discussions
- The need for Metro to better coordinate and communicate programs and planning efforts that address sustainability issues
- The need for Metro to conserve energy, reduce waste, and save money in its own operations.

**ANALYSIS/INFORMATION**

1. **Known Opposition**

There is currently no organized opposition to the proposed resolution.

**2. Legal Antecedents**

*Metro Council Goals*: Many Metro Council Goals relate to this resolution, particularly the following:

- 2.2 Our community is inspired to create a better future for wildlife and the environment.
- 2.3 The region's waste stream is reduced, recovered and returned to productive use, and the remainder has a minimal impact on the environment.
- 2.4 Metro is a model for sustainable business practices.
- 2.5 Urban land is used efficiently and resource land is protected from urban encroachment.
- 3.4 Stable, affordable sources of energy, combined with energy conservation, position the region for sustained economic growth and stability.

*Metro Council Resolution 03-3338*: On May 22nd, 2003, the Metro Council passed Resolution 03-3338, "For the Purpose of Directing the Metro Chief Operating Officer to Establish a Sustainable Business Model for Metro Departments and Facilities and to Undertake Related Duties," directing the Chief Operating Officer to establish a sustainable business model for Metro departments. In 2007, ENACT hired AXIS Performance to assist in creating an action plan for implementing this resolution, and AXIS recommended that Metro hire a sustainability coordinator.

*Oregon House Bill 3543*: In 2007, the Oregon legislature passed HB 3543, which mandates reductions in emissions of 10 percent below 1990 levels by 2020 and 75 percent below 1990 levels by 2050.

3. **Anticipated Effects**

If this resolution is adopted, the Chief Operating Officer and the Senior Management Team will have to create a work plan for implementing the different tasks addressed by the resolution. This may include procedures for establishing a Metro sustainability standard for planning efforts; integrating sustainability into internal operations through evaluations, budget procedures, and the organization of ENACT and facility Green Teams; and establishing a committee and/or workgroup.

Over the long term, this resolution will help to integrate sustainability into Metro policies, plans, and operations. While this resolution may not have a substantial effect on the scope and implementation of Metro's sustainability-related projects and policies, it will refocus them around a single goal. This will help Metro adopt a coordinated, agency-wide approach to climate change, energy use, waste generation, and other sustainability-related issues, and to engage and assist partners across the region in addressing these issues.

4. **Budget Impacts**

There is a wide range of potential budget impacts depending upon what elements the council chooses to include in the final resolution and adopt in the workplan. In particular, one item in the resolution, convening staff and officials from around the Metro area to create a regional climate change action plan, is a more aggressive step that will require greater staff and financial commitment. While this would be an unprecedented effort and the budget would depend heavily upon the process, scope, and timetable of the project, the best basis for comparison in the region is Portland and Multnomah County's Local Action Plan on Global Warming, which has required a total of slightly more than 1.0 FTE during the years that it is being compiled or updated, culled from planners and analysts in different departments throughout the two agencies.

**RECOMMENDED ACTION**

The Council should adopt the resolution.

# Chapter V
# Sustainable operations

## A. Introduction

As part of the RSWMP outreach in 2004, public input indicated a desire to see the solid waste system become more 'green' by engaging in broader environmental protection and resource conservation. In 2005, Metro facilitated a team of solid waste system stakeholders to develop goals for the RSWMP update that would guide system activities to become more sustainable. This chapter of the Plan reflects their work: a definition of sustainability, a framework through which potential improvements can be examined, and goals and objectives to guide progress. The goals and objectives that follow are intended to apply to any solid waste facilities and services in the region that are regulated by government.

## B. Sustainability and the solid waste system

Sustainability efforts are becoming widespread among governments and businesses in Oregon. Metro adopted its own resolution to make agency operations more sustainable in May 2003, and has since taken a leadership role in implementing sustainability practices for contracted solid waste operations. These have included the use of ultra-low-sulfur and biodiesel fuel in facility rolling stock and long-haul trucks, as well as requiring purchase of rolling stock with the latest emission control devices.

Achieving sustainable operations throughout the system will involve engaging all participants in thinking about values, behavior and business decisions over the long run. This chapter of the Plan as well as the next (Plan implementation) will enable the regional solid waste system to achieve sustainability progress in a more coordinated fashion. It will also provide a model for sustainable operations in solid waste management for other jurisdictions around the nation.

To guide the evaluation and incorporation of sustainable practices, the following definition of sustainability, consistent with that of the State of Oregon, will apply:

> "Sustainability" means using, developing and protecting resources in a manner that enables people to meet current needs and provides that future generations can also meet future needs, from the joint perspective of environmental, economic and community objectives [ORS 184.421 (4)].

Application of this definition to solid waste management practices requires a framework through which to examine, develop and deploy improvements. The framework that was chosen is based on "The Natural Step" as defined below.

"The sustainable operation of the solid waste system considers economic, environmental and societal resources and is consistent with the Natural Step system conditions so that nature is not subject to systematically increasing:

1. Concentrations of substances from the Earth's crust;
2. Concentrations of substances produced by society, or
3. Degradation by physical means;

   and in that system

4. Human needs are met worldwide."

The following nine goals and 23 related objectives were approved by the Regional Solid Waste Advisory Committee in 2005. These goals and objectives are intended to guide evaluation and implementation of sustainable operations practices over the next 10 years.

### Goal 1.0 Reduce greenhouse gas and diesel particulate air emissions

Objective 1.1: Implement plans for greater energy efficiency.

Objective 1.2: Utilize renewable energy sources.

Objective 1.3: Reduce direct emissions of greenhouse gases from landfills and other facilities.

Objective 1.4: Reduce diesel particulate emissions in existing trucks, barges and rolling stock through best available control technology.

Objective 1.5: Implement long-haul transportation and collection alternatives where feasible.

Options for realizing these objectives may include: choosing renewable energy options (both in daily operations and in the procurement of new contracts); implementing new energy audit and efficiency programs to ensure incorporation of the most energy-efficient practices available; and converting facility rolling stock, collection vehicles and transport equipment to ultra-low-sulfur fuels and incorporating the cleanest exhaust technology available.

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### Goal 2.0 Reduce stormwater run-off

Objective 2.1: Implement stormwater run-off mitigation plans.

Options for realizing this objective may include: employing best bio-swale systems; new oil/water separation technologies; active and passive filtration systems; and best management practices for wash-down and water usage procedures.

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### Goal 3.0 Reduce natural resource use

Objective 3.1: Implement resource efficiency audit recommendations.

Objective 3.2: Implement sustainable purchasing policies.

Objective 3.3: Reduce disposed waste.

Options for realizing these objectives may include: achieving higher-than-minimum recovery requirements; and implementing bid and procurement procedures that allow for maximum sustainability options

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### Goal 4.0 Reduce use and discharge of toxic materials

Objective 4.1: Implement toxics reduction and management plans.

Options for realizing this objective may include: using non-toxic cleaning and industrial supplies; and developing education programs regarding proper product usage.

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### Goal 5.0 Implement sustainability standards for facility construction and operation

Objective 5.1: Implement sustainability standards for site selection.

Objective 5.2: Require new construction to meet the Leadership in Energy and Environmental Design (LEED) or equivalent program standards.

Objective 5.3: Provide incentives for existing facilities to meet LEED or equivalent program standards.

Options for realizing these objectives may include: basing new facility site acquisition on the lowest environmental and social impacts associated with site selection and facility development; providing an information source for LEED or LEED equivalent program and product research for workshops and other practical purposes; and underwriting the cost of Green/ Sustainable Building program certification through system fees.

### Goal 6.0 Adopt best practices for customer and employee health and safety

Objective 6.1: Reduce injuries by automating operations where effective.

Objective 6.2: Implement health and safety plans that meet or exceed current minimum legal standards.

Options for realizing these objectives include: reducing task redundancy associated with moderate to high employee injury and/or toxic exposure risk; and setting safety standards above minimum requirements in the industry.

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### Goal 7.0 Provide training and education on implementing sustainability practices

Objective 7.1: Train key regional waste industry employees, government waste reduction staff and political officials in adopted sustainability practices.

Objective 7.2: Inform suppliers, contractors and customers of the adoption of sustainability goals and practices.

Options for realizing these objectives include: participating in training programs focused on sustainability that are designed to address business model concerns; learning peer-to-peer from businesses that have already adopted and successfully implemented sustainability practices; and developing and employing proposal and procurement standards to encourage standard evaluation criteria based on sustainability practices and programs adopted by others.

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### Goal 8.0 Support a quality work life

Objective 8.1: Pay a living wage and benefits to all workers.

Objective 8.2: Promote community service.

Objective 8.3: Strive to employ a diverse work force.

Options for realizing these objectives include: determining and implementing living wage compensation levels for workers; encouraging employee involvement in charitable giving and other community service projects; developing programs to "give back" to the communities in which the facility or services operates; and employing affirmative action principles in recruiting, hiring, training and promoting.

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### Goal 9.0 Employ sustainability values in seeking vendors and contractors

Objective 9.1: Request sustainability plans from potential vendors and contractors.

Objective 9.2: Assist vendors and contractors in achieving sustainable practices.

Objective 9.3: Support local vendors when feasible.

Options for realizing these objectives include: providing guidance and criteria standards for vendor sustainability plans or practices; promoting training and education programs to assist vendors in employing sustainable practices; and establishing affirmative purchasing policies for local companies that are able to provide needed services.

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### Monitoring and implementation methods

Metro will establish and coordinate a sustainable operations work group of policy and technical participants. The work group will develop priorities and strategies for achieving the objectives, and will report on progress annually to the Regional Solid Waste Advisory Committee and Metro Council.

**Transfer Station RFP Appendix: Sustainability**

Diesel Particulate Matter pollution reduction:

- Oregon DEQ Clean Diesel Program

Environmental Management Systems (ISO 14001)

- U.S. Environmental Protection Agency website

Sustainable Procurement for Contracts and Supplies

- Responsible Purchasing Network

Stormwater Pollution Prevention

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Diesel Emissions Reduction

- West Coast Diesel Collaborative: http://www.westcoastdiesel.org/

Oregon DEQ Clean Diesel Initiative: www.deq.state.or.us/aq/diesel/index.htm or contact Kevin Downing at Oregon DEQ at (503) 229-6549. [mc1]

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Minority, Women, and Emerging Small Business (MWESB) Program

- Metro's MWESB program: www.oregonmetro.gov/index.cfm/go/by.web/id=24904, or contact Angela Watkins, 503-797-1816.
- Oregon's MWESB program: www.oregon.gov/Gov/MWESB/index.shtml
- Oregon Association of Minority Entrepreneurs: www.oame.org

Sustainable Stormwater Management

Toxics Reduction

- PBT's reference, EPA
-

Sustainable Procurement and Purchasing

LOVETT DECONSTRUCTION
THE FIRST PHASE IN SUSTAINABLE REMODELING

# Building Material Reuse Pilot Project

## Troutdale Transfer Station

April – June 2009

Metro | *People places. Open spaces.*

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## EXECUTIVE SUMMARY

Metro conducted a six week pilot project at the Waste Management Troutdale Transfer Station (TTS) to test different methods for reclaiming reusable building materials (RBMs) from the TTS dry waste stream. The Contractor, Lovett Deconstruction Inc., trained the TTS sorting staff, managed the project, measured the results and reported the findings.

This project recovered RBMs that would have otherwise been recycled or land filled. During the six weeks the project recovered 1% of the incoming dry waste or 13.21 tons of RBMs from 1122.33 tons of incoming mixed dry waste. By diverting these RBMs into reuse markets, this project avoided emissions of over 23 tons of greenhouse gasses. This amount is equal to the annual emissions produced by four American car drivers, or the emissions from the production or the electricity used in the average American home over three years. The retail market value of the RBMs diverted during the pilot was $4150.45. After deducting the reuse sorting, processing and associated operating costs from the retail value, there was approximately 40% in profit for the facility operator once the initial training and operational changes were implemented.

## PURPOSE OF PROJECT

While deconstruction practices are the most effective way to recover reusable building materials (RBMs), waste composition data shows that C&D generators are still sending large quantities of usable wood and other RBMs as mixed dry waste to area transfer stations and material recovery facilities (MRFs). Area MRFs recover some of these RBMs through the normal sorting methods and ultimately they down-cycle them into fuel/recycling programs. This pilot project is a public/private partnership between Metro and TTS that tests several strategies that result in the recovery and reuse of RBMs from mixed dry waste at the Troutdale Transfer Station.

This project evaluated the impact of changing the dry waste sorting practices to incorporate reuse and the economic and environmental benefits of recovering RBMs. In addition to summarizing the outcome of the project, this report will serve as a resource for the implementation of RBM recovery practices at Metro regional dry waste MRFs and transfer stations.

## PROJECT DESCRIPTION

### A. Project Participants

The project team included a local deconstruction/building material salvage contractor, Lovett Deconstruction, Inc. and Cascadia Consulting Group out of Seattle. Lovett Deconstruction provided project management and training services, as well as their extensive experience sorting, processing and marketing RBMs. Cascadia Consulting Group provided analysis of the project's green house gas and carbon footprint.

Waste Management Troutdale TTS staff partnered with Metro by hosting the project, providing access to their incoming mixed dry waste stream and scales, equipment, loader operators, floor sorting staff, and a willingness to modify their operational procedures during the pilot project.

***Lovett Deconstruction, Inc.***

Lovett Deconstruction Inc. was hired to manage this project because the company has specialized experience in the field of harvesting RBMs and providing turnkey deconstruction services to the local construction industry. Deconstruction is the process of un-building structures with the intention of salvaging RBMs, and maximizing the recycling of the remaining demolition debris. While Lovett staff had never worked in a MRF, Lovett's staff job-site experience recovering and reusing building materials was an excellent match for the project.

Lovett provided one fulltime employee to work on site eight hours per day five days per week for six weeks. During the six weeks, the contractor's staff first observed standard operation at TTS and then tested different procedures for reclaiming RBMs. The contractor also trained the Waste Management sorters to identify RBMs that fit the description of the project. The intention of the training was to empower the Waste Management employees to identify RBMs and separate them from the dry waste stream. The contractor was responsible for the processing of RBMs and the facilitation of RBM pick up by venders. The wet waste stream at TTS did not play a part in this project.

***Cascadia Consulting Group***

Founded in Seattle in 1993, Cascadia Consulting Group provides services to business and government clients in sustainability, climate change, waste management and resource conservation. Cascadia is nationally recognized for its expertise in waste and recycling and its innovative solutions to key environmental challenges. Cascadia offers its clients the expertise, experience and cutting edge tools to quantify greenhouse gas emissions and voided emissions, identify carbon-intensive activities, target opportunities for reduction, and set achievable and meaningful goals.

***Waste Management, Inc.***

Waste Management, Inc. owns and operates the Troutdale Transfer Station (TTS), a local transfer station that serves multiple functions, receiving both wet and dry waste as well as source separated and commingled recyclables such as office paper, clean wood and yard debris. Most incoming loads are either wet waste from neighborhood routes, or dry waste in loose drop boxes. Waste Management TTS sorts incoming dry waste to recover recyclables as required by Metro.

The Troutdale Transfer station is located in Troutdale, Oregon and presented a good environment for conducting the pilot project. The facility had ample indoor space, which eliminated any weather related challenges and the flow of dry waste was not currently at capacity.

## B. Developing operational procedures to support RBM reuse

The existing pre-pilot TTS procedure for receiving, sorting and transporting dry waste generally follows the path of:

1. Hauler weighs in at the scale and is directed to one of the open bays.
2. Hauler enters the building and tips load in the designated area.
3. Dry waste tipped in the presort area is scanned for prohibited items and roughly sorted for recycling by the excavator operator to segregate large quantities of recyclables from the dry waste presort pile.
4. Dry waste is moved a short distance with front end loader to the staging pile.
5. Front end loader is used to distribute dry waste from the staging pile into two "windrows." Windrows are TTS's preferred way to separate waste by hand floor sorting. They are approximately 8' to 10' wide, 30' long, and 8" deep.
6. The windrows are sorted by hand via floor sort. Sorters carefully walk through the debris and use their hands to grab recyclables (cardboard, metal, clean wood, yard debris and concrete).
7. Sorters create piles of recovered recyclable material from the windrows next to the windrow and the front end loader drives through these piles, moving the recovered materials to the areas where like material is staged for transport to market.
8. What is left of the windrow dry waste is then swept from the sorting area by a front end loader into a large pile near the pit, awaiting loading into a top loaded waste trailer and transportation to a landfill.

The Contractor spent the first few days of this project becoming familiar with TTS's standard operating procedures, then adapting the existing system to allow for greater recovery of RBMs.

There was little need to vastly change the sorting operations to implement the pilot project. Figure 1 shows the flow of incoming and outgoing material at TTS during the pilot project. Sorters were already sorting the piles for recyclable materials so it was relatively easy to add RBMs to the sort list. The contractor experimented with several sorting options for RBMs and developed the following operational plan that resulted in the most efficient recovery with the least disruption to the ongoing TTS operations. The changes outlined below cover five types of tasks. Changes to existing processes at TTS occurred in three task areas: dry waste presort, windrow sorting, and source-separated wood drop off. Processing and shipping tasks were unique to building material reuse program and could be seen as new processes that had to be added to the facility operating plan. Task areas are shown on the facility diagram in Figure 2.

**Figure 1**
**TTS Material Flow Chart**

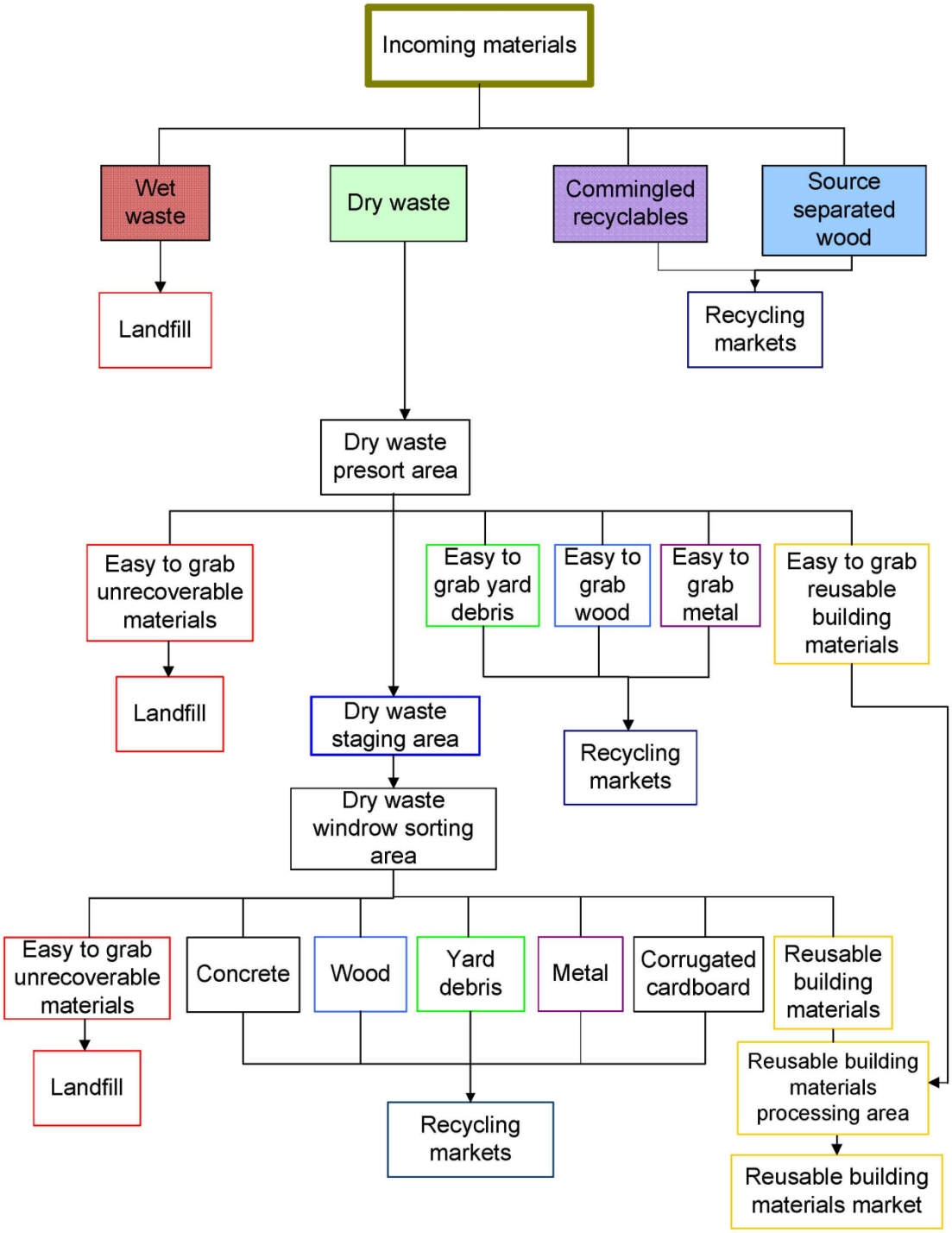
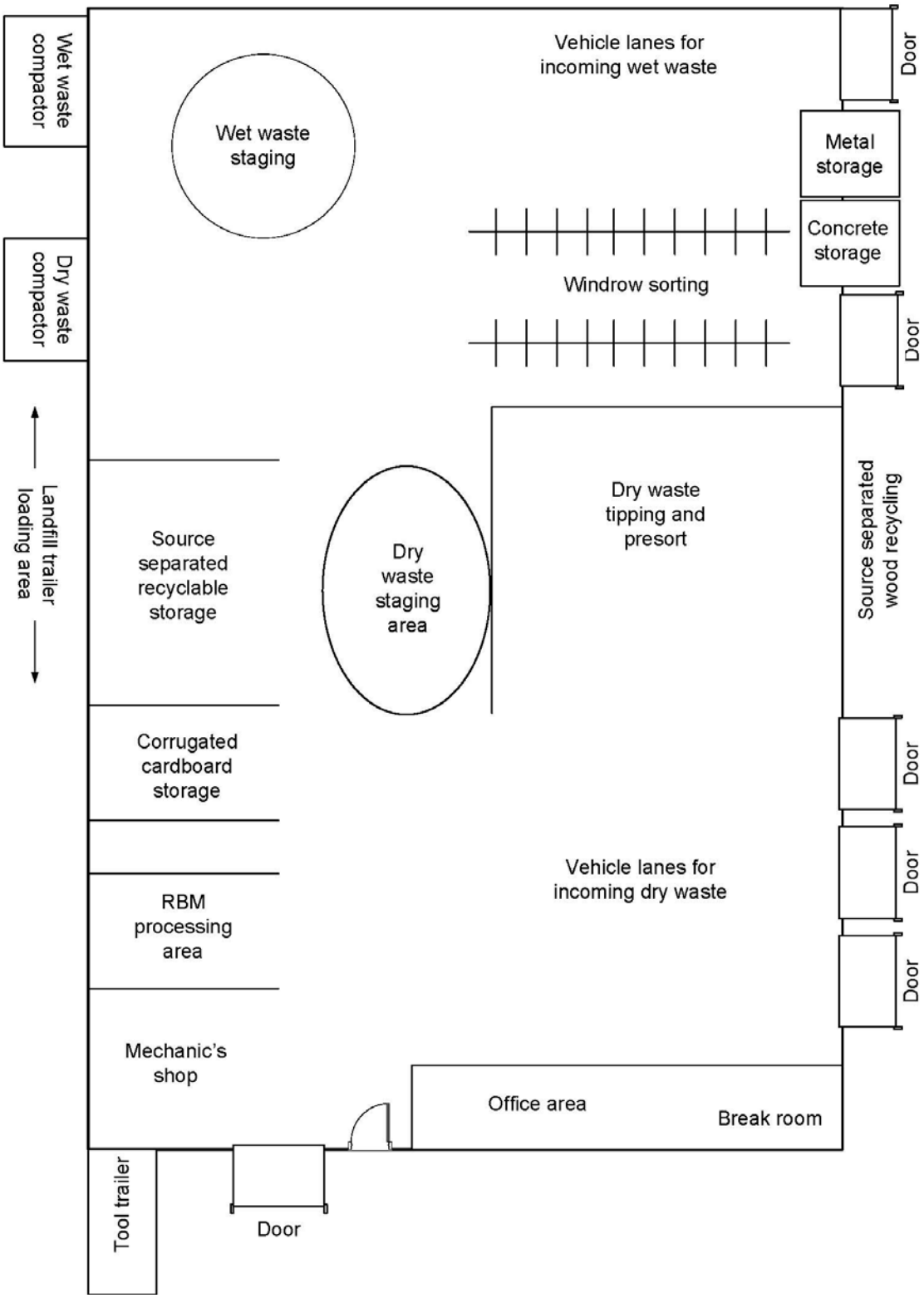


**Figure 2**
**TTS Facility Diagram / Task Areas**



1. **Pre-sort area (Mechanical/ Floor sort)**

   - Pre-sort is where dry waste loads are initially tipped from lose drop boxes onto the TTS floor and this area provided the highest quality and most concentrated RBMs in this pilot project. The track hoe operator in this area added RBMs to the list of targeted materials they were already sorting for and created piles of easily reached RBMs. Equipment operators also helped "loosen" piles of dry waste in the pre-sort area. Once equipment was finished, the floor sorters entered the area with lumber carts and picked up any RBMs made available by the equipment operator's redistribution of the pile.

2. **Windrow sorting area**

   - RBMs became a new target item for the dry waste sorters. RBMs were defined by the contractor and communicated to the Waste Management sorters through verbal description during orientation, break and lunch times, and through physical example while sorting. RBMs and recyclables were separated from the windrow simultaneously. Recyclables were placed in piles beside the windrows and the RBMs were loaded directly onto a lumber cart.
   - Tools were made available to the Waste Management sorters to aid in the recovery of reusables. Often reusable construction waste, comingled with non-reusable, is partially fastened, strapped, wrapped or otherwise prohibited from simply picking and placing on lumber carts. By using tools such as pry bars, hammers, box cutters, sledge hammers and metal shears, the sorters had the opportunity to quickly separate targeted RBMs from other debris. Once separated, the RBMs were placed on roll carts and transported to the processing area.

3. **Clean wood Drop off**

   - Occasionally clean wood loads were tipped at TTS's outdoor wood pile. Clean wood loads were a mixture of engineered wood, loose lumber and pallets. After new clean wood loads were tipped, the sorters scanned them visually for RBM potential, and then used pry bars, hammers and battery operated tools to extract reusable lumber.
   - With some loads it was necessary to use loaders to loosen jammed up loads to free up RBMs. Sorters then collected the RBMs on lumber carts.

4. **Processing**

   - RBM processing involves all the steps needed to prepare RBMs for transport to market. This included denailing and end cutting lumber, sorting and arranging lumber and engineered wood into piles of similar grades and materials. Non dimensional lumber items were neatly stacked, cabinet doors wrapped closed and loose RBMs contained in boxes and or pallets. The RBM processing and staging area set up by TTS staff was approximately 30'x45'. Three sides were bordered by a concrete ecology block wall. This arrangement worked well for the project. There was ample room for all processing and staging tasks. See photographs in the Appendix.

5. **Shipping**

- Pilot project RBMs were transported off site by three local RBM retail markets: Lovett Deconstruction's retail yard, Habitat for Humanity ReStore and The ReBuilding Center. The two non profit retailers, Habitat and ReBuilding Center, also provided the facility with a tax deductible inventory list of material collected. RBM retailers in the Metro region have sufficient trucking infrastructure that they can regularly collect RBMs at any local MRF.
- The vehicles used for material transport were generally box vans. Drivers stopped at the TTS vehicle scale on the way in and on the way out to track the quantities of RBMs leaving TTS. A little used maintenance vehicle door was located near the processing area so RBM transport vehicles could easily pick up RBMs without interfering with facility dry waste operations.

## PROJECT MEASUREMENT

The project recorded several types of data to measure and evaluate the benefit of reclaiming RBMs at dry waste MRFs. RBMs were recorded by material type size, shape, and weight. Standard, reoccurring materials, such as lumber and bricks were assigned an averaged unit weight and number count was maintained and applied to the average for weight records. Figure 3 is an example of a spreadsheet used to record daily reusable recovery. This sheet is flexible and was easily adjusted to reflect other types of materials, the description, size, etc. of materials being recovered. The left side provides space to record description of material, the center section records the labor investment in processing (when applicable) and the right side is for recording weight and quantity of material.

**Figure 3**
**TTS Daily RBM Data Report**

| Type | Description | | Size | Processing Time | Weight/bf | Count, ea. | Count L.F. | Total weight |
|---|---|---|---|---|---|---|---|---|
| Wood | Standard framing lumber with nails | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | Sheet goods | | | | | | | |
| | | | | | | | | |
| Plastic | Tube | | | | | | | |
| | | | | | | | | |
| | Misc | | | | | | | |
| | | | | | | | | |
| Metal | Lighting | | | | | | | |
| | | | | | | | | |
| | Misc | | | | | | | |
| | | | | | | | | |

## A. Project Data

### 1. Daily RBM Summary

A list of RBMs diverted was recorded for each day of the project. Material description and weights were recorded using a portable platform scale. Daily summaries were totaled into weekly summaries in Table 1.

**Table 1**
**Total Weight of recovered RBMs**

| | Week 1 | Week 2 | Week 3 | Week 4 | Week 5 | Week 6 | Total lbs | Tons | Metric tons |
|---|---|---|---|---|---|---|---|---|---|
| Wood | 7,031.4 | 1,840.2 | 4,445.1 | 1,107.9 | 2,572.7 | 3,401.1 | **20,398.4** | 10.2 | 9.3 |
| Metal | 302.3 | 146.9 | 231.8 | 2.0 | 55.5 | 69.0 | **807.5** | 0.4 | 0.4 |
| Plastic | 459.5 | 3.0 | 0.0 | 48.4 | 2.0 | 0.0 | **512.9** | 0.3 | 0.2 |
| Glass | 0.0 | 1.660.2 | 59.5 | 0.0 | 0.0 | 0.0 | **1,719.7** | 0.9 | 0.8 |
| Nylon | 0.0 | 0.0 | 4.2 | 0.0 | 0.0 | 0.0 | **4.2** | 0.0 | 0.0 |
| Concrete | 72.0 | 0.0 | 0.0 | 0.0 | 10.0 | 286.0 | **368.0** | 0.2 | 0.2 |
| Rubber | 173.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | **173.0** | 0.1 | 0.1 |
| Ceramic | 315.0 | 1,750.0 | 107.2 | 17.0 | 246.0 | 0.0 | **2,435.2** | 1.2 | 1.1 |
| Cotton | 0.0 | 15.4 | 0.0 | 0.0 | 0.0 | 0.0 | **15.4** | 0.0 | 0.0 |
| **Total lbs.** | **8,353.2** | **5,415.7** | **4,847.8** | **1,175.3** | **2,886.2** | **3,756.1** | **26,434.3** | **13.3** | **12.1** |

### 2. Summary of facility tonnage for dry waste reuse, recycling and MRF residual disposed

The pilot project was conducted during a time period that has been described as a recession with documented lower numbers of residential and commercial building permits and decreased generation of dry waste from construction. Incoming TTS dry waste for May 2009 was 872 tons, down 15% from 872 tons in May 2008. Table 2 shows that in the month of May 2009, TTS staff reported a 29.9% total dry waste recovery rate for May and recovered 7.07 tons of RBMs, or about 1% of all incoming dry waste.

The Contractor kept records for all RBMs and dry waste as the material entered and left the site. Incoming dry waste and clean wood waste records were recorded. Outgoing (post sort) dry waste, clean wood, metal and reuse load data were kept. The RBM quantities come from weight tickets from outgoing loads and weight tickets for loads bound for RBM reuse markets. Table 3 lists the incoming and outgoing tonnages flows during the pilot project.

**Table 2**
**May 2009 tonnage summary**

| Tons | Dry Waste | Reusable |
|---|---|---|
| Week 2 | 163.59 | 2.52 |
| Week 3 | 207.71 | 2.42 |
| Week 4 | 219.57 | 0.59 |
| Week 5 | 141.41 | 1.44 |
| Week 6 | 185.52 | 0.1 |
| **Total** | **917.8** | **7.07** |

| | |
|---|---|
| May recovery rate % | 29.90% |
| Dry waste | 917.8 |
| Total reusable | 7.07 |
| Total recovered | 274.42 |
| Reusable % of recovered | 2.50% |
| Increase in % recovered | 0.80% |

**Table 3**

**TTS dry waste tonnage flows during the pilot**

| | WEEK 1 | WEEK 2 | WEEK 3 | WEEK 4 | WEEK 5 | WEEK 6 | TOTAL |
|---|---|---|---|---|---|---|---|
| Total dry waste in | 181.82 | 186.3 | 207.71 | 219.57 | 141.41 | 185.52 | **1,122.33** |
| Dry waste recovered | 54.36 | 55.70 | 62.11 | 65.65 | 42.28 | 55.47 | **335.58** |
| Wood recycling | 43.49 | 44.56 | 49.68 | 52.52 | 33.83 | 44.38 | **268.46** |
| Metal recovery | 4.35 | 4.46 | 4.97 | 5.25 | 3.38 | 4.44 | **26.85** |
| Cardboard recovery | 5.44 | 5.57 | 6.21 | 6.57 | 4.23 | 5.55 | **33.56** |
| Concrete recovery | 1.09 | 1.11 | 1.24 | 1.31 | 0.85 | 1.11 | **6.71** |
| Total reuse recovery | 4.17 | 2.71 | 2.42 | 0.59 | 1.44 | 1.88 | **13.21** |
| % of dry waste recovered as RBMs | 2% | 1% | 1% | <1% | 1% | 1% | **1%** |

### 3. Green house gas and Carbon Foot print value (Cascadia Consulting Inc.)

A greenhouse gas (GHG) inventory is a measure of the greenhouse gasses associated with a particular organization, activity, process or product. There are six greenhouse gasses that are included in these inventories: carbon dioxide, methane, nitrous oxide, sulfur hexafluoride, hydroflurocarbons and perflurocarbons. Because carbon dioxide is the primary greenhouse gas, greenhouse gas inventories are commonly known as carbon footprints. Like GHG inventories, carbon footprints actually measure all six greenhouse gasses, but are expressed in terms of carbon dioxide equivalent (CO2e).

The avoided GHG emissions associated with the RBMs salvaged in this project were calculated in three steps. First, the RBMs salvaged for reuse from the transfer station were tabulated by material type and total weight. The main material types were wood, metal, plastic, glass, nylon, concrete, rubber, ceramic and cotton. Weights were calculated in both tons and metric tons (1 ton = 0.907 metric tons). Emission factors developed outside the US often use metric tons (or tonnes) as the standard unit of measurement.

Second, emission factors for each material type were identified to calculate avoided emissions associated with each material type. Emission factors are standard estimates of the amounts of greenhouse gases, in metric tons of carbon dioxide equivalent ($mtCO_2e$) that are produced in the manufacture of a material. The main sources of the emission factors were the UK Environment Agency Carbon Calculator and the US Environmental Protection Agency WAste Reduction Model (WARM). Wherever possible, EPA WARM was used as this model takes into account the full range of emissions avoided by salvaging building materials, including those emissions avoided from transportation and landfilling. The UK Environment Agency Carbon Calculator was a second source of information. This calculator is focused more specifically on the embodied emissions of building materials. There was no way to estimate transportation impacts for materials using this calculator.

Based on the available emission factors, several categories were broken down into more specific categories. Metals were subdivided into stainless steel, steel and aluminum. Wood was subdivided into framing lumber and engineered wood.

Lastly, the avoided emissions associated with each material type were calculated using standard greenhouse gas emission factors. Calculations for greenhouse gas emissions are shown in Table 4, but are based on the recovered RBM totals in Table 1.

**Table 4**

**Greenhouse Gas and Carbon Foot Print Emissions by Material Type (Cascadia Consulting Inc.)**

| | Tons | Metric tons | Emission factor | Source | Emissions |
|---|---|---|---|---|---|
| **Wood** | | | | | |
| Clean lumber | 8.1 | 7.3 | 2.02 | US EPA WARM | 16.28 |
| Engineered wood | 2.1 | 1.9 | 2.22 | US EPA WARM | 4.75 |
| **Metal** | | | | | |
| Stainless steel | 0 | 0 | 6.15 | UK Environment Agency | 0.07 |
| Steel | 0.4 | 0.4 | 1.82 | UK Environment Agency | 0.64 |
| Aluminum | 0 | 0 | 8.53 | UK Environment Agency | 0.03 |
| **Plastic** | 0.3 | 0.2 | 2.41 | UK Environment Agency | 0.56 |
| **Glass** | 0.9 | 0.8 | 0.58 | US EPA WARM | 0.14 |
| **Nylon** | 0 | 0 | 4.03 | US EPA WARM | 0.1 |
| **Concrete** | 0.2 | 0.2 | 0.12 | UK Environment Agency | 0.2 |
| **Rubber** | 0.1 | 0.1 | 4.25 | UK Environment Agency | 0.33 |
| **Ceramic** | 1.2 | 1.1 | 0.55 | UK Environment Agency | 0.61 |
| **Cotton** | 0 | 0 | 4.03 | US EPA WARM | 0.01 |
| **TOTAL** | **13.2** | **12** | | | **23.44** |

## B. Findings

The avoided emissions associated with this project total just over 23 metric tons of carbon dioxide equivalent ($mtCO_2e$). This is roughly equivalent to the emissions four American drivers produce annually, or the emissions produced from the electricity of the average American home over three years. According to EPA estimates, this project avoids as much emissions as would be sequestered by 590 tree saplings grown for 10 years.[1]

### *Considerations*

The emissions avoided by salvaging used materials are substantial when compared to the emissions from manufacturing new ones. The calculations here use best available data and likely underestimate total avoided emissions. One known area where avoided emissions are underestimated is regarding transportation of building materials using the UK Environment Agency calculator. Concrete in particular has a large greenhouse gas impact due to transportation. As no data was available to estimate these emissions, they are not included in the above estimates.

[1] US EPA Greenhouse Gas Equivalencies Calculator http://www.epa.gov/cleanenergy/energy-resources/ calculator. html

## COST/REVENUE

### A. RBM value/labor hours

The market values of RBMs quoted in this section are based on 2009 retail pricing at The Lovett Deconstruction, Inc. salvage yard. Lovett's pricing is generally consistent with The Rebuilding Center and Habitat for Humanity Re-Store. RBM retail pricing is generally set lower than the retail price for new materials, which for lumber in 2009 had been bottomed out at a 20 year low price. As the prices of new building materials go back up so will the value of RBMs.

Ninety percent of the non-management, hands-on labor hours for this project went toward processing lumber. The remaining 10% was spent cleaning, sorting, stacking and preparing other non-lumber RBMs for transport.

**Table 5**
**Material Value/Labor burden**

| | WEEK 1 | WEEK 2 | WEEK 3 | WEEK 4 | WEEK 5 | WEEK 6 | TOTAL |
|---|---|---|---|---|---|---|---|
| Hours processing | 28 | 12 | 15 | 4 | 8.5 | 15 | 82.5 |
| Lumber retail value | $955.05 | $404.80 | $416.95 | $143.35 | $368.10 | $511.20 | $2,799.45 |
| Other material retail value | $211.00 | $915.00 | $165.00 | $20.00 | $10.00 | $30.00 | $1,351.00 |
| Total material value | $1,166.05 | $1,319.80 | $581.95 | $163.35 | $378.10 | $541.20 | $4,150.45 |

These resale figures do not reflect transportation, marketing, packaging, storage or RBM program/ pilot management costs. It does leave a nice profit margin that leaves the door open to explore the possibility of setting up operations to recover RBMs and get them to market.

***Lumber***

The largest quantity of RBM harvested was dimensional lumber, which also required almost all of the RBM processing time. When looking for the greatest measure of cost/benefit, the first place to look was at lumber market value compared to the labor invested to reuse the material. Table 5 shows a total of 82.5 hours were devoted toward processing $2,799.45 worth of dimensional lumber and engineered wood. If one looks at these numbers and applies a value of $20.00 per hour for processing, one still sees a nice profit.

82.5 hrs x $20/hr = $1,650 direct labor cost
Retail RBM market value $2,799.45 - $1,650 = $1,149.45

Gross profit 41%

Wholesale value would be approximately half of retail.

***Red brick***

Standard bricks and cinder blocks are easy to market. Bricks often have mortar stuck to them and require removal via hammer, chisels, or pneumatic equipment. For this project, the contractor recovered 350 bricks in six hours. Used bricks on the Portland retail market sell for $.50 each. Other markets pay as much as $.75 to $1.00 plus shipping costs.

| |
|---|
| 6 x $20/hr= $120 direct labor cost |
| Retail Material market value 350 each x $0.50 = $175 - $120 = $55 |
| Gross profit 31% |
| Wholesale value would be approximately half of retail. |

***Other building materials***

Most non-lumber and brick RBMs required little or no processing. They were simply picked from the waste stream and staged for transport in the processing area. These RBMs estimated retail value came to $1,351.00 and are made up of a tremendous variety of building materials: sinks, plumbing and electrical fixtures, doors, windows, cabinets, toilets, hardware, pipe, etc. One example of the potential for unexpected RBM value was an entire 30 yard container of 18" diameter glass high-bay warehouse light shades. Because the shades were loaded loose in the drop box, over 75% of the globes were broken upon tipping onto the floor at TTS. The contractor was able to recover 85 unbroken globes. At a minimum market value of $10 each, this one load equates to $850 in resale value.

Ten percent of contractor processing time, or 8.25 hours, was dedicated towards handling these non-lumber and non-brick items and these represented a carbon footprint value of 1.78 tons of emissions, or 7.5% of the total avoided emissions for the project.

Clean lumber and engineered wood represent 89% of the total greenhouse gas emissions diverted as a result of this project. Ceramic bricks and concrete blocks represent 2.6% of the total greenhouse gas emissions diverted as a result of this project, see Table 3.

## CONCLUSIONS AND RECOMMENDATIONS

The conclusions from this project are intended to provide local dry waste MRFs and transfer stations with an outline of the strategies and techniques involved in implementing an effective RBM MRF recovery program. Differences between facility layout, size, traffic type, load type and tonnage levels may require modification of these recommendations for other facilities.

## A. An RBM recovery program can capture at least 1% of incoming dry waste tons

The pilot project shows that an effective RBM recovery program at a dry waste MRF can result in the reuse of at least 1% of all incoming dry waste tons. One percent of TTS's calendar year 2008 dry waste tonnage will result in 113 tons of reuse. If RBM recovery programs were initiated at Metro's two transfer stations, this could result in 636 tons of RBM recovery using 2008 data and if all dry waste MRFs in the region were to do this, this could result in 2,442 tons of RBM recovery using 2008 tonnage data.

Since the primary RBM being recovered is wood, the reuse of wood provides some market diversity and stability to the currently volatile and declining wood fuel markets.

## B. Develop a training and communication plan related to RBMs

The most important new skill set for any MRF sorting staff to learn are the various material quality specifications for the different types of RBMs. Most RBM retailers have a list of materials accepted and specifications for each material (i.e. lumber must be at least 5' long). RBM retailers may be willing to provide some basic on-site training to sort staff and field trips to the Rebuilding Center and Habitat for Humanity may provide a necessary context for sorters to be able to see what RBMs look like. Without the expertise and advising of an on-site deconstruction contractor, the process of staff learning which RBMs are accepted will likely be a trial and error process for most MRFs. This learning process is helped by the fact that when the three local RBM markets, Lovett Deconstruction, Habitat and ReBuilding Center, arrive to pick up RBMs, they generally do not take the materials that do not meet their specifications. These refusals help to reinforce learning about what they do not accept.

Communication played an important role in the success of this pilot project. Ensuring that all facility personnel are knowledgeable about the RBM program, RBM specifications and sorting procedures and how the program fits in with the facility safety and operations plan will help to make sure that the program succeeds.

## C. Utilize the scale house staff to help screen and identify RBM rich loads

The scale house is typically the first contact that an incoming driver has at a dry waste MRF. At this first point of contact, the driver has the opportunity to give the scale house their assessment of the RBM potential for the load. The MRF scale house staff may be able to assist with this determination if they have a list of questions to ask drivers and have some opportunity to view the load from above and communicate to floor sort staff the type of material coming in. To assist with this, facility staff might consider:

1. The installation of remote controlled closed circuit video camera that would be linked to a screen inside the scale house.
2. Elevating the scale house so the scale house employee is high enough to look down on loads without camera assistance.

3. Requiring incoming traffic to untarp loads before weighing in so scale house employees can view incoming loads.

## D. Limit mechanical handling of dry waste in the pre-sort area before recovering RBMs

Before the pilot project, there was little concern for how dry waste was handled. The original focus of the facility was to recover recyclables without concern for material condition. During this pilot, the Contractor found that the equipment operators at MRFs have a lot of control over how their movements affect the degradation of RBMs. The Contractor found that the most effective way to recover RBMs from the waste stream at a MRF is to get sorters' hands on it early to avoid the damage that happens with mechanical loader contact. This is the most important aspect of creating procedures to maximize recovery value of RBMs. Degradation of material quality begins with the tip, dump, toss or push of dry waste from the transport vehicle to the MRF floor. As comingled dry waste and RBMs are transported through the facility's process high potential for damage occurs at every stage.

Operators of equipment at the presort site generally push tipped dry waste into a larger pile which is a staging place for material to be sorted into windrows. For the pilot project, the Contractor established the expectation that the operator who was piling recently tipped dry waste in the presort area, would communicate with the floor sorters when there were RBM rich loads that could be sorted in the pre-sort area are before this material was pushed into the large pile to be sorted. This practice reduced potential RBM damage.

Floor sort facilities likely already have a dedicated staff member at the tipping area. This person can serve the function of directing incoming drivers, directing facility equipment operators, confirming to the scale house the type of material tipped, and identification of RBM rich loads. When rich loads are identified, the observer should call for hand sort staff to come and grab the easily handled RBMs and load these materials onto lumber carts for delivery to the RBM processing area.

There will be times when piled dry waste is jammed together to the point that a floor sorter cannot extract target RBMs easily or quickly. At this time a small loader like a bobcat could loosen up the newly tipped pile to allow for more effective harvest. Alternately, loosening up could be accomplished with smaller track hoe or fork style mechanical equipment. For this pilot project TTS staff used a track hoe with a pinch style bucket. This worked well. Another style of equipment that the contractor has used for this purpose on job sites is a telescoping forklift or fork attachment to a bobcat. The forks work well to dislodge intertwined materials. Forking the dry waste pile, picking it up and letting it settle will help increase harvest at the front end of dry waste MRF facilities.

After loosening, the RBMs should be collected by hand sorters, loaded onto lumber carts and transported to the processing area.

## E. Changes to floor sorting area

When the Contractor first arrived at TTS, the loader operator who laid out the windrow had a habit of repeatedly driving over the dry waste as he laid out the material for the floor sorters. When the

effect he was having on the potential recovery was brought to his attention he stopped this practice. For the remainder of the project windrows were laid out with equipment backing up while distributing dry waste into windrows, eliminating the chance for unnecessary damage while still maintaining normal operations.

The RBMs were often screwed, nailed or glued to other non salvageable materials. Initially WM floor sorters loaded RBMs while they were still connected to the non-reusable materials. The contractor introduced hammers and pry bars in the floor sort area to separate the non-reusable contaminates at first contact.

After the initial recovery of RBMs in the pre-sort area, dry waste was piled and staged with other dry waste loads in wait for windrow sorting. Windrow sorting provided a second stage sort. If the pre-sort is effectively done there will be less RBMs to harvest in floor sort windrows. Floor sorters easily added RBMs to their list of target recyclables. Floor sorters should have a dedicated place for placing RBMs, such as lumber carts (see photo in Appendix). The roll carts can be moved around by hand even with heavy loads. The carts can be moved by hand to remain in proximity with the area being sorted. Contractor experience was that a lumber cart reached maximum load capacity after about two hours of windrow floor sorting. Full carts were exchanged with empty ones at break or lunch times. RBM processing staff should keep watch for full carts and exchange them for the sorters when they can see a cart nearing its capacity.

## F. Changes for facilities that utilize an elevated sort line

While TTS does not use an elevated sort line, the contractor is familiar with this type of process equipment and has some insight into the process of integrating RBM sorting into an elevated sort line system.

The presort process would be the same as with floor sort processes and would still be the MRF's best opportunity for recovering RBMs before they are degraded by heavy equipment. Once fed into the sort line conveyor, the sort line recovery process would result in the same types and quantities of RBM that would be found in the windrow floor sort, mostly larger RBMs missed in the presort, and small items that are revealed as the dry waste is more carefully sorted through. The challenge with recovery of RBMs at facilities with elevated sort lines is finding an efficient way to lower RBMs down to the ground without damaging or double handling them. Possible solutions include rolling carts or forklift compatible stake-side boxes that can be forked up to the elevated sort line.

Larger, busier facilities with higher TPD flows and or larger numbers of self haul customers may want to consider these additional techniques to increase RBM efficiency and reduce related safety hazards including:

- Use traffic control devices to direct vehicle, loader and foot traffic.
- Dedicate small skid steer loaders to work with floor sorters on RBM recovery.
- Change the flow of material through the facility or facility layout to create a safer environment for effective recovery of RBMs in the pre-sort area.

- Create a mechanized RBM cart train, such as a small electric tractor with linkable lumber cart/trailers to drop and pick up RBMs around facility (similar to airport tarmac baggage transport carts).
- Dedicate a RBM team or project lead to focus on RBM diversion, developing staff skills in RBM processing, measurement of program performance and shipping materials to market

## G. Develop plan to be able to recover RBMs from source separated loads of clean wood

Outside the TTS facility, loads of clean source separated wood was tipped for later reload to wood recycling markets. While this wood recycling area was not originally thought of as a likely target for recovering RBMs in this pilot project, the contractor observed large quantities of reusable lumber being tipped out that was relatively easy to recover as RBMs. When new wood loads were being delivered and tipped, the contractor conducted a visual scan for RBMs. Because "clean" wood frequently was connected to non-reusable materials like sheet flooring and roofing, the contractor used circular saws and reciprocating saws to separate RBMs from these contaminates in the wood pile. The clean wood pile also contained a large number of pallets. See additional recommendation for pallet recovery later in this section.

## H. Develop list of target RBMs, possible markets and market material specifications

RBMs that are easiest to recover at transfer stations are materials that are heavy, are durable/not easily degraded, and are easily processed, transported and marketed.

RBMs targeted for the project were the materials known to be accepted by the local reusable building material yards, Lovett Deconstruction, Habitat for Humanity Re-Store, and The Rebuilding Center. The latter two locations are non-profit organizations that accept RBM donations to fund their parent organizations. Generally speaking, RBMs should be processed with the end market in mind. Usable lengths, widths and conditions should be considered for lumber. Any hardware, doors, cabinets, plumbing and electrical devices, and miscellaneous items should be in reusable condition. The specific criteria of the materials accepted changes seasonally. The following is a list of general specifications for some of the larger categories of RBMs to provide a clear idea of what building materials are reusable in the Portland Metro area.

***Lumber***

Dimensional lumber and sheet goods like plywood are some of the most durable building materials found in the dry waste stream. They are strong enough to survive loading, transport, tipping and repositioning by equipment. Because lumber is often used as skeletal material in construction, there are few market or end user issues with surface damage. It can be scratched, fractured, chipped, stained, handled roughly and still retain its functionality.

<u>Width</u>: Any width from 1" and greater.

<u>Length</u>: Any dimensional lumber with a usable length of 5' or greater. This project yielded lengths between 5' to 16'.

Condition: All grades of dimensional lumber are accepted. It is preferable to stage similar condition material in the same area. The greatest percentage of lumber salvaged from this project was approximately 25% low grade/utility quality non stamped lumber, 70% building grade #2 or better, and the remaining 5% high grade finish quality lumber.

Plywood, OSB, MDF and other sheet goods: Any thickness, but must be at least ½ sheet in size.

Unlike most RBMs, which are ready to market in their found condition, lumber/plywood requires more processing. Sometimes reusable wood receivers will accept wood with nails in it but in most cases they do not. When the RBM supply is low at The Rebuilding Center, they will sometimes accept wood with nails. Processing lumber includes removing fasteners and cutting broken or cracked ends with a circular saw. Lumber should be staged so that it can be fork lifted onto trucks or trailers for export. Similar dimensions should be staged together; banding standard size units is effective for managing growing quantities of lumber until transport.

***Bricks and Cinderblock***

Bricks, pavers and cinderblock are easy to recover and market. Bricks that have mortar attached need to be cleaned. Cleaning bricks is the process of knocking mortar free of the brick with a hammer or chisel. In cases when air compressors are available and increased efficiency is desired one can use a pneumatic chisel to remove the mortar. Typically, bricks with mortar that were installed before approximately 1930 are easier to salvage because of the lower Portland cement content in the mortar, making them easier to clean. Post 1930 mortar often is hard enough to prevent efficient removal from bricks. While these materials are not found in every load, they are easy to include in any RBM recovery program.

***Doors and Windows***

Doors and Windows are easy to spot in dry waste loads, and can be successfully recovered. Often these materials are targeted too broadly and a lot of effort goes into salvaging these items only to find that they do not meet current energy code and are not acceptable to reuse markets. Additionally, these items are often damaged beyond the threshold of reuse in transport and arrive at the recovery facility in unacceptable condition. Doors must be sound, square, have no holes and be hung in a door jam. These requirements tend to eliminate 90% of all hollow core, veneer, vinyl and metal clad doors common in newer buildings.

There is an important exception for older doors with historic value. Historic doors, typically multi panel and made of solid wood should always be salvaged as they almost always have value in the historic salvage market.

***Other Reusable Materials***

This project focused on building materials only. In the first week of the pilot, the Contractor used the criteria for RBMs defined by Lovett Deconstruction's retail yard, the ReBuilding Center and Habitat for Humanity ReStore. They typically accept other construction related materials like construction tools and equipment. At the request of TTS management, the contractor narrowed the

criteria to include only the building materials represented within the Construction Specification Institute (CSI) master format system, which does not include any tools and equipment. During the project, the contractor continued to come across reusable items that fit into the tools and equipment category, which would be easy for local RBM markets to sell.

If this pilot had been designed more broadly to include these other materials as well as furniture, household items, sporting goods, etc., this could potentially provide a much more comprehensive program that would result in higher reuse tonnages. Contractor estimates that home and office reusable items are in almost half of all the dry waste loads that came through TTS during the pilot. With a little creativity and organization, this untapped resource could be collected and distributed to the region's thrift organizations for resale.

The clean wood pile also contained a large volume of pallets. Pallets are operationally difficult to manage as they take up a lot of space and to attain transport efficiency may need to be mechanically broken apart before being top loaded into a truck. Additionally, most pallets also have a resale value. The pilot project was primarily focused on the mixed dry waste stream so only the easily recovered RBMs were pulled from the clean wood pile. A greater RBM effort at the clean wood pile could have recovered a sizeable stream of reusable pallets, which would generate revenue.

## I. Revise facility Safety Program to include tasks related to RBM recovery

Most material recovery facilities should already have an established operational safety program in place. Implementing a RBM recovery program may require some additions and revisions to the safety program. Sorters and processing staff should all be wearing hard hats, protective eye wear, hearing protection, long sleeve shirts and pants, steel toe boots with puncture resistant in-soles, and high visibility clothing. Working in the TTS facility, the contractor needed to transport full RBM carts from the windrow and pre-sort areas, traversing the path of large vehicles and equipment. This excursion was enough outside of the normal TTS operational plan that the contractor installed high visibility flags and flag poles on the lumber carts to increase the visible presence of foot traffic to the equipment operators (see photos).

The possible danger to floor sorters and other facility staff involved in RBM recovery increases at facilities with higher traffic flows, smaller footprint facilities, higher daily tonnage or those that accept self-hauled waste.

Handling RBMs, working around moving equipment and trucks, and using tools present many opportunities to review safety practices. Safety programs should include the following components:

### 1. Handling RBMs

- Reusable construction waste is often heavy, awkward and irregular. Sorting and RBM processing staff should be aware of limits to their lifting capabilities and hydraulic loaders should be used to accomplish any lifting tasks that exceed the floor sorter's capacity.

Minimizing the elevation necessary to pick an item up by using low deck roll carts or other well placed heavy equipment will relieve potential physical strain.

- Training for proper lifting techniques related to RBM recovery, mandatory morning and afternoon flex and stretch are recommended.

2. **Working around heavy machinery**
   - Placing floor sorters in the same work area as heavy equipment like wheel loaders and track hoes creates a safety risk and requires a comprehensive safety plan, similar to the one used at TTS. Operation staff and floor staff should be in constant communication about daily activities and expectations of one another. Simple guidelines for working alongside machinery include wearing high visibility clothing, using radio communications, always anticipating movements of one another and using well known pedestrian pathways.
   - TTS management also required all staff to remain a minimum of 15 feet from any piece of mobile machinery.
3. **Hand, electric and pneumatic tool use**
   - Hand tools and power tools help make the RBM/dry waste sorter's job easier. See Appendix for a list of tools used in the project. Each tool presents its own safety hazard potential. Training for the proper use and hazard potential for each tool will reduce injury rate and increase efficiency.
4. **Environmental**
   - It is likely that hazardous materials will arrive at dry waste MRFs. The sorting personnel on the floor are usually the first to encounter these materials after they are tipped. Common hazardous include lead based paint, PCBs, Mercury, asbestos and mold. Personnel should be trained in hazardous material identification, and operational plans should be in place to control and clean up these hazards as they are discovered.

## J. Develop plan to transport and market RMBs

There are two options for bringing RBMs to market. The first and most straightforward is to donate RBMs to nonprofits. In Portland there are at least two different options for donating RBMs. Many cities in the US are seeing the emergence of nonprofit used building material sellers. Donating RBMs can result in a 501(c)(3) tax deductable donation and helps support charitable organizations. There is an opportunity to market RBMs directly to the public with an open retail yard or through brokers. Selling directly will reap the highest direct cash value of the RBMs, but is usually outside the business model of most MRFs and transfer stations.

## K. Invest in the tools and Equipment needed to support an RBM recovery program

The tools and equipment necessary are similar to what one would find on a typical construction jobsite. Processing RBMs requires the piecing apart and removal of extraneous/contaminant materials. Most of the tools needed for RBM recovery are commonly found on typical construction jobsites (see table 6).

**Table 6**

**Sample list of RBM recovery/processing tools**

| HAND TOOLS | POWER TOOLS | MATERIAL HANDLING EQUIPMENT | EXTRAS |
|---|---|---|---|
| Crescent wrench | Air compressor | Bobcat with attachments | Banding supplies |
| Flat bar | Air hoses | Excavator | Brooms |
| Hand tools | Circular saw | Fork lift | Dust pan |
| Metal shears | De-nail guns | Front end loader | Shovels |
| Nail claw | Electric cords | Roll carts | Shrink wrap |
| Nippers | Pneumatic chisel | Sawhorses | Trash can |
| Pipe wrench | Power drill | | |
| Sledge hammer | Reciprocating saw | | |
| Tape measure | Replacement blades | | |
| Tape measure | | | |
| Tool belt | | | |
| Wrenching bars | | | |

## APPENDIX A

### DETAILED PILOT PROJECT TOOL/SUPPLIES LIST

| VENDOR | ITEM | DESCRIPTION | COST | QUANTITY | SUBTOTAL |
|---|---|---|---|---|---|
| Home Depot | Tape Measure | Stanley, Power Lock, 25ft | $5.86 | 5 | $29.30 |
| | Utility Knife | Stanley Retractable Utility Knife 99E | $3.48 | 5 | $17.40 |
| | Metal Snips | Wiss, Straight Cut | $12.97 | 3 | $38.91 |
| | Bear Claw | Vaughn 12" | $16.86 | 3 | $50.58 |
| | Flat Bar | Stanley, Wonder bar | $8.98 | 3 | $26.94 |
| | Flat Bar | Super Bar, X | $13.96 | 2 | $27.92 |
| | Small Sledge | Stanley 2.5lb., Black Smith | $17.97 | 1 | $17.97 |
| | Nippers | Channel Lock 10in. | $19.86 | 3 | $59.58 |
| | 10 Piece Pliers set | Work Force, pliers and wrench set | $19.87 | 1 | $19.87 |
| | Pipe Wrench | 14in Heavy duty | $10.96 | 1 | $10.96 |
| | Pipe Wrench | 18in Heavy Duty | $14.98 | 1 | $14.98 |
| | Tool Bag | Husky 20oz. Large Mouth Tool Bag | $28.36 | 1 | $28.36 |
| | Job Box | Ridgid 24x48x24 | $259.00 | 1 | $259.00 |
| **Sub Total** | | | | | **$601.77** |
| Western Tool Supply | Hammer | Vaughn, V5 19 oz. A/S M/F | $44.99 | 2 | $89.98 |
| | Sledge Hammer | Wilton UnBreakable | $49.99 | 1 | $49.99 |
| | Wrecking Bar | Stanley Fat Max 36" | $14.99 | 2 | $29.98 |
| | Tool Belt | CLC 4pc. Framers Combo | $24.99 | 2 | $49.98 |
| **Sub Total** | | | | | **$219.93** |
| Parr MLK | Wrecking Bar | 30" Wizard Bar | $31.99 | 1 | $31.99 |
| | Wrecking Bar | 36" Wizard Bar | $52.09 | 1 | $52.09 |
| **Sub Total** | | | | | **$84.08** |
| Chas. H. Day Co. | Air Compressor | Makita 2 hr. Mac 700 | $218.50 | 1 | $218.50 |
| | Air Hose | Flex Eel 1/4"x 50' | $29.40 | 2 | $58.80 |
| | Circular Saw | Bosch Worm BO-1677m | $149.95 | 1 | 149.95 |
| | Blades | Milwaukie 9" Wood 50 pack | $153.39 | 2 | $306.78 |
| | | Bosch Circ 7 1/4" CB724AB | $8.00 | 4 | $32.00 |
| **Sub Total** | | | | | **$766.03** |
| **TOTAL** | | | | | **$1,671.81** |

## APPENDIX B

### PROJECT PHOTOGRAPHS

**Presort area**

**Windrow sort area**

**RBM Processing area**

**Incoming source-separated wood**

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