



## Memorandum

To: Sego Jackson, Snohomish County Solid Waste Division

From: Marc Daudon, Principal  
Cascadia Consulting Group, Inc.

Date: December 30, 2010

Subject: **MRW Waste Collection Model and Documentation**

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Sego Jackson of the Snohomish County Solid Waste Division has engaged Cascadia Consulting Group to design a methodology to measure direct and indirect costs associated with the collection of oil-based paint and mercury lamps. To accomplish these objectives, Cascadia developed an Excel-based financial model to help existing and potential MRW collection sites estimate the cost of oil-based paint and mercury lamp collection. This model and its accompanying guidance documents are informed by two time-and-motion studies, the first conducted in November 2010 in Snohomish County, and the second in January 2011 in Kitsap County.

## Use and Methodology

This Excel-based financial model is flexibly designed, and can utilize either default values or customized data in its calculations. The default values used in the model are derived from data collected during the November and January time-and-motion studies and provide the user with convenient, study-based data points for ease of use. If a user desires, he or she can customize these values to more accurately estimate a material's collection costs at a specific MRW collection facility. The methodology used to collect time-and-motion data is detailed in the accompanying document, "Time & Motion Data Gathering Instructions," which can be used to generate customized data.

## General Instructions for Excel Tool

To use the Excel tool with default values:

- Begin at the top of the spreadsheet and enter the information in each of the three data-entry sections
  - (1) Labor Cost of Collection
  - (2) Supply Cost of Collection
  - (3) Indirect Cost of Collection.
- Yellow cells indicate points of data entry; gray cells indicate calculated values.
- Each data-entry cell includes a pop-up tip to help the user determine what information is needed.
- Toggle any cost line-item on or off by selecting "Y" or "N" in the adjacent column.

The spreadsheet is protected to decrease the likelihood of user-caused errors, but users can remove these protections without a password by selecting Excel's "Review" menu and clicking "Unprotect Sheet." All background calculations are hidden, but can be found by first "unprotecting" the worksheet and "unhiding" columns "X" through "AE." This information may be useful for users who wish to see how the model derives its outputs.

## General Instructions for Customized Data Generation

End-users who decide to use custom data will need to input facility-specific information, including:

- An average hourly labor cost (including benefits) for technicians.
- An average hourly labor cost (including benefits) for supervisors.
- Estimates of time spent handling materials for different activities.
- The cost of collection supplies (e.g., containers, pallets, plastic wrap, and other disposables directly associated with a specific material).
- The indirect cost of the overall facility from the facility's financial statements, apportioned as a percentage (based on square footage, tonnages of materials collected, or units of materials collected).

Additional guidance documents, including time-and-motion instructions, a data-recording sheet, and a diagram, are included to help users calculate these values.

## Assumptions

To create a model generalizable beyond one facility, we assumed:

- Technicians observed in Snohomish and Kitsap Counties work at a rate comparable to the industry average.
- Technicians work at a consistent rate throughout the process.
- Customers at hazardous waste facilities unload vehicles at a rate comparable to facility employees.
- On average, it takes approximately the same amount of time to receive and sort each unit of paint or light bulb, regardless of size or type.
- Time spent between material drop-off points ("shared time") can be divided equally between material types.
- The number of materials dropped off by a customer does not impact the average time of each activity.
- On average, 3.15 units of paint of varying sizes (from one pint to five gallons) fit into one cubic foot of paint containers (whether tub skids or gaylords).
- Material receptacles are prepared prior to customer arrival.
- Movement of materials is conducted by technicians, not supervisors. (However, the model can accommodate a different supervisor pay-rate and handling time, if a user wishes to customize data values.)

## Constraints

This model was created with a constrained timeline and limited budget; the study was therefore restricted to two days of time-and-motion data collection at two facilities. Of these facilities, only one accepted latex paint. (It is possible that facilities that accept latex paint receive more oil-based paint and may therefore experience larger average customer drop-offs. We address this concern with our assumption that the average time spent per unit of paint or mercury-based lightbulb does not vary with changes in drop-off quantity.)

This study excludes paperwork-related costs. The study also estimates bulking costs by dividing time spent on bulking activities during the day by the number of units handled that day.

## Sources

Information and data used to construct this model were obtained from the sources listed in the table below.

Facility or Organization Name	Contact Person	Information Provided
Snohomish County Solid Waste Division	Sego Jackson	Industry guidance and networking
Snohomish County Household Hazardous Waste facility	Jim Gustafson	Time-and-motion study site #1, technical background information, supply costs, labor costs
Kitsap County Household Hazardous Waste facility	Rick Gilbert	Time-and-motion study site #2, supply costs
Oregon Metro	Jim Quinn	Time-and-motion background materials, supply costs
Product Care Association	Mark Kurschner/Mannie Cheung	Volume-unit conversions for paint containers