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*Hurricane Katrina Disaster Debris Management:  
Lessons Learned from State and Local Governments*

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**BRIEFING REPORT**

Revised Version

**December 2005**



# Hurricane Katrina Disaster Debris Management

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### ATTACHMENTS

- 1 Hawaii Disaster Debris Management Plan – Final Draft (2005): Annex VI – Best Management Practices
- 2 Monterey Regional Waste Management District – Katrina Response Waste Processing Priorities
- 3 SOP #34 – Disaster HHW Collection Services



## 1.0 INTRODUCTION

The thoughts and prayers of the members of the Solid Waste Association of North America (SWANA) are with those who have been impacted by Hurricane Katrina.

SWANA is a 40-year professional association with a membership of over 7,200 solid waste managers and practitioners in the United States and Canada. In the aftermath of Katrina, many of our members expressed a desire to share the experience and lessons learned by those who have previously had to deal with the management of disaster debris with the state and local government managers now charged with removal and cleanup of the solid wastes caused by the hurricane.

In this regard, an email was forwarded to SWANA on September 13, 2005 from the *State of Louisiana Department of Environmental Quality* requesting assistance.

*“Louisiana is very interested in hearing from other state and local governments on their “lessons learned” from disaster debris handling.”*

*“Our need is urgent as we have little time to waste.”*

*”Specific subject areas included are:*

- *School laboratories*
- *Household hazardous materials*
- *Automobile salvage (tires, lubricating fluids, mercury switches, lead acid batteries, contaminated gasoline/diesel)*
- *Propane tanks*
- *White goods (freon recovery and mercury thermostats)*
- *Electronic wastes.”*

*“It looks like many communities in the New Orleans region will have to implement a building to building assessment and material removal before demolition. If anyone has experience with the issues surrounding abandoned vehicles and condemned buildings, please forward that too.”*

*“We are attempting to develop a debris removal strategy that will maximize diversion as much as possible, considering the circumstances. Concrete will be used as rip rap or ground up, tires will be chipped and ground, wood waste will be ground where there is a grinder, etc.”*

*“Any insight will be will be greatly appreciated.”*



# Hurricane Katrina Disaster Debris Management

Following the receipt of this email, SWANA sent out a request to each of its eight technical divisions requesting information.<sup>1</sup>

The purpose of this report is to respond to the Louisiana DEQ's request by summarizing the responses received from SWANA members, as well as other referenced documents, regarding the management of disaster debris.

This report, which was compiled by the staff of SWANA's Applied Research Foundation, was initially published on September 21, 2005. Following its publication, a number of comments were received regarding the report's recommendations concerning the handling of household hazardous wastes (HHW), conditionally exempt small quantity generator (CESQG) wastes, and school laboratory wastes during disasters. As a result, SWANA solicited comments and suggestions from its Special Waste Management Division as well as other outside organizations.

This version of the report (dated December, 2005) reflects the comments and suggestions received by SWANA in this regard since the report's initial publication. SWANA gratefully acknowledges the input and suggestions received from members of its Special Waste Division, as well as outside organizations, in the development of this updated version of the report.

SWANA would like to acknowledge the contributions of the following organizations and/or individuals in providing resource materials and/or otherwise contributing to the development of this report.

| Organization  | Contact              | Title  |
|---|----------------------|--|
| Washington Department of Ecology                          | David Nightingale    | Environmental Engineer                                       |
| Florida Department of Environmental Protection            | Jack Price           | Environmental Manager  |
| Southeastern Public Service Authority                     | Richard Cheliras     | Director of Environmental and Safety Management              |
| Onyx Environmental Services                               | Marissa Frischetti   | Account Manager  |
| Portland (OR) Metro District                              | Jim Quinn            | Hazardous Waste Program Manager                              |
| Monterey Regional Waste Management District               | Rick Shedden, P.E.   | Senior Engineer  |
| North American Hazardous Materials Management Association | Irene Gleason        | President  |
| University of New Hampshire                               | Jenna Jambeck, Ph.D. | Research Assistant Professor<br>Environmental Research Group |

<sup>1</sup> SWANA has eight Technical Divisions: Planning and Management; Waste-to-Energy; Waste Reduction, Recycling and Composting; Special Waste Management; Landfill Management; Communications, Education and Marketing; Landfill Gas; and Collection and Transfer. The request for information was e-mailed to the members of each of these Technical Divisions.



**TABLE 1**  
**Organizations and Individuals Who Contributed to the Development of this Report**

| Organization   | Contact               | Title  |
|--|-----------------------|--|
| North Carolina State University                            | Morton Barlaz, Ph.D.  | Professor and Associate Head, Dept. of Civil Engineering |
| Camp, Dresser and McKee                                    | Tom Parker, P.E., DEE | Principal  |
| Gerry Friesen and Associates                               | Gerry Friesen         | President  |
| Colorado Hazardous Materials and Waste Management Division | Kenneth Niswonger     | Senior Chemist   |
| Los Angeles County Sanitation Districts                    | John Gullede          | Department Head  |

## 2.0 RESOURCE MATERIALS

The following documents should serve as valuable resources to state and local solid waste managers charged with the responsibility for the management of disaster debris from Hurricane Katrina.

These resource materials can be easily accessed in the following ways:

- **Attachments** – Some resource documents have been included as attachments to this report.
- **Internet** – A number of the resource documents are available, free of charge, through the internet. In such cases, the internet address where the document can be retrieved is provided with the description of the document.
- **SWANA’s E-Library** – Some of the resource documents can be accessed and/or downloaded from SWANA’s E-Library. Since the E-Library is a “members-only” service of SWANA, solid waste managers involved in the Katrina cleanup who are not SWANA members can simply email Hugh Scott ([hscott@swana.org](mailto:hscott@swana.org)) and request a temporary Identification Name and password to access the E-Library. (SWANA is delighted to be able to offer this service free-of-charge as a donation in response to the Katrina disaster.)

### 2.1 [Planning for Disaster Debris \(US EPA, 1995\)](#)

This 30-page document provides a framework for the development of a disaster response plan. The document includes general information on what to expect from different types of disasters (including hurricanes and floods), as well as recommended planning actions and brief case histories (including the 1993 Midwest Floods and the three major hurricanes).



This document is available free of charge on the internet and can be accessed from the following web address: <http://www.epa.gov/epaoswer/non-hw/muncpl/disaster/disaster.txt>

## **2.2 Disaster Debris Management – Planning Tools (Reinhart and McCreanor, 1999)**

This 33-page report, while focusing on the recycling of disaster debris, provides an excellent summary of the recent literature regarding disaster debris management. It includes case studies that address both hurricane and flood debris.

This document can be downloaded in PDF format, free of charge, from the following web address: <http://people.cecs.ucf.edu/reinhart/DDfinalreport.pdf>.

Many jurisdictions are using software modeling tools, some of which are geographic information system (GIS) enabled, to predict quantities and types of debris. These improve upon the Army Corps of Engineers' first and simplest model in the early 1990s that uses a simple formula based on gross assumptions about mix of debris (vegetative v. C&D) and land use that are not necessarily valid for Florida. FEMA has developed the HAZUS-MH Hurricane Module, which takes into account additional storm parameters and built-environment types (see <http://www.fema.gov/hazus>).

Broward County, Florida, just began using a GIS-based model called HurDET (Hurricane Debris Estimating Tool). This tool was developed for Broward and other jurisdictions and can be quite site specific in its predictions. A discussion of HurDET compared with the Army Corps and HAZUS-MH prediction tools can be found in Umpierre, Diana, "Hurricane Debris Modeling," Geospatial Solutions, October 2005, pp. 20-24 and can be accessed on line at <http://www.geospatial-online.com/geospatialolutions/>.<sup>2</sup>

## **2.3 SWANA Executive Manager's Summit on Debris Management (SWANA Florida Chapter – 2005)**

On January 12, 2005, a summit was held in Altamonte Springs, Florida, at which Florida solid waste managers were invited to discuss management strategies and lessons learned during the clean-up efforts associated with the management of disaster debris from the four hurricanes which hit Florida in the summer 2004. The one-day summit was attended by about 40 persons.

The 74-page report documenting the summit contains 14 pages of report text and 60 pages of attachments, which include copies of contracts that were used by local governments to procure hauling, processing, and disposal services for the disaster debris.

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<sup>2</sup> Information provided in email from Jack Price, Environmental Manager, Hazardous Waste Management Division, Florida Department of Environmental Protection. Sent to Amanda King of SWANA on 11/03/05.



# Hurricane Katrina Disaster Debris Management

The report documents numerous lessons learned by the state and local government managers who were responsible for managing the disaster debris.

This document can be downloaded from the SWANA E-Library at [www.swana.org](http://www.swana.org). (Please note: If you are not a SWANA member, please email Hugh Scott at SWANA ([hscott@swana.org](mailto:hscott@swana.org)) to request a temporary ID and password to access the SWANA E-Library.)

## 2.4 Disaster Debris Best Management Practices (State of Hawaii, 2005)

This 16-page draft document is an appendix to the draft *Hawaii Disaster Debris Management Plan*, which was prepared in 2005. The appendix contains concise, one-page sheets recommending best management practices for the following waste types:

- Greenwaste
- Metals
- Mixed Debris
- Woody C&D Debris
- Asphalt Roofing
- Gypsum
- Plastics, including:
  - Plastic Sheeting
  - Plastic Water Jugs
- Aggregate and Rubble
- Household Furnishings and Belongings
- Hazardous Wastes:
  - Household Hazardous Wastes
  - Fugitive, Commercially-Generated Hazardous Debris
  - C&D Debris including Asbestos and Lead Paint
- Putrescible Wastes.

This document was emailed to SWANA by Gerry Friesen of G. Friesen Associates, Inc. and is presented as *Attachment 1* to this report.

## 2.5 Katrina Response Waste Processing Priorities (Monterey Regional Waste Management District, 2005)

This 3-page memorandum was developed by the staff of the Monterey Regional Waste Management District (MRWMD) specifically for the solid waste managers responsible for managing the disaster debris from Hurricane Katrina. The MRWMD provides regional solid waste management services to communities on the Monterey Peninsula in California. These services include the management and operation of an 1,100 tons per day landfill.



The memorandum provides recommendations for staging and processing areas, equipment deployment, and the handling of specific waste streams including C&D wastes, disaster-created MSW, household hazardous wastes, school laboratory materials, automobile wastes, propane tanks, white goods, and electronic wastes.

This document was emailed to SWANA by the MRWMD and is presented as *Attachment 2* to this report.

## 2.6 SOP #34 – Disaster HHW Collection Services

This 11-page “Standard of Practice” was developed by the Portland (Oregon) Area Metropolitan Service District (Metro) for the management of household hazardous waste (HHW) and “conditionally-exempt small quantity generator” (CESQG) waste during disasters.<sup>3</sup>

The document contains general guidelines and procedures for hazardous waste management at debris collection sites. It also contains forms for inventorying collected hazardous wastes, a methodology for predicting the need for HHW services, and a sample public information handout.

Metro reports that in two disasters that occurred on the west coast in the 1990s, an average of 50 to 100 pounds of HHW were collected from affected households.

This document was emailed to SWANA by Jim Quinn of Portland’s Metro District and is presented as *Attachment 3* to this report.

## 3.0 LESSONS LEARNED

### 3.1 General

The main priority is to focus on those recovery and collection activities that will be the quickest to implement with the least amount of human exposure to any hazardous or toxic materials present in the waste stream. Following collection efforts, materials are to be recycled, if feasible, or transported to an appropriate disposal facility (Reference 5).

In the initial phases of a disaster response, hazardous waste staff should confirm contacts and coordinate efforts with local, state, and federal agencies involved with hazardous waste management. This may include fire departments and hazmat teams, state environmental agencies, EPA, and the Coast Guard, as well as city and county health, water, and solid waste agencies.

<sup>3</sup> The federal “Resource Recovery and Conservation Act of 1976 (RCRA) allows for the disposal of small amounts of hazardous wastes generated by residences, as well as businesses or industries, in MSW landfills. Commercial and industrial waste generators, referred to in RCRA as “Conditionally Exempt Small Quantity Generators (CESQGs) can dispose of the hazardous waste they generate in MSW landfills if they produce less than 100 kilograms (i.e., 220 pounds) per month of hazardous waste.





## Hurricane Katrina Disaster Debris Management

Communication should be maintained throughout the recovery phase with local government debris removal coordinators (Reference 7).

Typically, there will be two major phases to a debris management strategy. The first is the removal of debris which could cause an immediate threat to public safety (highly unstable structures, clearing of roadways, etc.). Generally, the opportunities for diversion and recycling during this phase will be limited. The second phase is long-term debris removal associated with recovery. This phase provides the greatest opportunity for diversion and recovery (Reference 2).

Wastes vary significantly but generally consist of the following categories: concrete, asphalt, metals, green waste, plastic, sandbags, soil and rock, wallboard, glass, white goods, brown goods, bricks, household hazardous wastes, furniture, and personal belongings such as clothing (Reference 2).

Conventional waste collection equipment will have limited use during initial stages of disaster debris clean-up. Target large areas with “collection zones” set up for efficiency assigned to one contractor. Establish multiple zones within close geographic areas so contractors do not interfere with each other during collection. Utilize end-dump trucks and tracked excavators with grapples and/or wheeled bucket loaders to handle large scale debris clean-up. After a couple of passes, traditional collection assets such as roll-off containers and rear- and front-end loading packer trucks can swing into service for individual clean-ups (Reference 5).

Managers should develop multiple staging areas around hurricane-impacted areas with targets in mind for materials to be processed. Managers should establish areas for concrete and asphalt crushing close to areas accessible for future construction areas, wood and tree grinding in areas that will need organic supplements or slope stability improvements, and metal and vehicle processing as close to Port of New Orleans as possible since eventual markets will probably be off-shore or at least transported by ship (Reference 5).

Managers should also set up industrial hazardous materials drop-off sites near commercial/industrial areas. In addition, managers should target those larger quantity generators for special handling (Reference 5).

Conventional waste collection equipment will have limited use during initial stages of disaster debris clean-up. Managers should target large areas with “collection zones” set up for efficiency assigned to one contractor. Managers should also establish multiple zones within close geographic areas so contractors do not interfere with each other during collection. End-dump trucks and tracked excavators with grapples and/or wheeled bucket loaders should be utilized to handle large scale debris clean-up. After a couple of passes, traditional collection assets such as roll-off



containers and rear- and front-end loading packer trucks can swing into service for individual clean-ups (Reference 5).

All soft goods such as bedding, mattresses, curtains, carpet, and clothes should be handled as soon as possible. No salvageable material will be collected from these items. These items will be extremely heavy and hard to handle and will need to be mechanically loaded by bucket loaders and/or excavators with grapples (Reference 5).

In Kauai, Hawaii, residents were asked to place residential debris into five piles at the curb: green waste; metals and appliances; wood debris; aggregate materials (including toilets, tile roofing, and concrete), and mixed debris (Reference 1).

## 3.2 Management of Specific Wastes

In so far as possible, specific wastes (School Laboratory Materials, Hazardous Materials from Households and Businesses, Automobile Related Materials, etc.) should be handled separately from other types of debris. Even though many specific wastes are exempt from the Federal Resource Conservation and Recovery Act (RCRA) that regulates hazardous waste, these waste share the same toxic, ignitable, corrosive, reactive, and characteristic properties as RCRA regulated materials. Commingling certain types of these wastes can present significant risks to the safety and health of solid waste personnel and others involved in clean-up activities. Commingling these wastes may also result in uncontrolled reactions (explosions, fires, etc.) causing damage to homes, debris removal equipment, debris collection sites, and solid waste facilities.<sup>4</sup>

### 3.2.1 School Laboratory Materials and Hazardous Materials from Small Businesses

School laboratory materials and hazardous materials from small businesses affected by the disaster should be collected by trained personnel and should be treated and disposed according to hazardous waste management protocols.

If resources do not permit and/or if recovery of such materials is not possible due to commingling with other wastes or contamination with flood waters, it should be noted that small quantities of school laboratory materials and hazardous materials from small businesses (less than 220 pounds per generator per month) can be commingled with other debris and handled by conventional waste collection methods and legally disposed in municipal solid waste (MSW) landfills (Reference 5).

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<sup>4</sup> Email to Jeremy O'Brien of SWANA from Irene Gleason, North American Hazardous Materials Management Association, 11/23/05.



## 3.2.2 Household Hazardous Materials

At a minimum, promote the availability and utilization of local HHW collection facilities. Consider the implementation of one or more of the following options:

- Conduct “milk runs” to pick up hazardous waste materials left at debris collection sites.
- Provide trained HHW staff at debris collection sites.
- Provide door-to-door collection, either by appointment or curbside pickup of materials throughout an area.
- Conduct house-to-house (business-to-business) sweeps for hazardous waste collection from affected structures using trained HHW staff (Reference 6).

If sufficient personnel and/or resources are not available to provide separate HHW and/or CESQG management services, small quantities of HHW and CESQG wastes can be commingled with other debris and can legally be disposed in regular MSW landfills with composite liners (Reference 5).

## 3.2.3 Automobile-Related Materials

Whole car and truck bodies can be handled through establishment of additional processing areas as identified above. Non-hazardous household or consumer auto-type wastes can be handled safely enough through regular conventional waste collection (Reference 5). Hazardous automobile-related materials, such as contaminated gasoline/diesel fuel, lubricating fluids, and cleaning agents, should be handled as HHW or CESQG wastes.

It should be noted that most states have banned the disposal of lead-acid batteries, used motor oil, and whole tires from MSW landfills. Therefore, these items, as well as any other items that have been banned by the state where the MSW landfill is located, must be collected and managed separately.

## 3.2.4 Propane Tanks

Propane tanks need to be segregated and removed to a processing facility where they are emptied and recycled. Tanks are best handled with white goods on a house-by-house basis (Reference 5).



## 3.2.5 White Goods (Freon Recovery and Mercury Thermostats)

White goods need to be segregated and removed from homes individually—a very labor intensive process. These products will need to be placed curbside and handled with the combination of mechanical loaders and roll-off and/or end-dump trucks. Quantities will probably exceed the local capacity to process scrap metal. Additional outside processing capacity will likely be needed (Reference 5).

## 3.2.6 Electronic Products

Computers, televisions, monitors, and other electronic devices should be retrieved from the disaster debris and recycled. However, if such recovery is not feasible or if electronic products have been contaminated with sewage or other wastewaters, SWANA has found that modern MSW landfills can provide for the safe, efficient, and long-term management of electronic wastes (References 5 and 8).

## 3.2.7 Gypsum Wallboard

Gypsum wallboard (commonly referred to as “drywall”) has two components: a heavy paper backing and a 3/8-inch layer of gypsum. These materials must be separated and recycled separately, an extremely difficult task if the material is wet (Reference 2).

The landfilling of gypsum wallboard can lead to the production of hydrogen sulfide in MSW landfills. Therefore, one respondent suggested that wallboard be kept out of landfill to the maximum extent possible to avoid sulfide production.<sup>5</sup>

Some have expressed concern about the potential for hydrogen sulfide to be generated within piles of wet drywall that have been constructed and are awaiting transport to a disposal facility. However, in the opinion of at least one expert, there is no need for debris workers to worry about the hydrogen sulfide production from wallboard debris during the debris removal phase.<sup>6</sup>

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<sup>5</sup> Email to Jeremy O'Brien of SWANA from Dr. Morton Barlaz of North Carolina State University, 9/14/05.

<sup>6</sup> Email to Jeremy O'Brien of SWANA from Dr. Jenna Jambeck of the University of New Hampshire, 9/21/05. On this issue, Dr. Jambeck reports that “In many states drywall has been kept separate for collection and transport and I have not heard of any H<sub>2</sub>S problems. I have also visited piles of drywall waiting for recycling and they have not had any odor. The only thing different is that disaster debris drywall may be soaked (the drywall I have seen may have been exposed to rain, but not soaked in flood waters when piled up). There may be a little sulfate-reducing biological activity in pockets if the pile was dense enough, but I don't think it would be a big issue. Because this situation has never really happened before, I think it would be safe to say that, due to the strict anaerobic nature of sulfate reducing bacteria, piles of drywall open to the atmosphere are not likely to develop the necessary environment to generate large quantities of hydrogen sulfide.”



## 3.3 Other Lessons Learned

### 3.3.1 Suspension of Regulations

After a flood, the State of Missouri temporarily set aside its recycling policy so that communities could landfill leaves and yard wastes (Reference 1).

State solid waste agencies could temporarily lift permit requirements for solid waste facilities (Reference 1).

### 3.3.2 Use of Air-Curtain Incinerators

In Miami, Florida, the use of air-curtain incinerators that met all federal and state requirements led to many complaints from the public and environmental activists. As a result, county commissioners shut down all debris burn operations (Reference 1).

### 3.3.3 Miscellaneous

Asphalt roofing can be separated at temporary debris staging sites for recycling (Reference 4).

## 4.0 REFERENCES

The following references were used to compile this report.

1. U.S. Environmental Protection Agency. *Planning For Disaster Debris*. 1995.
2. Reinhard, D. and P. McCreanor. *Disaster Debris Management – Planning Tools*. U.S. EPA Region IV. September 24, 1999.
3. *SWANA Executive Manager’s Summit on Debris Management*. January 12, 2005.
4. *Annex VI- Disaster Debris Best Management Practices: Management Techniques For Debris Types*. (Appendix in draft 2005 Hawaii Disaster Debris Management Plan).
5. Monterey Regional Waste Management District. *Katrina Response To Waste Processing Priorities (Draft Memorandum)*. September 15, 2005.
6. Swan, R. *Planning for the Temporary Disposal of Disaster Debris: “Where Are You Going To Put It”*. SWANA Winter Technical Symposium, West Palm Beach, FL, Feb. 7-12, 2005.
7. Metro Hazardous Waste Program. SOP#34 – Disaster HHW Collection Services. December 1999.
8. SWANA. *The Effectiveness of MSW Landfills in Controlling Releases of Heavy Metals to the Environment*. Silver Spring, MD: SWANA, March 2004.



# Hurricane Katrina Disaster Debris Management

If you have any questions regarding the contents of this report or would like additional information, please feel free to contact Jeremy K. O'Brien, P.E., Director of Applied Research, SWANA at 704-906-7269 or [jobrien1@swana.org](mailto:jobrien1@swana.org).



# Attachment 1

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*Hawaii Disaster Debris Management Plan –  
Final Draft (2005): Annex VI –  
Best Management Practices*

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# **ANNEX VI**

## **DISASTER DEBRIS BEST MANAGEMENT PRACTICES**

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### **MANAGEMENT TECHNIQUES FOR DEBRIS TYPES**

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# DISASTER DEBRIS BEST MANAGEMENT PRACTICES

## 1 — INTRODUCTION

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This Annex includes Best Management Practices (BMPs) for specific material types of disaster debris. Annex VII presents protocols for management activities – collection, storage at TDSR sites, processing – for practical groupings of these material types. The protocols are based on these BMPs and they define how groupings of specific types of materials should be mixed and/or kept separate.

The pages that accompany this Annex address individual debris types. Tables that evaluate a range of alternative management techniques are provided when reasonable alternatives exist. Each page presents a recommended BMP for each type of debris.

These BMPs and the protocols in Annex VII are guidelines provided by the State. In pre-disaster planning the County should consider these guidelines and decide how to handle debris based on the conditions, needs, and policies of the County.

## 2 — DEBRIS TYPES

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The following material types are those most commonly generated in a disaster event. They are derived from analysis of the clean up after Hurricane Iniki and from disasters in other localities. The actual types of debris that are generated in different types of disasters vary greatly.

Some of these materials are selected because of their potential for diversion, or the need for proper handling. The potential for diversion from landfill, however, must be carefully evaluated in consideration of the conditions following a disaster. Since a disaster can rapidly consume years' worth of landfill volume, diversion may be a high priority. However, human health and safety, and community recovery will take precedence under certain circumstances. Only practical diversion activities are recommended, and the counties must evaluate the recommended BMPs in light of actual events and local conditions.

The following materials are addressed in the BMP pages that follow:

1. Greenwaste
2. Metals
3. Mixed Debris
4. Woody C&D Debris
5. Asphalt Roofing
6. Gypsum

7. Plastics, including:
  - a. Plastic Sheeting
  - b. Plastic Water Jugs
8. Aggregate and Rubble
9. Household Furnishings and Belongings
10. Hazardous Wastes
  - a. Household Hazardous Wastes
  - b. Fugitive, Commercially-Generated Hazardous Debris
  - c. C&D Debris including Asbestos and Lead Paint
11. Putrescible Wastes

### **3 — MANAGEMENT TECHNIQUES FOR DEBRIS TYPES**

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The recommended best management technique(s) is (are) printed in bold type in the tables that follow. Several techniques may be designated as feasible in the second column. More than one technique may be recommended for implementation if event conditions, such as storm size, could affect the selection of a technique, or if they could occur in parallel.

Each cell in columns three through nine includes a designation of “High”, “Moderate” or “Low”. These are based on professional judgment. “High” is in all cases intended to be good or best, so that the table can be quickly scanned to compare techniques. Thus the column that deals with cost is defined as “Cost Feasibility”. This way a “High” in the “Cost Feasibility” column is preferred. (Just like a “High” in “Debris Reduction Efficiency” is preferred.) That is, it means that the cost is low.

Note that all management techniques must comply with applicable laws and regulations. For example landfilling should only include disposal in a permitted MSW or C&D landfill.

## GREENWASTE

**Definition:** Tree limbs, stumps, and leaves; brush, grass and incidental soil

**RECOMMENDED BMP:**

**Objective:** Efficient and cost effective recovery and diversion-from-landfill.

**Response Phase:** Source separate greenwaste during response, with possible exception of first 24 hours if public health and safety is endangered by limited access from roadways. Remove greenwaste from roadways and separate it prior to collection to facilitate diversion.

**Recovery Phase:** Source separate greenwaste as early as possible in collection process. Remove greenwaste from roadways and separate it prior to collection to facilitate diversion. Citizens should separate for collection at the curbside. If mobile chippers are available, greenwaste may be chipped at the time of collection. Process greenwaste upon arrival at TDSR site for use as compost or fuel for a biomass boiler, depending on cost effectiveness of composting and the availability of markets and practical end-uses. “Compost” is used in this Plan to include mulch, which is not a fully matured product and is used for ground cover and erosion control. In the event that disaster is severe with major downage of vegetation, greenwaste may be air curtain incinerated at TDSR, at county’s option.

| Management Techniques   | Feasible Option? | Cost Feasibility                                      | Capital Cost Feasibility                 | Debris Reduction Efficiency    | Environmental Friendliness          | Human Health and Safety                             | Current Availability of Resources/Markets   | Public Acceptability                          |
|---|------------------|---|--|--------------------------------|-------------------------------------|---|---|---|
| <b>Source Separation for Composting or Incineration in Biomass Boiler</b> | Yes              | <b>High</b><br>Small additional labor cost            | <b>High</b><br>Use existing equipment    | <b>High</b><br>Best efficiency | <b>High</b>                         | <b>High</b>   | <b>High</b><br>Existing composting market may be limited, and could be negatively damaged by production of too much product; Incineration is a back-up market | <b>High</b>                                   |
| <b>Air Curtain Incineration at TDSR Site</b>                              | Yes              | <b>High</b><br><b>Cheapest</b><br>method of reduction | <b>High</b><br><b>Low cost</b>           | <b>High</b>                    | <b>Low</b><br>Particulate emissions | <b>Moderate</b>                                     | <b>Moderate</b><br><b>Needs to be imported from mainland</b>  | <b>Low</b>                                    |
| Processing from Mixed Materials for Composting or Incineration            | No               | <b>Low</b><br>Large additional labor cost             | <b>High</b><br><b>Small capital cost</b> | <b>Low</b>                     | <b>High</b>                         | <b>Moderate</b><br>Health and safety risks involved | <b>High</b><br>Existing market that is supply limited   | <b>High</b><br><b>Acceptable in emergency</b> |
| Landfilling with No Reduction/Processing                                  | <b>Yes</b>       | <b>Moderate</b><br>Lost opportunity cost              | <b>High</b>                              | <b>Low</b>                     | <b>Low</b>                          | <b>High</b>   | <b>Moderate</b><br>Landfill capacity varies by island   | <b>Low</b><br>Potentially controversial       |

NOTE: Recommended Management Technique(s) is (are) bolded; “High” in cell is good.

## METALS

**Definition:** Primarily ferrous metals including metal roofing, white goods, junk autos, and miscellaneous ferrous scrap. Also includes nonferrous metals such as copper wire.

**RECOMMENDED BMP:**

**Objective:** To divert as much as possible from landfill through recycling.

**Response Phase:** Segregate major items such as junk autos and appliances on TDSR sites.

**Recovery Phase:** Source separate all recyclable metals for separate collection from curb. Recover large metal items such as metal roofing, and appliances through processing of mixed debris. Store metals separately on TDSR. Process ferrous and nonferrous metals for recycling.

| Management Techniques                            | Feasible Option? | Cost Feasibility   | Capital Cost Feasibility                       | Debris Reduction Efficiency | Environmental Friendliness | Human Health and Safety                                    | Current Availability of Resources/Markets | Public Acceptability |
|--|------------------|--|--|-----------------------------|----------------------------|--|---|----------------------|
| Source Separate for Recycling                    | Yes              | High<br>Scrap value can pay costs of separation and processing | Moderate<br>Requires shredding & densification | High                        | High                       | Moderate<br>Requires worker health & safety (H&S) planning | High                                      | High                 |
| Post Collection Separation at TDRS for recycling | Yes              | Moderate<br>Higher processing costs than source separated      | Moderate                                       | High                        | High                       | Moderate<br>Requires worker H&S planning                   | High                                      | High                 |
| Landfilling with No Reduction/Processing         | Yes              | Moderate<br>Market revenue lost                                | High   | NA                          | Low                        | High   | High                                      | Low                  |

NOTE: Recommended Management Technique(s) is (are) bolded; "High" in cell is good.

## MIXED DEBRIS

**Definition:** Mixed debris consists of materials from all the other disaster debris categories. Does not include MSW or putrescibles, but may include many of the same materials, such as C&D debris, household items, mixed plastics, that are generated as debris during a disaster event.

**RECOMMENDED BMP:**

**Objective:** Divert as much as possible from this category. Reduce the volume of debris landfilled.

**Response Phase:** Where it is impractical to avoid creating mixed waste, strive to keep any material that could be separated into other components free of contaminants (e.g. putrescibles). Deliver directly to landfill for removal efficiency, or to TDSR sites for reduction.

**Recovery Phase:** Deliver material directly to landfill for removal efficiency, or to TDSR sites for recovery and/or volume reduction. Process for segregation of recyclable materials (conveyor with sorting), screen off fines, and grind for volume reduction. If air curtain incineration is feasible, process material to remove non-combustibles and incinerate.

| Management Techniques                    | Feasible Option?        | Cost Feasibility                     | Capital Cost Feasibility | Debris Reduction Efficiency | Environmental Friendliness                                   | Human Health and Safety | Current Availability of Resources/Markets                | Public Acceptability |
|--|-------------------------|--------------------------------------|--------------------------|-----------------------------|--|-------------------------|--|----------------------|
| Processing for Recycling                 | Yes                     | Moderate                             | High                     | Moderate                    | High   | Mod                     | Moderate<br>For aggregate, OCC, metals, greenwaste       | High                 |
| Processing for RDF                       | Yes - Oahu No elsewhere | Moderate                             | Moderate                 | High                        | Moderate<br>Requires pollution control                       | Moderate                | High at H-POWER<br>(if capacity exists)<br>Low elsewhere | Moderate             |
| Source Separation for Recycling          | Yes                     | Moderate                             | Moderate                 | Low                         | High   | High                    | High<br>Depends on type and condition of products        | High                 |
| Air Curtain Incineration at TDSR Site    | No                      | High<br>Cheapest method of reduction | High                     | High                        | Low<br>Numerous problem emissions, Unlikely to be permitted. | Low                     | Moderate<br>Needs to be imported from mainland           | Low                  |
| Incineration Using Biomass Combustor     | No                      |                                      |                          |                             | Low<br>Not permitted   |                         |  |                      |
| Landfilling with No Reduction/Processing | Yes                     | Moderate                             | High                     | Low                         | Moderate   | High                    | Moderate<br>Will consume landfill capacity               | Mod                  |

**NOTE: Recommended Management Technique(s) is (are) bolded; "High" in cell is good.**

## WOODY C&D DEBRIS

**Definition:** Principally treated dimensional lumber and engineered wood products, frequently mixed with non-wood materials. Treated wood is mostly comprised of chromated-copper-arsenate (CCA) treated products, with some pentachlorophenol, creosote, etc.

**RECOMMENDED BMP:**

**Objective:** Minimize landfill space utilization. Treated wood is non-recyclable in most applications.

**Response Phase:** Post collection separation at TDSR for incineration.

**Recovery Phase:** Source separation for reuse and incineration. Post collection separation at TDSR for incineration. Salvage by positive sorting intact dimensional lumber. Production of fuel. Air regulations continue to tighten – even under emergency permits, regulators can be expected to closely examine emissions data. Old sugar mills have permits with broader allowable emissions than new mills if equipment not modified and may qualify for temporary burn permits. H-POWER can burn treated wood, but capacity is limited.

| Management Techniques   | Feasible Option? | Cost Feasibility  | Capital Cost Feasibility                      | Debris Reduction Efficiency | Environmental Friendliness  | Human Health and Safety           | Current Availability of Resources/Markets   | Public Acceptability |
|---|------------------|---|---|-----------------------------|---|-----------------------------------|---|----------------------|
| Source Separation for Recycling & Incineration at Controlled Facility           | Yes              | Moderate<br>Depends on structure type and percentage treated wood | High<br>Low if new pollution control required | High                        | Moderate<br>Emissions from treated wood. Must meet DOH air standards. | Moderate<br>Airborne toxics       | Moderate<br>Biomass burners need permit modifications<br>High at H-POWER (if capacity exists) | Moderate             |
| Post Collection Separation at TDSR Site for Incineration at Controlled Facility | Yes              | Moderate<br>Involves labor and high-wear mechanics                | Moderate heavy-duty sorting equip             | High                        | Moderate<br>Emissions from treated wood                               | Moderate<br>Airborne toxics       | Moderate<br>Biomass burners need permit modifications<br>High at H-POWER (if capacity exists) | Moderate             |
| Mixed Wood Debris Air Curtain Incineration at TDSR Site                         | No               | High  | Moderate                                      | High                        | Moderate<br>Smoke and Particulates                                    | Low<br>Airborne toxics, not legal | Moderate<br>Needs to be imported from Mainland  | Low                  |
| Re-Use / Salvage of Materials   | Yes              | High<br>Positive Sort   | High  | Moderate<br>Limited volume  | High  | High                              | Moderate<br>In conjunction with Re-Use store operations                                       | High                 |
| Shredding at TDSR Site and Landfill Disposal                                    | Yes              | Moderate  | Moderate                                      | Moderate                    | High  | High                              | Moderate<br>Heavy grinders  | High                 |
| Landfill, No Reduction  | Yes              | High  | High  | Low                         | Moderate  | High                              | NA  | Moderate             |

**NOTE: Recommended Management Technique(s) is (are) bolded; "High" in cell is good.**

## ASPHALT ROOFING

**Definition:** Roofing waste consisting of residential asphalt roofing (3-tab shingle type), commercial asphalt roofing and various non-asphalt roofing products in small percentages. Asphalt roofing is assumed to include all residential roofing debris and only commercial asphalt roofing that is free of asbestos hazard. Asphalt roofing consists of fiberglass or plant fiber mat, asphalt and inert granular materials.

**RECOMMENDED BMP:**

**Objective:** Minimize landfill space utilization.

**Response Phase:** Post collection separation at TDSR for recycling.

**Recovery Phase:** Source separation for recycling. Post collection separation at TDSR for recycling.

| Management Techniques                                      | Feasible Option? | Cost Feasibility                                   | Capital Cost Feasibility          | Debris Reduction Efficiency | Environmental Friendliness    | Human Health and Safety                        | Current Availability of Resources/Markets                       | Public Acceptability |
|--|------------------|--|-----------------------------------|-----------------------------|-------------------------------|--|---|----------------------|
| Source Separation for Recycling                            | Yes              | High<br>Fairly easy to isolate                     | High                              | High                        | High                          | High<br>Asbestos certified inspectors required | Moderate<br>Combine with aggregates for road base or paving mix | Moderate             |
| Post Collection Separation at TDSR Site for Recycling      | Yes              | Moderate<br>Involves labor and high-wear mechanics | Moderate heavy-duty sorting equip | High                        | High                          | High<br>Asbestos certified inspectors required | Low<br>Combine with aggregates for road base or paving mix      | Moderate             |
| Mixed Asphalt Debris Air Curtain Incineration at TDSR Site | No               | High   | Moderate                          | High                        | Low<br>Smoke and Particulates | Moderate                                       | Moderate<br>Needs to be imported from Mainland                  | Moderate             |
| Landfilling with No Reduction/Processing                   | Yes              | High   | High                              | Low                         | Moderate                      | High   | NA  | Moderate             |

**NOTE: Recommended Management Technique(s) is (are) bolded; "High" in cell is good.**

## GYPSUM

**Definition:** Old material is frequently limited to small broken pieces and large pieces that are still fastened to framed structures, and typically painted or otherwise laminated with surface treatments. Clean gypsum scrap free of contaminants is generated from reconstruction.

**RECOMMENDED BMP:**

**Objective:** Minimize landfill space utilization by recycling clean scrap from reconstruction.

**Response Phase:** Deliver to landfill with no reduction/processing, or store for surge capacity at TDSR.

**Recovery Phase:** Source separate clean gypsum scrap, including only new material from reconstruction, for recycling with green waste. Landfill old scrap with no reduction/processing.

| Management Techniques  | Feasible Option?          | Cost Feasibility        | Capital Cost Feasibility | Debris Reduction Efficiency              | Environmental Friendliness | Human Health and Safety | Current Availability of Resources/Markets               | Public Acceptability |
|--|---------------------------|-------------------------|--------------------------|--|----------------------------|-------------------------|---|----------------------|
| Source Separation for Recycling with green waste                   | Yes<br>(clean scrap only) | Moderate<br>Hand sorted | High                     | High                                     | High                       | High                    | Moderate<br>Can be combined with green waste composting | High                 |
| Landfilling with No Reduction/Processing                           | Yes                       | High                    | High                     | Low                                      | Moderate                   | High                    | NA  | Moderate             |
| Post Collection Separation of old scrap at TDSR Site for Recycling | No                        | Low<br>Pieces too small | NA                       | High                                     | Moderate                   | Moderate                | Low<br>No uses for painted & contaminated scrap         | High                 |
| Mixed Debris Air Curtain Incineration at TDSR Site                 | No                        | Low                     | Moderate                 | Low Calcium carbonate does not burn well | High                       | High                    | Moderate<br>Needs to be imported from mainland          | Low                  |

**NOTE: Recommended Management Technique(s) is (are) bolded; "High" in cell is good.**



## PLASTIC SHEETING

**Definition:** Mixed grades of plastic sheeting used to cover roofs following storm event. Most is supplied by FEMA or USACE. Possibly includes several resin types. When disposed can be dirty and degraded by UV exposure.

**RECOMMENDED BMP:**

**Objective:** To reduce landfill space utilization if possible, and to recover energy.

**Response Phase:** Not applicable.

**Recovery Phase:** If event is large and number of households using sheeting is large, material may be stored at TDSR mixed with combustible debris or separated in covered drop boxes and incinerated in a boiler with adequate pollution controls, such as H-POWER. Resident drop-off at TDSR is possible. Otherwise material should be landfilled.

| Management Techniques  | Feasible Option? | Cost Feasibility  | Capital Cost Feasibility                       | Debris Reduction Efficiency                              | Environmental Friendliness                               | Human Health and Safety | Current Availability of Resources/Markets                                | Public Acceptability |
|--|------------------|---|--|--|--|-------------------------|--|----------------------|
| Post Collection Storage at TDSR Site for Possible Incineration at H-POWER (if capacity exists) | Yes              | Moderate<br>When volumes are great. Labor intensive                 | High   | Moderate<br>Could exceed 300 tons on Oahu                | High<br>Includes pollution control                       | High                    | High<br>Feasible to incinerate, possibly at H-POWER (if capacity exists) | High                 |
| Landfilling with No Reduction/Processing   | Yes              | High  | High   | Low  | Moderate   | High                    | NA   | ?                    |
| Source Separation for Recycling  | No               | Low<br>Costs of collection & processing not covered by market value | Moderate<br>Must dedicate collection equipment | Moderate<br>Quantities not great, except in large event. | High   | High                    | Moderate<br>Markets exist, but prices paid are modest.                   | High                 |
| Mixed with Debris for Incineration in Biomass Boiler   | ?                | High  | High   | Moderate   | Low<br>Possible PVC presence requires pollution control. | Low                     | High   | High                 |

**NOTE: Recommended Management Technique(s) is (are) bolded; "High" in cell is good.**

## PLASTIC WATER JUGS

**Definition:** Polyethylene water jugs. Most water supplied in liter bottles, resin unknown. Excludes large, 5-gallon, blue-tinted water jugs, which cannot be recycled together with polyethylene plastics.

**RECOMMENDED BMP:**

**Objective:** Recycle where feasible locally.

**Response Phase:** Include in mixed debris for landfilling.

**Recovery Phase:** If event is large and amount of supplied water is large, jugs may be source separated and dropped-off at TDSR site, stored in covered drop boxes. No separate collection. Material can be recycled presently on Maui, but also request bids from mainland markets and plastics brokers. If bids are not cost-effective, incinerate at H-POWER or landfill.

| Management Techniques   | Feasible Option? | Cost Feasibility  | Capital Cost Feasibility | Debris Reduction Efficiency                                    | Environmental Friendliness | Human Health and Safety                              | Current Availability of Resources/Markets              | Public Acceptability |
|---|------------------|---|--------------------------|--|----------------------------|--|--|----------------------|
| Source Separation for Recycling   | Yes              | Moderate<br>Easily source separated & dropped off by users. | High                     | Moderate<br>H. Andrew reported 17 tons of water jugs recycled. | High                       | High   | High<br>Processor on Maui can accept large quantities. | High                 |
| Mixed with Debris for Incineration in Biomass Boiler                                      | ?                | High  | High                     | High   | Moderate                   | Moderate<br>Some unacceptable resins may be mixed in | High   | ?                    |
| Source Separation for Incineration in Biomass Boiler or H-POWER (if capacity exists)      | Yes              | Moderate<br>Easily source separated & dropped off by users. | High                     | Moderate   | Moderate                   | High   | High   | ?                    |
| Post Collection Separation at TDSR Site for Possible Incineration at H-POWER              | No               | Low<br>Difficult to separate once mixed s                   | High                     | Low<br>Capture rate would be low.                              | High                       | High   | High   | High                 |
| Landfilling with No Reduction/Processing  | Yes              | High  | High                     | Low  | Moderate                   | High   | NA   | ?                    |
| <b>NOTE: Recommended Management Technique(s) is (are) bolded; "High" in cell is good.</b> |                  |   |                          |  |                            |  |  |                      |

## AGGREGATE

**Definition:** Mixed aggregates including rubble, masonry, paving material, and concrete components typically include steel-reinforcement. Paving materials include asphalt, often mixed with some dirt and rock. Masonry materials include bricks, concrete masonry units (CMUs), and various roofing tiles.

**RECOMMENDED BMP:**

**Objective:** To reduce transportation costs, utilize processed material in reconstruction activity, and minimize landfill space utilization.

**Response Phase:** Source separate for direct transportation to pre-designated quarry sites for processing. Resident drop-off (non-commercial loads) at TDSR. Some storage of commercial loads at TDSR may be necessary during response phase.

**Recovery Phase:** Source separate for direct transportation to pre-designated quarry sites for processing. TDSRs could be designated to receive contractor and commercial loads at county's option and processed with a mauler for use as aggregate. Resident drop-off (non-commercial loads) at TDSR. Salvage network for certain brick masonry products should be established.

| Management Techniques                                 | Feasible Option? | Cost Feasibility                                   | Capital Cost Feasibility                       | Debris Reduction Efficiency                       | Environmental Friendliness | Human Health and Safety | Current Availability of Resources/Markets  | Public Acceptability |
|---|------------------|--|--|---|----------------------------|-------------------------|--|----------------------|
| Source Separation for Recycling                       | Yes              | High<br>Can best minimize costs by diverting       | Moderate to High<br>Must add process equipment | Moderate<br>No major reduction in volume possible | High                       | High                    | High<br>Several quarries already have basic processing equip, and market channels for crushed aggregate products | High                 |
| Post Collection Separation at TDSR Site for Recycling | Yes              | Moderate<br>Involves labor and high-wear mechanics | Moderate heavy-duty sorting equip              | Moderate  | High                       | High                    | Low<br>Requires a complete C&D sorting line with picking and trommels  | High                 |
| Re-Use / Salvage of Materials                         | Yes              | High<br>Positive Sort                              | High   | Moderate  | High                       | Low                     | High - possible direct sales from TDSR sites   | High                 |
| Landfilling with No Reduction/Processing              | Yes              | Moderate<br>High collection cost                   | High   | NA  | Moderate                   | High                    | NA   | ?                    |

**NOTE: Recommended Management Technique(s) is (are) bolded; "High" in cell is good.**

## HOUSEHOLD FURNISHINGS AND BELONGINGS

**Definition:** Furniture, mattresses, carpets, textiles etc.

**RECOMMENDED BMP:**

**Objective:** Couches, mattresses, carpets, textiles etc. disposed of after a disaster event are not recyclable due to bulk and contamination. The primary processing objective for these types of materials is to reduce their volume prior to loading onto trucks headed to the landfill and to minimize the volume of landfill space that they occupy.

**Response Phase:** Couches, mattresses, carpets, textiles etc. to be delivered to the TDSR sites and stockpiled separately.

**Recovery Phase:** Couches, mattresses, carpets, textiles etc. will continue to be delivered to the TDSR sites as buildings are demolished/rehabilitated and household furnishings are replaced. Bulky materials should be reduced in volume at the TDSR sites prior to hauling and disposal at the landfill.

| Management Techniques                                 | Feasible Option? | Cost Feasibility                          | Capital Cost Feasibility | Debris Reduction Efficiency | Environmental Friendliness         | Human Health and Safety     | Current Availability of Resources/Markets                                | Public Acceptability |
|---|------------------|---|--------------------------|-----------------------------|------------------------------------|-----------------------------|--|----------------------|
| Separation, Crushing at TDSR Site & Landfill Disposal | Yes              | High                                      | High                     | Moderate                    | High                               | High                        | High<br>Tracked dozers or track hoes used for crushing                   | High                 |
| Source Separation for Recycling                       | No               |   |                          |                             |                                    |                             | Low<br>Technology/Markets not currently available                        |                      |
| Air Curtain Incineration at TDSR Site                 | Yes              | High<br>if used for other materials       | Moderate                 | High                        | Moderate<br>Smoke and Particulates | Moderate<br>Airborne Toxics | Moderate<br>Needs to be imported from mainland                           | Low                  |
| Incineration Using On-Island Biomass Boiler           | No               | Low<br>Material Processing Costs are High | Low                      | High                        | Low<br>Smoke and Particulates      | Moderate<br>Airborne Toxics | High<br>Biomass Boilers with permits and air pollution control equipment | Moderate             |
| Shredding at TDSR Site and Landfill Disposal          | Yes              | Moderate                                  | Moderate                 | Moderate                    | High                               | High                        | Moderate<br>Heavy duty grinders required                                 | High                 |
| Landfilling with No Reduction/Processing              | Yes              | Moderate                                  | High                     | Low                         | High                               | High                        | High<br>Will utilize valuable landfill disposal capacity                 | Moderate             |

**NOTE: Recommended Management Technique(s) is (are) bolded; "High" in cell is good.**

## HOUSEHOLD HAZARDOUS WASTE

**Definition:** Household hazardous waste (HHW) includes products commonly used in the home that display one or more of the following characteristics; ignitability, corrosivity, reactivity or toxicity. Examples include batteries, motor oil, automobile products, paint and paint-related products, household cleaners and drain openers, swimming pool chemicals, pesticides, and herbicides.

**RECOMMENDED BMP:**

**Objective:** Reduce the potential for these materials to threaten human health and safety, or the environment.

**Response Phase:** Where practical, segregate HHW from other debris. Inspect HHW product containers to confirm their integrity. If necessary, place damaged containers in plastic buckets, tubs, or garden bags.

**Recovery Phase:** Direct residents to bring HHW to collection events and not to set it out at curb. Minimize HHW coming to TDSR sites. Locate temporary storage units and supplies at TDSR sites for HHW that is received. Sort it from incoming debris when identified and temporarily store HHW until contractor can process material. Only properly trained individuals should perform final characterization, packaging, and disposal.

| Management Techniques   | Feasible Option? | Cost Feasibility   | Capital Cost Feasibility                     | Debris Reduction Efficiency              | Environmental Friendliness                | Human Health and Safety                                      | Current Availability of Resources/Markets           | Public Acceptability |
|---|------------------|--|--|--|---|--|---|----------------------|
| Separate from Debris & Store HHW at TDSR to be Processed by Qualified Contractor for Disposal and/or Reuse of Certain Items | Yes              | Moderate<br>Cost similar to conventional management practice | High<br>Low capital cost for materials       | Low<br>HHW is small part of waste stream | High                                      | Moderate<br>Some risk involved, but high if properly managed | High<br>Contractors available; disposal on mainland | High                 |
| HHW Neighborhood Collection Events  | Yes              | Mod. to Low<br>Events are expensive but common.              | Moderate<br>Contractor will supply equipment | Low                                      | High                                      | Moderate<br>Some risk involved, but high if properly managed | High<br>Contractors available                       | High                 |
| Inspection of Structures for Hazardous Materials prior to Demolition  | Yes              | Moderate<br>Need experienced contractor                      | Moderate<br>Contractor will supply equipment | Low                                      | High                                      | Moderate<br>Some risk involved, but high if properly managed | High<br>Contractors available                       | High                 |
| Landfilling with No Segregation or Processing   | No               | High   | High   | NA                                       | Low<br>Identified HHW not in MSW landfill | Low<br>HHW is a threat to human health and safety            | NA  | Low                  |

**NOTE: Recommended Management Technique(s) is (are) bolded; "High" in cell is good.**

## FUGITIVE, COMMERCIALY-GENERATED HAZARDOUS DEBRIS

**Definition:** Fugitive, commercially-generated hazardous waste includes materials and items that display one or more of the following characteristics – ignitability, corrosivity, reactivity or toxicity – and that have escaped from commercial properties with no identifiable source. For example, fugitive drums that have been washed onto public properties. Only items for which no source is identifiable are included in this category. If a source is identifiable, that source shall be immediately notified and held responsible. This category also includes any downed electrical transformers that have not been properly tested for presence of PCBs.

### RECOMMENDED BMP:

**Objective:** Reduce the potential for these materials to threaten human health and safety, or the environment.

**Response Phase:** Identify any materials or items potentially meeting hazardous waste characteristics. Observe for potential release of contents from the maximum distance feasible. If a release is in progress or imminent, call EOC and request immediate assistance from a hazardous materials team. If containers are not in immediate danger of rupture or release record the location and report to EOC or hazardous materials teams. Clearly mark the area surrounding the materials with temporary fencing or barrier tape and post warning signs to prevent public contact.

**Recovery Phase:** Identify source or generator of hazardous materials from labels or location of materials. Notify owner or generator of hazardous materials if possible, or hazardous waste contractor if no generator can be identified. Only properly trained individuals should handle or dispose of these materials. The details of handling and disposal of hazardous materials shall be the responsibility of the owner or generator. Hazardous materials will not be accepted at the TDSR sites. For electrical transformers, notify electric utility. If a transformer appears to be leaking and does not have a sticker declaring that it is PCB-Free, immediately notify the EOC and the electric utility, then restrict access to the area using temporary fencing or barrier tape.

## C&D DEBRIS INCLUDING ASBESTOS-CONTAINING MATERIALS AND LEAD PAINT

**Definition:** Damaged or demolished buildings, or other debris may contain asbestos that is friable and lead paint. Asbestos may be included in older products such as insulation, tiles, roofing, or other building materials.

### **RECOMMENDED BMP:**

**Objective:** Reduce the potential for these materials to threaten human health and safety or the environment.

**Response Phase:** Generally not practical to accurately identify these materials during response phase. If debris is suspected to include asbestos that is friable it should be subject to the minimum amount of handling required to clear easements and protect public health. If it is absolutely necessary to move or collect C&D debris during the response phase, this work should be performed by a contractor licensed to handle asbestos containing materials.

**Recovery Phase:** Where practical, identify and segregate debris that may contain asbestos from other debris for testing by hazardous waste contractor. When buildings are identified to be demolished, potential asbestos should be identified by a licensed contractor and removed prior to demolition of the structure,. No materials suspected to contain asbestos should be processed at the TDSR by grinding or incineration. Only properly trained individuals should perform final characterization and disposal. Lead based paint chips may be disposed in the general waste stream so long as they are not segregated from C&D debris.

## PUTRESCIBLE WASTES

**Definition:** Matter that rots or decays rapidly. Items may include fruits, vegetables, meats etc. from grocery stores restaurants and residents.

A putrescible surge occurs after a disaster when residents and businesses throw away food and other putrescible material stored in freezers and refrigerators because electrical power was interrupted for an extended period of time. After electrical power has been restored, residents and businesses will continue to throw away putrescibles that will be collected on normal refuse collection routes or at the counties' transfer stations.

### RECOMMENDED BMP:

**Objective:** Prevent contamination of other debris with putrescible wastes. Dispose of putrescibles as quickly as possible to reduce odor problems and potential environmental contamination.

**Response and Recovery Phases:** Putrescibles should be disposed of at municipal solid waste (MSW) landfills that are available on each island. Putrescibles should only be accepted at the temporary debris storage and reduction sites if the MSW landfills are inaccessible. If this occurs, putrescibles should be temporarily buried and then removed and disposed of at the MSW landfill after access has been restored.

Putrescibles should be collected when rubbish service resumes. If rubbish service is not quickly resumed, drop boxes for putrescibles and other household rubbish should be stationed in neighborhoods and their availability promoted to residents.

### FUTURE OPTION:

**Composting Potential:** Composting of putrescibles from the MSW waste stream is not currently practiced on a significant scale within any of the counties. If organics composting programs are developed, selected putrescibles from grocery stores or restaurants could be diverted to the composting operation. Alternatively, where a rendering plant exists, rendering of unusable foodstuffs may be a significant method for diversion of putrescibles.



## **Attachment 2**

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### ***Monterey Regional Waste Management District – Katrina Response Waste Processing Priorities***

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## DRAFT

### KATRINA RESPONSE WASTE PROCESSING PRIORITIES

Submitted By Monterey Regional Waste Management District

September 15, 2005

Rick Shedden – Senior Engineer  
Glen Evett - HHW Manager  
Tim Flanagan - Assistant General Manager

#### Overview

The main priority is to focus on those recovery and collection activities that will be the quickest to implement, with the least amount of human exposure to any hazardous or toxic materials present in the waste stream. Following collection efforts, materials are to be recycled if feasible, or transported to an appropriate disposal facility.

#### Processing

- Develop multiple staging areas around hurricane-impacted areas with targets in mind for materials to be processed. Set up areas for concrete and asphalt crushing close to areas accessible for future construction areas, wood and tree grinding in areas that will need organic supplements or slope stability improvements, metal and vehicle processing as close to Port of New Orleans as possible since eventual markets will probably be off-shore or at least transported by ship.
- Set up industrial hazardous materials processing sites near commercial/industrial areas. Do not waste resources on retrieving small quantities of household hazardous waste (HHW). Target those larger quantity generators for special handling and allow small quantities of HHW commingled with other debris to move to regular MSW landfills with composite liners.

#### Equipment

- **Tow trucks** will be required to removing cars and trucks left behind. Local neighborhood staging areas should be established to give insurance companies the ability to capture multiple cars in one location before being shipped out for scrap. Towing companies should be assigned to handle certain areas to allow for streets to be cleared in order for the next stage of debris collection and street cleaning to occur.
- Conventional waste collection equipment will have limited use during initial stages of disaster debris clean-up. Target large areas with “collection zones” set –up for efficiency assigned to one contractor. Establish multiple zones within close geographic areas so contractors do not interfere with each other during collection. Utilize **end-dump trucks and tracked excavators with grapples and/or wheeled bucket loaders** to handle large scale debris clean-up. After a couple of passes, traditional collection assets such as **roll-off containers and rear and front end loading packer trucks** can swing into service for individual clean-ups.
- Handle all soft goods such as bedding, mattresses, curtains, carpet, clothes as soon as possible. No salvageable material will be collected from these items. These items will be extremely heavy

and hard to handle and will need to be mechanically loaded by *bucket loaders and/or excavators with grapples*.

- *Street sweepers and vacuum trucks* will need to follow initial collection of bulky debris by end-dumps and wheeled loaders. *Pressure washing* streets after initial passes by this equipment will help next collection phase.

### Waste Designation

- **C & D waste** – Establish multiple areas for processing as close to areas for eventual rebuild as possible with greatest amount of storage space available to allow for time delay between take down and rebuild. Concentrate on concrete, asphalt, large size organic debris such as stumps and trees and large dimensional lumber (non-contaminated). Whole trees that can be easily segregated should be processed through grinding equipment.
- **Disaster-created MSW** (food waste, wet carpeting, etc.) - Target for conventional waste collection ASAP.
- **HHW** – Small quantities of HHW commingled with other debris can be handled by conventional waste collection methods and disposed in regular composite-lined MSW landfills.
- **School Laboratory Materials** – Same methodology as above, unless quantities are significant, and retrieval is feasible.
- **Automobile Wastes** – Whole car and truck bodies can be handled through establishment of additional processing areas as identified above. Any household or consumer auto type wastes can be handled safely enough through regular conventional waste collection.
- **Propane Tanks** – Need to be segregated and removed to a processing facility where they are emptied and recycled. Best handled with White Goods on a house-by-house basis.
- **White Goods** –Need to be segregated and removed from homes individually – a very labor intensive process. These products will need to be placed curbside and handled with the combination of mechanical loaders and roll-off and/or end-dump trucks.. Quantities will probably exceed the local capacity to process scrap metal. Additional outside processing capacity will likely be needed.
- **“E”-waste** – Computers, TV’s, monitors, and other electronic devices pose no real hazard to landfills. Limited resources available to Katrina Recovery should target other materials that are more harmful to the environment, or are easily recyclable. Most e-waste can be easily handled within conventional waste collection and disposal methods.

### Summary

The overriding consideration should be given to the safety of the collection personnel and the protection of the environment. The next consideration is to provide for the efficient clean-up of the infrastructure so that the communities can be re-established as quickly as possible. Material recycling and re-use should receive secondary consideration and be contemplated only when it is easily implemented, financially viable, and operationally possible. The establishment of zones for collection and waste processing will maximize the limited amount of collection assets and personnel assigned to areas.

Viable markets should be in place before any particular waste stream is targeted for recovery. Tax credits and other forms of financial incentives should be quickly established to motivate potential buyers into receiving recovered materials for reuse and/or recycling.

Remaining waste capacity of local landfills should be determined and site life projections assessed after the impact of waste disposal from Katrina Recovery is completed. Additional capacity or expansion of

local landfill assets should be done in conjunction with recovery process and pass under Federal mandate – bypassing traditional permitting processes, if perfunctory environmental review reveals no “environmental flaws” – not political ones.

Neighborhood or area type assessments should be done with collection and processing experts to determine what areas can be handled first without any extreme assistance.

Areas that need major road repairs and clearing, major housing and business demolitions, essentially the severely affected areas, need a strategic and coordinated plan. Assessments for processing capabilities and market absorption of targeted recoverable materials should be determined prior to collection efforts. Environmental priorities for disposal or reuse/recycling should be grounded in good science and communicated to the public up front so expectations are clear and achievable.

## **Attachment 3**

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***SOP #34 – Disaster HHW Collection Services***

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# SOP # 34– Disaster HHW Collection Services

- A. GENERAL GUIDELINES
- B. PROCEDURES FOR HAZARDOUS WASTE MANAGEMENT AT DEBRIS COLLECTION SITES
- C. DEBRIS COLLECTION SITE DAILY HAZARDOUS WASTE INVENTORY FORM
- D. PREDICTING THE NEED FOR POST-DISASTER HHW SERVICES
- E. SAMPLE PUBLIC INFORMATION HANDOUT

## A. GENERAL GUIDELINES

1. **Coordinate with other agencies.** In the initial phases of a disaster response, Metro hazardous waste staff should confirm contacts and coordinate efforts with local, state and federal agencies involved with hazardous waste management. This may include fire departments and hazmat teams, DEQ, EPA, and the Coast Guard, as well as city and county health, water and solid waste agencies. Communication should be maintained throughout the recovery phase with local government debris removal coordinators.
2. **Determine type of services to offer.** A variety of hazardous waste services may be offered in response to a disaster. Service options include:
  - promoting the availability of the permanent facilities
  - “milk runs” to pick up hazardous waste materials left at debris collection sites
  - providing staffed hazardous waste collection at debris collection sites
  - door-to-door hazardous waste collection, either by appointment or curbside pickup of materials throughout an area
  - house-to-house sweeps of affected structures

The most appropriate type of service to provide will vary depending on the nature, severity and scope of the disaster, as well as the resources available for hazardous waste management. For a method of estimating the need for services after a disaster, see section D below.

For minor disasters, simply promoting the permanent hazardous waste facilities and any upcoming regularly-scheduled collection events will be the best option.

In more severe disasters, solid waste debris collection sites will be established. Any of these sites that are expected to receive significant quantities of hazardous waste should have trained staff at the site to minimize the risks of releases, reactions, exposures, etc. Procedures for operating a staffed hazardous waste collection site are detailed in section B below.

Some debris collection sites will receive only small quantities of hazardous waste. This may be due either to low turnout at advertised hazardous waste collection points, or to incidental hazardous waste

deposited at sites not advertising hazardous waste collection. At these sites, hazardous waste may be handled by daily “milk run” pickup. Appropriate secondary containers such as tub skids should be left at these sites.

In the most severe disasters, collection services that require minimal effort from those whose homes have been seriously damaged will be the most effective. If resources allow, door-to-door or curbside collection services may be offered in affected areas.

House-to-house sweeps may be appropriate when severe damage has occurred, and hazardous materials must be removed from homes prior to demolition. Entry and removal of waste from damaged structures poses significant hazards that Metro hazardous waste staff is not familiar with. Prior to any work of this kind, substantial planning and coordination with local building authorities and demolition contractors will be necessary, as will development of detailed safety plans.

### 3. **Determine timing and duration of services**

Some residents with post-disaster hazardous waste may be ready to dispose of their waste within a few days of the disaster. Others will be dealing with more pressing matters, especially after a major disaster, and may not be ready to deal with that aspect of cleanup for several weeks after the event.

As recovery needs evolve, it will be prudent to monitor the demand for collection services and adjust as necessary. Data from any solid waste debris collection sites should be monitored as the recovery progresses, and adjustments made to hazardous waste efforts upon consultation with local government debris removal coordinators.

### 4. **Assist with developing public information**

See sample public information sheet, section E below.

5. **Determine whether waste is exempt.** Whatever collection services are offered, it is important to ensure that all wastes collected are within Metro’s authority to handle. Some sort of screening criteria should be provided to the staff receiving wastes, in order to ensure that loads are household, CEG, Universal Waste, or RCRA-exempt waste. See section F below, for a sample CEG screening flow chart.

Also to consider is whether collection of waste from businesses will be free, or if we will charge fees, such as the prices that have been developed for Metro’s CEG program.

6. **Determine whether waste is disaster-generated.** When hazardous waste collection services are provided in response to a disaster, it is likely that inquiries will be received from residents or businesses that have hazardous waste that is not a result of the disaster. In order to receive disaster relief funds, it is important to ensure that wastes are disaster-related. Publicity about collection services should specify that only disaster-related waste is to be accepted. Prior to mobilizing collection services, collection staff should have a plan for handling non disaster-generated waste that is received in spite of the publicity. This may include referring the generator to other services, or accepting the material and tracking it separately.

7. **Load checking.** After a disaster, it is possible that some generators may improperly throw hazardous wastes into the trash, even if separate hazardous waste services are available. It may be useful to provide enhanced load checking of incoming trash loads at transfer stations, MRF’s, and landfills in the region, as well as any temporary debris storage and transfer sites. In particular this may be

considered for sites that are unpaved or have limited environmental controls such as capture of runoff water.

8. **Be prepared to collect detailed data from the beginning.** Hazardous waste collection services may be mobilized very quickly in a disaster. It is important for a variety of reasons to track all expenditures, participation levels and waste volumes from the start. See the attached inventory form in section C for an example of waste tracking at disaster debris collection sites.

## **B. PROCEDURES FOR HAZARDOUS WASTE MANAGEMENT AT DEBRIS COLLECTION SITES**

Staffed hazardous waste collection sites must include at least two properly trained people to handle incoming waste. Site preparation should include: a tent for protection from the elements, plastic lining over the ground in case of spill, various equipment for sorting and storing waste, and full-time security to prevent unauthorized persons from coming in contact with hazardous waste after hours. Metro hazardous waste staff at the site will:

- receive loads of separated hazardous waste from households and CEG's
- assist debris customers with removing hazardous waste contained in their loads
- sort and package hazardous waste received
- if the volume of hazardous waste is low, hazardous waste staff may assist customers and site personnel with non-hazardous tasks (if the volume is consistently low then we will probably downgrade the site to a "milk run" site).
- if the volume of waste is very high, and non-hazardous waste volunteers are available at the site, they may assist with handling paint. They may unload and sort cans of paint and place them into baskets/skids. Only Metro hazardous waste staff shall handle any hazardous materials other than paint.

### **Tracking:**

- use the debris collection site daily hazardous waste inventory form, attached. The form should be filled out at the end of the day. If any waste is shipped from the site during the day, be sure that it is properly recorded on a hazardous waste transportation inventory form, designating the site as the point of origin.
- the total number of hazardous waste customers should be recorded. At some sites local government personnel will be greeting customers, and may be designated to keeping track of customer counts.
- loads of non-disaster-related household hazardous waste that come in should be accepted, but a separate tally should be kept. It should not be publicized that we are accepting non-flood-related HHW at these sites.
- CEGs with disaster-related waste will be accepted, but should be tracked separately also.

### **Shipping- depending on the volume received, there are various options:**

- Waste may be left at the site in appropriate secondary containment if the site has security for the night



- Waste may be brought back to Metro South or Metro Central at the end of the day
- Waste may be picked up by Metro staff in a truck designated to serve the sites during the day
- Waste may be picked up by contractors directly from the sites

For more details on waste storage and transportation, see guidelines in SOP # 21 Neighborhood Events, and #22, Hazardous Waste Transporting.

**C. DEBRIS COLLECTION SITE DAILY HAZARDOUS WASTE INVENTORY FORM**

Site \_\_\_\_\_

Date \_\_\_\_\_ person filling out this form \_\_\_\_\_

| Waste type                           | Quantity |
|--------------------------------------|----------|
| Latex paint                          |          |
| "G-waste" (water-based glues, etc.)  |          |
| Oil-based paint and other flammables |          |
| Pesticides, Acids, Bases, Oxidizers  |          |
| Aerosols                             |          |
| Cleaners                             |          |
| Oil                                  |          |
| Antifreeze                           |          |
| Other:                               |          |
|                                      |          |
|                                      |          |
|                                      |          |
|                                      |          |
|                                      |          |

Total disaster-related HHW customers: \_\_\_\_\_

Total non-disaster HHW customers: \_\_\_\_\_

CEG customers: \_\_\_\_\_

## **D. PREDICTING THE NEED FOR POST-DISASTER HHW SERVICES**

It is possible to make some estimation of the need for special HHW collection services following a disaster in the region. Three factors may be important in estimating the volume that will need to be managed- the scope of the disaster, the type and severity of the disaster, and the manner in which wastes will be collected. The scope of the disaster will influence the number of homes affected, the type and severity of disaster will influence the amount of waste generated by each home, and the manner in which wastes are collected will influence the total volume that will be handled by the collection program.

**Scope of disaster.** As soon as possible during the recovery phase following a disaster, details about the area affected should be obtained. Single family homes are historically 94% of the customers using Metro's collection program, so optimally a count of the number of single family homes in areas experiencing moderate to severe damage should be determined.

**Type and severity of the disaster.** Different types of disaster vary in the way they affect homes. Some may completely destroy houses, requiring management of all hazardous materials contained within, some may cause damage to only portions of a home, requiring disposal of damaged containers only, and others may have little effect on hazardous materials storage areas. Homes with modest damage are likely to generate an average of about 50 pounds each, while homes that are destroyed are likely to average closer to 100 pounds of hazardous waste each.

Ice storm, wind storm. While potentially debilitating to roadways, power lines, etc., these are unlikely to result in any widespread need for HHW collection services. Regardless of how widespread the damage from one of these disasters is, homes are seldom damaged to the point where proper storage of potential HHW materials is no longer possible.

Flood. A flood such as the one affecting the Portland area in February 1996 tends to cause moderate damage to a number of homes, requiring complete demolition of only a small number of structures. Hazardous waste loads will therefore average closer to 50 pounds each. More severe flooding, as seen in the Missouri River area in the mid-1990s may completely envelope populated areas. Because a large number of homes are destroyed, hazardous waste loads will tend to be closer to the 100 pound figure .

Earthquake. Damage to homes may range from minor to moderate to severe, and the size of hazardous waste loads will vary accordingly.

Fire. Wildfires such as those that California has experienced over the last several years tend to have an all-or-nothing effect on structures. Homes often either escape the fire, or are gutted. Loads of hazardous waste are likely to average about 100 pounds each.

**Manner in which wastes are collected.** A range of post-disaster hazardous waste service options are available. The type of service offered can have a significant effect on the percentage of people who utilize the service. The greater the amount of initiative required of the hazardous waste generator, the smaller the percentage of those who need the service that will actually use it. This is true in non-disaster times, but particularly during the recovery period after a disaster there will be many demands on people's time, and some will choose to dispose of waste improperly, or continue to store it in spite of damage.

These service options require the least effort on the part of generators:

- door-to-door hazardous waste collection, either by appointment or curbside pickup of materials throughout an area
- house-to-house sweeps of affected structures

Hazardous waste collections held at designated debris collection sites require some travel, but ideally will be located in the neighborhoods of those affected. Transporting waste to the existing permanent facilities obviously requires the most effort on the part of those with hazardous waste to dispose of.

**Disaster types, expected waste generation rates, and recommended service options:**

| Type of Disaster                                       | Expected hazardous waste generation per affected home | Recommended service options   |
|--|---|---|
| <b>Ice storm, wind storm</b>                           | minimal   | <ul style="list-style-type: none"> <li>• Promote existing facilities</li> </ul>   |
| <b>Flood- moderate (most affected homes reparable)</b> | 50 pounds   | <ul style="list-style-type: none"> <li>• Collection sites near affected areas</li> </ul>  |
| <b>Flood- severe (many destroyed homes)</b>            | 50-100 pounds   | <ul style="list-style-type: none"> <li>• Collection sites near affected areas</li> </ul> If resources available: <ul style="list-style-type: none"> <li>• Door-to-door/curbside collection</li> <li>• House-to-house sweeps</li> </ul>  |
| <b>Earthquake</b>                                      | Minimal to 100 pounds                                 | <u>Minor:</u> <ul style="list-style-type: none"> <li>• Promote existing facilities</li> </ul> <u>Moderate:</u> <ul style="list-style-type: none"> <li>• Collection sites near affected areas</li> </ul> <u>Severe:</u> <ul style="list-style-type: none"> <li>• Collection sites near affected areas</li> </ul> If resources available: <ul style="list-style-type: none"> <li>• Door-to-door/curbside collection</li> <li>• House-to-house sweeps</li> </ul> |
| <b>Wildfire</b>  | 100 pounds  | <ul style="list-style-type: none"> <li>• House-to-house sweeps</li> </ul>   |

**Expected percentage of affected residents who will use services:**

| Service method                              | Estimated utilization   |
|---|---|
| <b>Collection sites near affected areas</b> | 5-10%   |
| <b>Door-to-door/curbside collection</b>     | 10-50%  |
| <b>House-to-house sweeps</b>                | 50-75%  |
|   | (percentage in which significant hazardous materials will be found) |

**Developing a quantitative estimate:**

The total volume of HHW to be managed in a collection program will be:

(# of homes experiencing damage) X (% of homes HHW is collected from) X (# of pounds/home collected on average)

Two actual examples:

- Portland-area flooding February 1996

Scope- approximately 8500 single-family homes were affected by the flooding. Severity- many of the homes that were affected damage were partially damaged and were repairable. The average load was about 50 pounds. Homeowners were allowed to bring wastes to one of several collection points set up in the weeks following the flood. Of the 8500 households affected, about 500, or 6% utilized the hazardous waste collection services offered by Metro. (8500 homes experiencing moderate damage) X (50 pounds/home) X (6% of homes in a door-to-door sweep). = total waste collection, about 25,000 pounds.

- Oakland hills fire, October 1991

Scope- 2,897 dwelling units were affected, of which 2,345 were single-family homes. Severity- homes were generally complete losses; an average of about 100 pounds per home was collected. Wastes were collected by contractors hired to go through the entire affected area. Hazardous materials were removed from about 2,000 homes. (2,897 homes experiencing severe damage) X (100 pounds/home) X (69% of homes with hazardous materials in neighborhood sweep) = total waste collection, about 200,000 pounds.

Sample hypothetical scenario for the Portland area:

Earthquake, doing moderate damage to 5% of region, severe damage to 1%. Structure-to-structure sweeps in half of the severely affected areas, collection points offered for the remainder of the affected areas.

Moderately affected homes:  $5\% \times 300,000 = 15,000$ .

Severely affected homes:  $1\% \times 300,000 = 3,000$

Total volume =  $15,000 \times 50 \text{ pounds} \times 5\% \text{ participation} = 75,000 \text{ pounds}$   
+  $1,500 \times 100 \text{ pounds} \times 75\% \text{ with HHW} = 112,500 \text{ pounds}$   
+  $1,500 \times 100 \text{ pounds} \times 10\% \text{ participation} = 15,000 \text{ pounds}$

Expected total of about 202,500 pounds.

## **E. SAMPLE PUBLIC INFORMATION HANDOUT**

### **Flood-related Hazardous Waste** *(from February 1996 flood)*

#### **Households:**

If any hazardous materials are leaking, putting out a strong odor, or otherwise seem to be a health threat, **call 911**

Residents with flood-related hazardous waste may bring it to many of the flood debris collection sites. Household hazardous waste may also be brought to the Metro South and Metro Central Transfer Stations. Residents can call **234-3000** for current information on all of these options.

Products that may be hazardous include paint, solvents, pesticides, automotive fluids, batteries, and aerosols. Look for label warnings such as danger, warning, and caution, toxic, corrosive, flammable, combustible, or poison. Hazardous items should be brought in separately from trash, properly sealed, in a sturdy box. If a product does not have a label and you know what it is, write it on the container. Never mix products together.

#### **Businesses:**

If any hazardous material or waste is spilled, leaking, generating fumes, or otherwise releasing or threatening to release to the environment, the Oregon Emergency Response System must be called, at **1-800-452-0311**.

Businesses with moderate amounts of flood-related hazardous waste may bring it to most of the debris collection sites or to Metro South or Metro Central Transfer Station. This includes businesses that generated up to 220 pounds of hazardous waste as a result of the flood. Call **234-3000** for current information on these options.

The following types of business waste **cannot** be taken to the debris collection sites: hazardous waste from businesses that generated more than 220 pounds as a result of the flood, or from business that generate more than 220 pounds per month in the course of their normal operations. For disposal assistance contact DEQ at **229-5263**.

#### **Hazardous Materials washed up by the flood:**

Any drums or other hazardous materials that are floating in one of the area's rivers, or were washed up at the high water mark of the rivers will be handled by the Coast Guard. Call **240-9370**.