Integrated Solid Waste Management Plan

Prepared for:

County of Maui
Department of Environmental Management
Solid Waste Division

Prepared by:

GBB
SOLID WASTE MANAGEMENT CONSULTANTS

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Final Draft as of April 30, 2008
Printed on recycled paper

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OFFICE OF THE MAYOR
County of Maui

May 11, 2008

I am pleased to present this draft of the updated Integrated Solid Waste Management Plan for the County of Maui. This plan illustrates specific recommendations for increasing efficiency, diverting more tonnage from our landfills, and considers new options for managing the waste stream.

Last year I appointed 16 community members with a broad spectrum of representation to a new Solid Waste Resource Advisory Committee. The Committee has worked closely with the County's Department of Environmental Management, Solid Waste Division, and with consultants Gershman, Brickner & Bratton during the past ten months to assess our needs, facilities, recycling and green waste programs, landfills and waste stream resources, and to consider new policies and options. The result is a draft of the updated solid waste plan that will guide us in the years ahead. I am grateful for their dedication and commitment to taking care of the people, the environment, and the islands of Maui County. Their efforts are reflected in the comprehensive results shown in this draft plan.

Prior to implementation, the draft plan will undergo a review by stakeholders in government and the community. Ultimately, the plan will serve as a long-term blueprint for a healthy environment and improved services for solid waste needs. Input from our stakeholders will help accomplish the best possible plan for the County of Maui.

Sincerely,

Charmaine Tavares

Charmaine Tavares
Mayor

Acknowledgements

Mayor Charmaine Tavares

Managing Director Sheri Morrison

Solid Waste Resource Advisory Committee (SWRAC) Members

Greg Apa, Executive Vice President, Maui Disposal Company

Mauricio Avila, Soil Scientist, Maui Land & Pineapple Company

Eve Clute, Doctor of Public Health, West Maui

Darlene Endrina, Image Consultant, Island of Lanai

Jack P. Freitas, Jr., Owner, Maui Tow & Transport Company

Stuart Funke-d'Egnuff, Executive Director, Tri-Isle Resource Conservation & Development Council, Inc.

Rob Hoonan, Director of Facility Management, Grand Wailea Resort

Debra Kelly, Office Manager, Molokai-Lanai Soil & Water Conservation District, Island of Molokai

Councilmember Bill Medeiros, East Maui/Hana

Kuhea Paracuelles, Environmental Coordinator, Office of the Mayor, County of Maui

Steve Perkins, Program Director, Maui Economic Development Board

Victor Reyes, Energy Commissioner, Office of Economic Development, County of Maui

Susie Thieman, CEO, MEO Business Development Corp., an affiliate of MEO, Inc.

Terryl Vencl, Executive Director, Maui Visitors Bureau

Councilmember Mike Victorino, Wailuku/Waihee/Waikapu

Rick Woodford, Realtor; Maui Recycling Group, President

State of Hawaii Department of Health, Solid and Hazardous Waste Branch, Office of Solid Waste Management staff members attending the SWRAC meetings:

Karl Motoyama, Supervisor

Lane Otsu, Planner

Agency and business representatives in the States of Oregon and California that provided guided tours to SWRAC and County staff.

The numerous agency and business representatives, and community members who met with the County's consultant's and staff providing background information regarding solid waste related and recycling activities in the County.

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Table of Acronyms

Acronym	Full Name
A&E	Architect and Engineering
AD	Anaerobic Digestion
ADC	Alternative Daily Cover
ADT	Average Daily Trips
ASL	Automatic Side-Loader
BLS	Bureau of Labor Statistics
C/PC	Closure and Post-closure
C&D	Construction and Demolition Debris
C&DMRF	Construction and Demolition Materials Recovery Facility
CAA	Clean Air Act
CERCLA	Comprehensive Environmental Response Compensation and Liability Act
CESQGs	Conditionally Exempt Small Quantity Generators
CFCs	Chlorofluorocarbons
CFR	Code of Federal Regulations
CML	Central Maui Landfill
County	County of Maui
CRT	Cathode Ray Tube
CY	Cubic Yard
Division	Division of Solid Waste, County of Maui
DOT	Department of Transportation
DPW	Department of Public Works
EDF	Environmental Defense Fund
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
FA	Financial Assurance
FCA	Full Cost Accounting
FOG	Fats, Oil, and Grease
FY	Fiscal Year
GIS	Geographic Information System
HazMat	Hazardous Materials
HDPE	High Density Polyethylene
HHW	Household Hazardous Waste
HRS	Hawaii Revised Statues
ISWMP	Integrated Solid Waste Management Plan

KWh	Kilowatt Hour
LDPE	Low Density Polyethylene
LFG	Landfill Gas
MCL	Maximum Contaminant Level
MECO	Maui Electric Company
MRF	Materials Recovery Facility
MSL	Mean Sea Level
MSW	Municipal Solid Waste
NDA	National Demolition Association
NIMBY	Not In My Backyard
NPDES	National Pollutant Discharge Elimination System
NSWMA	National Solid Waste Management Association
OCC	Old Corrugated Container (Cardboard)
OSHA	Occupation Safety and Health Act
PET	Polyethylene Terephthaiate
PM	Preventive Maintenance
PO	Purchase Order
PPB	Parts-Per-Billion
PPM	Parts Per Million
PS	Polystyrene
QA/QC	Quality Assurance/Quality Control
RCRA	Resource Conservation and Recovery Act
R&D	Research and Development
RDF	Refuse Derived Fuel
RFB	Request for Bids
RFP	Request for Proposals
RFQ	Request for Qualifications
RPPC	Rigid Plastic Package Containers
RPS	Renewable Portfolio Standard
SWANA	Solid Waste Association of North America
SWRAC	Solid Waste Resource Advisory Committee
TEQ	Toxic Equivalents
TPD	Tons Per Day
TPY	Tons Per Year
USEPA	United States Environmental Protection Agency
WasteTEC	Waste-to-Energy Conversion Technologies
WTE	Waste-to-Energy

1. Introduction

1.1 Objectives and Purpose

The County of Maui Integrated Solid Waste Management Plan (ISWMP) presents a comprehensive, long-term blueprint to solid waste management. The ostensible reason for developing this ISWMP is to comply with the Hawaii Integrated Solid Waste Management Act which calls for each county in the state to update the plan every five years.

The state's penultimate goal for requiring counties to develop ISWMPs is to provide a review of current operations, research alternative approaches, develop long-term scenarios, and provide capital and operational cost/revenue projections. Together, these provide both policy-makers and solid waste staff with a guide to assist them in managing future solid waste issues.

This ISWMP is a draft plan that will be reviewed by stakeholders and will need to take legal, financial and union considerations into account prior to implementation.

1.2 Summary of Project

Mayor Charmaine Tavares appointed members to an advisory panel, the Solid Waste Resource Advisory Committee (SWRAC). The County's Solid Waste Division (Division) assigned significant resources to SWRAC: the Division's staff supported the SWRAC's activities, provided a research tour of solid waste facilities in Oregon and California, and presentations by consultants and staff on various aspects of the industry practices and current County operations.

Division staff, the consultant, and SWRAC interacted with a representative from the State of Hawaii Department of Health's (DOH) Solid Waste Office. A DOH representative from the State took an active part in SWRAC meetings by making himself available to the presenters as well as the Division's staff and SWRAC.

To facilitate the SWRAC meetings, the Division provided the committee with professional mediators to facilitate the discussions and the development of consensus points SWRAC worked through. These consensus points became SWRAC's initial recommendations to the Division. Division staff and consultant worked these initial recommendations into five potential scenarios and presented them to SWRAC for comment. SWRAC reviewed these five scenarios over the course of two meetings and made recommendations to Division staff for possible changes.

The Division took SWRAC's advice into account and finalized the five scenarios the consultant was to analyze. Each scenario had operational details with their associated capital and operational costs extended out to 2030 and then to 2042.[1] These

[1] Although a 20-year planning period is used for General Plans and for ISWMPs, the County requested projections be made to 2042 for all scenarios so they coincided with the projected life of the Central Maui Landfill.

scenarios and their financial findings are discussed in detail in Chapter 13 but are briefly summarized here:

Scenario 1: Keeps operations as they are now with no changes. This is referred to as the Status Quo and is based on the full cost of capital and operations for fiscal year 2006;

Scenario 2: Uses the Status Quo numbers for FY2006 and applies capital and operations costs of programs that drive diversion up to 60 percent. These programs include, but are not limited to, household hazardous waste collection, a materials recovery facility (MRF), construction and demolition (C&D) MRF, curbside green waste and recycling collection, a new convenience/recycling center in the Hana Region, with landfill as the disposal point for the remaining 40 percent.

Scenario 3: Builds on Scenario 2 and adds a waste-to-energy (WTE) facility that can generate electricity for use and sale and still keep the diversion rate at 60 percent.

Scenario 4: Takes Scenario 3 and replaces the WTE facility with a gasification plant. It also places the landfills on Lanai and Molokai on “Standby with Permit.” This term means that these landfills will maintain their solid waste permit but not regularly landfill any municipal solid waste (MSW). They would be on standby to handle disaster debris and other emergencies. The latter would be contained and shipped off island.

Scenario 5: Takes Scenario 4 and increases the diversion rate from 60 to 75 percent with the elimination of any alternative disposal facility, such as a WTE and gasification plant. A reuse facility is added to this scenario as are ordinances requiring diversion in the business sector of the community.

Each of these scenarios was costed using a financial model that developed comparable results. The results of these financial models were presented to Division staff and SWRAC. The latter advised the Division as to which scenario, or parts thereof, were right for the County to pursue. Next, the Division chose a scenario.

The consultant developed a draft Plan of the scenario chosen by the Division. This draft Plan, with its costs, timelines, and descriptions, was submitted to SWRAC for its recommendation before official submittal to the DOH. Also, public hearings were held where the Division staff and consultant presented the draft Plan and received comments from members of the public. SWRAC reconvened after the public comment period to advise the Division on how best to accommodate these comments. Another draft was developed and submitted to both the executive and the legislative branches of the County.

1.3 Planning Time Span

Project Initiated	February 2007
Operational Review	February through October 2007
Mayor Charmaine Tavares appointed the members to SWRAC	June 2007
Research Tour	July 7 – 14, 2007
SWRAC Meetings	June 2007 through ???, 2008
Public Hearing	
DOH Approval	
County Council Review	

1.4 Reading Directions for ISWMP

Many ISWMPs are filled with tables, timelines, action points, technical jargon, etc. Such ISWMPs seem foreign to citizens with little background in the field of waste management and may, unfortunately, not be read as a result. The Division felt strongly that this document should be available to all readers and that its language and construction be such that every person who should begin reading a chapter would be able to understand it, and that terms and concepts should be presented within a context so the reader can understand their meaning. To achieve this goal, many chapters have a history that explains, for instance, the kind of collection vehicles used for municipal solid waste collection (garbage) and white goods (household appliances). It also explains technologies and operational activities used in other locations that may be applicable to the County.

Chapters 2 and 3 provide an overview of the County's solid waste situation, its operations with some observations, and the remaining capacity of its active landfills. This provides the reader with an overall view of the situation as it stands, today. Chapters 4 and 5 detail the County's current collection programs for recycling, MSW, bulky waste, and white goods. Background on the tools and operations of the trade are provided at the beginning of each of these chapters so that the reader can be familiarized with the industry. Chapters 6 and 7 examine the source reduction and educational activities that the County could do to reduce waste and inform citizens of the County's programs. These two chapters provide examples from other communities. Chapters 8, 9, 10, 11, and 12 explain C&D waste management programs, composting and other organic operations, the management of metals, household hazardous waste collection programs, and alternative disposal options such as WTE and gasification. Chapter 13 focuses on funding options for the County's new ISWMP and on the financial analyses of the five scenarios. Finally, Chapter 14 takes the County's chosen plan and presents considerations for its implementation.

During certain portions of this document, the text references technical documents in the Appendices. A case in point is Chapter 3 which provides short and clear descriptions of the capacity for burying MSW in each active County landfill. Technical information is provided in an appendix that provides scaled maps for further review.

Those readers wanting to get into the technical details are invited, at the beginning of that specific chapter, to review the appropriate appendix.

1.5 Summary of Field Research

Consultant team members made site visits to all solid waste operations located on the Islands of Maui, Molokai and Lanai. These site visits reviewed the operations and equipment at all the collection base yards, recycling operations, and landfills. The contracts with vendors were reviewed, and many of the vendors were contacted and interviewed. Contractors related to C&D were contacted and interviewed regarding the situation as it pertains to this material. The owner of the private C&D debris facility was also contacted. Operators of private recycling enterprises who do not have a contract with the County were contacted as well.

Formal and informal community meetings were held so that residents could express their views on the topic of solid waste management. Interviews were conducted with state regulators and the Maui Harbor Master. Parties involved with barging material were contacted and interviewed as were solid waste professionals in the other counties in the State.

Much of this research is provided in both the presentations to SWRAC and notes on research activities in the appendices.

1.6 SWRAC

1.6.1 Committee Appointments

Mayor Charmaine Tavares appointed the following individuals to the SWRAC:

- Greg Apa was made a member of the committee as representative of the waste and recycling industry. Mr. Apa is manager of Maui Disposal which has contracts with the County.
- Mauricio Avita works for the Maui Land & Pineapple Company and has a Ph.D. in agriculture.
- Dr. Eve Clute has a Ph.D in Public Health from the University of Hawaii.
- Darlene Endrina was appointed to the SWRAC to represent the community on the Island of Lanai.
- Jack Freitas, Jr. was appointed to SWRAC as a representative for the recycling and scrap metals industry.
- Stuart Funke-d'Egnuff is the Executive Director of Tri-Isle Resource Conservation and Development.
- Rob Hoonan represented the tourism industry and is the Director of Facilities Management for the Grand Wailea.
- Debra Kelly, office manager for the Molokai–Lanai Soil and Water Conservation District, represented the Island of Molokai on the committee.
- Bill Medeiros is a County Councilman, resident in East Maui and Co-chair of the Council's Public Works and Facilities Committee. Councilman Medeiros took part

in a solid waste tour in Richmond, Virginia, while attending the National Counties Conference held there.

- Kuhea Paracuelles is the Mayor’s Environmental Coordinator.
- Steve Perkins is the Program Director for the Maui Economic Development Board.
- Victor Reyes is the Commissioner of Energy for the County.
- Susie Thieman is the Executive Director of Business Development Corp, an affiliate of Maui Economic Opportunity, Inc.
- Terryl Vencl is the Executive Director of the Maui Visitors Bureau, and who, in 2002, was a member of a Solid Waste Task Force that examined diversion options.
- Mike Victorino, a County Councilman, is a resident of the Wailuku-Waihee-Waikapu area and Co-chair of the Public Works and Facilities Committee. Councilman Victorino took part in the SWRAC research tour.
- Rick Woodford has been President and an active member of the Maui Recycling Group since it began in the 1980s.

1.6.2 SWRAC Meeting Dates and Times

The SWRAC met under the HRS Chapter 92 sunshine law and confined its discussions to its formal meetings. The topics and dates of the SWRAC meetings were:

Table 1-1 – SWRAC Meeting Schedule

Topic	Date of Meeting
Orientation	6/21/2007
Garbage & Recycling Collection	7/19/2007
Review of Tour / Organization	8/2/2007
C&D / Yard Waste	8/23/2007
Pay as you Throw	9/6/2007
Alternative Disposal/WTE/Landfill Capacity/ Organics to Energy/Facilities	9/20/2007
Review: Consensus Points/HHW/Zero Waste	10/4/2007
Household Hazardous Waste/ Education/ Financials/Consensus Points/Draft Scenarios	10/18/2007
County Finance Director/Consensus Points/ Draft Scenarios	11/15/2007
Scenarios Presentation	2/7/2008
Presentation on Draft ISWMP	3/6/2008

1.6.3 Facilitation and Summary Notes

To facilitate the SWRAC meetings, the Division provided the committee with professional mediators, MSM, to facilitate the discussions and the development of consensus points the SWRAC worked through. These consensus points became SWRAC's recommendations to the Division.

Two MSM trained staff attended each SWRAC meeting. One member facilitated the meeting while the other took notes. Within five days after the completion of the previous SWRAC meeting, MSM provided County staff with a draft which, after editing, was placed on the Division's web site specifically created for SWRAC documents. These notes were summaries of the presentations and discussion.

1.6.4 Tour

SWRAC members, Division staff, and the Managing Director for the County took part in a seven-day tour that began on Saturday, July 7, 2007. On the following Monday, the tour started with a visit to the Metro Portland (Oregon) Regional Authority. The Authority became operational in 1979 with a membership of 25 cities and three counties. It is responsible for comprehensive solid waste disposal planning for the area but not collection.

Two members of the Authority met the tour group and discussed the various aspects of the Authority with them. Scott Klag, one of the guides, discussed the Authority's role in the Governor of Oregon's recent signing into law of the Product Stewardship Bill (HB2626). Bryce Jacobson was the group's other tour guide who discussed the area's commitment to C&D diversion.

The tour group walked through a four-bay transfer facility that the Authority owns and contracts out the operation. To keep commercial and residential traffic separate for safety reasons, residents use one bay exclusively. The bay has a series of bunkers where items can be placed for diversion and reuse. The second bay is for MSW and is where commercial haulers unload. The third bay is for C&D and is shown in Photo 1-1. Commercial haulers unload C&D in this bay, a third shift of workers conducts a quick sort to segregate reusable and recyclable items from the rest of the material. In 2005, 14,654 tons were diverted. A final bay is dedicated for the 5,839 tons of food waste collected and shipped to a processor in Washington State.

Photo 1-1. Metro Portland's C&D Bay

Members of the tour then went through one of two household hazardous waste (HHW) facilities that are open 312 days annually, processing 2,048 tons.

The final stop in Portland was the Authority's latex paint processing facility. The facility takes the 243,000 gallons of potentially recyclable paint collected at the HHW operations and processes it into recyclable paint. The recyclable paint, "Metro Paint," currently has five percent of the regional latex paint market.

Photo 1-2. Tour group at Covanta Brooks Waste–to-Energy Facility

On Tuesday, July 9, the tour went outside of Portland to Marion County in Oregon which has a 57 percent diversion rate. The tour took members through the Covanta Brooks WTE facility that began operation in 1987 (Photo 1-2). The facility takes in 550 tons a day of MSW and produces 13.1 megawatts of energy that is sold to Portland General Electric.

The byproduct of WTE is ash, and the facility produces 138 tons of ash per day. The Tour left the power facility and went to the ash monofill. This is a dedicated landfill cell where ash is taken and buried. The SWRAC talked to the Marion County's solid waste personnel about the ash site and walked up closed cells of ash, see Photo 1-3.

Photo 1-3. Tour group climbs a closed ash cell

That night, the tour flew to San Francisco, California and the following morning, the group left to meet with officials at the San Francisco Department of Environment.

Officials of the Department discussed the City's efforts to promote green building practices, recycling, HHW collection, product stewardship, banning plastic bags, and commercial recycling. Robert Haily, the recycling director, met with the group and discussed San Francisco's role in motivating change and aspiring to Zero Waste. Mr. Haily had also been a recycling coordinator for the City and County of Honolulu and discussed his insights into the practical problems counties in Hawaii face with implementing recycling programs.

Photo 1-4. San Francisco's Fantastic 3 program

The Fantastic 3 program is the name of San Francisco's curbside recycling program that services 325,000 homes. Photo 1-4 illustrates the three carts: blue for recyclable items, green for compostable material, and black for trash. The program is for businesses as well as residents and has an 85 percent set-out rate for the recycling cart and 40 percent for the compostable cart.

The tour group took a tour of the City's 200,000-square-foot MRF that its contractor, NORCAL, owns and operates. The contractor bales its recovered material and sells them for between $100 and $225 per ton. The price fluxes with the market.

The tour next went to the facility where self-haulers and commercial haulers take their MSW, C&D waste, and HHW material. Self-haulers are separated from the commercial haulers and go through a bay where items that can be recycled are separated (Photo 1-5).

Photo 1-5. San Francisco's self-haul drop-off for recyclables

Commercial trucks with C&D material are directed to the C&D reclamation operation. The material is emptied onto the tip floor, a rubber tire loader pushes the material up onto a conveyer belt and elevates it to the picking line where workers separate the material and place it into the bays below them. This is shown in Photos 1-6 and 1-7.

Photo 1-6. Drop-off area for C&D to the left

Photo 1-7. Elevated picking stations with bays underneath for separated material

The MSW transfer station (Photo 1-8) is located adjacent to the C&D reclamation facility. The garbage trucks back up and dump their material into the pit where a dozer compacts the MSW and pushes it into open-top trailers. The material is then shipped to a contracted landfill located outside of the jurisdiction.

Photo 1-8. San Francisco's MSW Transfer Station

The following day, the tour group traveled to Vacaville, approximately 45 miles north of San Francisco. The compostable material, including food waste, from the City's Fantastic 3 program is composted at the Hay Road facility. The material is transported in a tractor trailer and is emptied using a tipper, as Photo 1-9 illustrates. The material is conveyed to a picking station where contaminants are removed. The compostable material is then ground by an 800-horsepower grinder, screened to size, and placed in rows. Approximately 70 percent of the material is food waste while the remainder is green waste. The materials had originally been placed into a giant bag called an Ag Bag but, a few months before the tour group had arrived, the City transitioned to a Gore-Tex

Photo 1-9. San Francisco's food waste unloaded to be composted

product where the rows of material are covered with the waterproof and breathable material.

The tip fee for the waste coming into the facility was $26.80 at the time of the tour. The compost material sold for $15 per cubic yard.

The University of California in Davis was the next stop to view the experimental anaerobic digestion technology system, “Biogas Energy Project.” There was no operating commercial facility at the time of the tour, however, a contract with a jurisdiction in southern California for a 120-ton-a-day facility is being negotiated.

The operating pilot facility which the tour members saw processes eight tons a day of solid and liquid food, green, and animal waste. The Davis pilot plant is shown in Photo 1-10. The bio-digestion process uses microorganisms to convert organic material into a biogas. This can be further processed into value-added products such as electricity and biofuel.

Photo 1-10. UC Davis Biogas Energy Project

The next day, the group visited the Monterey Regional Waste District, the last stop. The District has won many awards, including two from the Solid Waste Association of North America (SWANA): 1998 Best Integrated Waste Management Facility and the National Outstanding Public Agency Award in 2000.

The District handles disposal and diversion for its region. It constructed a MRF in a 95,000-square-foot building at a cost of $9.6 million. It receives 132,262 tons a year and diverts 61 percent from landfilling. The material delivered to the MRF includes everything but household trash. The material is dropped off, a quick check by the District’s employees is made for reusable material and, if found, it is pulled out. The rest is pushed onto a conveyer that transports the material to elevated picking stations and sorted by workers as shown in Photo 1-11.

Photo 1-11. Monterey MRF picking line


Photo 1-12. Engine generators using methane gas to produce electricity

Green waste is dropped off along the side of the building. It is pushed onto a conveyer and transferred up to a grinder where it is shredded. The District processes 41,000 tons of green waste.

In 1983, the District’s landfill was one of the first to put in an active methane gas collection system into its landfill. At the time of the tour, it had 120 acres with 45 wells collecting 610 million cubic feet of gas per year. Four engine generators (Photo 1-12) utilize the methane-rich landfill gas to produce 4.4 megawatts of power for use on site and to sell to the local utility company, enough to power 4,000 homes. The sale of this power generates $1.5 million in gross revenue to the District a year.


Photo 1-13. Tour members in the Last Chance Mercantile

The District's HHW facility receives 62,248 gallons of material from 9,128 customers a year. It is able to reuse 21,955 gallons of the material. Also, the District recycles 42 tons of car batteries per year.

Adjacent to the HHW facility is the Last Chance Mercantile, shown in Photo 1-13. This facility receives the reusable material from the HHW facility and the MRF and sells it at low prices. It diverts 822 tons annually for a revenue stream of $457,055 from sales.

The District's offices provide an example of green building principles. Its offices are constructed using materials made mostly out of recycled material. Photo 1-14 shows a recycled glass tile floor.


Photo 1-14. Tile floor made from recycled glass in the District's offices

1.6.5 SWRAC Goals

After the tour and presentations, SWRAC developed, through discussion, a series of consensus recommendations to the County's Division. These were outlined in a memorandum to aid the discussion and documented in the SWRAC Minutes. The SWRAC recommendations are as follows:[2]

1. Establish overall objectives for solid waste management.
2. Develop new ordinances and/or statutory authorities for recycling requirements.
3. Plan and implement a hazardous waste materials collection program and facility, including, at a minimum, annual collections from the Hana region, Molokai and Lanai.
4. Develop systems for intra-county and inter-island transportation of solid waste materials.
5. Provide universal curbside collection for all residences served by streets and roads meeting County standards. This would include:
    - Refuse collected once per week in a cart;
    - Single-stream marketable recyclables collected once every other week in a cart;

[2] The SWRAC did not prioritize the recommendations, and the order of presentation does not imply ranking.

- Yard and large green waste collected in cans, paper bags, or bundled, called in by route drivers if within volume and size restrictions and collected every other week;

- Bulky collection on a call-in (appointment) basis within ordinance limits; and

- White goods collection, expanded to include all metals, on a call-in basis.

6. Construct a new, fully enclosed MRF to process the County-collected materials, both curbside and recycling center materials, on the Island of Maui. Single-stream collection will demand a MRF that can process the material. There is no such facility in Maui County. Also, the MRF site should be centrally located, such as Central Maui Landfill or Puunene, and implementation planning for the MRF should start immediately.

   The SWRAC recommended a procurement process incorporating a design, build and operate structure resulting in a long-term service agreement.

7. Reduce landfilling at Hana landfill to a minimum and maintain the permit by limited landfilling, mainly inert materials. This would provide the County with a facility on the east end of Maui, when needed. The waste received each day (four tons) will be transferred back to Central Maui Landfill using two rear-load trucks.

8. Utilize the Hana facility as a staging ground for any storm management operations. This may include stockpiling, processing, and loading debris at the site.

9. Pursue landfill gas utilization. As SWRAC members saw in Monterey, collecting methane gas generated from trash already buried can create energy, revenue, and diminish emissions. If a WTE facility is recommended, it is still recommended to have an active gas collection system to extract the methane resources from the trash already buried. This resource will last decades into the future.

10. Evaluate the feasibility of commercial technology alternative resource management.[3] This recommendation is specifically for the advancement of a Maui County-specific feasibility study utilizing established data and best practices.

11. Expand Olowalu Convenience Center. This new center would include:

    - Convenience center for residential refuse and recycling drop-offs as currently operated;

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[3] A unanimous vote in favor of this with the intent being that the County releases an RFP for this study and that the alternative technologies be reviewed by using the research that Los Angeles County has recently amassed so that Maui is not paying to “reinvent the wheel.” The County and its consultant would digest this new research and then do a feasibility study that is specific to Maui.

- Base yard for County Refuse Collection Section operations serving west Maui;

- Transfer station for MSW, green waste and recyclable materials collected by the County Refuse Collection Section and private collectors.

(The committee foresaw a need to include the infrastructure needed for ingress and egress of the facility.)

12. Evaluate the feasibility of extending the life of the C&D landfill. The committee proposed the evaluation to encourage the County to initiate a strategy to provide for significant C&D diversion, since C&D amounts to approximately 19% of Maui's waste stream.

13. Immediately form a C&D Task Force of all interested stakeholders to provide a forum to discuss: C&D waste generation, on-site waste handling practices and issues, materials markets issues and opportunities, C&D transportation/transfer site issues, state/local regulatory issues and County disposal issues.

14. Review local ordinance changes associated with C&D waste generation and management options that could increase diversion. Consider using Santa Monica, San Jose, and San Francisco, California, and other models for the draft ordinances. These ordinances would apply to the building permit process and mandatory recycling typically conducted through the use of a local C&D processing/recycling center prior to any material being disposed. (Note: this assumes that such a processing/recycling center would be developed). SWRAC included other models so as not to limit the scope of the search of possible ordinances of which Maui could learn from and implement.

15. Contract with the private sector to receive, store and process abandoned autos and discarded appliances rather than the County initiating its own operations on the Island of Maui. The County, however, may be a member in the development of such operations on the Islands of Molokai and Lanai and the Hana region.

    (The intent was to promote private-sector operations unless the private sector created a void of such operations on the islands of Molokai and Lanai and the Hana region.)

16. Pursue revenue streams to cover the cost of doing business such as:

    a. System revenue bonding for major capital investments such as land purchase, MRF, WTE, HHW, collection trucks and carts, etc.

    b. Plan and implement Solid Waste System Benefit Fee and collect via property tax bills

    c. For all properties: covers debt, administration, and funding for non-revenue program requirements

        i. Plus, for those receiving County collection services and using landfills, an additional fee, including possible "Pay As You Throw" fees

ii. Utilize full service contracting for major infrastructure improvements requiring sale of products working toward an Enterprise Fund or Solid Waste Authority in the future.

17. Continue SWRAC involvement with annual review and comment on Plan implementation.

1.7 Governmental Regulations and Policies

1.7.1 Federal

The federal government regulates solid waste in the United States under Title 40 of the Code of Federal Regulations Subchapter 1 (40 CFR 239 to 2999). On October 9, 1993, new federal regulations went into effect for the control of MSW landfills. These regulations are in 40 CFR 258 (also known as Resource Conservation Recovery Act [RCRA] Subtitle D), Criteria for Municipal Solid Waste Landfills.

Under authority of RCRA, the United States Environmental Protection Agency (USEPA) administers Title 40 regulations and enforces solid waste regulations and policies through its Office of Solid Waste (OSW).

Figure 1-1 shows USEPA's hierarchy of integrated solid waste management which is illustrated in the form of a pyramid of ranked approaches. Source Reduction is at the highest (A) level of the pyramid with landfilling at the bottom. Recycling comprises the middle blocks (B & C) followed by combustion with energy recovery (D) above combustion without energy recovery and landfilling (E).

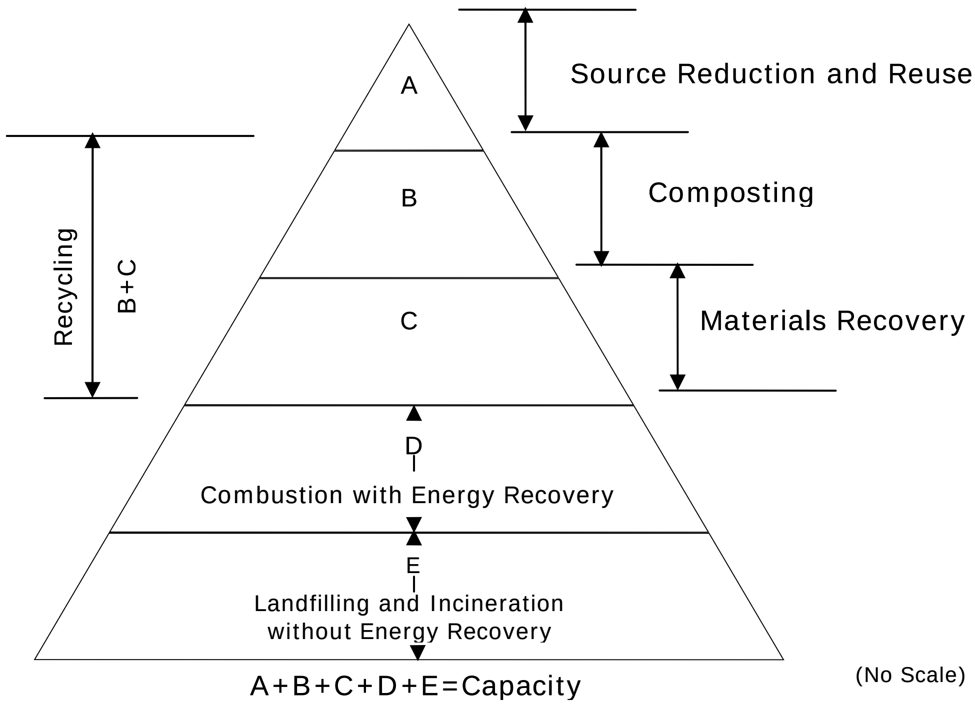
1.7.2 State of Hawaii

The State of Hawaii Department of Health (DOH) houses the Environmental Management Division, which includes the Solid and Hazardous Waste Branch. This Office was established by the Integrated Solid Waste Management Act, Hawaii Revised Statutes (HRS) 342G (attached as Appendix A). The Solid and Hazardous Waste Branch is responsible for implementing solid waste management policies and regulations on the State level. Hawaii Administrative Rules, Title 11, Chapter 58.1 (HAR 11-58.1) regulates landfills, composting facilities, recycling operations, used oil transporters, and salvage yards. HAR 11-58.1 incorporates the provisions of the federal regulations relating to solid waste programs and, thereby, delegated the responsibility for permitting and regulating solid waste disposal facilities to DOH.

The Solid and Hazardous Waste Branch is charged with the oversight of the integrated solid waste management planning as required by HRS 342G. HRS 342G requires that each county shall consider the following solid waste management practices and processing methods in their order of priority: 1) source reduction 2) recycling and bioconversion and 3) landfilling and incineration.

The goals of HRS 342G include the reduction of the solid waste stream prior to disposal by 25 percent by January 1, 1995 and 50 percent by January 2000. The State of Hawaii's 2000 Plan for Integrated Solid Waste Management acknowledged that the 50 percent goal had not been reached but was still practical to attain.

Figure 1-1 – Solid Waste Management Hierarchy[4]



In 2002, the Twenty-first Legislature of the State of Hawaii passed House Bill 1256 that imposes requirements and fees for beverage containers to discourage littering and promote recycling. This is an operating program and is referred to as "HI-5." Beverage containers are redeemable for a refund of a five-cent deposit.

1.7.3 County of Maui

The Division is responsible for overseeing all solid waste management activities within the County. The Division is under the aegis of the new Department of Environmental Management which began operations as of July 1, 2007.

In 1989, the Division developed the County Comprehensive Solid Waste Management Plan. This plan promoted waste reduction, recycling, composting and administrative and enforcement measures.

In response to the State's 1991 ISWMP for the State, the County developed an ISWMP that was approved in 1994. (This plan and its specific recommendations will be referred to throughout this document.)

[4] A reproduction of a figure printed in H. Lanier Hickman, Jr., Solid Waste Collection & Transfer, American Academy of Environmental Engineers Staff, pg. 4

2. Existing and Future Conditions

This chapter provides a background of the County of Maui with its unique natural environment, its expected population growth and waste generation, a review of its landfill activities and, finally, reviews of its collection and recycling programs. The chapter, as a whole, is meant to give a picture of how solid waste is managed on the island.

2.1 Natural Environment

The natural environment in Maui is a major factor in the daily lives of citizens of and visitors to Maui. But it also creates challenges unique to the County both within the State of Hawaii and the nation as a whole.

2.1.1 Geography of the County of Maui

"Paradise" is the noun one hears most when referencing Maui. The waterfalls, forests, the majestic mountain of Haleakala rising 10,023 feet above sea level, and coral reefs, are all on a land mass surrounded by brilliant blue water under a canopy of tropical climate. "Paradise" appears constant even as Haleakala, the tallest mountain on Maui, frequently has temperatures dipping below freezing as year-round sunbathers lay out on the beaches below.

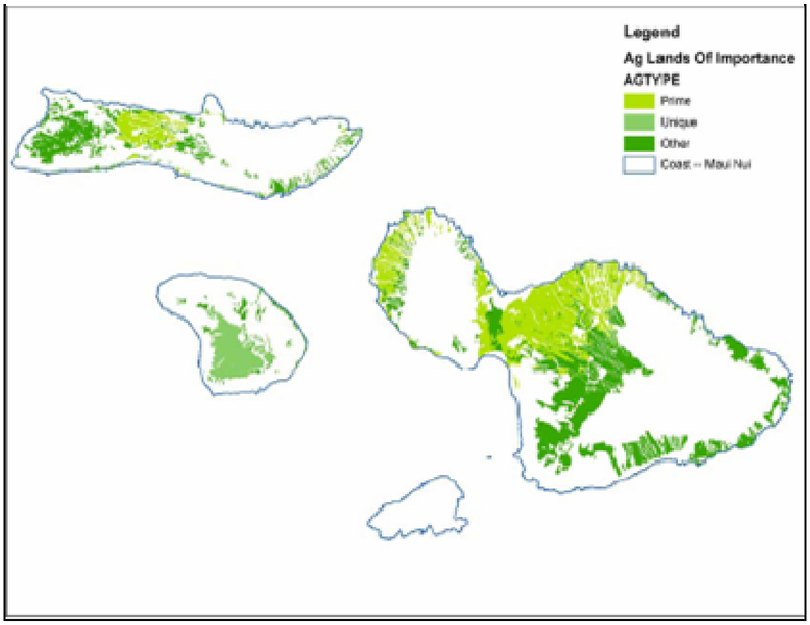
Many visitors do not realize that the County consists of four islands: Maui, Molokai, Lanai and Kahoolawe. Not being interconnected by land makes it different than most counties in the United States. The waters immediately encircling the islands that make up the County are known to be no more than 300 feet deep. Yet, just ten miles off of the southwest coast of Lanai depths of 14,000 feet can be found.

The four islands are actually connected as one large land mass known as Maui Nui. "Nui" means "great/large" and defines a Maui that nearly 1.2 million years ago was 50 percent larger than the present-day Island of Hawaii. Over the hundreds of thousand of years, however, the weight of the volcanoes, erosion, and the rising height of the sea water has caused much of Maui Nui to be blanketed by the sea leaving only half of the land mass visible, today.

The County is the second largest of the four Hawaiian counties. It comprises a total of 1,175 square miles of land. Maui Island has 728.6 square miles, Molokai has 260.9 square miles. Lanai has 140.4 square miles, and Kahoolawe has 45 square miles.[1]

[1] Maui County Data Book, 2002.

Agricultural lands of the County have traditionally been a resource to its inhabitants. The State Department of Agriculture has a land rating system that analyzes soil productivity, water retention, erosion, chemical make-up and factors favorable for root growth. There are three land classifications that have been determined to be valuable for agricultural purposes: (1) "Prime" land that has the best physical, chemical, and climatic properties; (2) "Unique" land that is suited for high-value crops such as coffee; and (3) "Other" that may have a convenient location because of access to water but is not as productive as the other two. The map illustrates these three land categories in Maui County.



2.1.1.1 Island of Maui

Maui Island is the second largest island of the main Hawaiian Islands. It, along with the other islands in the County, was formed by volcanic activity. Specifically, two volcanic cones, Puu Kukui and Haleakala, flowed and united in the central valley. West Maui is geologically older than East Maui as evidenced by the lack of canyons and volcanic lava and cinders.

The trade winds blow in from the east and northeast and, consequently, those shores receive more rain than those on the west side of the islands. Thus, the rainfall varies within, as well as among, the islands that make up the County. The eastern side of Haleakala, between the 2,000 and 4,000 foot elevations, has a median annual rainfall between 200 and 300 inches. In the central Maui town of Kihei, however, only 10 inches of rain fall a year. The majority of the storms that affect Maui Island approach it from the Hana region. This area is difficult to get to during any time but especially if storms have hit the shores in the east.

2.1.1.2 Island of Molokai

The Island of Molokai is the fifth largest island of the main Hawaiian Islands. It consists of two volcanoes, Mauna Loa to the west and Kamakou, Molokai's highest peak at 4,970 feet, in the east, whose lava filled the Hoolehua Saddle. Toward the end of its geological development, the island's eastern volcano slid into the ocean, creating sea cliffs that are known to be the tallest in the world.

Molokai is 38 miles from the east to the west. On the east side of the island is a high plateau of 4,970 feet on Kamakou peak. In the high elevation areas, the native Ohia

Lehua trees are the mainstay. In the east, the Nature Conservancy has two preserves, Kamakou and Pelekunu.

Flowing water from Molokai's upland gulches of Kaunakakai, Kawela, and Kamaloo deposited sand, silt, and clay on the southeastern edge of the island. This rich soil, springs, and streams, as well as the natural protection afforded the shore by the broad reef platform, made this area especially inviting to humans.

Molokai has an average temperature of 74 degrees F and fluctuates between 6 and 7 degrees on either side of that number. The average rainfall in Molokai is 20 inches in the central area, 20 inches in the western portion, and 35 inches in the east. Once or twice a year, the Kona storms drop 8 to 10 inches on the south side of the island.

2.1.1.3 Island of Lanai

The Island of Lanai's tall Cook Pine trees are seen on most ridge tops. They are currently about 100 feet tall and only one-third through their growth cycle. The height of the tree allows it to capture moisture from the clouds in an area that feels the effects of being in the rain shadow of Maui Island's Mount Haleakala and its West Maui Mountains. This means that Lanai is dry with miles of arid land.

Lanai is only 13 miles wide by 18 miles long but is the 42nd largest island in the U.S. Its park-like environs illustrate the ramifications of initiating a non-native species. In the 1920s, 12 Axis deer were released on Lanai where no deer had been before. With no known predators, there are, today, thousands of such deer on the island. Non-Polynesians introduced numerous species of birds to Lanai and the other islands. The Rio Grande turkeys were the first such birds. Wild chickens and peacocks roam the uplands and the area north of Lopa. Lanai is a destination for hunters.

As with Maui and Molokai, volcanic development created Lanai, but unlike its two neighbors, it had just one volcano.

2.1.1.4 Island of Kahoolawe

There is a fourth, but uninhabited, island within the County called Kahoolawe. Located just seven miles off the southwest coast of Maui and southeast of Lanai, Kahoolawe is the eighth largest island in the Hawaiian chain.

The island lacked fresh water and, over time, had become a dry, grass-covered area with few trees. King Kamehameha III replaced the death penalty with the punishment of exile to Kahoolawe. As a result, a male penal colony was founded on the island circa 1830. The lack of food and water on the island caused many to starve. In 1853, the punishment of exile was terminated.

The island has seen an ever-increasing erosion of its limited natural resources. Cattle were placed on the island beginning in 1858 that denuded the island further and made it susceptible to the strong trade winds blowing the topsoil off the island, leaving behind a red hard pan. The Hawaiian territorial government attempted to restore the island's vegetation between 1910 and 1918 but with little success, so it leased the property for the next 21 years to Wyoming rancher Angus MacPhee and the Maui landowner Harry Baldwin. The two used it as a cattle ranch with varied success.

In 1941, the two lease holders subleased it to the U.S. Army where troops were trained in the art of invading an island during the cover of military shelling. The island was continually used as a military training target throughout World War II, the Korean War, and the Cold War.

A group known as Protect Kahoolawe Ohana (PKO) filed suit in 1976 to stop the military's use of the island as a location for military training. The Federal District Court for the District of Hawaii ruled, in 1977, that the military could continue its training but had to prepare an environmental impact statement and complete an inventory of historic sites on the island. On March 18, 1981, the island was added to the National Register of Historic Places. In 1990, President Bush ordered an end to the live-fire training on the island by the U.S. military.

Hawaii's Senator Daniel Inouye sponsored Title X of the 1994 Department of Defense Appropriations Act that not only transferred Kahoolawe to the State of Hawaii but called for the clearance of unexploded armaments and environmental restoration of the island. The military has spent approximately $400 million as of 2003, but the work is still not complete.

The Island of Kahoolawe is technically under the aegis of the Kahoolawe Island Reserve Commission and not the County of Maui. This commission is currently working on a plan to control erosion, rebuild vegetation, recharge the water table, and reintroduce native species. Kahoolawe is not, however, within the scope of this ISWMP.

2.1.2 Conditions Unique to County of Maui

The County is alone among the State of Hawaii's counties to have multiple inhabited islands. This creates interesting issues for the Division in terms of allocating equipment and managerial oversight. Operationally, for example, woody waste would be ground at a central facility or, at the most, two facilities, as is done in the County of Hawaii, but in the County of Maui wood debris is accumulated on the islands of Lanai, Molokai, and on Maui both at the Central Maui Landfill and Hana Landfill. Purchasing a grinder for each of the facilities involves a large capital outlay. Transporting a grinder from one location to the next operationally is very expensive, as well, because of the use of private barging.

The spatial separation by water also causes problems in the allocation of human resources. On the Island of Molokai, for instance, there currently is not enough solid waste work to justify a full-time solid waste employee to handle the collection of trash. This work is done by employees of the Highways Division within the Department of Public Works, yet, they use the equipment of the Solid Waste Division. The same is true in Hana.

Many jurisdictions in the United States that have rivers or lakes within their jurisdictions will have water transports owned and operated by those jurisdictions; the County, with its three inhabited islands, does not. The cost of doing the Division's work increases because of the noncontiguous land mass and the lack of regular transportation available to the County to support its operational functions, such as solid waste collection.

2.2 Human Environment

2.2.1 Planning Period

The scope of time for the planning is 20 years. Chapter 13 of this ISWMP reviews the scenarios that the County has assembled to compare operational and capital costs of each scenario's components. However, this financial analysis is carried to the year 2042,[2] using FY2006 as the base year. The population projection was taken directly from the Maui County 2030 General Plan (2030 Plan).[3] Waste generation figures are based directly off past generation figures and advanced with the population figures from the County's 2030 Plan. Other projections included herein are carried out to the year 2030.

2.2.2 Population Projections

The beautiful vistas and comfortable lifestyle have helped Maui County grow at a faster rate than the State of Hawaii as a whole. Between 2000 and 2004, the County's population grew at 9.2 percent compared to the State's 5.3 percent. This trend is not new. Between 1990 and 2000, Maui County's population increased by 26.2 percent compared to a statewide increase during the same period of 8.9 percent. Table 2-1 shows the historical change of population over time on the islands of Maui, Molokai, and Lanai.

[2] Initially, 20 years was chosen; however, in order to evaluate scenarios relative to the longest landfill life of a scenario, the year 2042 was chosen by the County.

[3] See the County's 2030 Plan at the following website: http://www.co.maui.hi.us/departments/Planning/gp2030/index.htm

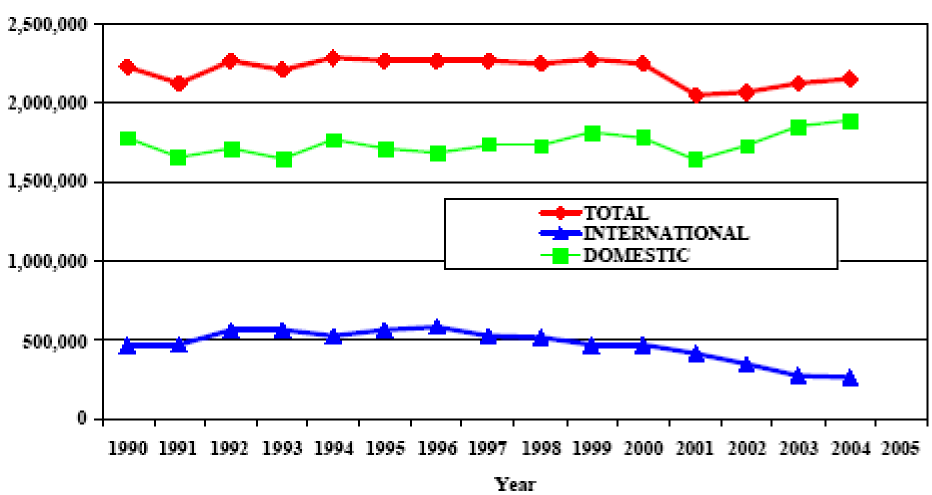
Table 2-1 - Population History Changes

Area	Population			Percentage Change		
	1980	1990	2000	1980-1990	1990-2000	1980-2000
Maui	70,84	100,37	128,09	42%	28%	81%
Hana	1,423	1,895	1,855	33%	10%	30%
Makawao	19,00	29,207	36,476	54%	25%	92%
Wailuku	321,1	45,685	61,346	42%	34%	91%
Lahaina	10,28	14,574	17,967	42%	23%	75%
Molokai	5,905	6,587	7,257	12%	10%	23%
Lanai	2,119	2,426	3,193	14%	32%	51%

Maui County Data Book, 2000.

Within the State of Hawaii, visitors to Maui Island are second in number only to those who visit Oahu. The chart below, Figure 2-2, shows the historical number of visitors from both within the United States and from other countries. The chart illustrates a return from a sharp downward trend after the terrorist attacks on September 11, 2001, in the U.S. Maui, as other places, is experiencing higher numbers once again as the chart below illustrates.[4]

Figure 2-1 - Historical Annual Visitation to Maui



Projecting to 2030, the County's Planning Department estimates that the population of residents in the County is projected to increase from approximately 150,000 in 2000 to 200,000 in 2030. In addition, visitors to the County are projected to increase to over 70,000. In the County's 2030 Plan, the County forecasts that the rates of growth in resident population, housing, and jobs are higher than the rate of growth for visitors. This is expected to result in an economy more diversified and less driven by tourism than in the past. The number of wage and salary jobs is expected to increase by 1.7 percent a year while per-capita income will increase very little.

[4] The data come directly from the August 8, 2006 "Maui County Tourism Strategic Plan: 2006 – 2015," page 8.

Table 2-2 shows the population projections (resident inhabitants and visitors), the number of households, and number of jobs for each of the three inhabited islands in the County. The table also sums the individual islands into a County total.

Table 2-2 - Demographic Projections 2030[5]

Area	2006	2030 Forecast	Numeric Change	2006-2030 Growth (%)
Population				
Lanai	3,452	4,901	1,449	42%
Molokai	7,127	8,395	1,268	18%
Maui Island	129,471	186,254	56,783	44%
Maui County	140,050	199,550	59,500	42%
Visitors				
Lanai	1,224	1,827	603	49%
Molokai	909	1,349	440	48%
Maui Island	45,676	68,194	22,518	49%
Maui County	47,809	71,370	23,581	49%
Households				
Lanai	1,285	1,955	670	52%
Molokai	2,382	3,006	624	26%
Maui Island	45,474	70,058	24,584	54%
Maui County	48,141	75,018	26,878	53%
Employment				
Lanai	2,257	3,204	947	42%
Molokai	2,720	3,731	1,011	37%
Maui Island	81,420	109,777	28,357	35%
Maui County	88,397	118,712	30,316	36%

2.3 Solid Waste Stream

2.3.1 Sources

This section describes the waste stream in the County and forecasts future disposal levels. The County's waste disposal trends and corresponding historical population data were used to forecast solid waste needs.

The total waste stream is defined as tons of solid waste disposed and recycled in Maui County. Most types of solid waste are disposed in landfills, while some are recycled, used as soil amendment, or disposed in sites designated for specific wastes.

The County's largest component of the waste stream is mixed municipal solid waste (MSW). This is generally disposed at landfills. It typically consists of waste generated by residences, offices, and other businesses and institutions but excludes wastes generated from industrial facilities or construction and demolition activities that

[5] "Socio-Economic Forecast: The Economic Projections for Maui County General Plan 2030" Maui County Planning Department, June 2006, pp. I-II.

generate wood and inert wastes. It also excludes biomedical wastes, sludges, septic tank pumpings, derelict vehicles, and tires.

At times, the sources of the quantities are estimates because not each facility has scales to weigh incoming and outgoing trucks. Fortunately, the largest of the County's facilities, the Central Maui Landfill, uses scales and can therefore provide reliable figures. The landfills in Hana and Lanai, however, estimate quantities.

2.3.2 Quantities

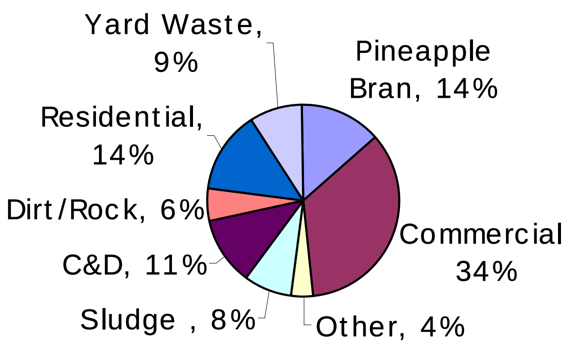
Waste generation is influenced by various demographic and economic factors including changes in levels of employment and personal income, the value of recyclable materials, the price of disposal services, changes in product design and packaging, and changes in behavior affecting waste reduction and recycling levels. Some of these factors are difficult to measure over time while others are interrelated. Using them in a statistical analysis lowers the accuracy of the forecasts. For these reasons, the forecasts used are based on the number of households for residential waste and the employment for commercial waste.

The base forecast shows that the amount of waste disposed in the County, without taking into account the projected increase in recycling, is expected to rise from the current 220,000 tons by 30 percent. These data translate to a per-capita waste disposal rate of nine pounds per person per day during the planning period. Projections of waste generation and recycling are discussed and presented in tabular form in Section 2.3.5.

2.3.3 Composition

The composition of the waste stream is important for determining a baseline of activity. Maui County's 1994 ISWMP looked at its 1989 waste stream composition and compared it to Kauai County's 1990 waste stream study. The 1989 waste stream composition is shown in Figure 2-2.

Figure 2-2 – Maui 1989 Waste Stream Composition



In 1994, the County conducted two waste composition audits at the Central Maui Landfill. Figure 2-3 shows the results of this audit of materials that were collected from residential and commercial customers in the County and brought into the facility by private haulers. Figure 2-4 shows the results of the analysis of waste dropped off by self-haulers, people bringing the material to the landfill directly from their homes and businesses. The two categories that show significant differences between the materials brought in by private haulers and those brought in by the self-haulers are "Other" and "Paper."

The County decided a new physical waste sort was not required at this time. The 1994 study was reviewed in conjunction with other recent sorts, such as the 2006 Kauai study and the 1999 California statewide study, and the characteristics are consistent and within the normal variability.

Construction and demolition (C&D) waste constituted 15 percent of the "Other" material that self-haulers brought in compared to just four percent by the private haulers. Since 1994, C&D waste has been banned from the Central Maui Landfill and goes to a private landfill on Maui.

Figure 2-3 - Maui 1994 County and Commercial Hauled: Residential and Commercial (ICI)[6]

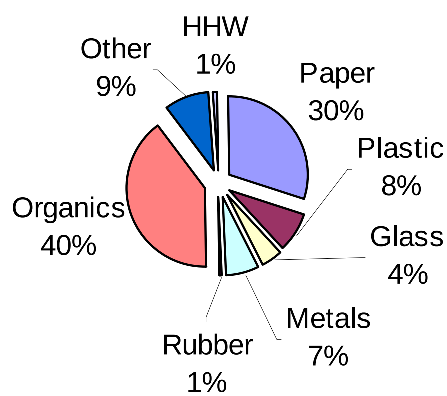
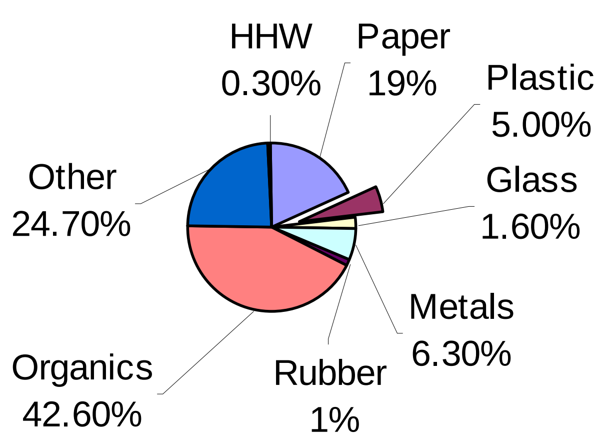


Figure 2-4 – Maui 1994 Waste from Self-haulers: Residential & Commercial (ICI)



[6] ICI stands for Industrial, Commercial, and Institutional

2.3.4 Diversion Rate

The materials diverted from landfill disposal in the County include the traditional materials collected in curbside and drop-off programs. These include newspaper, cardboard, magazines and other paper, as well as metal cans and bottles made of glass and plastic. In addition, the County currently diverts green waste and other woody organics, scrap metal, tires, batteries, used motor oil, and other fats and oils. These materials are collected and recycled by both the County and private businesses. In 2006, the County generated a total of 345,000 tons of solid waste. In addition, 21,000 tons of biosolids were generated and recycled into compost. Of these quantities, a total of 124,000 tons of material were diverted from landfilling and recycled. This resulted in a diversion rate of 30.6 percent. Table 2-3 provides a history of the diversion rate for the County.

Table 2-3 – Diversion Rate History

2001	2002	2003	2004	2005	2006[1]	2007
33.2%	26.9%	34.3%	31.8%	30.8%	30.6%	36%

[1] Fiscal Year 2006 is the base year for the ISWMP.

2.3.5 Waste Generation Projections

Solid waste is generated by normal human activities associated with work and home life. This dichotomy corresponds to the convention used in solid waste planning that divides solid waste into two categories based on the type of generator: (1) residential and (2) commercial. This categorization is independent of what entity does the actual collection of solid waste. In Maui County, some residents have their solid waste collected by the Department of Environmental Management, some contract directly with private waste firms and some haul their own waste to the collection points. The businesses in the County contract with private firms or haul their own solid waste to transfer/disposal points.

Residential solid waste includes all waste generated from residences, both single-family and apartments (multi-family dwellings). Residential solid waste includes all types of waste materials that can be mixed together or separated, including food waste, paper (newspaper, magazines, junk mail, packaging, etc.), containers of plastic, glass or metal, yard trimmings, old appliances, tires and many more items and/or materials. These become solid waste when the owner no longer feels that they have utility and wants to get rid of them even though some may still have useful life.

Commercial solid waste is generated from businesses and other entities where people are employed. Commercial entities generate essentially the same materials as those discarded by residential generators, including office paper, cardboard, other papers and containers.

Industries produce specialized process wastes. An example of a process waste is sugar cane bagasse produced as a waste product from sugar making. Like many process wastes, sugar cane bagasse is managed separately from the general commercial solid waste. Bagasse generated in the County is burned for energy in the sugar factory's power plant. This analysis will evaluate the solid wastes generated by the residential and commercial generators but will not include industrial wastes such as bagasse.

The County is a popular tourist destination and, therefore, has many dwelling units that are leased to visitors for varying lengths of time. These dwelling units generate solid waste as do those occupied by permanent residents. The issue becomes how this waste should be categorized. The Maui County Planning Department makes the distinction between permanent residents and temporary ones in its 2030 Plan. This solid waste analysis will follow this convention. Solid waste characterized as Residential Solid Waste will be generated by residences or housing units occupied by permanent residents, which can include single-family dwellings, townhouses, and apartments. The solid waste generated by visitors will be included with the solid waste from other commercial generators even though they can be staying in the same types of buildings.

Solid waste generation includes all the waste produced in a residence or business, including that which is reused or recycled as well as that which is disposed in landfills. To determine the total quantity of solid waste generated in the County, the solid waste that is disposed, reused, and recycled must be identified and added together. This includes solid waste disposed in the five landfills, recycled by the recycling facilities, public and private, composted in the composting facilities and redeemed for cash by the HI-5 program. This was done for Fiscal Year[7] 2006, the base year, and is shown in Table 2-4, which identifies the different facilities and programs that manage the solid waste generated in the County.

Table 2-4 - FY2006 Total Solid Waste Quantities

Program or Facility	Waste Material	Quantity (Tons)
Central Maui Landfill[1]	MSW, recyclables, special waste	213,993
Lanai Landfill	MSW, recyclables, special waste	5,355
Molokai Landfill	MSW, recyclables, special waste	10,868
Hana Landfill	MSW, recyclables, special waste	1,618
Maui C&D Landfill	Construction & demolition wastes	50,000
County Recycling Centers	Containers, paper & plastic bags	2,267
EKO Compost Facility[1]	Yard waste, sludge, wood, etc.	54,253
Maui Earth Compost	Yard waste, wood, etc.	4,000
HI-5 Redemption Program	Containers	110
Aloha Glass Recycling	Glass containers	5,400
Maui Disposal Recycling	Aluminum, fibers, glass, bimetal	7,233
Kitagawa's Towing	Scrap autos, appliances, etc.	5,300
SOS Metals	Scrap autos, appliances, etc.	0[2]
Other Recycling		3,300
TOTAL TONS		363,697
TOTAL POPULATION		140,050
PER CAPITA GENERATION (TPY)		2.6

[1]The report shows 268,246 tons which has been reduced by assigning the 54,253 tons to EKO Compost.
[2]SOS Metals was not operating in the base year and now has the County contract.

[7] Fiscal years are from July 1 through June 30.

The total solid waste generated in the County in FY2006 as shown in Table 2-4 was approximately 366,000 tons, which includes biosolids or sewage sludge. This will be used as the base line number from which waste generation will be estimated. The per-capita generation of solid waste, including recycling and disposal, in the County in FY2006 was 2.6 tons per person per year[8] or 14.3 pounds per person per day. This is three times the 4.6 pounds per person per day that USEPA shows as the nationwide waste generation rate.[9] Of this solid waste generated in FY2006, 30.6 percent were recycled or composted and found new uses.

2.3.5.1 Maui Projected Summary Waste Generation

The summary projections for MSW generation for each island in the County through 2030 are shown in Table 2-5. Table 2-5 does not include recycled materials or special wastes, which will be addressed separately. These results of the solid waste projection model separately estimate the quantity of waste generated from residences and from commercial sources. The increases in waste generation are primarily a result of increases in population and employment during the planning period as is discussed in later paragraphs. As noted above, not all the solid waste generated is destined to be disposed in Maui's landfills because a large portion will be reused, recycled, composted or otherwise diverted from disposal.

[8] 2.6 tons per person is 365,964 tons divided by 140,050 population.

[9] Municipal Solid Waste in the United States: 2006 Facts and Figures, USEPA, 2007.

Table 2-5 - Summary of Mixed Solid Waste Projections

	2005	2010	2015	2020	2025	2030
Lanai						
Residential Waste Generation	2,174	2,394	2,631	2,843	3,075	3,308
Commercial Waste Generation	2,864	3,089	3,341	3,532	3,746	3,966
Total Waste	5,038	5,484	5,972	6,375	6,821	7,275
Molokai						
Residential Waste Generation	3,716	3,861	4,061	4,246	4,465	4,689
Commercial Waste Generation	3,775	4,014	4,270	4,465	4,720	4,975
Total Waste	7,491	7,875	8,331	8,711	9,185	9,664
Maui						
Residential Waste Generation	104,394	116,537	125,720	137,163	149,058	160,887
Commercial Waste Generation	98,913	104,411	109,971	115,707	121,650	127,903
Total Waste	203,307	220,948	235,691	252,870	270,708	288,790
County of Maui						
Residential Waste Generation	110,285	122,793	132,412	144,252	156,598	168,885
Commercial Waste Generation	105,552	111,513	117,583	123,704	130,116	136,844
Total MSW	215,836	234,306	249,994	267,956	286,713	305,729

2.3.5.2 Maui Projected Growth

Generation of solid waste in the future will depend upon the number of people or families living in the County and on the level of business and other productive activity. In the 2030 Plan, the Planning Department has estimated the growth in population, households, and employment for the planning districts in the County for the years 2010, 2015, 2020, 2025 and 2030. These projections, shown in Table 2-6, will be used to project the solid waste generation for the ISWMP which is looking at essentially the same planning horizon.

Table 2-6 - Population and Employment Projections

	2005	2010	2015	2020	2025	2030
Population	140,050	151,301	162,599	174,450	186,850	199,548
Households	49,140	54,646	58,912	64,136	69,590	75,020
Average Family Size	2.85	2.77	2.76	2.72	2.69	2.66
Jobs/Employment	66,723	70,478	74,298	78,162	82,201	86,438

It can be seen in the table that the population and the number of households are projected to increase during the next 20 years by 32 and 37 percent, respectively. Also, the number of jobs is expected to increase over the same period by 23 percent. These projections are used to project the quantity of solid waste generated in the County over the next 20 years.

As mentioned above, the Planning Department made individual growth projections for each of the eight planning districts that make up the County. These planning districts are: Lahaina, Kihei-Makena, Wailuku-Kahului, Makawao-Pukalani-Kula (Upcountry), Paia-Haiku, Hana, the Island of Lanai and the Island of Molokai. These planning districts correspond reasonably well with the solid waste collection areas used by the Department of Environmental Management. Individual growth projections were therefore developed in the solid waste generation model for these planning districts.

The Planning Department broke the overall Jobs/Employment summary into nine individual job or employment categories with Services broken into two subcategories: Hotels and Other Services. The nine job categories are:

1. Agriculture
2. Manufacturing
3. Construction
4. Transportation, Communications & Utilities
5. Trade
6. Banking and Finance
7. Services
8. Government
9. Self-employed Jobs

Jobs and employment were projected for each of these categories separately by the Planning Department, and, in most planning districts, the different categories were projected to have different growth rates. The growth in commercial waste was matched to the overall growth in employment in each district with one exception. Construction employment differed from the general trend with the number of construction jobs projected to decline in several areas.

2.3.5.3 Residential Waste Generation Rate

The residential waste generation rate is generally expressed on a per-capita and per-household basis. For example, waste generation can be shown as pounds per person per day or tons per household per year. For the Maui County projection model, the household generation rate was chosen and is expressed as tons of solid waste generated per household per year. A separate household generation rate was developed for four of the planning districts in the County: Lanai, Molokai, Hana and the remainder of the Island of Maui. Based on the disposal data from the base year, these districts were different enough to warrant their own rates. As previously mentioned, some residential solid waste is collected by the County and some by private collection companies. The solid waste collected by the private companies is a mixture of residential and commercial waste so the landfill records do not provide a clear quantity of residential solid waste. Therefore, the waste generation, waste disposed and recycled, for each household was estimated by dividing the waste quantity collected by the County for each district by the number of households served by County collection. This resulted in a distinct residential rate: Tons Per Year (TPY) of solid waste per household. This residential solid waste generation rate was multiplied by the total permanent households in each district to estimate the total residential solid waste for each year. The residential solid waste generation rate for each district is shown in Table 2-7.

2.3.5.4 Commercial Waste Generation Rate

The residential waste generation rate was determined for the base year and applied to the future years in the planning period. A commercial solid waste generation rate was also estimated. These generation rates are expressed as tons of solid waste generated per employee per year. The generation rates vary depending on the nature of the business activity. For example, government employees generate less than one-half ton of solid waste per year while construction workers generate several tons of solid waste each year. This is one reason that construction and demolition wastes are treated separately in this ISWMP. Also, as mentioned earlier, construction employment is projected to decrease as well as increase as projected by the 2030 Plan. In addition, the solid waste generation varies from district to district in relation to the employment. This was particularly important in Hana, Lanai and Molokai. The commercial generation rate was estimated by subtracting the residential solid waste from the total for each district and dividing by the number of employees. The resulting commercial generation rates are shown in Table 2-7.

Table 2-7 - Waste District Generation Rates

Planning District	Residential Generation Rate (ton per household per year)	Commercial Generation Rate (tons per employee per year)
Lanai	1.69	1.63
Molokai	1.56	1.83
Hana	1.7	0.47
Maui (less Hana)	2.3	1.58

2.3.5.5 Solid Waste Recycled

Once the total solid waste generated on Maui was projected as discussed above, the next step was to project the amount of waste that would be recycled for the Status Quo. The recycling in this case is limited to the materials collected in traditional curbside and drop-off programs, i.e., paper of all kinds including cardboard and containers. Other materials, such as yard waste and special wastes, are recycled, and they are addressed separately. The traditional recyclable materials were identified and summed for all County and private programs for the base year of FY2006. These include the County recycling centers, the HI-5 program from all sites in the County both public and private, and the private recycling collected from businesses and residents. The quantities of recycled materials from the various programs in the County for FY2006 are shown in Table 2-8. Maui has a separate glass recycling program for restaurants which send glass containers to the Aloha Glass Recycling facility. In addition, glass is collected at County facilities and included in these quantities. These materials totaled approximately 19,000 tons in FY2006 or 5.5 percent of the total solid waste generated.

Table 2-8 – Traditional Materials Recycled in FY 2006

(Glass, Plastic, Metal Containers and Paper)

Recycling Program	County Recycling Centers	County Landfills	HI-5 Program	Aloha Glass Recycling	Maui Disposal Recycling
Quantity in Tons	2,267	73	110	5,400	7,233

Next, this quantity of material was used to estimate the recycled quantity for FY2005 and projected forward, shown in Table 2-9, using the residential growth rates. For the Status Quo projection in Table 2-9, the projection model assumes that recycling on

Maui, Lanai and Molokai is going to stay at the same rate as it was in FY2006, the base planning year. Additional scenarios will be developed based on the assumptions associated with the implementation of various alternative programs incorporated into the ISWMP.

Table 2-9– Summary Status Quo Recycling Projections

	2005	2010	2015	2020	2025	2030
Traditional Materials	18,398	20,465	22,064	24,024	26,069	28,106

2.3.5.6 Special Wastes

Biosolids

Included in the special wastes category is biosolids or sewage sludge. In FY2006, the Wastewater Reclamation Division produced approximately 22,000 tons of biosolids that were delivered to be composted at the Central Maui Landfill as discussed below. The County of Maui and EKO entered into a contract in 1995 where the County agreed to pay EKO on a per ton basis to receive and process the biosolids with green waste. The County provides a site for EKO at the Central Maui Landfill for co-composting. EKO is responsible for marketing the product.

Fats, Oil, and Grease

Fats, oil and grease (FOG) are processed into biofuel by Pacific Biodiesel. In 1995, the company entered into a contract with EKO and established a plant at the Central Maui Landfill. It has a facility to take FOG and convert approximately 5,000 tons into 200,000 gallons of fuel for diesel engines.
Adding FOG and Biodiesel

Construction and Demolition Wastes

Theses materials, commonly referred to as C&D wastes, or just C&D, are generated during the construction and/or destruction of buildings, bridges, and other structures. They are also generated in renovation projects. When renovation projects are small and performed by the householder, the materials can become part of the municipal waste stream. C&D waste can be composed of concrete and masonry, wood, roofing materials, gypsum wallboard, plastics, metals from reinforcing bar, cooling and other equipment, cardboard and other materials. Most of these can be recycled, and some communities are achieving 60 to 70 percent recycling of these materials.

C&D is banned from the Central Maui Landfill. Citizens and contractors take their C&D waste to a private landfill. There has been some recycling of specific projects, and the remainder has been disposed in the County's four landfills. In FY2006, approximately 50,000 tons of C&D were disposed in the private landfill. The baseline C&D projection is shown in Table 2-10.

Green Waste

Most of the green waste and other woody wastes are received at the Central Maui Landfill and processed by the County's contractor, EKO Compost Company (EKO). The materials are shredded and combined with the biosolids from the Wastewater Reclamation Division to make compost. The excess is available as mulch. In addition, green waste is processed into mulch and compost by private operators in the County, including Maui Earth Compost. This processing results in this material being recycled. A small quantity of the green waste in the Lanai, Molokai and Hana regions is landfilled. In FY2006, approximately 32,000 tons of green waste was recycled and disposed. The baseline green waste projection is also shown in Table 2-10.

Scrap Metal

Scrap metal consists primarily of abandoned automobiles and appliances. These two streams are collected separately and brought together for processing. The fluids, including CFCs, are removed and the materials are crushed. The County has ongoing contracts for collection, processing and marketing of the scrap metal so that this material is recycled. In FY2006, approximately 6,700 tons of scrap metal was recycled. The baseline scrap metal projection is also shown in Table 2-10.

Other Recyclable Materials

This category includes a variety of recyclable materials that has been combined because their quantities are small. Materials included are vehicle tires, lead acid batteries, used motor oil and others. In the Other category, the largest single material is fats that are made up of cooking oils, cooking grease and grease trap cleanings, which totaled approximately 6,000 tons in FY2006. These fats were all sent to Pacific BioDiesel in Kahului to be refined into biodiesel. In FY2006, approximately 6,200 tons of Other Recyclable Materials were recycled. The baseline projections for these are also shown in Table 2-10.

Asbestos

Asbestos is a special waste that needs special handling to be disposed. In FY2006, approximately 1,000 tons of asbestos were disposed in the County landfills. The baseline projection for asbestos is also shown in Table 2-10.

Table 2-10 - Summary Base Case Special Waste Projections in Tons

	2005	2010	2015	2020	2025	2030
Boisolids (Sewage Sludge)	21,647	23,448	25,199	27,036	28,958	30,926
Construction and Demolition Wastes	51,162	52,664	53,153	53,168	53,168	53,153
Special Waste - Asbestos	1,085	1,121	1,210	1,320	1,434	1,548
Green Waste Plus Compostables	60,407	67,220	72,441	78,898	85,629	92,328
Scrap Metal - Cars, appliances, propane tanks, etc	5,400	6,005	6,474	7,048	7,648	8,244
Other Recyclable[1]	18,907	21,027	22,664	24,676	26,775	28,865

[1]Includes grease trap wastes and cooking oils converted to biodeisel.

2.3.5.7 Solid Waste Disposed

Once the total solid waste generated and the solid waste recycled in Maui County were projected as discussed above, the amount of solid waste that would require disposal is the difference. The summary values for solid waste that is projected to need disposal during the planning period are shown in Table 2-11. In addition, Table 2-11 shows the projections, for the Status Quo, of the quantities of solid waste expected to be generated and recycled through the year 2030. This projection maintains the County's current baseline recycling rate of approximately 33 percent and disposal rate of 67 percent throughout the planning period.

Table 2-11 - Solid Waste Projections (TPY)

	2005	2010	2015	2020	2025	2030
Lanai						
MSW Generated	6,439	6,924	7,470	7,931	8,441	8,959
Materials Recycled	1,401	1,441	1,498	1,556	1,620	1,684
MSW Disposed	5,038	5,484	6,030	6,433	6,884	7,339
Molokai						
MSW Generated	12,350	12,881	13,556	14,145	14,865	15,598
Materials Recycled	4,505	4,637	4,837	5,029	5,254	5,487
MSW Disposed	7,846	8,919	9,308	9,836	10,344	(5,487)
Maui						
MSW Generated	356,188	387,267	411,579	440,065	469,642	499,381
Materials Recycled	102,104	113,966	122,943	134,125	145,749	157,309
MSW Disposed	254,084	273,301	297,612	317,122	335,516	353,632
County of Maui						
MSW Generated	374,977	407,072	432,605	462,141	492,947	523,938
Materials Recycled	108,009	120,045	129,279	140,710	152,624	164,480
MSW Disposed	266,968	287,703	312,950	333,391	352,745	355,484

2.4 Solid Waste Management System[10]

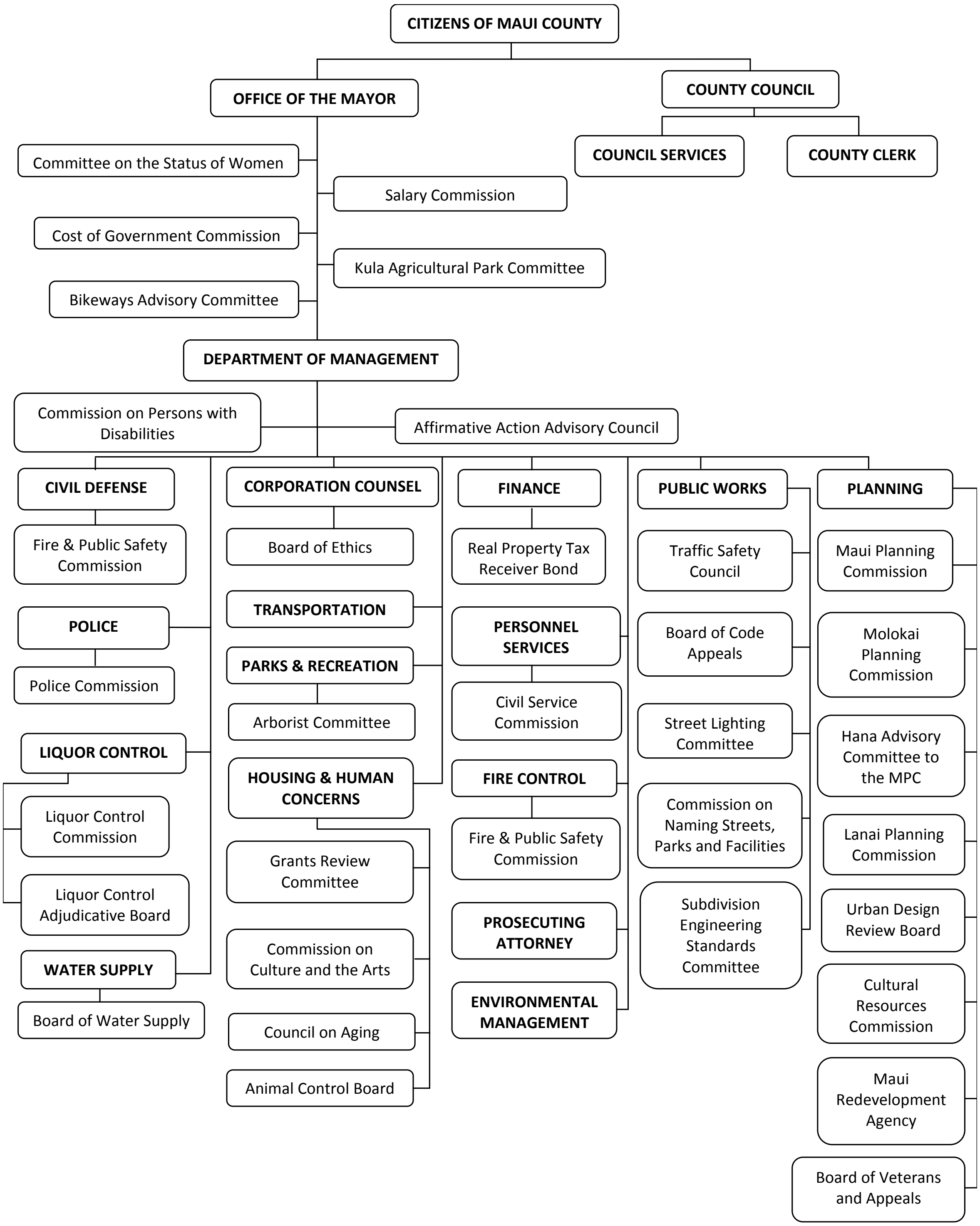
2.4.1 Current Organizational Structure

2.4.1.1 New Department

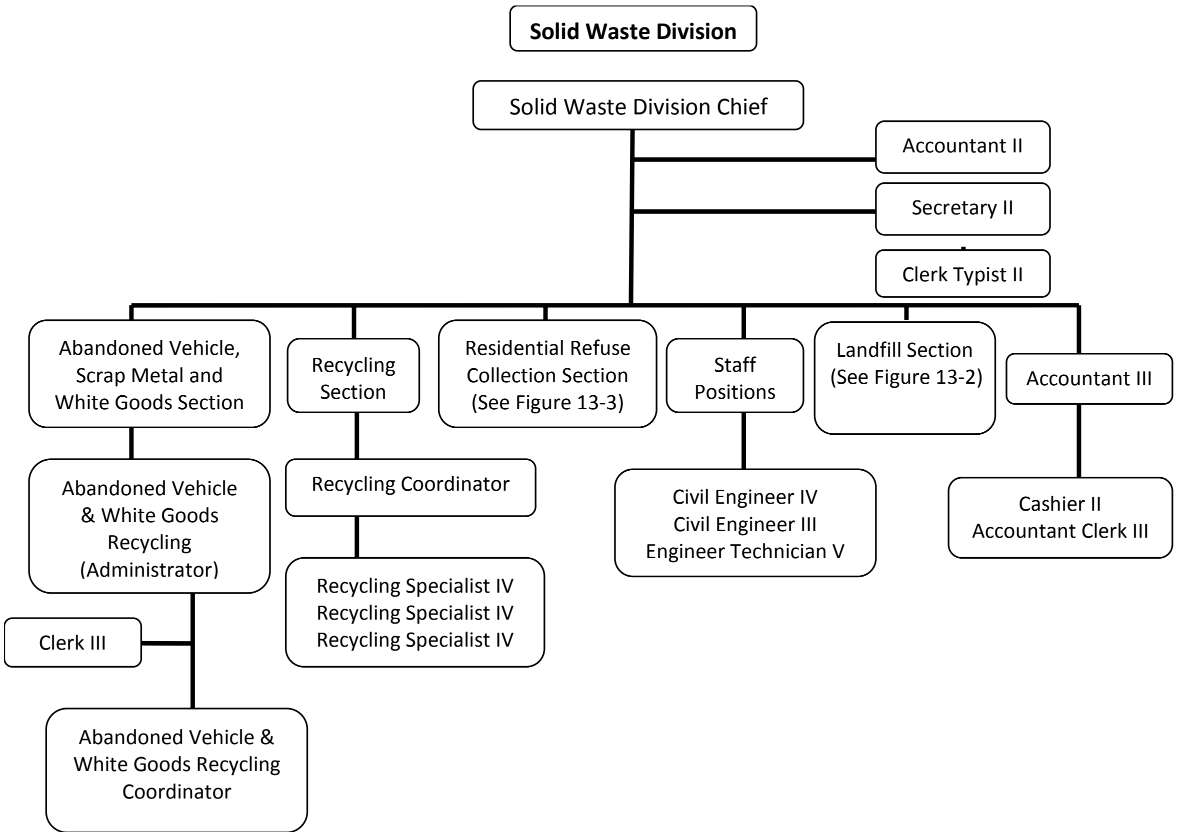
On November 7, 2006, residents in the County passed a Charter amendment, establishing the Department of Environmental Management, effective July 1, 2007. This new Department includes the Solid Waste Division and the Wastewater Reclamation Division.

[10] HRS Chapter 342G addresses the requirements of Integrated Solid Waste Management, Section 2.5.1 addresses the contents of the County plans.

2.4.1.2 County of Maui Organizational Chart



2.4.1.3 Solid Waste Division Organizational Chart



2.4.2 Landfills

The following sections review location, number of employees, and operations at the five individual landfills in the County: Central Maui Landfill, Lana Landfill, Molokai Landfill, Lanai Landfill, and the private C&D landfill. Chapter 3 discusses the capacities at each of these landfills. Appendix F-1, Solid Waste and Recycling Facilities Technical Memorandum, provides further information on the operations of the County's landfills. The solid waste is brought to the landfills by County trucks crewed by County staff, private haulers and individual residents and businesses. These people and businesses that provide the transportation necessary to move their refuse to the landfill for disposal are referred to as "self-haul."

2.4.2.1 Central Maui Landfill

2.4.2.1.1 Location

Central Maui Landfill is located on Pulehu Road, one mile north of Hansen Road. This is on the isthmus between western Maui and Haleakala, approximately 14,000 feet southeast of the Kahului Airport. The Tax Map Key identification for the site is TMK (2) 3-8-03:4, 19, 25.

2.4.2.1.2 Number of Staff

Central Maui Landfill is the largest disposal facility in the County and serves as the base for the Sanitary Landfill Section of the Solid Waste Division. There are a total of 23 funded full time employed (FTE) positions at the Central Maui Landfill. These include the landfill supervisor, who oversees all the County-operated landfills, a work site supervisor, working supervisor, one support staff, nine heavy equipment operators, six attendants, three cashiers, and two laborers.

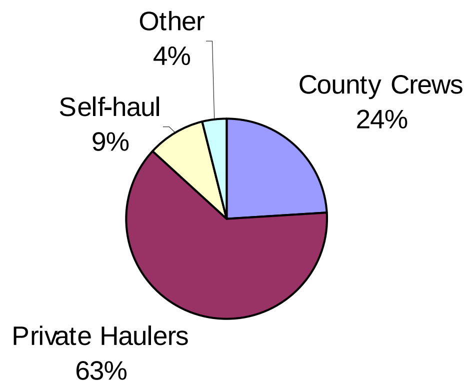
2.4.2.1.3 Hours and Days of Operation

The Central Maui Landfill operates and receives waste seven days per week. Its receiving hours are 6:00 am to 4:00 pm on Monday, Wednesday, and Friday, and 7:00 am to 2:30 pm on Tuesday, Thursday, Saturday and Sunday.

2.4.2.1.4 Activities on Site

The customer base for the landfill is made up of the County's collection crews delivering residential waste; the private haulers bringing in both residential and commercial waste; and self-haulers who are residents and individual businesses. The following chart illustrates the user base of the landfill based on the percentage of material each group brings in to the facility.

Figure 2-4 – Customer Base of Central Maui Landfill 2006



The Division operates the active face and scalehouse of this facility. County crews operate all activities associated with disposal of MSW and the collection of motor oil. Self-haulers take their material to a drop-off location and place their MSW into open-top roll-off boxes which landfill employees collect with a roll-off truck and take to the open face of an MSW cell. Private haulers and large self-haul loads are taken by the customer to the open face and dumped directly into the cell. There is a recycling drop-off center on site for customers to unload their post-consumer newspaper, cardboard, plastic, aluminum and glass.

Surrounding the landfill are separate private entities, such as Ameron and HC&S, and Division-associated activities where contractors for the Division perform work on its behalf. EKO entered into a contract in 1995 to accept and compost the County's biosolids and green waste. The County provides a site adjacent to the Central Maui Landfill where EKO conducts the co-composting operations. EKO is responsible for the marketing of the resulting products. Green waste loads going to the landfill are directed to the EKO operation.

Pacific Diesel has a subcontract with EKO to receive fats, oils and grease (FOG) from restaurants and other commercial generators. Pacific Diesel converts FOG into biodiesel fuel. If a customer brings FOG to the scalehouse, the attendant instructs them to leave the landfill site and go to the adjacent facility to be recycled.

Observation of Activities:

1. At one time, the County charged self-haulers to drop off their MSW at the landfill. When self-haulers had to pay, cars lined up waiting to get through the scales. These lines extended out onto the public road causing a traffic hazard. Also, space has been a problem for EKO. Recently, the County negotiated additional space for the green waste process, but if the County should increase the collection of green waste, as is discussed in Chapter 9, then more space will be needed for EKO to process the material. As the County plans for the operational growth of this facility, space should be provided for these particular operational matters.

2. The scalehouse stays open seven days a week, and there is no charge to self-haulers. On Sundays, two or less private haulers come into the facility that the scale-house attendant charges. The Division should be proactive and either work out an arrangement with the private hauler whereby these trucks either come in on another day or develop an automated accounting system so as to eliminate this labor.

3. Although the landfill employees do a good job redirecting customers with green waste, FOG, and cardboard to other locations, there appears to be little to no further education by the landfill staff to customers on recycling and environmental matters such as promoting separation of material so that less items go into the landfill.

4. Equipment at the landfill has little tracking data to assure that preventive maintenance is actually being performed. Appendix F-8, Equipment Review Technical Memorandum, examined purchase date, use, and repair data but found that the landfill data were limited if non-existent.

2.4.2.1.5 Tons/Volume

For calendar year 2006 during which all disposal activity occurred in Phase IV-A, the total volume was 199,507 tons. On a 365-day/year basis, this averages to 546 TPD.

2.4.2.1.6 Energy Balance

The County's operation at the Central Maui Landfill includes 17 pieces of equipment. Of these, eight are heavy equipment, such as compactors, that are fueled by diesel. The remainder are light trucks, pumps and other items fueled by gasoline. In FY2006, the fuel usage was approximately 58,000 gallons.

2.4.2.2 Hana Landfill

2.4.2.2.1 Location

The landfill is located on a parcel of land identified as Tax Map Key (TMK)1-3-06: 12, which is owned by the State of Hawaii and has been set aside by the State of Hawaii Board of Land and Natural Resources (Board) to the County by Executive Order No. 3304. The Board approved the County's request for a right of-entry to Parcel 12 of TMK: 1-3-06 for a garbage dump site, along with an easement for access purposes 20 feet wide over and across Parcel 7 of TMK: 1-3-06 on March 14, 1969. Although it has been used for landfill purposes by the County since 1969, for the first 15 years, the land was never formally placed under the County's control and management. In 1984, the property was set aside to the County under the current executive order (Brown & Caldwell, 1994).

The landfill has been in operation since 1969. It was permitted and developed under the exemption, based on receiving less than 20 TPD, for small landfills in arid areas, as provided in Hawaii Administrative Rules, Chapter 11-58.1 Section 11(f). Accordingly, it has been developed without liners and leachate collection and removal.

2.4.2.2.2 Number of Staff

The Hana Landfill is the smallest disposal facility in the County, and it is overseen by the landfill supervisor based out of the Central Maui Landfill. There are two staff assigned to the Hana Landfill. These include one heavy equipment operator and one attendant.

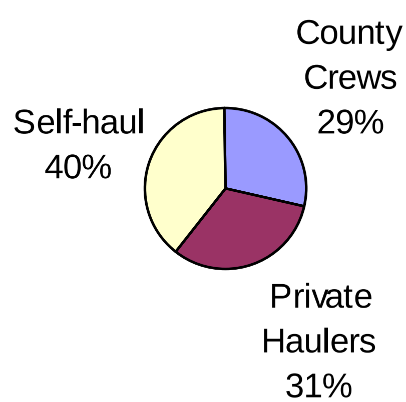
2.4.2.2.3 Hours and Days of Operations

The Hana Landfill operates and receives waste six days per week. Its receiving hours are 8:00 am to 4:30 pm on Monday through Friday, and 8:00 am to noon on Saturday. The Hana Landfill is closed on Sunday.

2.4.2.2.4 Activities on Site

The Hana landfill receives material from County crews who collect household garbage, self-haulers who bring material into the Hana landfill, and private haulers. These three customer groups make up the sum total of clients of this facility. The following chart illustrates the user base of the landfill based on the percentage of material each group brings in to the facility.

Figure 2-5 – Customer Base of Hana Landfill 2006



County employees perform all the work at the facility which receives green waste, motor oil and glass to be recycled. This facility has become an uncontrolled dumping area for scrap metal. The County periodically contracts out for the cleanup and removal of the materials. Scrap metal that is removed is recycled, and the County is currently contracting for cleanup.

Observation of Activities:

1. There is little designed surface water management on the site. A flat grassy area is referred to as a "basin" and stormwater collects in it before running off to the southeast.

2. The daily cover is retrieved from an off-site cinder excavation area under no current agreement with the owner of this site.

3. Yard waste is deposited at the Hana Landfill, stored in piles and not processed.

4. There is a general sense among personnel that the facility is overlooked because of its remote location and small daily tonnage, approximately four to five tons a day.

2.4.2.2.5 Tons/Volume

Because there are no scales at Hana Landfill, disposal volumes are estimated based on typical weights delivered by commercial vehicles and per-capita waste generation rates. The County has estimated the annual volume of waste received at the site to be approximately 1,620 TPY, including 1,370 tons of MSW and 250 tons of scrap metal, green waste and other recyclable materials. Based on this estimate, the volume of MSW averages approximately 4.5 tons per operating day.

2.4.2.2.6 Energy Balance

The County's operation at the Hana Landfill includes three pieces of heavy equipment, such as compactors, that are fueled by diesel. No light trucks, pumps and other items are included. In FY2006, the fuel usage was approximately 4,200 gallons of diesel.

2.4.2.3 Molokai Landfill

2.4.2.3.1 Location

The Molokai Integrated Solid Waste Facility (MISWF) is located in Naiwa near the southern coast of the Island of Molokai, on the dry leeward side of the island, approximately three miles northwest of Kaunakakai and approximately 1.25 miles inland, with the elevations spanning between approximately 200 to 250 feet mean sea level (MSL), and the topography gently slopes toward the south-southwest.

The project area is bounded to the north-northwest by Manawainui Gulch and to the south-southwest by a smaller unnamed gulch. Manawainui Gulch lies approximately 500 feet north-northwest of the site. Rock has been quarried from the southeast canyon wall of the gulch. The quarry is owned by Grace Pacific, Inc. and is presently being operated by Tri-L construction, Inc. The Tax Map Key identification for the site is TMK (2) 5-2-11:27 (portion).

The landfill was developed in 1993 to replace the Kalamaula Landfill which had reached capacity. It was permitted and developed under the exemption, based on receiving less than 20 TPD, for small landfills in arid areas, as provided in Hawaii Administrative Rules, Chapter 11-58.1 Section 11(f). Accordingly, it has been developed without liners and leachate collection and removal.

2.4.2.3.2 Number of Staff

The Molokai Landfill is a small disposal facility, and it is overseen by the landfill supervisor based out of the Central Maui Landfill. The landfill working face is operated by County employees. There is a total of two County staff assigned to the Molokai Landfill. These include one heavy equipment operator and one attendant. A contractor for the County operates the scale at the entrance to the landfill and the recycling center at a cost of approximately $214,000 per year.

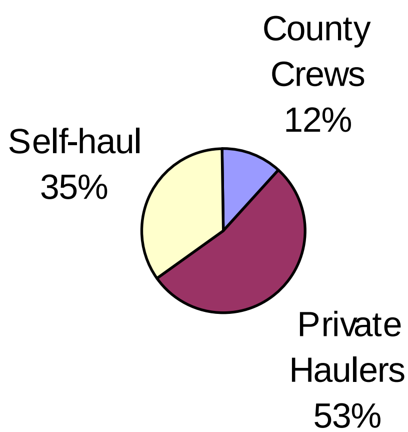
2.4.2.3.3 Hours and Days of Operation

The Molokai Landfill operates and receives waste seven days per week. Its receiving hours are 8:00 am to 4:30 pm on Monday, Tuesday, Wednesday and Friday, and 8:00 am to noon on Thursday, Saturday and Sunday.

2.4.2.3.4 Activities on Site

The landfill receives material from three customer groups: material brought to it by County crews, private haulers, and self-haulers. The following chart illustrates the user base of the landfill based on the percentage of material each group brings in to the facility.

Figure 2-6 – Customer Base of Molokai Landfill 2006



The Contractor operates the scales and weighs the vehicles on entry, except for some County collection vehicles that arrive before the scale operator. The contractor receives green waste and pallets which are ground up for mulch for use by residents, using the County grinder. The contractor also receives cardboard, newspaper, plastic, and aluminum, which are processed using the County-supplied equipment for shipment off island. Used motor oil is accepted and shipped off island also for recycling. The glass accepted at the facility is crushed and is currently stockpiled.

Observation of Activities:

1. The land slopes off to the south where there is a swale, and stormwater collects in it before running off to the southwest.
2. The landfill has a scale, however, all trucks are not weighed. Some enter before the scale is opened, and the scale readout is not set so that weights can be taken manually.

3. The landfill does not have proper equipment, the in-place density is low which means that there could be better compaction, and the ratio of cover dirt to waste is high. This is expensive since cover dirt is purchased.
4. There was a large accumulation of scrap vehicles, appliances, batteries and other material. The County contracted for the removal of the material, and it has been removed.
5. The recycling facility equipment is in need of an upgrade, and the electrical service is not adequate.

2.4.2.3.5 Tons/Volume

Based on current estimates by the County, the average daily volume during calendar year 2006 was 6,421 tons, or 17.6 TPD on a 365-day/year basis. It is important to note, however, that there is uncertainty in the estimated weights. Although scales are at the site, only commercial waste hauling vehicles (51 percent of estimated volume) are weighed. County collection vehicles and residential self-haul vehicles and bulky waste deliveries are estimated using population and estimated weights of typical deliveries.

2.4.2.3.6 Energy Balance

The County's operation at the Molokai Landfill includes five pieces of equipment. Of these, three are heavy equipment, such as compactors, that are fueled by diesel. The remaining two are a light truck and a bobcat fueled by gasoline. In FY2006, the fuel usage was approximately 7,900 gallons.

2.4.2.4 Lanai Landfill

2.4.2.4.1 Location

Lanai Landfill is located in the southwestern portion of the Island of Lanai, approximately four miles southwest of Lanai City, between Kaumalapau Highway and the Kalamaiki Gulch. The elevation of the site is between 850 and 1,020 feet above MSL. The site is on and adjacent to land owned by subsidiaries of Castle & Cook, Inc. The landfill footprint occupies approximately 20 acres on a 36-acre site.

The landfill has been in operation since 1969. It was permitted and developed under the exemption, based on receiving less than 20 TPD, for small landfills in arid areas, as provided in Hawaii Administrative Rules, Chapter 11-58.1 Section 11(f). Accordingly, it has been developed without liners and leachate collection and removal.

2.4.2.4.2 Number of Staff

The Lanai Landfill is a small disposal facility, and it is overseen by the landfill supervisor based at the Central Maui Landfill. There are a total of three County staff assigned to the Lanai Landfill. These include two heavy equipment operators, who also are assigned to operate the waste collection vehicles, and one attendant.

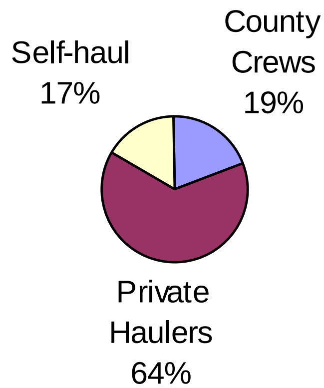
2.4.2.4.3 Hours and Days of Operations

The Lanai Landfill operates and receives waste five days per week. Its receiving hours are 7:00 am to 3:30 pm on Monday through Friday. The Lanai Landfill is closed on Saturday and Sunday. On weekends, Lanai Waste, a private firm, sets out roll-off boxes just outside the gate for refuse drop-off by residents and businesses.

2.4.2.4.4 Activities on Site

The Lanai landfill receives material from County crews, private haulers, and self-haulers. The following chart illustrates the user base of the landfill based on the percentage of material each group brings in to the facility.

Figure 2-7 – Customer Base of Lanai Landfill 2006



The County employees divert inert material to the side but bury everything else that enters the site.

Observation of Activities:

1. The employees at the facility borrow equipment from the Lanai Company in order to do their work on site. Although there appears to be no official arrangement for this borrowing of a CAT 980 rubber tire articulating loader, County personnel will drive their personal car down to the Lanai Company and drive back the borrowed piece of equipment to use in the County's operations.

2. Landfill personnel work and charge overtime on the days they borrow the Lanai Company's equipment to move the soil that has been delivered to the active face.

3. The only equipment on site is a new D-7 CAT dozer. In addition to not having a loader, the landfill has no water truck to minimize dust on that arid landfill.

4. Cover soil is delivered on an apparently irregular basis as the table below illustrates. The delivered soil is applied one or two times a week to the active face.

Table 2-12 - Cover Soil Deliveries, Two Months

Date	Loads	Cubic Yards
1/10/07	16	192
1/11/07	20	240
1/17/07	5	32
1/21/07	6	120
2/5/06	9	180
2/12/07	4	48
2/13/07	6	96
2/14/07	5	100
2/15/07	5	100
2/20/07	6	120
2/21/07	13	170
2/22/07	5	100
2/23/07	6	120
2/26/07	12	184
2/27/07	16	229
2/28/07	7	140
TOTAL	141	2,171

2.4.2.4.5 Tons/Volume

The Lanai Landfill is not equipped with truck scales. The County estimated the total quantity of waste disposed at Lanai Landfill from July 1, 2005, through June 30, 2006, to be 5,127 tons. This is equivalent to 14.0 TPD (365 day/year basis) or 19.7 tons per operating day (the site is open five days a week).

2.4.2.4.6 Energy Balance

The County's operation at the Lanai Landfill includes two pieces of heavy equipment, both dozers that are fueled by diesel. No light trucks, pumps and other items are included. In FY2006, the fuel usage was approximately 4,400 gallons of diesel.

2.4.2.5 Private Construction and Demolition Debris Landfill

2.4.2.5.1 Location

The DeCoite Landfill is a privately-owned facility located near Maalaea, Maui. It is permitted to receive only C&D waste within a permitted site of 14.7 acres. Waste is placed in a pit created by previous excavation of volcanic cinders used as a building material, after lining the pit floor and walls with a geomembrane liner.

2.4.2.5.2 Hours and Days of Operations

The DeCoite C&D Landfill operates and receives waste six days per week. Its receiving hours are 7:00 am to 4:30 pm on Monday through Friday, and 7:00 am to 2:30 pm on Saturday.

2.4.2.5.3 Activity

The primary activity is the disposal of C&D material. Site personnel segregate and remove scrap metal from incoming loads for diversion to recycling facilities. Asphalt and concrete rubble are also separated to the extent possible and used within the landfill for roads and wet-weather tipping pads.

2.4.2.5.4 Tons

Annual disposal volumes have increased significantly at the DeCoite facility during the last five years. All incoming loads are weighed on truck scales with the following results reported for the period 2002-2006.

Table 2-13 – C&D Tonnages

Year	Annual C&D Waste Tonnage
2002	29,976
2003	32,211
2004	30,571
2005	41,279
2006	49,984

Assuming a nominal 10 percent diversion of incoming C&D loads, the County estimates approximately 45,000 tons of C&D material were disposed in 2006.

2.4.3 Recycling Centers

2.4.3.1 Locations

The County has nine recycling centers throughout the County to provide convenient recycling for residents and businesses, as shown in Table 2-14. Seven of these are operated by a contractor for the County.

Table 2-14 - Recycling Center Locations

Recycling Centers	Location
Central Maui Landfill	Pulehu Rd, 1 mile mauka off Hansen Rd
Wailuku Recycling Center	Kahekili Hwy, at Makaala Dr
Kahului Recycling Center	Wahine Pio Rd., beside MCC Campus
Makawao Recycling Center	Off Makani Road, behind Kalama Intermediate School
Haiku Recycling Center	Hana Hwy at Pauwela Rd, near Haiku Community Ctr.
Kihei Recycling Center	Corner of Welakahao Rd & Piilani Hwy, across from Hope Chapel
Olowalu Recycling Center	Honoapiilani Hwy, 3 miles south of Lahaina
Hana Landfill	Makai off Hana Hwy, just before Hana Town
Recycle Molokai at Molokai Landfill	Off Maunaloa Hwy, between mm 3 and 4

2.4.3.2 Tons/Volume

The quantity of material received and recycled by the County recycling centers was 2,278 tons in FY2006. This was made up of aluminum, glass containers, plastic containers with necks, plastic bags, cardboard and newspaper.

2.4.3.3 Energy Balance

The nine recycling centers have very little powered equipment. Olowalu has one compactor which uses electricity, and Molokai has a crusher, two balers and a skid steer. The main energy use is for transportation using diesel trucks to transport the recovered materials to be processed. On Lanai and Molokai, the materials are shipped off island. In FY2006, the electricity and diesel usage is estimated to be 8,400 gallons of diesel or 1,210 million Btu.

2.4.4 Redemption Centers

2.4.4.1 Locations

The County and private operators have established 17 redemption centers to receive the containers included in the State of Hawaii's HI-5 program. Nine of the HI-5 redemption centers are owned and operated by private firms or non-profit groups. The County-sponsored redemption centers are shown in Table 2-15. These are operated for the County by a contractor.

Table 2-15 – HI-5 Redemption Center Locations

HI-5 Redemption Centers	Location
Kahului Recycling Center	Wahine Pio Rd, beside MCC Campus
Kihei Recycling Center	Corner of Welakahao Rd. and Piilani Highway
Haiku Recycling Center	Hana Hwy at Pauwela Rd, near Haiku Community Ctr.
Lahaina Redemption Center	Keawe Street across from Cannery Mall
Lanai Redemption Center	Lanai City, off of 9th street (not under contract with the County)
Makawao Recycling Center	Behind Kalama Intermediate School, off of Makani Rd
Molokai Landfill & Recycling Center	Off of Maunaloa Highway Twice/month operator takes mobile unit HI5 redemption trailer out to east and west ends of island for collection

2.4.4.2 Tons/Volume

The HI-5 beverage container deposit system covers beverage containers for all non-alcoholic drinks (i.e., soft drinks, soda, water, juice, tea and coffee drinks), certain alcoholic drinks (i.e., beer, malt beverages, mixed spirits (up to 15% alcohol content), wine coolers (up to 7% alcohol content) in metals, glass or #1 or #2 plastic, up to 68 fluid ounces. In FY2006, there were 110 tons of containers collected because this was the start-up and not a full year. In FY2007, there were 6,900 tons collected. About 49% of the containers redeemed is aluminum, about 28% is plastic and 23% is glass, by volume.

2.4.5 Reuse Centers

Reuse is identified by the USEPA as the second level in the solid waste hierarchy. Reuse is when an item that could become waste or has been set out with waste for collection is removed from the waste stream and returned to its original use.

2.4.5.1 Locations

There are a dozen or more private and nonprofit facilities that collect items for reuse, usually through the sale of the reuse item. The fees are used to pay for the cost of the facility. These reuse facilities include: Aloha Shares Network, Big Brothers/Big Sisters, Buyer's Paradise, Community Work Day, Friends of the Library, Habitat for

Humanity-Restore, Kidney Clothes, Savers Thrift store, Salvation Army, and Maui Food Bank. The facilities are mainly located in the Kahului and Wailuku areas. In addition, facilities are located on Lanai and Molokai.

2.4.6 County Refuse Collection

The Division is responsible for collection of single-family residential properties serviced by roads or streets meeting County standards.[11] Currently, not all such property receives County service as subscription is voluntary. In FY2007, the Division collected from approximately 24,000 of the estimated 51,000 permanent resident households in the County. In some instances, as noted later, the Division is assisted by the Highways Division. Solid waste collection on the three islands of Maui County operates out of six separate locations or base yards that serve the population of the County. Those locations, listed in order of size, are:

1. Wailuku Base Yard
2. Makawao Base Yard
3. Lahaina Base Yard
4. Lanai Landfill
5. Molokai Base Yard
6. Hana Base Yard

Note that these locations correspond with the Community Plan areas used in the 2030 Plan except that Paia-Haiku and Kihei-Makena are served from the Wailuku Base Yard. Each of these Collection Section base yards and the operations currently conducted from these base yards are discussed in the sections that follow.

Since July 1, 2007, management of the six collections operations has been configured as shown in the organizational chart for the Maui County Solid Waste Collection Operations in Section 2.4.1.3. Most of the collection base yards are co-located with Highways Division facilities. The exception is Lanai where the landfill serves as a collection base yard.

2.4.6.1 Location of Base Yards

The Wailuku Facility is located at 1827 Kaohu Street and is the home base of the Collection Section. It is responsible for curbside collection of waste and white good materials for the County. The Collection Section operations personnel at the Wailuku facility provide service for the Wailuku-Kahului, Kihei-Makena and Paia-Haiku Community Plan areas. Of the approximately 31,000 households in these Community Plan areas, 13,506 receive County refuse collection service on a twice-per-week basis.

Makawao Base Yard is located at 1295 Makawao Ave in Makawao. It is responsible for curbside collection of waste and white good materials in the “Upcountry” area that includes Makawao, Pukalani, and Kula.

The Lahaina solid waste collection operation works out of the Highways Division base yard located at 3310 Honoapiilani Highway in Lahaina. It is responsible for the collection of curbside waste from homes in Lahaina, Kaanapali, Kahana and Napili.

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[11] Commercial collection of communities not meeting County road standards (often gated communities), multi-family and business establishments is not managed by the Solid Waste Division and is outside the scope of this ISWMP.

The Hana solid waste collection service operates out of the Highways Division facility located in Hana at 35 Hana Highway. The Collection Section has no personnel assigned to solid waste collection in Hana. Curbside collection and supervision are performed by Highways Division personnel.

Lanai Landfill is the base yard for curbside waste collections on the Island of Lanai. The landfill is located on the Kaumalapau Highway approximately four miles southwest of Lanai City.

Molokai collection operates out of the Highways Division's facility located off the Maunaloa Highway in Kaunakakai. The Collection Section has no personnel assigned to Molokai; curbside collection and supervision are performed by Highways Division personnel. The work is supervised by the Highways Division Supervisor for the island.

2.4.6.2 Number of Staff at Each Collection Base Yard

Table 2-16 presents the number of staff at each Collection base yard.

Table 2-16 – Base Yard Employees

Base Yard	Number of Employees
Wailuku	23
Makawao	14
Lahaina	13
Hana	3 (Highways Division)
Lanai	1
Molokai	3 (Highways Division)

2.4.6.3 Number and Type of Equipment

Table 2-17 lists the number and equipment type assigned to each facility during 2007. It should be noted that the Collection Section is in the process of converting refuse collection to automated side-load collection using carts as much as practical. Additional automated side-load vehicles are on order and scheduled for delivery in 2008. Please see Appendix F.8 for more detail as to the make, year, and cost of the equipment listed below. The Wailuku Facility has the largest number of collection vehicles.

Table 2-17 – Base Yard Collection Vehicles

Base Yard	Automated Side-load Trucks	Rear-load Trucks	White Goods Trucks
Wailuku	10	3	1
Makawao		6	1
Lahaina		4	
Hana		1	
Lanai	2		
Molokai		2	
TOTAL	12	16	2

2.4.6.4 Tons/Volume

The Division, with the assistance of the Highways Division, collected refuse from those residents electing County service and meeting the road/street access requirements of the County. Throughout the County in FY2006, County trucks and crews collected 52,448 tons of refuse. Table 2-18 shows the estimated quantity of refuse collected by the trucks and crews from each base yard.

Table 2-18 - Refuse Collected by Base Yard in FY2006

Base Yard	Wailuku	Makawao	Lahaina	Hana	Lanai	Molokai
Quantity in Tons	28,424	13,995	7,715	388	998	928

2.4.6.5 Energy Balance

The County operates 30 collection vehicles from the six base yards on the three islands. These are fueled by diesel fuel, and there are seven supervisor/utility vehicles (pick-up trucks) that are fueled with gasoline. In FY2006, the fuel usage was approximately 75,000 gallons.

2.4.6.6 Private Trash Collection

There are four privately-owned refuse collection companies that provide collection services in the County. There is also one company the offers only recycling collection on the Island of Maui. These companies contract directly with the residential and business entities that generate refuse and recyclables.

2.4.6.6.1 Private Collection Service Providers by Island

The islands that comprise the County are served by different companies. Table 2-19 shows the companies that collect refuse and recyclable materials on each Island.

Table 2-19 - Private Collection Service Providers by Island

Island	Private Service Provider
Maui	Aloha Waste Systems, Inc.
Maui	Maui Disposal Co., Inc.
Maui	Kama Aina Recycling
Maui	Maui Recycling Service, Inc.
Maui	Empire
Maui	Any Kine Services
Lanai	Lanai Waste Removal, Inc.
Molokai	Island Disposal

2.4.6.6.2 Tons/Volume

Table 2-20 shows the quantity of refuse collected by the private service providers on each island that makes up the County. These data are from the reports done annually by each of the County landfills so that the Island of Maui has quantities at Hana Landfill and at the Central Maui Landfill. In addition to collection of refuse, the private companies collect recyclable materials including green waste.

Table 2-20 - Refuse Collected by Private Service Providers in FY2006

Landfill	Maui	Hana	Lanai	Molokai
Quantity in Tons	130,412	420	3,265	3,972

2.4.6.7 Market Share of Collection by Island

For market share, the concept is to show which entities collect from the largest number of solid waste generators in the County. As mentioned in Section 2.4.6.6.1, there are a total of five private service providers in the County and four of them offer refuse collection. In addition, there are large numbers of residents and businesses that do not contract for refuse collection that need to be accounted for in the market share calculation. These people and businesses self-haul. The total quantity of refuse collected for disposal by the County, private service providers and those who self-haul is used as the measure of market share. The percentage of the refuse delivered to the County landfills by each sector is shown in Table 2-21.

Table 2-21 - Market Share by Collector[1]

Landfill	Maui (CML)	Hana	Lanai	Molokai
Private Collection	65%	31%	64%	52%
County Collection	25%	29%	19%	12%
Self Haul Collection	10%	40%	17%	35%

[1]Percentages may not add to 100 percent due to rounding.

3. Landfill Capacity and Disposal

3.1 Purpose

This chapter presents facts related to the capacity of the landfills the County currently operates. The chapter also introduces the concept of keeping a landfill's solid waste permit open but not actively disposing of MSW on site. This concept is referred to as 'Standby with Permit' and is discussed in other areas of this ISWMP. Finally, this chapter presents some operational findings related to the concept 'Standby with Permit' that will be used in Chapter 13 to try and derive a cost of performing such an operation.

Much of the information regarding the capacity of the landfills comes directly from a more detailed technical memorandum found in Appendix F-7, "County of Maui Integrated Solid Waste Management Plan: Technical Memorandum, Task 4, Landfill Capacity," June 2007 (Landfill Capacity) which was prepared by A-Mehr. The reader should refer to this technical memorandum for further explanations and site plans for each of the landfills.

3.2 Central Maui Landfill

3.2.1 Capacity Remaining

The Central Maui Landfill has six phases of development. Phases I and II were operational from 1987 through November 2005, after which disposal operations were moved to Phase IV-A. Phases I and II were closed and capped during 2006. Phase III is not currently planned to be constructed, and the area is being used for co-composting of biosolids and green waste, and production of biodiesel fuel from fats, oil and grease.

Ameron Corporation's rock quarry and crushing operation had mined an area that is now used for Phase IV. Special Use Permit Number SP97390 covers 29.034 acres of which approximately 11 acres are used for entrance and other ancillary facilities while 18 acres are being developed for disposal facilities. Phase IV-A disposal began in 2005 and consists of approximately 10 acres. Phase IV-B began construction in October 2006 on approximately eight acres and, in February 2007, an initial section of Phase IV-B was completed, allowing disposal operations to begin. Table 3-1 provides the results of the capacity projections using the current in-place refuse density. See Appendix F-7 for details.

Table 3-1 – Central Maui Landfill Capacity (2007)

Combined disposal capacity for Phases IV-A & B	1,600,000 cubic yards
Total gross volumetric capacity of Phase IV, V, & VI	8,007,000 cubic yards
Net capacity available for refuse and daily/intermediate cover soil (after deduction for volume used up for leachate collection, gravel, protective cover soil, and final cover	7,344,000 cubic yards
Phase IV-A total refuse disposed as of 12/31/2006	211,199 tons
Phases I, II, IV estimated in-place density	1,240 Lbs. refuse per cubic yard of volumetric capacity consumed (industry standard is 1,400 Lbs. per cubic yard)
Daily tonnage	550 tons
In-place density	340,600 cubic yards of volume
Phases IV-VI remaining capacity	1,259,400 cubic yards (780,000 tons)
Capacity available until the year	2026

3.2.2 Plan for Capacity

Based on recent and ongoing discussions with Alexander & Baldwin, Inc., owners of adjacent property, and Ameron Hawaii, the County anticipates that adjacent property can be acquired for future capacity. Phase V will be approximately 50 acres in size, but the County plans to purchase additional land to accommodate a maintenance area, 80-foot buffer, land encroachment issues and the gulch. The County is presently negotiating for the purchase of additional property to use for landfill cells and associated solid waste management functions. Existing capacity for the Central Maui Landfill is estimated to run out in 2026. Even if the County chooses to pursue and implement an alternative disposal method, e.g., waste-to-energy[1], some portion of the municipal solid waste stream will have to be buried. The County continues to look after the long-term disposal needs of its citizens and businesses.

3.3 Hana Landfill

3.3.1 Capacity Remaining

The Hana Landfill has much space and little waste going into the facility. This low level of activity has caused the Division’s managers to consistently review ways to haul the MSW back to the Central Maui Landfill, preserving the capacity at the Hana Landfill indefinitely. Table 3-2 reviews the capacity projections for the Hana Landfill using the current in-place density. See Appendix F-7 for details.

[1] Waste-to-Energy or WTE is used in this ISWMP in the generic sense; it does not imply a particular technology and could include mass burn, gasification by thermal or biological techniques or other approaches.

Table 3-2 – Hana Landfill Capacity

Volumetric capacity of the MSW disposal area	415,000 cubic yards
Airspace utilization	600 lbs. of refuse per cubic yard (0.3 tons per cubic yard)
Annual capacity	4,700 cubic yards per year
Daily tonnage	3.8 tons
Capacity in years remaining	88 years

3.3.2 Plan for Capacity

The existing capacity at the Hana Landfill is beyond the planning scope of this ISWMP; therefore, no plan for additional capacity has been developed.

3.3.3 Standby with Permit

The Hana Landfill handles a small amount of MSW a day. In Chapter 5, a plan is presented whereby the Hana Landfill will keep its permit but transfer its MSW to the Central Maui Landfill. Then the landfill will be on ‘Standby with Permit’ so that the County, if it should need to, can operate the facility without having to renew the facility’s operating permit. Under this scenario, the landfill would operate periodically to accept inert and other selected materials. The key function of the Hana Landfill in the long-term plan is to provide short-term storage and ultimate disposal for debris that is a result of storms and other natural disasters in the Hana region. To fulfill this function, the facility will need to maintain its permit and be managed on a periodic basis to maintain its compliance with applicable Department of Health regulations.

The purpose of placing the Hana Landfill on Standby with Permit is two-fold. First, there are approximately four tons a day of material being buried in the facility. Instead, this material could be transported to the Central Maui Landfill, freeing up the Hana Landfill employees to operate a convenience center or collect refuse as discussed in Chapter 13. Second, the Hana Landfill has a limited supply of dirt to use for cover material. The Division currently takes dirt from a nearby cinder cone. The Division has no long-term agreement to do this and can have this access to cover material stopped at anytime.

3.4 Molokai Landfill

3.4.1 Capacity Remaining

The Molokai Landfill, also called the Naiwa Landfill, is part of the Molokai Integrated Solid Waste Facility (MISWF). The current permitted capacity will accommodate disposal until 2015. Table 3-3 provides the capacity projections for the Molokai Landfill using the current in-place density. See Appendix F-7 for details.

Table 3-3 - Molokai Landfill Capacity

Annual estimated volume disposed	6,570 tons
Annual consumption of airspace	19,300 cubic yards
Daily estimated tons	17.6 tons
Phase I disposal began	1993
Phase II disposal began	1997
Phases I & II total estimate disposed as of July 23, 2006	232,700 cubic yards
Phases I & II estimated remaining capacity	25,000 cubic yards
Phase III scheduled for construction	2008
Phase IV estimated to be in operation	2010
Design capacity for all four phases	387,000 cubic yards
Remaining capacity for all phases	166,400 cubic yards
Permitted capacity filled	January 2015
Airspace utilization factor	680 Lbs. per cubic yard (industry standard is 1,400 Lbs. per cubic yard)

3.4.2 Plan for Capacity

The existing permitted disposal area occupies approximately 12 acres. There are nine additional acres within the existing property limits available for future permitting and development for disposal capacity after Phases I-IV are filled. A horizontal expansion into this area could provide an additional 440,000 cubic yards of capacity for refuse and daily/intermediate cover soil. This would extend the available capacity from 2015 to 2029. The Division has contracted with A-Mehr to develop a master site plan for this facility. These and other options to extend capacity will be reviewed in that document.

3.5 Lanai Landfill

3.5.1 Capacity Remaining

A topographical survey of Lanai Landfill was conducted on March 29, 2007. These data along with the final permitted grades helped to estimate the remaining refuse disposal capacity of the Lanai Landfill. As presently permitted, disposal capacity is approximately 178,000 cubic yards. Table 3-4 provides the capacity projections for the Lanai Landfill. See Appendix F-7 for details.

Table 3-4 – Lanai Landfill Capacity

Annual capacity usage	13,400 cubic yards
Annual quantity of waste disposed	5,127 tons
Tons per day disposed	19.7 tons (per operating day)
Airspace utilization	700 Lbs. per cubic yard (industry standard is 1,400 Lbs. per cubic yard)
Capacity remaining	178,000 cubic yards
Capacity remaining until the year	2020

3.5.2 Plan for Capacity

The Lanai Landfill is contained in a relatively narrow strip of land (400 to 500 feet wide) between the Kaumalapau Highway and the Kalamaiki Gulch. There is no opportunity for a significant horizontal expansion of the existing Lanai Landfill.

A modest increase in capacity could be achieved by modifying the existing final grading plan. The existing design is based on refuse fill slopes constructed at a grade of 4:1 (horizontal/vertical), to a maximum elevation nominally 10 to 20 feet above that of the adjacent highway. Additional capacity could be gained by placing additional refuse against the side slopes on the gulch side to increase those slopes to a typical landfill grade of 3:1, and raising the top deck elevation by an average of approximately 10 feet. Such a revision would add approximately 50,000 cubic yards of capacity to the site. At an average usage rate of 13,400 cubic yards per year, the additional capacity could add approximately 3.7 years to the life of the existing site. This would provide a total life of approximately 17 years, and in the short-term planning, the Lanai Landfill will continue its current operation.

3.6 Barging Investigation

3.6.1 Investigation of Barging Strategy

As stated in Section 2.1.2, the County is unique in having three inhabited islands and no County-owned or leased transportation to shuttle equipment, work crews, and materials from one island to another. This creates interesting issues for the Division in terms of allocating equipment and managerial oversight. Operationally, for example, the woody waste would be ground at a central facility or, at the most, two facilities, as is done in the County of Hawaii, but in the County of Maui, wood debris is accumulated on the Islands of Lanai, Molokai, and on Maui at the Central Maui Landfill and Hana Landfill. Purchasing a grinder for each of the facilities involves a large capital outlay. Transporting a grinder from one location to the next operationally is very expensive, as well, because of the use of private barging.

The spatial separation by water also causes problems in the allocation of human resources. On the Island of Molokai, for instance, there currently is not enough solid waste work to justify a full-time solid waste employee to handle the collection of trash. This work is being done by employees of the Highways Division within the Department of Public Works, using Solid Waste Division equipment.

Field research was conducted to see whether trash and other material generated on the Islands of Lanai and Molokai could be barged to a disposal site off island, resulting in saving of capacity for the County and a more cost-efficient alternative to active landfilling on these two islands. This information was used in the development of Scenarios IV and V discussed in Chapter 13. Under these scenarios, both landfills on Lanai and Molokai would no longer dispose MSW but, rather, would remain active by handling inert and other selected materials. This status is called 'Standby with Permit.' The MSW would be processed at each site by being compacted into overseas or specialized waste containers and shipped to a disposal site off island. The disposal location of MSW would, in this scenario, depend upon the best shipping and disposal terms the Division could procure at the time of implementation.

3.6.2 Results of Investigation

Shipping contractors, state regulators, and a state harbor master were contacted on the subject of the County shipping MSW from one of the County's islands to a disposal point off of that island. The strategy of the County owning a barge and shipping with a private concern was discussed. The following is a summary of the findings:

3.6.2.1 State Fee Structure

State Tariff: Hawaii Administrative Rules, Dept of Transportation, Chapter 44 clarifies the three fees and the scale of those fees that the County will have to pay to the State:

- Parking fee dockage
- Port entry fee
- Wharfage fee (largest of the three) which is the privilege the customer gets in order to have the opportunity to unload its goods

3.6.2.2 Charter Barge Fee

The cost for chartering a barge and tugboat is more expensive for a single use than if it were scheduled for routine uses. The following costs, as of December 2007, are based on a single use. The hourly rate for a tugboat is $850; a barge is $100 per hour. If transporting trash from the Island of Lanai, the total time charged is an estimated 60 to 70 hours. These charter barges hold a total of 4,400 tons and can carry approximately 180 boxes if loaded by a crane, and just over 100 boxes if the barge is loaded by a fork lift.

One 40-foot or two 20-foot containers have a volume of 2,400 cubic feet which would hold approximately 20 tons of refuse if compacted to 445 pounds per cubic yard. This would be approximately six containers per week to transport waste and recyclables from Lanai and 11 containers per week for Molokai. Equipment to handle these containers may need to be purchased or upgraded at one or both sites.

Table 3-5 contains examples of barging costs to transport by way of Young Brothers in 40-foot containers, as of December 2007.

Table 3-5 – Barging Costs between Islands (2007)

	Recycling Cost	MSW Cost
Molokai to Maui	$903	$1,081
Molokai to Oahu	$710	$854
Lanai to Maui	$850	$1,029
Lanai to Oahu	$658	$ 801

3.6.2.3 Harbors

Both Molokai and Lanai have the capability to load and unload containers from a barge. Photos 3-1 and 3-2 show the dock at Lanai where both a crane and a large forklift are available to load containers.

Photo 3-1. Dock at Lanai Harbor

Photo 3-2. Dock at Lanai Harbor

Scenarios IV and V in Chapter 13 have cost estimates on this operation using a private shipping company as opposed to the County owning and operating a barge itself. The capital cost of the vessel and the new duties it would involve take the Division's staff away from its core responsibility, collecting and disposing solid waste in an environmentally safe and cost-efficient manner. There are many variables the County must consider when assessing the viability of this option. Although this may be operationally feasible, the County will have to negotiate a change of duty of its workers on each of these islands so as to operate the job efficiently. The interests of the communities on each of these islands must be taken into account. There may be social and cultural reasons why a community may not want its MSW shipped off island. Finally, policymakers will have to make a value judgment as to whether this is an operation the County wishes to initiate. Even though a program is operationally feasible to implement, if it is not politically and culturally supported, then the risk of failure increases.

3.7 Summary

This chapter has reviewed the land disposal elements of the solid waste system for the County. The capacity of the active landfills and the associated activities are summarized as follows:

- Central Maui Landfill – has capacity; more being developed and planned; good to 2042

- Hana Landfill – capacity exceeds planning period; go to Standby with Permit
- Lanai Landfill – capacity to 2021 with permit modifications; go to Standby with Permit if off-island disposal selected
- Molokai Landfill – planning expansion for necessary capacity in plan period with permit modifications; go to Standby with Permit if off-island disposal selected

It also provided fundamental facts related to the concept of transporting trash by barge from the Islands of Molokai and Lanai to a disposal point off island.

4. Recycling

4.1 Purpose

This chapter includes a short history about the recycling industry's background and growth in Section 4.2. For those readers who have a firm background on recycling, it is suggested that they skip to Section 4.3 where the recommendations of the 1994 ISWMP are listed. Section 4.4 reviews what the County has done toward implementing that plan. Section 4.5 examines pertinent legislation regarding recycling, and Section 4.6 examines recycling alternatives for the County to implement.

The SWRAC advised the Division to provide universal curbside collection which means providing collection services to all residences served by streets and roads meeting County standards. The services would include single-stream marketable recyclables collected once every other week from a cart placed at the curb. The SWRAC also recommended constructing a new, fully enclosed MRF to process the County-collected materials and recycling drop-off materials on the Island of Maui. These recommendations are discussed in Sections 4.6 through 4.8 and make up the bulk of this chapter.

4.2 Background on Recycling

Recycling is the act of taking a discarded product and reprocessing it into a new product. It differs from reuse because the actual product is physically transformed into a different state before becoming a new or renewed item. This process reduces the consumption of raw materials that go into making a product as well as potentially reducing the energy involved in developing that new product. For example, it takes 60 percent less energy to make paper from recycled material than from virgin feedstocks.

The recycling industry denotes two forms of recyclables: (1) pre-consumer recyclables and (2) post-consumer recyclables. Pre-consumer recyclables are materials that are discards in the process of producing an item. These materials never are placed in the hands of the consumer of the product but are used and discarded within the production phase of that commodity. Industries traditionally recycle this type (pre-consumer) of recyclables to lower disposal cost and save on raw material costs.

Post-consumer recycling, the use of a commodity after it has been purchased and used by the consumer, has captured the attention of the U.S. public over the past 30 years. Common post-consumer recyclables include newspapers after they have been read, soda cans after their contents have been consumed, and old corrugated containers (OCC) (also commonly referred to as cardboard) after the container has been emptied and not in use any more.

Recycling is not a new concept. Many people remember times when a shortage of raw resources occurred. During World War II, for instance, communities across the country promoted the recycling of post-consumer paper and metal because the access to raw resources was limited because of the priority for war goods. After the war, when shortages of raw materials abated, neither the government nor consumers placed much importance on post-consumer recycling.

In the 1970s, however, two variables came together to help jumpstart a post-consumer recycling campaign. The first was the rise in the cost of oil due to an embargo initiated on October 17, 1973 by the Organization of Arab Petroleum Exporting Countries (OAPEC). The jump in price and fall in available supply caused U.S. businesses to look for less energy-intensive means to manufacture a product.

The second call to recycle was more cultural than economic. In the 1970s, a growing faction of citizens became concerned about actions that affect the Earth and its raw resources. In 1970, the federal government created the United States Environmental Protection Agency (USEPA), which, in turn, promoted Earth Day One in the same year that brought the issues of air and water quality, as well as recycling, into the country's classrooms. EPA began to close the open dumps and to implement safer and more stringent landfill regulations known as Subtitle D.[1]

The second stage of this cultural pressure to recycle got started when Lowell Harrelson loaded 3,100 tons of industrial waste onto a barge, and a tugboat named the "Break of Day" left Islip Harbor of Long Island, New York, to find a cheap disposal opportunity. Six months later, the barge returned to New York, and its cargo was incinerated in Brooklyn. During that time, editorials were written, speeches were given, and late night TV hosts joked about the garbage barge no jurisdiction wanted.

The six-month journey of the garbage barge, *Mobro*, and the USEPA's implementation of Subtitle D regulations began to underscore, for people, a need to recycle because of a false sense that U.S. landfill capacity was running out. Recycling took on a new importance after *Mobro*'s well documented journey. When the barge left New York on March 22, 1987, only 600 cities had curbside recycling. In 2007, the number had increased to nearly 10,000 cities.

These two primary forces to recycle, economic and cultural, have never fully collaborated in a seamless manner. As the recycling movement progressed into the 1990s and beyond, articles were written assailing the proposition that recycling without having a basis in market realities was unrealistic. Yet, when the interest of each is complemented, the representatives of these two forces come together to implement programs that have wide support and success.

Some of these widely supported programs are discussed in this chapter. These municipal recycling collection programs fall into two types: self-haul (the household or business brings the material to a central point) and door-to-door collection systems.

4.2.1 Drop-off Collection

Drop-offs are the most common form of self-haul. Drop-off facilities are locations where citizens and small businesses can drive to, unload their material by category, usually, or commingled into a large container, and leave. Once the large container is

[1] Subtitle D of the Federal Resource Conservation and Recovery Act (RCRA) was enacted in 1976 and addresses the management of municipal solid waste.

full, a hauling truck comes to the facility and collects the full container and replaces it with an empty one or unloads the container into the truck body.

Some drop-off centers have dumpsters, usually eight cubic yards, where citizens can unload their material, and a front-loading collection vehicle loads the container's contents into the compactor body of the truck. After the contents are emptied, the empty dumpster is set back down to be loaded with recyclables again. Locations that utilize these types of containers need less site development work than other container collection methods.

Other containers used at drop-off facilities are roll-off containers. These are either enclosed or open-top containers that are approximately 20 feet long and range in capacity from 20 to 40 cubic yards. If enclosed containers are used, they normally are between 27 and 35 cubic yards with multiple portals on the sides for customers to dump their material through. When open-top containers are used, site locations generally are built to facilitate the citizen unloading the material from above the container. This is done by developing a site where there are two levels, with the containers on the lower portion and the citizens on the higher level. If the site is configured where the cost of developing a split level is prohibitive, then some communities build ramps where a citizen can either drive or walk above the container and dump material directly into the open-top roll-off. If no site elevation is created, the roll-off container will generally be smaller in size so that citizens can easily reach the portal to place the material into the container.

Compactors can also be used in drop-off facilities, particularly for cardboard. These can either be stationary with a dedicated power source to operate a metal blade or ram to compress the material, or a mobile compactor such as a rear-loader trash truck that once full transports its contents to a distant location.

Compacting material is an efficient method of transferring material that has much volume but not much weight. Items, such as OCC, for instance, when placed in an open-top container that is 40 cubic yards may weigh two tons but, when compacted into a 40-cubic-yard container, may weigh between five and seven tons. This means that a compacted OCC container will be hauled away one time for every two to three times a loosely loaded OCC container is hauled.

Drop-off sites can be managed and staffed with municipal employees, contractors, or non-profit groups. Schools, for instance, may host a recycling drop-off facility and have its science club, for instance, oversee the site by cleaning it up, helping customers, and distributing education material in exchange for a percentage of the proceeds gained from the sale of the material. Some jurisdictions do not staff drop-off sites but send crews periodically to clean debris on- and around the site.

4.2.2 Curbside Collection

Instead of citizens taking their materials to drop-off facilities, a collection vehicle can go to the resident and collect the material. The resident simply places the recyclable materials at the curb. There are different approaches to prepare the materials for curbside collection: (1) either the resident or the collector source-separates the material at the curb; (2) the resident combines most, if not all, of the recyclables into one container, and it is taken to a separation facility (MRF); and (3) MSW and recyclables are combined into one facility where it is then taken to a separation facility.

Collecting source-separated material at the curb requires a collection vehicle with multiple compartments for different commodities. Either the resident sets the material out on the curb and has segregated the material into categories, or the collector sorts the combined material at the curb and places each commodity in its compartment on the truck. When the truck is full, or when any one commodity is too full to take more material, the collection vehicle goes and unloads. The benefit of this system is that it eliminates the cost of separating the material at a facility, but the collection is slow which means more trucks have to be in service thereby driving up the costs.

The second manner of collection is when commingled materials are placed at the curb. The resident places the material together into one or two containers. Single-stream collection is the term used when all the recyclables are placed in one container. Dual-stream collection is the term used when paper is placed in one container and commingled materials (metal, plastic and sometimes glass) are placed in a second container. The collection crew unloads the container(s) into the body of the truck and all sorting of the material is done at a MRF. The commingled collection has variations on the same theme. Some locations find their paper more marketable if kept separate from other material, especially glass bottles and jars. A collection vehicle may have the capacity of collecting paper and the other material separately, either by having two compactors or compartments on the truck.

The third collection is when trash and recyclables are placed together, collected, and transported to a materials recovery facility that can handle the weight and grime of municipal solid waste. The recyclables are picked out of the waste stream while the non-recyclables are loaded into a container to be landfilled or incinerated. This method cuts the cost of collection drastically, but the cost of separation is higher and contamination is a problem.

4.2.3 Commodities Collected

Paper: In 2005, 51.5 percent of the paper consumed was recovered for recycling. Paper recovery now averages 346 pounds for each person in the U.S. Every ton of paper that is recovered saves approximately 3.3 cubic yards of landfill space.

Paper is not just a single commodity but a plethora of commodities grouped under a heading called "paper." Old newsprint (ONP) is recycled into new newsprint, egg cartons, and paperboard (material that is used for cereal boxes). High-grade, white office paper is recycled into almost any paper product including tissue paper. Old corrugated containers are made into new corrugated containers.

When the post-consumer paper is recovered, it is baled and shipped to a paper processing mill. At the mill, the paper is shredded and mixed with water to make a pulp. The pulp is washed, refined, and cleaned, then turned to slush in a beater. Color dyes, coatings, and other additives are mixed in, and the pulp slush is pumped onto a large moving screen. As the pulp travels down the screen, water drains away. The resulting paper sheet, known as a web, is pressed between massive rollers to extract most of the remaining water and to ensure smoothness and uniform thickness.

This semi-dry web is then run through heated dryer rollers to remove any remaining water.

Chemicals and contaminants are filtered out and often burned in an on-site industrial power plant that helps to meet the energy needs of the facility, and, in some cases, of the local community. The finished paper is then wound into large rolls of up to 30 feet wide and a weight of 25 tons. A slitter cuts the paper into smaller, more manageable rolls, and the paper is ready for use in its new recycled form.

In the 1980s, very few paper mills in the U.S. used post-consumer paper to make new paper. By 2005, 78 percent of paper and paperboard mills in the U.S. used some percentage of recovered paper, and 149 mills used only post-consumer paper.

<u>Glass bottles and jars</u>: Glass jars and bottles are heavy and therefore add to the recycling weight collected. Municipalities and post-consumer collectors were enticed by the post-consumer glass industry to collect this material back in the 1980s because of the weight diverted from the landfill and the potential of receiving $0.02 per pound for glass. In 1991, the price per pound dropped to $0.01 and then went negative for green glass as glass container manufacturing plants across the U.S. closed operations because of less demand for glass containers. The packaging market share for glass has consistently gone down over the past 20 years while plastic containers have increasingly become the substitute container.

Many municipalities had already begun their programs before the price dropped. These localities decided to continue with the collection of glass because both the customer had come to expect the service, and the weight was valuable to the municipality because it added to its diversion rate.

After it is collected, the post-consumer glass is segregated into colors and freed of heat-resistant glass such as cookware, ceramics, window glass, drinking glasses and light bulbs. These heat-resistant items are made of ingredients different from container glass and will cause problems in the glass-container-making process.

The glass is loaded and shipped to a processor that further cleans the glass of all debris, such as metal caps and labels, and then crushes the glass into "cullet." This cullet is screened to a predetermined size set by the manufacturer. The cullet is mixed with virgin material and heated to 1,500 degrees Celsius. Molten glass is fed as 'gobs' to an automatic bottle- or jar-making machine which first makes a blank shape and then blows the final bottle or jar. Bottles and jars pass into an oven where they are reheated to remove stresses, cooled and inspected.

Because glass as a commodity provides little to no revenue, glass collection is an issue for competing post-consumer commodities that do provide revenue. As municipalities increasingly move toward single-stream collection of recyclables, the paper industry discourages the co-collection of glass with paper. Broken glass mixed with the paper creates a problem for paper mills, making paper co-collected with glass less valuable in the post-consumer market.

The use of post-consumer glass lowers the energy required to make new glass with every 10 percent of recycled glass in the manufacturing of new glass. However, instability in the manufacturing process increases if post-consumer glass rises above 32 percent. In other words, the glass production system has a higher percentage of breakage when the percentage of post-consumer glass content rises above 32 percent.

<u>Plastic bottles and jugs</u>: Unlike post-consumer glass, post-consumer bottles and jugs are a potential revenue stream. And, unlike glass, plastic containers weigh very little. If collectors were to place one plastic jug after another into a baler, 7,200 soda bottles are needed to produce a 1,200-pound bale. It takes a lot of plastic to compensate for the expense of transporting this light-weight material to a processing facility. Plastic collected is generally separated by resin and color and then baled.

Bales of plastic are sold to reclaimers who tear the bale apart and place the contents onto a conveyor belt. The conveyer takes the plastic through a shredder producing tiny flakes of plastic. These flakes are washed, rinsed, and dried after which they are melted and put into an extruder that reforms the plastic into tubular strands. These strands are chopped into pellets and used to make items such as soda jugs, plastic lumber, decking furniture, and thread for clothing.

The economics of plastics is problematic, however. As oil prices continue to climb, one would suspect that post-consumer plastic recycling would become relatively cost efficient. Yet, those same oil prices increase the cost of collection, transportation, and processing. And, as discussed above, accumulating the quantity of plastic needed to make cost efficient entry into the post-consumer market is difficult.

<u>Steel Cans</u>: In 1809, the French began preserving food in cans, and in 1812, tinplated cans were produced in Britain. In 1938, the first steel beer can was produced. These steel cans have a thin layer of tin on the can's inner and outer surfaces to prevent rust and to protect food and beverage flavors. This is the derivation of the term "tin can."

In the U.S., there were 2.6 million tons of steel cans produced in 2005. Approximately 1.56 million tons of these were recycled. Each person, on average, consumed the contents of 1,000 cans with an average weight of 2.3 ounces.

After the can is collected, it is segregated from other kinds of metal and densified into small bundles and shipped to a processor that removes the layer of tin from the old steel cans. Then, the material is melted in a furnace with other scrap and poured into casters that continuously roll and flatten the steel into sheets.

Using post-consumer steel cans takes 60 percent less energy than using virgin iron ore. Recycled steel cans may be mixed with other sources of recycled steel, vehicles, appliances, etc., and made into new cars, girders for buildings, or new food cans. Steel is a widely and easily recyclable material.

<u>Aluminum</u>: Aluminum cans were introduced in the U.S. in 1965 and are used primarily for beverages, beer and soda. Post-consumer aluminum also uses 95 percent less energy to manufacture new aluminum than from virgin material. With the rising cost of energy, the manufacturers of aluminum cans actively encouraged localities to develop collection program. In 1972, 15 percent of the 7.5 billion cans shipped were retrieved in collection programs. In 1982, the percent captured had risen to 56 percent, and in 2000, it had reached 68 percent. The aluminum cans are separated from other material in a MRF (usually by an eddy current separator and compacted into bales that range from 30 to 1,200 pounds, depending on the size of the baler. The bales are shipped to aluminum smelters which break the bales, strip the labels and melt the aluminum along with virgin material. Other aluminum items, including

foil, roasting pans and other packaging, are also recycled in these programs. These other aluminum items have lower value than aluminum cans.

4.3 Review of 1994 ISWMP

The following are recycling recommendations from the 1994 ISWMP. Although they are listed in numerical order, those recommendations that better apply to other chapters are omitted in this chapter.

- Recommendation 4-3: Promote community drop-box program and expand where needed.
- Recommendation 4-4: Ensure capacity for processing an increased amount of recyclables. This is both to encourage private-sector development and contracting out for processing.
- Recommendation 4-7: Continue and expand in-house recycling program.
- Recommendation 4-8: Develop a monitoring/reporting system for recycling /composting where retailers must report recycled quantities to the County.
- Recommendation 4-9: Continually investigate local markets for glass, newspaper, plastic, cardboard, white office paper, aluminum cans, and green waste.
- Recommendation 4-10: Continue recycling grant program.
- Recommendation 4-11: Provide technical assistance to private recycling service operators for more efficient/effective programs. This recommendation is to move local post-consumer industry to the highest market value possible.
- Recommendation 4-12: Develop procurement policies that favor recycled products.
- Recommendation 4-13: Support a state resolution to develop reduced costs for shipping recyclables.
- Recommendation 4-14: Establish advanced disposal fees (county or state legislation) with suggested fees of:
    - $0.015 per glass bottle
    - $2 per automobile tire
    - $500 per automobile (collected with initial registration fee)
    - $0.025 per quart of oil
    - Encourage the state to consider ADF on white goods
- Recommendation 4-15: Request that the state hold semi-annual meetings of all County recycling coordinators and designated task force members.
- Recommendation 4-16: Establish a Recycling Roundtable for private/public recycling managers.

- Recommendation 4-17: Attract businesses involved in diversion work in Maui County.

- Recommendation 4-18: Designate one census tract as an enterprise zone suitable for recycling related businesses.

4.4 Activities Done Since 1994 ISWMP

Since the adoption of the 1994 ISWMP, the County has implemented a number of the recommendations in this ISWMP with regard to recycling. In 1994, the County's diversion rate was 4 percent, and in 2006, it was at 30.6 percent, a significant increase due to the programs listed below. These activities are summarized as follows:

1. The community drop-box program has been expanded and a network of nine drop-off recycling centers now serves the residents and businesses in the County. These facilities are discussed in Chapter 2, Section 4.3.

2. Composting of green waste has been expanded and includes biosolids. This is discussed in Chapter 9, Section 9.8.

3. Capacity for processing the recyclable materials collected by the County drop-off recycling centers has been secured through a contract with Maui Disposal.

4. The in-house recycling program has been continued in County facilities.

5. Local markets continue to be investigated. Since the 1994 ISWMP, pulverized glass aggregate (PGA) has been used in asphalt base course, glassphalt demonstration projects, as sandblasting grit, in water filtration systems, as pipe cushioning, in landscape projects and other on-island end uses.

6. The recycling grant program has continued since the 1994 ISWMP, and grants have been issued by the County to a variety of businesses and non-profit organizations totaling $1.4 million over the last ten years. In addition, $5.2 million of State grant funds have been dispersed for glass, used oil and bottle bill programs.

7. A glass collection and recycling regulation has been established for restaurants and bars, and private haulers provide the hauling and recycling to end markets.

8. The County has executed contracts with private firms to collect, store, process and market white goods, scrap cars and other metals.

The County collects other recyclables at its landfills and has contracts for their processing and marketing.

4.5 Legislation

4.5.1 County of Maui

Glass Recycling for Licensed Liquor Establishments: Chapter 20.22 stipulates that all such establishments shall separate their glass containers from refuse for the purposes of recycling. These establishments shall keep records reflecting such recycling of glass. A penalty of not more than $1,000 shall be levied against a violating entity.

4.5.2 State of Hawaii

Recycling and Materials Recovery Facilities: Chapter 11-58.1-32 states that a permit application shall contain a site analysis, description of equipment list and description, drainage plan, plan to mitigate nuisance, health and safety risks. An operational plan shall also be made part of the application describing materials processed, how material will be measured, and what happens to the residue. A MRF operator is also required to submit annual reports to the State of Hawaii detailing the volume in tons of each recoverable material processed.

HRS Chapter 342G-2 requires the Department and the counties to follow solid waste management practices and methods in the following order of priority:

1. Source Reduction
2. Recycling (to include composting)
3. Landfilling and incineration

Advance Disposal Fee: Distributors of glass containers of non-deposit beverage containers pay an advance disposal fee to the State. The State distributes funds to counties based on de facto population so that it can establish glass buy-back programs that divert glass away from disposal to recycling.

Beverage Container Deposit Program: the statewide program known as HI-5 began on October 1, 2004, with redemption of deposit beverage containers starting January 1, 2005. As of June 30, 2006, DOH had certified 84 redemption centers and reduced the number of containers in the Advance Disposal Fee program by 55 percent. The program places a five-cent deposit on each container which is redeemable when the containers are returned to a redemption center. The deposit applies to glass, plastic, aluminum and bi-metal beverage containers. The redemption rate in FY2006 was 68 percent, and DOH has a goal of 80 percent for the program.

4.6 Recycling on the Island of Maui

4.6.1 Current Curbside Collection Operations

The Division does not operate or fund curbside recycling collection programs on the Island of Maui. A private company, Maui Recycling Services, has for several years provided curbside collection on a subscription basis for central Maui. Also, private haulers have piloted curbside recycling in selected communities.

4.6.2 Proposed Curbside Collection Options

4.6.2.1 Universal Curbside Collection

The SWRAC recommended that the County implement a universal curbside collection. "Universal" collection specifically means for all residences served by streets and roads meeting County standards and that this collection specifically includes single-stream marketable recyclables collected once every other week. Implementing such a plan would involve several steps.

If single-stream collection were to be implemented and if its items were to be marketable, then the material would have to be processed and prepared for markets in a MRF. Currently, there is no single-stream MRF on the Island of Maui.

Carts are used for collection of single-stream materials. If the County were to provide carts to the residents for recycling as it has for trash, it would be prudent to provide them with carts that are of a different color so as to easily distinguish them both for the resident and for the collection driver.

Single-stream collection entails using semi-automated trucks (trucks configured with hydraulic tippers) or automated vehicles (trucks that have an automated arm that reaches out and clasps the cart, lifts it and empties its contents into the vehicle's packer). The use of mechanical lifters lower injury rates for workers. Also, the automated vehicles can service more residences in a day.

The materials collected in the program would have to be marketable and maintain the marketability of the other items in the collection program. For this reason, glass bottles and jars may be excluded from the curbside collection program but be collected at the drop-off and redemption centers.[2] Alternatively, a separate container for glass could be utilized. Because of its low value and its contamination potential, both of these approaches are in practice in other jurisdictions. Cardboard, paper, and aluminum and steel cans would be included, as would #1 and #2 plastics. Because of the low value of recovered glass, local markets need to be developed, for example, use as alternative daily cover for landfills.

A new collection program needs a strong and ongoing education component to it. This means that the education element must be on the front-end of the program to instill the purpose of the program. Education also needs to work closely with the collectors to prevent problems from occurring. (Chapter 6 provides details on educational support for new programs.)

New collection programs along with new routes need support staff during the first two months after the initiation of the program. The County needs to prepare a bank of customer service representatives to handle inquiries from customers who have become confused on the days of collection or did not get some needed piece of information. To prepare for a surge of calls, communities sometimes hire temporary employees, train them in advance, and utilize them during the implementation of a new collection system.

[2] The County has a separate glass collection program for restaurants and collects glass in its drop-off centers.

With any collection of recyclables, the County will have to decide whether it is better to collect the material with County trucks and employees, contract the function out, or develop a partnership with the private sector whereby the County purchases and owns the vehicles for collection but the winning contractor is in charge of the operations, maintenance, and personnel. This merges the best assets of each partner: the County has access to lower cost capital for capital procurement, while the private sector may be more efficient with human resources. These are policy decisions for the County to make going forward with a new collection operation that especially must take into account the County's contractual obligation to the Union.

4.6.2.2 Other Options for Curbside Collection

4.6.2.2.1 Collection Intervals

Alternatives to the every-other-week collection stated in Subsection 4.6.2.1 fall into two categories: intervals of collection and strategy for collection. The timing of the collection of recyclables can be as often as once a week, such as in San Francisco and San Jose, to as less frequently as once a month. Once-a-week collection is more costly than every-other-week collection, currently performed in Seattle, Washington, and Marion County, Oregon, because collection vehicles run twice as much, but it does provide a high level of service. Advocates of recycling may argue that weekly collection generates more pounds a month than every-other-week collection. Anecdotal evidence on both sides of this argument can be found, however.

Once-a-month single stream recycling collection currently is used in Milwaukee, Wisconsin, and Nashville, Tennessee, utilizing 96-gallon containers. Seattle, Washington, also had once-per-month collection for half the City until 2004. Milwaukee's collection has been operating for nearly 16 years while Nashville's has been operating for the past five years. Milwaukee's collection occurs every fourth stated day of the collection. This means it may occur in the last week of the month and the third week another month, and so on. The jurisdiction hands out color-coded calendars to its customers to remind them on which week the collection is each month.

Nashville implemented a collection strategy of one through four weeks with collection occurring in one of those weeks on a certain day. This allowed residents to remember, for instance, that the second week of the month on Tuesday is the collection. This collection also had the added benefit of utilizing the collection crews for other work on those months with a fifth week.

Once-per-month collection lowers costs. To help residents remember their collection day, an automated email reminder and/or an automated phone call reminder can be sent the day before their collection at a minimal cost.

4.6.2.2.2 Garbage and Recycling Co-Collection

Combining trash and recycling into one truck can be done in two ways. The truck can be fitted with two compactor units, one for trash and one for recyclables. The SWRAC research tour made a site visit to San Francisco which operates a co-collection fleet. Most of the collection vehicles have a packer split whereby 60 percent of the volume is allocated for trash and 40 percent for recyclables. This ratio appears to work well for San Francisco and helps to eliminate two collection trucks going down the street.

Yet, not having the right split for the community served can cause problems. Just south of San Francisco in San Jose, the same company that services San Francisco received the contract to collect trash and recyclables for the City of San Jose. This company initiated an even split of 50 percent for recyclables and 50 percent for trash. The result was that the dedicated compactor for trash filled up faster than the compactor for recyclables. One of three things happened at that point. The driver would either decide to go to the landfill and unload the trash and go back to the route to collect until the recyclables were full and then drive to the MRF and unload. The second option to the driver was to unload both packers at that time. The third option was to start loading trash into the recyclable packer until both were full and taken to their respective deposit areas and unloaded. As a result, San Jose's recyclables had a high percentage of contamination.

The other option of co-collecting trash and recyclables is to not separate them at the source but to take it to a MRF sized for the separation of recyclables, organics, and material to be landfilled. These facilities are known as "dirty MRFs." Although collection costs go down significantly, processing costs are significantly higher.

4.6.3 Drop-off Programs

The centers the County currently operates are described in Subsection 2.4.3. The SWRAC did not recommend any changes to the existing drop-offs on Maui Island excluding the Hana region. Items that are collected at the curb will be diverted from the drop-off sites located in the areas that this curbside collection occurs. However, these same materials will be coming into the center from homes not collected by the County and from small businesses wishing to recycle. If the County implements an education program to raise the awareness of recycling, this may increase the desire to recycle in those homes and businesses where the County will not provide curbside recycling service.

If the volume of materials collected at the drop-off sites were to diminish, the County should consider either increasing the types of materials taken at these sites or consolidating them. Some communities, such as Montgomery County, Maryland, provide a full service convenience center where all types of material can be taken to this single site, such as traditional recyclable items, as well as household hazardous waste, electronics, batteries, reusable construction materials, white goods, waste oil, and textiles. Any new material the County may collect would have to be carefully researched to assure that the County can recycle such material in a cost-effective manner.

4.6.3.1 Central Maui Region

The Division plans to implement the SWRAC's recommendation of universal collection including recyclables for all residences served by streets and roads meeting County standards and that this collection specifically include single-stream marketable recyclables collected once every other week. The material collected will be all fiber products, aluminum and tin cans, and plastics #1 and #2. As markets are developed for post-consumer material, the Division will review the ability to collect additional material. Glass jars and bottles will continue to be received at the recycling drop-offs and, at least bottles, may be redeemed at the Redemption Centers. The Division believes that plastic bags are the responsibility of the generators who should receive these items back from the public for the purpose of recycling.

To implement this collection service, several things will have to be done:

- A MRF will have to be available to process the commingled material into separate categories of products. The collection program will need to be implemented in conjunction with the implementation of a MRF;
- Carts for recyclables will have to be purchased and delivered to the customers by the Division;
- Drivers will have to be trained on the automatic collection fleet;
- Routes will need to be developed for the collection of the material; and
- An education strategy will need to be devised and implemented to educate citizens on the collection services.

The drop-off programs will remain the same with the Division continuing to look at the feasibility of augmenting the number of categories of items that can be taken and recycled/diverted in an economical fashion The Division will continue to track the tonnage of material going to the individual drop-off depots, and if there is a significant drop in tonnage due to the curbside collection service, then the Division should review the option of consolidating the number of drop-off depots.

4.6.4 Hana Region

4.6.4.1 Curbside Collection Operations

The Hana region has no current collection of recyclables. The collection of residential trash currently occurs once a week with a rear-loader. The SWRAC has recommended that this region be provided universal collection service which would include every-other-week recycling collection to residences served by streets and roads meeting County standards. Approximately 600 homes would be collected.

At a projected 24 pounds per set-out of recyclables, a rear-load semi-automated truck would collect approximately 3.6 tons per day. The truck would be taken back to the MRF either on the same or a different day where the material would be processed. Having the material placed in carts also allows the Division to send an automated side-loader to collect the material in the event a mechanical problem prohibits its semi-automated rear-loader from performing the work.

4.6.4.2 Drop-off Program

The SWRAC unanimously recommended placing a full-service and staffed convenience center (a recycling drop-off facility that also receives MSW) in the Hana Region. The facility would accept all the materials that the curbside program collects as well as other items that the County finds reasonable to take. This may include green waste and household hazardous waste (HHW).

It is important to provide a full-service center if the County decides not to bury garbage in the Hana Landfill. Citizens who are accustomed to self-hauling will need a place to take their material so that it does not end up on the side of the road. Since the material will be coming into the facility, Division employees should maximize the material recycled as well as reused. Spotters in this facility would educate people on separating metals from garbage, HHW from garbage, and recyclables. These employees are the front-line education people for the Division. These functions would be performed by the Division employees currently operating the landfill.

The recyclables would be placed into roll-off containers and transferred back to the MRF to be processed. At the MRF, the containers will be weighed, providing the County with accurate data on the weight of the material collected in Hana.

4.6.4.3 Plan for New Operations

The Division plans to implement the SWRAC's recommendation of universal collection of recyclables for all residences served by streets and roads meeting County standards and that this collection specifically includes single-stream marketable recyclables collected once every other week. The material collected will be all fiber products, aluminum and tin cans, and plastics #1 and #2.

To implement this collection service, several things are required:

- A MRF will have to be available to process the commingled material into separate categories of products. The collection program will need to be implemented in conjunction with the implementation of a MRF;
- Carts for recyclables will be purchased and delivered to the customers by the Division;
- Drivers will collect the material using rear-load collection vehicles with cart lifters;
- Routes will need to be developed for the collection of the material; and
- An education strategy will need to be devised and implemented to educate citizens on the collection services.

A full-service convenience center will be placed on the Hana Landfill where citizens can place metal appliances to be recycled, limited types of household hazardous waste to be transported to the HHW facility, and household garbage to be transported to the Central Maui Landfill. The Convenience Center will be implemented before the curbside recycling service because of the latter's dependence upon the construction of a MRF.

4.7 Recycling on the Island of Lanai

4.7.1 Curbside Operations

Lanai currently has no curbside recycling program but, as with Hana, this change is recommended. Currently, a County landfill employee collects refuse in an automated collection truck from approximately 600 homes. Universal collection would expand this to 1,300 homes. Carts for recycling could be provided to these customers, and collection would then occur every other week.

The projected 16 tons of material collected would be taken back to the Lanai landfill where it could be stored commingled with or without compacting. Once a few containers have been filled and readied for shipment, the containers would be shipped to an, as yet, undetermined processor on Oahu or Maui. The materials collected would include fiber (all paper), metal drink containers, and plastic drink containers.

4.7.2 Drop-off Programs

The Lanai Landfill currently has carts, as seen in Photo 4-1, placed outside the office with handwritten signs on each designating them as the facility's recycling center for citizens to use. There is no promotional literature on recycling and apparently no encouragement on the part of the staff. Although the site is small, there is room to place a proper drop-off facility with recycling literature for people to take with them on how they can reduce, reuse, and recycle more items.

Photo 4-1. Public Recycling Drop-Off at the Lanai Landfill

The facility would accept all the materials that the curbside program collects as well as other items that the County finds reasonable to take. This may include green waste and household hazardous waste. A site other than the landfill may be more efficient, such as a location adjacent to the HI-5 redemption center.

4.7.3 Plan for New Operations

The Division plans to implement the SWRAC's recommendation of universal collection of recyclables for all residences served by streets and roads meeting County standards and that this collection specifically include single-stream marketable recyclables collected once every other week. The material collected will be all fiber products, aluminum and tin cans, and plastics #1 and #2.

To implement this collection service, several things will have to be done:

- Lanai is not tethered to the construction of a MRF. The Division can make an arrangement with a MRF on Oahu to process the commingled collection materials on Lanai and ship them to the facility from Lanai;
- Carts for recyclables will have to be purchased and delivered to the customers by the Division;
- The Division currently collects garbage using an automated side loader and can use the same vehicle to collect recyclables every other week on Lanai;
- The Division would use the routes already developed for garbage collection; and
- An education strategy will need to be devised and implemented to educate citizens on the collection services.

The Division also plans to develop a more customer friendly drop-off facility at the Lanai landfill. This will involve roll-off containers that can be moved on the landfill site.

4.8 Recycling on the Island of Molokai

4.8.1 Curbside Operations

There is no collection of curbside recycling currently performed by the County on the Island of Molokai. However, the County does have a mobile recycling drop-off unit for HI-5 deposit containers only. Recovered materials are shipped to Oahu for processing. The current refuse curbside collection of approximately 600 units is performed by the County's Highway Division using the Solid Waste Division's rear-loader vehicles. SWRAC has recommended universal collection with every-other-week recycling collection to these homes plus an estimated 600 additional homes. Carts would be provided to these homes and collected with semi-automated collection vehicles (rear-loaders with hydraulic lifters on the back).

Once the material is collected, it would be deposited at the Molokai Landfill where it would be containerized commingled for shipping. If this were to occur, adequate loading and unloading of shipping containers would need to be put in place. The material would most likely be shipped directly to Oahu to a processor which is where recycled paper and other materials are currently shipped. Future approaches would be determined through a procurement process.

4.8.2 Drop-off Programs

The existing drop-off programs operated by the County would continue at the landfill, and the mobile unit would be phased out.

4.8.3 Plan for New Operations

The Division plans to implement the SWRAC's recommendation of universal collection of recyclables for all residences served by streets and roads meeting County standards and that this collection specifically include single-stream marketable recyclables collected once every other week. The material collected will be all fiber products, aluminum and tin cans, and plastics #1 and #2.

To implement this collection service, several things will have to be done:

- Molokai is not tethered to the construction of a MRF. The Division can make an arrangement with a MRF depending upon best price and lowest cost to process the commingled collection materials on Molokai and ship them to the facility direct (This is done currently by the County's recycling contractor for the materials recovered on Molokai);

- Carts for recyclables will have to be purchased and delivered to the customers by the Division;

- Drivers will collect the material using rear-load collection vehicles with cart lifters;
- Routes will need to be developed for the collection of the material; and
- An education strategy will need to be devised and implemented to educate citizens on the collection services.

4.9 Materials Recovery Facility

Recyclable materials collected at the curb or in drop-off centers require processing to meet the specifications of industrial markets, and storage to collect sufficient quantity to ensure economical shipping. Materials recovery facility, or MRF, refers to an enclosed facility consisting of areas for receiving, processing, and product storage and loading. The design of a MRF is geared to the type(s) of materials collection used. For example, if dual-stream collection is used, the receiving area will have two conveyors that feed the two processing areas: one for mixed paper (newspaper, cardboard, junk mail, magazines, etc.) and one for commingled containers (aluminum, steel cans, plastic and glass). If the collection is single-stream, there is a single conveyor in the receiving area which feeds a set of screens and other equipment that produce the dual streams for further processing. The processing of commingled containers uses magnets, eddy current separators, pneumatics, and screens to separate steel, aluminum and glass, respectively. Plastics can be sorted manually or by using an optical or other electro-magnetic spectrum scanning and air blast separator. The mixed paper fraction is separated using screens and manual sorters. These are processes using sensors that determine the type of resin in plastic and the color of material thereby triggering separation of predetermined material with a high percentage of reliability.[3] All the products except glass are baled to increase the density for economical shipping. Bales are stored until one or more trucks or containers constitute a shipment. MRFs also are testing material identification and sorting methods.

4.9.1 History of an Idea: County MRF

The County has been grappling with the idea of having a MRF since the 1994 ISWMP was passed. Recommendation 4-4 of that ISWMP called for the County to ensure capacity for processing an increased amount of recycling, and projected that $2 million would be spent by the County on the construction of such a facility.

In October 2002, a County-sponsored Recycling Task Force released its recommendations for achieving the state goal of 50 percent recycling. The committee's first recommendation was, in part, for the County to develop "a permanent material recovery facility" on the Island of Maui.

In 2003, the previous permanent Solid Waste Chief for the County produced a memorandum entitled "Solid Waste Programs & Issues." In this document, the Chief wrote:

[3] For further information on optical sorting, see: "Low Cost Optical Sorter for Recyclable Materials: Final Report" Sonora Environmental Research Institute, Inc. by Monika L. Crank, Jamie M. Kern, Jennifer L. Lindquist, Anna H. Spitz, Ann Marie A. Wolf, and Anita Zavodska.

> "Currently, the primary barrier to increasing County diversion rates and improving the economic viability of recycling on Maui is the lack of adequate processing capacity. While there are two commercial facilities on Maui who receive, process, and ship out the majority of the island's recyclables, both are operating beyond reasonable capacity…."

The Chief went on to estimate that the facility would need five acres of land, the facility itself should be under roof, and should be placed adjacent to the Central Maui Landfill. For several years, the County allocated monies in the Division's budget to pursue the concept of a MRF. For the past few years, the County has kept an inventory of acceptable vendors to assist the County in the design and procurement of such a facility.

The concept of a MRF developed by the County seems to have won support in the first ISWMP, in the 2002 Solid Waste Task Force, within the Division, and in the budget process. On October 4, 2007, SWRAC recommended that the County develop a MRF that is fully enclosed, centrally located, built to handle single-stream material, and that its operational functions should be contracted out.

4.9.2 Private Processing Facilities in Maui County

Maui County has two recyclable materials processing facilities, located in or near Wailuku and Kahului, as shown in Table 4-1. Both of these facilities are owned and operated by private companies. In addition, the County has some processing capability at Molokai for recyclable materials, including a baler and a glass crusher. None of the current facilities has full MRF capability. The recyclable materials processing facilities are small and have limited capability. These facilities, their locations and quantity of materials processed are shown in Table 4-1.

Table 4-1 - Maui County Recyclable Materials Processing Facilities

Name	Location and Description	Status
Aloha Recycling, Inc.	Located at 75 Amala Place off Hobron in Kahului. This site is approximately 1.0 acre.	Processes glass into processed glass aggregate (PGA) road base and backfill for the landfill and other road construction. In FY2006, processed approx. 5,400 tons. Also, permitted for OCC, plastic and aluminum.
Maui Disposal Co. Inc.	Located in the Central Maui Base Yard off Mokulele Hwy, just south of Puunene. The site is approximately 1.2 acres.	Recycling processing facility, just installed new Marathon Badger baler (bales OCC, plastic & metals) with a building over it. Baled materials stored outside. In FY2006, processed approximately 9,500 tons of materials.

4.9.3 Marketing of Existing Recycled Materials

At the present time, the County maintains contracts with the private sector for processing recyclable materials. These contracts also include provisions for marketing the materials processed. This applies to the drop-off center materials, scrap autos and white goods, fats and greases, used motor oil and green waste compost.

4.9.4 Proposed Plan for County Single-stream MRF

The Division plans to procure a single-stream recyclables materials processing facility to process the material its curbside collection of service collects. SWRAC advised the Division to develop a public-private partnership using a design, build, and operate procurement. In that way, the Division would interface with one entity that is responsible for the overall development and operations of the facility. The Division would provide the land for the facility and have ownership of the buildings and the equipment, which could be transferred right after the acceptance test or turned over to the County at the end of the contract term. The Contractor will process all of the County's curbside and drop-off recyclable material as well as material brought to it by private vendors.

The Division and the contractor partner to assure completion of tasks. The Division will need to develop performance specifications for the facility that identify parameters, including daily capacity, residue rate, products recovered and marketing requirements. Engineering studies needed for the approval and building of the facility may be shared by both the Division and the contractor. Construction of the building and the procurement of equipment would be the responsibility of the contractor but must be equal to or above the standard of quality set by the County.

4.9.5 Summary

The Division has reviewed the various options to enhance recycling and has decided to do the following:

- Implement curbside recycling on all three inhabited islands and the Hana Region within the County;
- Develop a new convenience center in Hana with recycling operations;
- Upgrade the recycling drop off at the Lanai Landfill; and
- Procure for the design, build, and operate of a MRF in Central Maui.

4.10 Private Recycling

4.10.1 Active Haulers

There are three private service providers on the Island of Maui that provide collection services for refuse and recyclable materials for a fee. In addition, the Islands of Lanai and Molokai each have a private service provider for businesses. However, in many instances, both residents and businesses prefer self-hauling and have no service, either County or private.

4.10.1.1 Service Provided

The five private collection service providers operating in the County of Maui are listed in Table 4-2, along with their service areas and services.

Table 4-2 - Maui County Private Service Providers

Name	Service Area	Services
Aloha Waste Systems, Inc.	Island of Maui	Provides collection of recyclable materials and refuse from residents and businesses, including office paper. Collects glass and yard waste separately.
Maui Disposal Co. Inc.	Island of Maui	Provides collection of recyclable materials, including office paper and refuse from residents and businesses. Collects glass and yard waste separately.
Maui Recycling Service, Inc.	Island of Maui	Provides collection of recyclable materials only.
Lanai Trucking	Island of Lanai	Provides collection of refuse from residents and businesses. Offered recycling services previously but found it unprofitable.
Island Disposal	Island of Molokai	Provides collection of recyclable materials and refuse from residents and businesses.
Puaa Food Waste Services	Island of Maui	Provides collection of food waste from commercial generators. Food waste is taken and used by pig farmers.
Empire Disposal, Inc.,	Island of Maui	Provides collection of refuse from businesses.

4.10.1.2 Tons Reported to County

The County weighs all private trucks of the service providers at the Central Maui Landfill. At the Hana and Lanai Landfills, there are no scales and the waste quantities are estimated. At the Molokai Landfill, there are scales, and most private service provider trucks are weighed and the rest estimated.

The County of Maui has a number of other private service providers that offer various recycling and disposal services to residents and businesses in addition to those discussed above.

Table 4-3 - Maui County Private Refuse and Recycling Service Provider FY2006 Quantities

Name	Quantity of Refuse (tons)	Quantity of Recyclables (tons)
Aloha Recycling, Inc.	NA	5,400
Aloha Waste Systems, Inc.	48,400[1]	NA
EKO Compost, Inc.	NA	54,253
Island Disposal	3,972	0
Kitagawa Towing	NA	5,300
Lanai Trucking	3,265	0
Maui Earth Compost, Inc.	NA	4,000
Maui Disposal Company, Inc.	82,400[1]	9,500
Maui Recycling Service, Inc.	NA	NA[2]
Pacific BioDiesel	NA	6,200
SOS Metals	NA	0

[1] Estimated by GBB. NA = not applicable.

[2] Materials collected by Maui Recycling Service is processed by Maui Disposal and included in that quantity.

Table 4-3 shows the private service providers and the quantity of recyclable materials and refuse collected.

5. MSW, White Goods, and Bulky Waste Collection

5.1 Purpose

The purpose of this chapter is to review the history, trends, and operations of solid waste collection in Maui. For those readers who are not familiar with the types of equipment and operational options used for the collection of Municipal Solid Waste (MSW), white goods (appliances), and bulky waste (furniture), then they should read Section 5.2. Terms are described in this section and are used throughout the chapter. If the reader is familiar with the background on this subject, then moving directly to Trends is recommended.

Trends begin with Section 5.3 and summarize what operations, if any, are conducted in the other counties in the state. Section 5.4 then looks at the trends on the Mainland as it relates to operational issues.

Beginning in Section 5.5, pertinent legislation, a review of the 1994 ISWMP recommendations and a summary of what was done since that report are provided.

Sections 5.8 and 5.9 discuss the actual operations of the County and possible alternatives to those operations.

5.2 History

5.2.1 Background

Two complementary trends are apparent in the collection of waste. The profession has evolved its collection equipment from four legged animals to highly technical equipment and from the legs and backs of men to the aptitude and willingness of any worker whether male or female.

Photo 5-1. Example of a 1940s advanced collection vehicle by Heil

Serious changes in the collection of trash began in the 1940s. Progressive companies began to move toward motorized collection vehicles with compactor units powered by something other than human effort. Up to the 1980s, large crews were the norm on collection trucks. Over time, both manufacturers and haulers refined many physical elements of the hauling business. High loading heights, for instance, were the norm before compactors emerged as the collection body of choice. Those high loading heights required workers to extend their bodies as they lifted heavy metal cans filled with garbage. Injuries on duty were extremely high in the waste collection field.

Unloading devices were refined to move the work further away from human effort. The more mechanical this work became, the quicker the truck could be back on the road collecting from more homes. The first effort was a cable netting device to wench the material off the bed of the truck. Over time, the mechanics of unloading rested upon two techniques: (1) the hydraulically operated dump body where the bed of the truck raises up to allow gravity to assist in pulling material out of the container and (2) the hydraulically operated movable pusher plate which essentially pushes the material out of the container without raising the bed.

The turning radius of trucks improved, allowing trucks to get closer to the trash being collected. Even today, when a company or jurisdiction tests trucks for possible purchase, they drive the truck into tight cul-de-sacs or alleys with tight turns so as to test their ability to service the specific needs of the community. Getting the truck close to the collection site saves labor and decreases collection time at each stop, thereby being more efficient. Manufacturers have increasingly improved the trucks' turning radius by, in part, placing the cab over the engine.

Photo 5-2. Heil's trailer collection vehicle that allows for tight turns and large loads

Containing the material within the collection body became more of a requirement as urban communities became densely populated and the roads became paved not allowing the spilled liquid to be soaked into the ground hence maintaining the smell for longer periods of time. The welded-steel, fully enclosed collection bodies provided manufacturers with opportunities to contain the trash and its liquid by-product.

Photo 5-3. Cart lifters on the back of a rear-loader

As the collection vehicles became more sophisticated, they also became more dependent upon uniformity, specifically, the uniformity of residential containers. When large collection crews were the norm, employees would jump off the truck and push, pull, or sway a container of trash over to the collection vehicle and, if need be, all of the crew would struggle together to inch the can of trash up into the loading area, called a hopper, of the compactor.

Semi-automated loader trucks are the same as manual collection vehicles with the addition of a cart lifting device on the back of a rear-loading truck. These lifters attach to the mainframe of the truck and have two hooks on the faceplate that, as they lift, latch to the inset and bar on universal carts. The worker on the back of the truck must wheel out this special cart to the lifter and engage the hydraulic system to lift and dump the contents of the cart into the hopper. When the hopper approaches full, the worker on the back engages the hydraulic system that brings the metal blade down and sweeps the hopper full of garbage into the compactor unit.

Uniform containers help collection be more efficient and allow for greater worker safety. The manual crews must be physically capable of performing repetitious lifting of containers, often exceeding 50 pounds, for most of the workday. These manual trucks, with three person crews, can collect 700 or more homes in a day if the homes are clustered together. Under such circumstances, the workers on the back will have lifted between 10 to 15 tons in a day.

The resident's container, in the case of a semi-automated collection vehicle, must fit the lifter in order to work smoothly and not slow up the collection of trash. These lifters on the trucks reduce injuries, prolong an employee's work-life, and reduce Workman's Compensation and absentee costs to the service provider.

5.2.2 Automated Collection Vehicles

Both private and public entities have moved toward automated collection over the past few decades. This section reviews the different collection strategies chosen by communities and private industry.

Semi-automated collection: The concept of the rear-load collection vehicle was described in the earlier section of this chapter. For many jurisdictions, this is an advantageous way to move toward automation because the jurisdiction may already own a fleet of rear-load trucks that, for less than $10,000 each, can have two lifters placed on the back of the vehicles to make them semi-automated trucks.

Photo 5-4. Rear-loader with two compaction units

Rear-load, semi-automated trucks can also be outfitted with two compactors in the body of the collection vehicle so that two carts containing different items (for example, one for trash and the other for recyclables) can be collected while making the same stop.

Such a collection strategy lowers the cost of collection but, as described in Chapter 4, can cause routing and quality issues if the compactors are not sized proportionately to the commodities being collected.

A benefit to collecting with rear-load trucks is that they are versatile vehicles that can, when needed, collect large loads of brush or storm debris, or bulky waste.

Automated Side-Loaders (ASL): The County has been transitioning from manual rear-load trucks to automated side-loaders (ASLs) for the past few years. These are trucks equipped with an extendable arm that actually wraps its ends around a cart, pulls it closer to the truck, lifts it up and over the hopper of the compactor, turns it upside down to empty the contents, and then sets it back onto the ground. These trucks can do a thousand or more homes in a work day shift provided the homes are clustered together. The work is done with a single crew member who generally does not leave the cab.

Photo 5-5. Drop-frame truck for both automated and manual collection

ASLs are more expensive to purchase than rear-load trucks but are faster and less costly for overall collection operations because of increased efficiency, and the crew size drops down to one person. Since the trucks are technically advanced, they are costly to maintain. Maintenance schedules, including preventive maintenance, must be followed on these trucks.

Drop-Frame Trucks: Normal operation of an ASL requires the driver to leave behind any refuse not contained in the cart. The drop-frame allows the opportunity for the driver to load material directly into the hopper. This would eliminate the need for a second truck to come behind and collect the material. The risk with this type of collection strategy, ironically, is worker safety. The driver may feel compelled to pick up and throw into the hopper items that the driver should not be picking up at all because of its size and/or weight.

The County of Maui would have to renegotiate its Union agreement if it decided to implement this collection vehicle.

Front-End Loader Commercial Trucks: Front-end loader trucks collect dumpsters from institutions and commercial enterprises. These are collection vehicles with two forks on front arms that unfold to extend out and, after being inserted into the sleeves of the dumpster, hydraulically raise the container up, over, and behind the cab, turning the container upside down, and unloading its contents into the hopper of the compactor.

The crews on these front-end loaders for dumpster collection vary between 1 and 2 people. The second person normally is included if many of the dumpsters have to be wheeled out to the road for the collection vehicle to lift and unload it. If a highly trafficked area has many dumpsters that need to be rolled out along the street for collection, a jurisdiction or private hauling concern will send a crew early in the morning in a pick-up truck to push the dumpsters out before the collection vehicle gets there so it can collect and be on its way to easier collections while the crew rolls the empty dumpsters back to their original locations.

Front-End Loader Residential Trucks: An alternative to ASLs that appears to be gaining in market share over the past few years is the front-end loader with a dumpster and lifting arm on the side of the dumpster. The most prominent manufacturer of this mechanical attachment is the Curotto Can. The Curottos spent nine years in research and development by using different units on their own routes in Sonoma, California. In 2000, the family put the product on the market. Essentially, the product is an attachment that slips over the front-end-loader forks. The attachment is a 4.6 cubic yard container on a metal skid that the forks of the front-end loader insert through to carry the container. Attached behind the container is an automated arm that can grab a cart ranging in size of 32 to 106 gallons and has a lift capacity of 500 pounds. The arm extends out sixty inches and has the ability to not only lift from any place within the sixty inches, making tight collection spots easier, but can lift the cart and roll it back over the container thereby eliminating the problem of filling only one side of the container and minimizing spillage. By evenly distributing the waste into the container, loads are maximized before having to dump its contents into the compactor.

Photo 5-6. Front-end loader with a Curotto Can on the front for residential collection

A benefit of using this type of automated residential collection is if the arm mechanism should have a maintenance problem. The Curotto equipment can be dropped off at the shop, the truck can pick up a second one, and back on the route it can go. With an arm problem on an ASL, the whole truck is down until fixed.

A second benefit this has over an ASL is its ability to collect bulky waste items without the driver having to step out of the cab. The arm can grab such items as furniture, lift it into the Curotto dumpster and finally into the hopper of the compactor without the driver having to get out.

A third benefit over an ASL is that the driver can inspect the material in front of him for contamination as the material is being placed into the Curotto Can. This is especially helpful when collecting recyclables. In comparison, the dumping of the cart in an ASL occurs behind the driver who has to rely on cameras to see contamination.

There are concerns about the use of the front-end loader residential collection vehicle in certain areas, however. In jurisdictions with narrow streets, the extended length of the collection vehicle, because of the addition of the dumpster, can be problematic. The second concern is the height of the dumpster when lifted to its apex. In an area with many low-hanging wires and tree limbs, that height may be a problem and slow down collection.

5.2.3 Bulky Waste and White Goods Collection

Bulky waste is material too large to be placed into a cart. Examples of bulky waste are furniture and mattresses. White goods are appliances, such as stoves and hot water heaters, which are made primarily of metal and can be easily recycled. Many communities offer collection of these items at the curb. The collection vehicles differ, however, in type and ability.

5.2.3.1 Collection Vehicles

<u>Flatbed Trucks</u>: Communities may use a flatbed truck with stake sides and a hydraulic liftgate on the back. Normally, a crew of two to three people staffs the collection vehicle. When they get to the site, they load the flatbed with the material using the liftgate to raise the heavy material to the bed of the truck. The crew must either lift or “walk” each item onto the liftgate and then in the truck. The benefit of this type of truck is its low cost and multi-use as well as the ability to designate and keep separate items for reuse. Loading, however, takes more time and involves a larger crew than other types of collection vehicles.

The County collects its white goods on the Island of Maui using this type of truck.

<u>Rear-Loader</u>: A rear-loader packer, the same kind used for collecting trash, is a workhorse vehicle for bulky waste. The truck pulls up to the curb, and one to three workers get out and load the material into the hopper and compact it. If the material is too big to put into the hopper and compacted at one time, then it is done in stages. A sofa, for example, will be picked up by the crew and fed into the packer as one pushes a long board through a table saw. The blade of the packer comes down and severs a section off and places it into the compactor.

Stops can sometimes take longer than with a flatbed because of this process, but the rear-loader can pick up many more stops before filling up than a flatbed. Crews have been known to purposely use the blade of the rear-loader to dismantle an object, such as dressers and sofas, more than is necessary because, at the end of the process, coins that had inevitably been lost in these pieces of furniture will be left at the bottom of the hopper. This may result in slower than necessary collections and undue burden on the truck's mechanics.

Although not recommended, some jurisdictions collect white goods with a rear-load packer truck for the same reasons it collects the bulky waste, i.e., collect more stops before unloading. One problem with using this method to collect white goods is the high potential of breaking a Freon line and releasing the contents to the air and ground.

Another reason to avoid using this type of truck to collect white goods is that crews have been known to use the blade to sheer copper and other valuable metal off of items, such as air conditioners, and then sell them at scrap yards for personal gain. The blade will become pitted, dented, and out of alignment, causing it to not sweep in all the material into the compactor and may, in extreme cases, not compact or move at all. Higher maintenance cost is a result of this practice.

Knuckle-boom Truck: These are trucks with a boom that hydraulically extends out and away from the truck up to twenty or so feet depending upon the design of the model used. At the end of the boom is a clamshell that opens and closes hydraulically. The crew member who operates the device with a joy stick can, essentially, use the boom and clamshell as an extension of their hand and pick-up the material and place it into either a container attached to the bed of the truck or a container on a linked trailer. The crew member has the ability to break the material down, similar to a compactor or segregating material for potential reuse, by using the clam shell to crunch the items into smaller bits.

There are options for the configuration of this type of equipment. The boom and clamshell device can be attached to the cab with one or two trailerized containers. This allows the crew member to fill the first trailer, drop it at the side of the road, and hitch directly to the second trailer so that the boom can keep on loading. A separate transport truck will hitch to the full trailer and take it to the unloading area and bring it back to the knuckle-boom so it can keep loading. This type of system works well to clear large amounts of storm debris.

The truck can also be a unified truck and container where the option of detaching the container from the truck is not available. Once the container is full, the truck takes it directly to the unloading area.

Some communities staff knuckle-boom trucks with two employees. One to drive and work the boom and the other to sweep up around the area the citizen had set the materials. Other jurisdictions have allocated one crew member working the truck since much of the physical stress has been taken out of the loading.

The operator of a knuckle-boom generally becomes adept at picking-up and placing material into specific spots on the trailer. White goods can be collected with Knuckle-boom trucks, but the operator must be trained to avoid pinching lines that may release such items as Freon to the atmosphere.

Front-End Loader: Front-end loader trucks, as described above, can be used to collect bulky waste. A dumpster can be placed on its forks and when the truck gets to the designated location, the crew members (normally two) load the dumpster until it is full and then the dumpster is unloaded into the trucks hopper for compaction.

Front-end loaders are more expensive pieces of equipment than rear-loaders, flat-beds, or knuckle-booms, however, with not any noticeable advantages for the collection of bulky waste and white goods.

5.2.3.2 Bulky Waste and White Goods Operations

There are several methods that communities use to collect bulky waste and white goods. The following describes these methods.

Collection Events: These are published locations and times, generally at a neighborhood school on a weekend, where citizens can bring their bulky waste to the site. The bulky waste items are placed directly into a collection vehicle and when the vehicle is full it is driven to the disposal point while an empty vehicle takes its place receiving bulky waste.

These collection events usually have little chance for reuse, and they tend to work crews on overtime thereby making the collection more expensive to the Division. They also preclude those citizens who cannot transport large items away from their home.

Collecting along Trash Routes: Some jurisdictions collect bulky waste and white goods from existing trash collection routes on a periodic basis. These customers may be notified by a flyer that on, for example, the normal Thursday trash collection the resident can place their bulky waste item out for collection. If the crew normally collects the trash with a rear-load truck then much of the bulky waste can be collected during the same stop. Otherwise, a separate truck follows the route and collects just the bulky waste. White goods should have a separate non-compacting vehicle collecting them.

A variation of this concept is when the trash customer sets out the material on any of their trash collection days. The normal refuse collector will spot the bulky waste or white good item at the address and communicate the location to the base yard. This can be accomplished by a Global Positioning System (GPS) on the truck or by communicating the address by way of radio, phone, or email. A GPS, however, works more efficiently and is becoming a less expensive and more efficient manner by which to designate pickups. A GPS device is on the truck and initiates a microwave signal, using a constellation of medium Earth orbit satellites provided by the United States Department of Defense, to send the location/address back to the base yard. As these data points are received from the trucks collecting household garbage that morning, a route is developed back at Sanitation's headquarters for a vehicle to collect the bulky waste and white goods that late morning and early afternoon.

The latter tactic for collection eliminates much of the driving of the former since it is unlikely that a majority of the customers will have placed material out for collection.

Collection by Appointment: Citizens who wish to have bulky waste and white goods collections are asked to make an appointment either by phone or email. The system then provides them a day that the material must be out at the curb. The collection routing system divides the jurisdiction into sectors and assigns a collection day to each sector. When a citizen calls or emails from that area, the system places the address on the first available pick-up day in that sector by reviewing the truck capacity remaining on the next collection pickup scheduled for that area. If space is available, then that address is placed on the list. If not, that address is designated to the first available date.

These addresses are computed, either by a person working with a map or using a computerized routing system, to determine the most efficient route a truck can take to maximize collections. This is called point-to-point routing.

This is a controlled collection system and works especially well when the customer is charged by the pickup or only allowed a certain number of bulky waste collections a year. The call-in system also provides tracking of the collections by work order so that reports can be run and the program analyzed for effectiveness.

Mass Collection: A hybrid of the appointment and collecting along trash route systems is the mass collection method. This system divides the jurisdiction into sectors by geographic areas and notifies its residents that, on certain days, collection vehicles for bulky waste will be driving down the street to collect items placed out by the resident. Trucks are sent into the area for the stated period of time to collect the material.

There are a few problems that arise with this system, however. First, the neighborhood fills up with material, some of which may be brought from outside the specific zone and dumped along the side of the road to avoid having to pay a disposal fee. The material may be in any state of condition possibly causing a vector problem and, at the very least, is unsightly. Inevitably, residents place material out after the collection vehicles have passed causing either a confrontation between the resident and manager of the collection system and may result in the collection vehicle having to retrace its route thereby making the collection period longer than publicized and, again, causing confusion among neighbors seeing the truck drive down the street for a second time.

5.2.4 Routing

There is an adage that time costs money. The routing of collection vehicles can either add or decrease time to operate a collection system. The cost of fuel, vehicles, and labor increases every hour a truck operates. Therefore, both the private and public collection systems are looking seriously at fine-tuning their routing capability to eliminate nonproductive time.

Efficient routing has, as its goals, to maximize the amount of time that collection vehicles are actually collecting solid waste/recyclables. It also looks to limit the amount of time that the collection vehicles are involved in non-collection activities. Routing should also balance the routes so that each route takes the same amount of time. A disproportionate amount of the work should not be placed on a few trucks while the remainder finishes their routes early.

As touched on elsewhere in this chapter, there is a difference between developing routes that occur on a regular basis and ones that never occur again. The weekly collection of curbside trash is a route that changes little over time. The appointment collection of bulky waste, on the other hand, will be a unique route each time.

Managers of jurisdictions that did not codify the regular occurring routes often find themselves in difficult situations when a generation of drivers is replaced. These jurisdictions may not have specific driving directions or maps made of the route.

When the driver of that route retired, the next driver would be taught the route by driving it with the previous driver before he retired. In such circumstances, management had to rely on the memory of drivers to preserve the nuances of that specific route. New drivers could not go to a set of maps and driving directions to perform the route competently the first time.

These jurisdictions, generally speaking, never increase efficiencies such as route balancing. Collection crews sometimes resist routing exercises because it develops a new level of accountability as well as a self-satisfying belief that no routing system can really make the system more efficient than the expertise of that specific driver assigned to that specific route.

A case in point is the front-end loader routes for the Metropolitan Government of Nashville and Davidson County. The Division collected dumpsters at government institutions and public housing using seven collection vehicles. The collection crew resisted the routing for such a small number of collection vehicles. After the routing was computed and checked for errors, the number of collection vehicles needed each day dropped from 7 to 5. This reduced the cost of equipment, labor, fuel, overtime, and overall budget. The new routing also eliminated a sizable portion of overtime that certain drivers appeared to share over a year's time.

5.2.5 Transfer Stations

Transfer stations are waste transportation components employed to reduce hauling costs by moving the waste to larger vehicles. These include transfer trailers, railroad cars, or barges which haul from a central point(s) within a jurisdiction to one or more distant solid waste management facilities. The act of transfer includes unloading of collection vehicles at the transfer station, loading solid waste from the transfer station to the transfer vehicles, and hauling it to distant solid waste management facilities.

Photo 5-7. Transfer station in Oklahoma

The construction of a transfer station may take advantage of a natural differential in elevation so that the loading of the top-loading transfer trailer will be more efficient. Photo 5-7 shows the transfer trailer down below and the entrance for the trash trucks on the top level. The collection vehicle goes in through the top door, unloads its material on a concrete floor (tipping floor), and then drives out the other side of the building. A rubber tire loader pushes the waste on the tipping floor to the far end of the building above the trailer seen on the lower right side of the picture. The waste is pushed into an opening in the tipping floor which is right over the transfer trailer. Often, the trailer being loaded with waste is parked on scales with a meter above the tip floor so the operator of the rubber tire loader knows when the trailer has reached its legal weight limit. When the trailer is filled, a truck takes it straight through the other side of the building and onto a final disposal point with an empty trailer taking its place waiting to be loaded.

For odor and litter control, the best practice is to have the facility enclosed. Solid waste permits generally require that the trash be taken off the floor and into the trailers at the end of the day. Except for mechanical breakdowns or hazardous road conditions, the transfer station and the transfer trailers are clean of trash at the close of the work day.

5.3 Trends in Hawaii

5.3.1 MSW

The County of Hawaii: The County has no residential or commercial collection fleet. Currently local private haulers collect residential and commercial trash and dump the material at one of two landfills for $85 per ton. The residential trash haulers have an agreement with the County for a rebate based on the number of residential accounts the local haulers have.

The County operates its network of 21 transfer facilities most of which are staffed with County contractors and supervised by the County. The County owns and operates the transfer tractor-trailers servicing these transfer stations.

The County owns both its landfills but operates one while contracting out the operations of the second. One of these landfills is nearing capacity and the jurisdiction is in the midst of procuring for the development of a Waste-to-Energy facility.

The County of Kauai: The County operates its own rear-loader collection vehicles with three-person crews. There are six collection crews servicing the island Monday through Friday. The County also owns and operates 4 transfer stations. Kauai has a landfill owned and operated by the County and is considering the development of a Waste-to-Energy facility.

The County and City of Honolulu: This jurisdiction operates a system to collect curbside refuse from 160,000 units. Most (130,000) are provided with carts that are collected using automated side-loaders. The remainder is collected using rear-loader trash trucks. Honolulu began a pilot curbside recycling collection program in two communities, Mililani and Hawaii Kai, with a total of 18,000 residences. The pilot program has a cart for green waste and a cart for recycling, including newspaper, cardboard, glass, aluminum cans and plastic jugs (No. 1 and No. 2)

5.3.2 Bulky Waste and White Goods

The County of Hawaii: The County provides no separate collection of bulky waste items. It allows citizens to dispose of bulky waste at its network of transfer stations after which it is taken and disposed of in the County's landfills.

The County of Kauai: The County had not conducted a collection of either bulky waste or white goods for nearly 20 years. A few years ago, it initiated a collection of bulky waste through a contracted firm for collections during certain dates. The total cost of the program was approximately $600,000. The bulky waste is currently dropped off at two of the County's four transfer stations for disposal.

The County has recently contracted with a firm to handle its white goods. Citizens can drop this material off at all four of the County's transfer stations at no expense. The contractor collects them, extracts CFCs in an environmentally correct manner, and ships the material off island. The cost of this service is approximately $300 per ton.

There is no curbside collection for bulky waste or white goods currently performed by the County.

The County and City of Honolulu: Beginning in July 2006, this jurisdiction provides monthly collection for bulky waste items using the "Mass Collection" system. The customer does not call in for an appointment but simply has a monthly schedule to abide by. The island is divided into sectors and each sector has a collection period lasting no longer than four days. This jurisdiction considers bulky waste items to also include appliances often referred to as "white goods." Two different trucks are used for the collection. A flatbed with staked sides and a lift-gate collect the white goods while a rear-loading trash truck collects the bulky waste items such as furniture.

5.4 Trends on the Mainland

5.4.1 MSW

5.4.1.1 Operations

The collection of MSW, on average, amounts to 42 percent of the solid waste budget. Given the tightening budgets of municipalities, collection organizations, both private and public, are continually striving to lower costs. This has caused many such entities to move toward automated collection of containerized garbage once a week and a routing evaluation performed for this transition.

Moving toward automation allows the division to reallocate labor to needed areas. Representative ranges of service stops for various collection system designs are displayed in the following table.[1] Many areas of the country have moved increasingly to semi-automated trucks with a one-person crew or ASLs with a one-person crew. The west coast trend is to automated collection using ASLs and three carts: recyclables, green waste and refuse.

Table 5-1 – Service Stops

Design	Manual 2-Person Crew	Manual 3-Person Crew	Semi-Automated 1-Person Crew	Semi-Automated 2-Person Crew	Fully Automated 1-Person Crew
# of Stops	500 - 700	700-900	400-500	600-800	800-1,100

The move to automation and once-a-week (instead of twice-a-week) collection means the jurisdiction must face the issue of excess trash. Those locations that have transitioned from twice- to once-a-week collection have found that the second collection actually collected significantly less waste. Collection crews, in other words, were often done before 10:00 a.m. during that second weekly collection.

The public outcry over the loss of the second collection is normally displeasure over losing the convenience of having two options to place the trash out at the curb or

[1] H. Lanier Hickman, Jr., Solid Waste Collection & Transfer, American Academy of Environmental Engineers Staff, 2000, pg. 91.

keeping it on the premises for a full week's time. Providing carts, as Maui County is doing, generally mitigates the public concern.

Taking the second weekly collection of waste away from the customers is always a difficult move but more so when automated collection is being implemented. Residents fear that the cart will not hold two collections a week worth of trash. The collection manager wants to mitigate that fear but also wants to hold firm in his belief that the driver of an ASL should stay in the cab. This tension can often result in a flood of calls to the mayor's office. If that mayor is not fully behind the collection strategy, this can result in the driver being instructed to get out of the cab to collect bags of garbage sitting alongside the cart more than is reasonable thereby ruining the collection efficiency.

5.4.1.2 Excess Trash

The fact that household waste is placed in a prescribed container and that it is collected by an ASL brings up the question of what happens when a household has more than the container can hold.

Edmond, Oklahoma, faced this issue when it transitioned from a sanitation department with a workforce of 58 people using 27 rear-loader collection trucks servicing 14,500 homes to 20 people using seven automated side-loaders, one rear-loader all of which collected 45,000 carts from 28,000 homes over a 45-hour work week with each ASL collecting up to 1,200 homes a day.

Edmond solved this tension by introducing a city-coded 30-gallon bag that it sells on demand for $1.50. Citizens can put only their excess trash into the coded bag. When the weekly trash collection occurs, the driver notes the coded bag alongside the cart, a GPS on the truck initiates a microwave signal back to Edmond's base yard with the address of the coded bag. As these data points are received from the trucks out collecting that morning, a route is developed back at sanitation's headquarters for a rear-load packer truck to collect the coded bags.

Another tactic to solve the problem of extra trash outside the cart is to provide the customer with a second cart. CLM Sanitation, for example, has been servicing residents and municipalities in and near the Atlanta, Georgia, area. It opened its doors in 1987 and is still a family-owned business with a customer base made up of 80 percent from the private market (subscription) and the remaining 20 percent from municipally-contracted customers. Customers who regularly have more than one cart's worth of trash receive a second cart free from CLM. CLM analyzed its costs and realized that the majority of the cost is in the dumping of the first cart with the second being incidental when compared to a driver's time getting in and out of the cab. The City of Santa Monica provides carts in two sizes, 64 and 96 gallons. If a 96-gallon cart is not sufficient, a customer may have two and pays more for the second cart.

Some jurisdictions solve the problem of excess trash outside of the cart by using a second collection vehicle (a rear-loader) following behind an ASL to collect the excess. This results in two trucks burning fuel and two crews to collect from the same households on the same day. This ruins the efficiencies that were first thought to be gained by going to automated collection. This practice should be avoided.

5.4.1.3 Bulky Waste and White Goods Collection Trends

If communities have a commitment to divert material away from the landfill, the bulky waste item collection tends to be done on an appointment basis using either a knuckle-boom or a flatbed truck with a rear tailgate lifter. In this way, the material collected is not destroyed and can be triaged for reuse or recycling back at the collection base yard or disposal point.

If communities have an illegal dumping concern, then this collection service tends to be performed at no direct charge to the resident. The cost, instead, normally resides in either the resident's property tax, solid waste collection fee, landfill tipping fee, or a combination of these approaches.

Jurisdictions that have a history of private-sector collection normally have the private sector collect this material. Portland, Oregon, for instance, franchises out much of its collection, and bulky waste collection is part of the service. The franchise arrangement controls the private-sector services and fees paid by the resident.

As part of its permit arrangement with the City and County of San Francisco, NORCAL provides all residential rate payers two bulky waste and white goods item collections a year. If the customer calls before noon, the appointment will be made for the next day. Multi-family owners and dwellers are allowed one bulky waste item collection per year. The limit on the number of individual items these residents can place out for collection is five.

Because there is little to no size uniformity to the bulky waste items that can be set out, most jurisdictions limit the number of items to less than five. Some municipalities, such as Raleigh, North Carolina, limit the collection to a number of cubic yards. Raleigh provides free bulky waste collection of up to four cubic yards. If there is more than four cubic yards of material set out for collection, Raleigh will charge the resident $50 for the excess.

The Seattle Public Utilities collects its white goods with the bulky waste. Citizens are asked to request an appointment for collection. The Utility charges the customer $20 per item collected and $26 additional if the item contains chlorofluorocarbons (CFCs).

5.5 Legislation

5.5.1 Federal

Collection vehicles are defined as a single or combination of motor vehicles with a gross combined weight (GCW) or gross vehicle weight (GVW) of 26,001 pounds or more, any vehicle that transports 16 or more people as well as vehicles that transport hazardous material that requires USDOT or USEPA placarding. The Commercial Motor Vehicle Safety Act (US Congress 1986) requires, and the U.S. Department of Transportation (USDOT) in 1999 implemented, regulations licensing of and testing of all drivers of commercial vehicles. Through testing, drivers are required to demonstrate driving skills, knowledge of driving rules, and pre-trip inspection skills.[2] Routine physical examinations are also required.

[2] Requirements for commercial drivers' licenses are described in the Commercial Drivers License Manual, American Association of Motor Vehicle Administrators.

Every collection organization must have a drug and alcohol abuse program and polices and procedures that define that program. The program must be implemented through employee education, drug testing, and enforcement.

5.5.2 State of Hawaii

Transfer Stations (11-58.1-31): All solid waste transfer stations are subject to permit requirements that require a site analysis, description of equipment list and description, drainage plan, plan to mitigate nuisance, health and safety risks. An operational plan shall also be made part of the application describing materials processed, and how material will be measured. A transfer station operator is also required to provide signage of hours of operation, submit annual reports to the State of Hawaii detailing the daily volume of material received and transported and a yearly report on tonnage handled and transported to specified disposal points.

5.5.3 County of Maui

The County's collection ordinances fall under Chapter 108 "Rules for Refuse Collection." The definitions in Chapter 108 refer to both automated and manual collection but no reference to semi-automated.

Manual collection for garbage and rubbish includes cardboard (old corrugated containers), tree branches, tree trunks and stumps not exceeding 3 feet long and 50 pounds can be set out. [§15-108-9 (b) (1 & 2)]. Refuse containers cannot be greater than 32 gallons and 50 pounds. Citizens can set garbage and rubbish in trash bags as long as they are closed. Manual refuse collection unit means the aggregate of six (6) containers, bags, and bundles (defined in "definitions" under "Manual Refuse Collection Unit.")

Automated collection for garbage and rubbish requires the home owner to use a County-issued container. An automated refuse collection unit is defined as one (1) county-issued cart in "definitions" under Automated Refuse Collection Unit."

<u>Collection (Ord. 2731 § 4, 1998)</u>

To protect the public health, safety, and well-being, to prevent the spread of vectors and to protect environmental resources, the owner, occupant, or other person responsible for the day-to-day operation of every place or premises in the County shall make arrangements for the collection of solid wastes with either the Department of Public Works and Waste Management or a solid waste collector, as set forth in this chapter. This section shall take effect on July 1, 2000.

<u>Lanai Exemption (Ord. 3052 § 9, 2002)</u>

Unless otherwise provided in this section, the provisions of this chapter concerning sanitation collection and landfilling shall not apply to the Island of Lanai. The director is authorized to adopt rules for refuse collection for the Island of Lanai. Monthly charges for refuse collection services shall be imposed and collected with the rates as set forth in the annual budget.

Recommendation (Ord. 3052 § 10, 2002)

Maui ordinances need to be updated to reference the Director of Environmental Management not the public works and waste management director. The Director has the authority to adopt rules regarding refuse collection.

Recommendation

It is suggested that a new ordinance be enacted whereby all household refuse collected by the County shall be placed in a wheeled cart with a lid. Any household or business refuse collected by a commercial hauler should be placed in a wheeled cart or other container with a lid approved by the County. This will help to keep County roadsides and business/commercial neighborhoods clean.

When universal recycling collection is implemented, references to placing fiber material, such as old corrugated material, should be eliminated from garbage and refuse collection in Chapter 108.

5.6 Review of 1994 ISWMP

The 1994 ISWMP reviewed collection as it affects recycling. It looked at the rate charged for collection and how the rate would be charged, e.g., the charge for collection could be based on the amount placed at the curb or collected through property tax assessments. The specific recommendations were as follows:

- Recommendation 6-1: Evaluate the current rate structure by establishing a citizen committee to evaluate alternatives for the refuse collection system. This group was to weigh its opinion on making refuse collection "mandatory" for every resident in the urban areas and charging them directly versus making refuse collection "universal" for the same residents but charging them through their property tax assessment.

- Recommendation 6-2: Develop a system to tabulate illegal dumping incidences by recording annual statistics in order to better assess the problem.

- Recommendation 6-3: Analyze impact of implementing mandatory/universal collection in urban areas.

5.7 Actions Taken since 1994 ISWMP

The County commissioned a study to evaluate a rate study per Recommendation 6-1. Although a citizens' committee group was never established several advisory groups were established to review the concept of making the waste management system a financially self-sustaining program. Both committees recommended universal, mandatory collection but without charging for the service through property tax assessment.

The County has worked at various times on various issues regarding the problem of illegal dumping. (Chapter 10 discusses this with regards to derelict automobiles.) Community groups, such as Community Work Day through Keep America Beautiful, have assisted the County in trying to assess the best ways to prohibit illegal dumping incidences. In 2006, the Mayor appointed members to an Anti-Litter Task Force which supported the current campaign to abate litter.

Although there has been much discussion on the issue of implementing mandatory/universal collection in urban areas, the County has not made any specific policy change since the 1994 ISWMP.

5.8 Collection in Maui

5.8.1 MSW and Bulky Waste/White Goods

5.8.1.1 County of Maui

The Division is responsible for collection of single-family residential properties serviced by roads or streets meeting County standards.[3] Currently, not all such property receives County service as subscription is voluntary.

In FY 2007, the Division collected from approximately 24,000 of the estimated 51,000 permanent resident households in the County of Maui. In some instances, as noted later, the Division is assisted by the Highway Division. Solid waste collection on the three islands of Maui County operates out of six separate locations or base yards that serve the population of the County. Those locations, listed in order of size, are:

1. Wailuku Base Yard
2. Makawao Base Yard
3. Lahaina Base Yard
4. Lanai Landfill
5. Molokai Base Yard
6. Hana Base Yard

5.8.1.2 Island of Maui

Collection services begin early in the day out of the four base yards on the Island of Maui:

1. Wailuku Base Yard
2. Makawao Base Yard
3. Lahaina Base Yard
4. Hana Base Yard

Each of these base yard facilities is described in the following paragraphs.

Wailuku Facility

The Wailuku Facility is located at 1827 Kaohu Street and is the home base of the Collection

Photo 5-8. Collection base yard in Wailuku has one small office.

[3] Commercial collection of communities not meeting County road standards (often gated communities), multi-family and business establishments is not managed by the Solid Waste Division and is outside the scope of this Plan Amendment.

Section. It is responsible for curbside collection of waste in the most populated areas of the County. The facility has the largest number of collection vehicles (14) and the largest number of employees (23) of all of the collection base yards. As a result, crews for the Wailuku section service the largest number of collection points and collect the largest quantity of solid waste materials, approximately 45,000 tons in FY2006. Wailuku provides service for the Wailuku-Kahului, Kihei-Makena and Paia Community Plan areas. Of the approximately 31,000 households in these Community Plan areas, 13,506 receive refuse collection service from the Collection Section based at the Wailuku facility.

The Wailuku Base Yard is owned and operated by the Highway Division, and the Division Collection Section is essentially a tenant. The Collection Section is assigned one small office, a parking area for its staff, and 14 collection vehicles.

The maintenance facility at the Wailuku Base Yard is operated by the Highway Division and handles all repairs and purchases of sanitation collection vehicles and landfill equipment. Since several other operations other than solid waste collection work out of this site, space is limited. Only equipment for the Wailuku Collection Base Yard is repaired by the Fleet facility located in Wailuku.

All County refuse drivers, as employees of the Collection Section, work under the "task" system as outlined in the Union contract signed initially in the 1970s by the County and Union and effective on July 1, 1993.[4] The task system in solid waste collection is common throughout the U.S. refuse collection industry, both public and private. If the worker finishes his/her route and corresponding duties before the end of the shift, then he/she can leave work but still be paid for a full day's work. In Maui, this work practice is referred to as "Uku Pau."

As long as routes are equitably distributed, this system can promote efficiencies and good morale. Maui County's agreement with the Union, however, limits the efficiencies to the County by limiting the number of stops per day per route: 350 stops per day for manual collection routes and 1,000 stops per day for automated routes. There is a section in the Agreement that provides additional pay if the number of stops in the Agreement is exceeded.

From the Wailuku Base Yard location, the Collection Section operates the following routes:

- 7 automated routes – 9 trucks total[5]
- 2 rear-loader routes – 3 trucks total; crew size is 3.
- 1 white goods collection truck[6]; crew size is 2.

[4] Task Work Policies for Refuse Collection Operations.

[5] One route is assigned one truck and crew; trucks in excess of the number of routes indicated are back-up trucks.

[6] Bulky waste trucks do not have fixed routes but are routed on a daily basis depending on the location of the residents who call for service.

Collection

From the Wailuku Base Yard, the Collection Section operates two different types of weekly MSW collection routes and trucks, ASLs and manual rear-load, as discussed in the following paragraphs.

Automated Side-Loading (ASL) Routes

The County's ASL vehicles have a one-man crew and collect single-family residential waste set out in wheeled 96-gallon carts twice a week. Residents receiving service provided by automated equipment operating out of the Wailuku Base Yard either receive twice-per-week collection of garbage service on a Monday and Thursday schedule or a Tuesday and Friday schedule.

These automated routes (one truck per route) service between 680 and 960 homes per day and complete their assigned routes generally within a ten-hour day. Drivers on these units are scheduled to work four ten-hour days per week - Monday, Tuesday, Thursday and Friday. Overtime payment is reported to be rare for these routes except when a mechanical breakdown of equipment occurs.

These daily workloads, however, are unbalanced because initial routing of the automated equipment compensated for areas where large growth was anticipated. These routes initially received fewer homes in anticipation of this growth. After more than two years, these route imbalances remain in the automated collection system as indicated in Table 5-2.

Currently, routes continue to grow as a result of housing construction and the annexation of neighborhoods into the County collection system. A system of computerized routing would allow the County to operate fewer routes and optimize the routing to address the growth as it occurs instead of routing fewer stops per truck in anticipation of the housing growth. Routes are currently established based upon the total time to run the route, including the trips to and from the base yard, the times to dump at the landfill, anticipated growth, and the time picking up individual stops. Other key indicators of balance are tonnage for the individual routes (data not available) and the number of stops per day. This is shown for the seven automated routes in Table 5-2.

Table 5-2 – Wailuku-based Automated Routes

Route Area	Number of Stops Per Week[1]	Average Stops Per Day
A-1	3,392	848
A-2	3,748	937
A-3	3,312	828
A-4	3,182	796
A-5	2,928	732
A-6	2,722	681
A-7	3,004	751
Overall	22,288	796

[1]Stop is used to describe one curbside pickup of refuse or recyclables from a residence or business. For the Collection Section, which collects from residences, stop equals residence.

Manual Routes

The rear-loading collection vehicles operate five days per week with a three-member crew: one Refuse Collection crew leader and two Refuse collectors. Their scheduled work week is five days at eight hours per day, which are the terms of their Union contract.

These crews collect between 231 and 242 homes per day on a once-per-week collection basis. The terms of their Union contract specify collection of 1,750 homes or less per week (350 homes per day) per crew. Stops collected by a crew over the 1,750 limit are paid at an additional rate of one minute for each account in excess of 1,750 per crewmember as additional compensation.

Refuse is placed in customer-owned, 32-gallon containers (a maximum of six is allowed by ordinance) or 32-gallon plastic bags with a 50-lb. weight limit per can/bag. These routes are not well balanced. In addition, the manual collection routes work primarily in the Makawao area, and these routes require some additional travel time. More detailed information for the two manual routes is shown in Table 5-3.

Table 5-3 - Wailuku-based Manual Routes

Route Area	Number of Stops Per Week	Average Stops Per Day
W-1	1,209	242
W-2	1,153	231
Overall	4,362	236

Makawao Base Yard

Solid Waste Collection crews provide service to the “Upcountry” residents, including Makawao, Pukalani, and Kula out of the Makawao Highway Division Base Yard located at 1295 Makawao Ave in Makawao. The Collection Section has seven trucks and 14 staff members assigned to the Makawao base yard.

The Collection Section employees have no area for meetings, training, or assembly in the facility. There are parking spaces for the seven collection vehicles in the yard.

Of the approximately 8,500 households in the Makawao-Pukalani-Kula (Upcountry) Community Plan area, 6,696 receive refuse collection service on a once-per-week basis. These homes are serviced out of this location by four manual routes daily, where each truck on the route is staffed by a crew of three. An estimated 6,805 tons of waste was collected in Fiscal Year 2006.

From the Makawao Base Yard location, the Collection Section operates the following routes:

- 4 rear-loader routes – 6 trucks total
- 1 white goods collection truck

These crews manually collect between 312 and 368 homes per day on a once-per-week collection basis. Refuse is placed in customer-owned, 32-gallon containers or plastic bags. Almost all routes require two loads per day to the Central Maui Landfill. More detailed information for the four manual routes is shown in Table 5-4.

Table 5-4 – Makawao-based Manual Routes

Route Area	Number of Stops Per Week	Average Stops Per Day
M-1	1,688	338
M-2	1,609	322
M-3	1,560	312
M-4	1,839	368
Overall	6,696	335

The on-site supervisor at this location reports to the Collection Section supervisor. Highway Division personnel at the Makawao Base Yard perform all maintenance on solid waste collection equipment.

Lahaina Base Yard

The Lahaina solid waste collection operation works out of the Highway Division base yard. This facility is located at 3310 Honoapiilani Highway in Lahaina. The Collection Section has four trucks and six staff members assigned to the Lahaina base yard. There is no dedicated office space assigned to the Collection Section and no specifically assigned parking places for the vehicles.

Of the approximately 7,050 households in the Lahaina Community Plan area, 2,421 receive refuse collection service on a once-per-week basis. These households in Lahaina, Kaanapali, Kahana and Napili are serviced by four trucks on two routes, operated by six employees. This essentially provides two back-up vehicles for four routes. There is no on-site Collection Section supervisor for the Lahaina Crew.

The rear-loading collection vehicles operate five days per week with a three-member crew: one refuse collection crew leader and two refuse collectors. Their scheduled work week is five days at eight hours per day.

These crews manually collect between 138 and 367 homes per day on a once-per-week collection basis. Refuse is placed in customer-owned, 32-gallon containers or 32-gallon plastic bags. These routes are smaller because of the travel time required to go to the Central Maui Landfill when the trucks are filled. More detailed information for the two manual routes is shown in Table 5-5.

Table 5-5 – Lahaina Based Manual Routes

Route Area	Number of Stops Per Week	Average Stops Per Day
L-1	1,224	245
L-2	1,197	239
Overall	2,421	242

On average collection days, two loads are taken from Lahaina to the Central Maui Landfill (CML). On days when waste is extremely heavy, one of the spare trucks is run on the route and loaded. Both trucks are then driven to Central Maui Landfill to be dumped with only one operator per truck. This eliminates using one truck which would have to make two trips in one day. Otherwise, one of these trips would be in the middle of the route requiring the full crew to make the trip to CML.

A Highway Division mechanic on site performs collection vehicle maintenance at this location.

Hana Base Yard

The Hana solid waste collection service operates out of the Highway Division facility located in Hana at 35 Hana Highway. There is one collection vehicle operated by three Highway Division staff. Collection Section has no personnel assigned to solid waste collection in Hana.

Of the approximately 670 households in the Hana Community Plan area, 249 receive refuse collection service on a once-per-week basis. This is provided by one truck with three Highway Division employees. Because of the small number of customers, curbside collection is done only on Friday. The route is long and, at times, occurs on narrow roads.

General observations of Hana collection operations are:

- One rear-load manual packer;
- Crew of three people;
- The collection truck is two years old with no spare;
- Truck appears to be clean and well maintained;
- No ability to collect appliances, residents self-haul to the Hana Landfill; and
- Collection operations, including maintenance, appear to be well managed.

Olowalu Convenience Center

The Olowalu Convenience Center is unique among the facilities operated by the County in the services that it provides. As noted in Chapter 2, Olowalu serves as both a recycling center and a waste convenience center. In addition, the facility at Olowalu serves as a transfer station for refuse delivered by residents. Waste delivered by residents is loaded into open-top, roll-off containers or the one stationary compactor and then transferred to the Central Maui Landfill (CML). Green waste and bulky waste are accepted in 40-yard, open-top, roll-off boxes, and transferred to the EKO Compost operation and Central Maui Landfill, respectively. Other materials accepted at Olowalu include tires, lead acid (automobile) batteries, scrap metal, and construction and demolition (C&D) waste from “do-it-yourself” home projects.[7] Approximately 5,000 tons of refuse and bulky waste items were transferred from Olowalu to the Central Maui Landfill for disposal in FY2006. This material was delivered to Olowalu by “self-haul vehicles;” currently, the County and private collection vehicles deliver waste to Central Maui Landfill. The Olowalu facility is operated for the County by Maui Disposal under a contract which ends in 2010.

[7] Even though C&D waste is officially not accepted at County of Maui facilities, GBB observed some in the roll-off containers.

Maui Disposal transfers the refuse and green waste to the Central Maui Landfill as part of their contract. In FY2006, approximately 23 TPD of materials were transferred from the Convenience Center to the Central Maui Landfill six (6) days per week. This included self-haul refuse and self-haul green waste. The recyclable materials were sent to processors not to Central Maui Landfill.

5.8.1.3 Island of Lanai

Lanai Landfill

The Collection Section has no employees on the Island of Lanai. A landfill employee performs curbside collection of waste, and the collection truck is based at the Lanai Landfill located on the Kaumalapau Highway approximately four miles southwest of Lanai City.

Of the approximately 1,300 households in the Lanai Community Plan area, approximately 640 receive refuse collection service on a once-per-week basis. This is provided by one ASL truck operated by one Landfill Section employee. The supervisor of this employee and the operations is the Landfill Manager located at the Central Maui Landfill.

Residents place their refuse in 96-gallon carts which are collected on Monday. An estimated 998 tons of solid waste was collected in FY2006 from Lanai City. The Lanai Landfill has no scale, and the waste quantity was estimated in the Lanai Landfill Annual Operating Report for FY2006 using an average set-out weight of 60 pounds (640 stops X 52 weeks X 60 lbs.) as shown for the Monday route in Table 5-6.

Table 5-6 – Lanai Based Automated Route

Route Area	Number of Stops	Avg. Stops Per Day	Average On-route Time	FY2006 Avg. Wkly. Setout (lbs.)	FY2006 Waste (tons)
L-1	640	640		60	998
Overall	640	640			

General observations of Lanai operations are:

- Collection is made with fully automated vehicle;
- The base yard is at the Lanai landfill where there are minimal facilities;
- The landfill supervisor on the Island of Maui oversees the collection operation on Lanai. The absence of an on-site supervisor means minimal day-to-day oversight; and
- No ability to collect bulk waste or appliances; residents self-haul to the Lanai Landfill.

5.8.1.4 Island of Molokai

Molokai Base Yard

Solid waste collection for Molokai operates out of the Highway Division's facility located off the Maunaloa Highway in Kaunakakai. The Collection Section has no personnel assigned to Molokai; curbside collection and supervision are performed by

Highway Division personnel. The work is supervised by the Highway Division supervisor for the Island. While collecting waste, these personnel are covered by the Solid Waste Union Labor Agreement.

Of the approximately 2,400 households in the Molokai Community Plan area, 595 receive refuse collection service on a once-per-week basis. This is provided by one rear-load packer truck staffed by three Highway Division employees. There is one spare truck. Because of the small number of customers and the large geographic area, curbside collection is done on Thursday and Friday. The number of collections per day is not known.


Photo 5-9. County's flatbed truck with liftgate

General observations of Molokai collections operations are:

- Highway Division employees perform all collections;
- Collection crew is staffed by three people;
- One rear-load truck in good repair and one spare are on site;
- All equipment appears to be clean and well maintained;
- Employees appear to be well supervised;
- In discussing with GBB, personnel indicated they were receptive to continuing to perform collection operations with Highway Division personnel. It was emphasized that the decision was up to the County.

5.8.1.5 Bulky Waste and White Goods

There is no official program for the collection of bulky waste items in the County by the County crews. However, a de facto operation exists at locations, such as Hana, where the collection crew picks up bulky waste items in a rear-loader as it collects the curbside trash on its routes. There is no separate record for this activity on all three of the County's islands.

The County collects, by appointment, white goods throughout the Island of Maui, but the County does not provide this same service to the residents living in the Hana region. In addition, citizens can take the white goods to the contracted metals processor for no direct fee as discussed in Chapter 10 of this document.

The County collects the white goods in a flatbed truck with stake sides and a liftgate on the back as shown in Photo 5-9. Citizens call the collection office to make an appointment for the collection of white goods. Currently, information related to number of stops, quantity of material, cost of the collection, and number of hours worked per day is not tracked by the County. There is no record of current white good collection activity on the Islands of Lanai and Molokai.

5.9 Possible Alternatives

5.9.1 MSW

The SWRAC has advised the Division of the following recommendations that pertain to this chapter. *The numbers correspond to the order that they were provided in Chapter 1, Section 1.3.2.6*. These recommendations are:

4. Develop systems for Intra-County and Inter-island transportation of solid waste materials.

5. Provide universal curbside collection for all residences served by streets and roads meeting County standards. This would include:

    - Refuse collected once per week in a cart;

    - Single-stream marketable recyclables collected once every other week in a cart;

    - Yard and large green waste collected in cans, paper bags, or bundled, called in by route drivers if within volume and size restrictions and collected every other week;

    - Bulky waste collection on call-in (appointment) basis within ordinance limits; and

    - White goods collection, expanded to include all metals, on a call-in basis.

7. Locate a base yard and convenience center facility at the Hana Landfill site. The Hana Landfill would have landfilling minimized and receive mainly inert materials. This would provide the County with a facility on the east end of Maui, when needed. The waste received each day (four tons) will be transferred back to Central Maui Landfill using two rear-load trucks.

11. Expand Olowalu Convenience Center. This new center would include:

    - Convenience center for residential refuse and recycling drop-offs as currently operated;

    - A new base yard for County Refuse Collection Section operations serving West Maui; and

    - Transfer station for MSW, green waste and recyclable materials collected by the County refuse collection and private collectors.

    The SWRAC also foresaw a need to include the infrastructure needed for ingress and egress of the facility.

In reviewing the County's collection system for household waste several possibilities emerge for both infrastructure and services.

Infrastructure: There is a fractured element to the County's collection system that comes, in part, from the splitting of crews and, in part, from the natural geographic situation Maui County finds itself in. The former exists on the Island of Maui and the latter on the islands of Lanai and Molokai.

5.9.1.1 Island of Maui

1. The County has hindered its ability to maximize efficiencies by not consolidating its equipment and personnel into one major location. Currently, there are three base yards outside of the Hana region lacking management, equipment, and space for personnel as detailed in Section 5.8 of this chapter.

   Consolidating two (Wailuku and Makawao) base yards into one facility would allow one collection manager to determine the overall work needs of these two areas each day and how best to allocate personnel and equipment to meet those work needs. A central yard also allows the collection manager to more accurately account for work done, care of equipment, and dissemination of information and training important to keeping safety and professionalism at a high level.

2. The combination of these base yards, Wailuku and Makawao, should take place at a central location near the CML, i.e., disposal point. This central location should become a solid waste campus where several collection and non-collection activities are performed.

   a) All collection vehicles currently operating in Wailuku and Makawao should be placed at this location;

   b) A maintenance facility with four bays, each a drive-through, and one bay with a service pit should be built at the solid waste campus and operated with mechanics under the management of the collection manager. There should be one mechanic per ten collection trucks and one mechanic to work with the landfill equipment. One bay must have a floor made of a heavier concrete specifically for the heavier landfill equipment. There should be lockers and a changing room as well as bathroom and showers at the fleet facility and an office for the lead mechanic.

      The purpose of this facility would be to perform preventive maintenance and minor repairs. The hours of the facility should be offset from the hours the collection crews are operating on their routes. Having the collection vehicles ready for work in the morning is the primary objective of the garage. Sophisticated and technical repairs such as rebuilding transmissions and engines would be performed off site by private shops.

   c) Combined on this campus, as detailed in Chapter 4, is a materials recovery facility (MRF). If the County implements single-stream recycling collection, then having the processing point (MRF) near the base yard saves time in the routes. Locating both, MRF and base yard, near the disposal point for MSW saves time in the routes for collecting household trash. By combining the MRF onto this site, mechanics in fleet maintenance can be trained on routine maintenance of the MRF equipment and assist with its maintenance as well.

   d) This solid waste campus would become the center of solid waste activities on the Island of Maui. As such, administrative offices for diversion, engineering, budget and administration should be relocated to this location. Having management at the site where a major portion of the work is being conducted is as important to morale and efficiency as it is for direct and specific understanding by managers of those work duties.

e) Since bulky waste trucks would be based on campus, the triage of material where items will be siphoned off to a reuse facility should take place on the solid waste campus. A reuse facility, much like the Last Chance Mercantile the SWRAC tour group visited in Monterey, California, could be supplied by both the collections and the landfill operations. Such a facility can be located in a new solid waste campus.

3. The lack of facilities in Lahaina and the transporting of material from that area to the disposal point provide a combined opportunity for a base yard and more economical transportation.

The Olowalu Convenience Center has the natural elevation differential that would allow for a relatively low-cost, enclosed transfer facility to be built that would consolidate loads. The results would be lower cost per ton and less trash trucks on the highway from Olowalu to the disposal point.

A transfer station would serve as a “remote gate” for the Central Maui Landfill to service the far western part of the Island of Maui. Both County and private industry collection vehicles would be encouraged to use this facility to move their waste to the Central Maui Landfill. This facility would diminish the amount of waste collection equipment traffic on the Honoapiilani and Kuihelani Highways.

By providing this facility and charging a tipping fee, revenues from the use of the facility by the private sector can offset the cost of the facility. Table 5-7 shows the FY 2006 quantities of material at Olowalu and the estimated quantities of materials managed by Olowalu after the construction of the new transfer facility. The projected increase in County collection and green waste will result from the County offering universal collection in the Lahaina/Westside region to all qualifying residences. Because waste material is collected at the curb for residences, it is estimated that the quantity of self-haul waste will drop.

Table 5-7 - Olowalu Facility Material Quantities

Material	FY 2006 Quantity (tons)	Projected Transfer Station Quantity (tons)
County Collection Vehicles	3,800[8]	7,600
Private Firm Collection Vehicles		9,000
Self-Haul Vehicles	4,763	1,200
Green Waste	2,259	4,000
Scrap Metal	35	35
Drop-off Recycling	117	25
TOTAL	10,974	19,860

[8] FY2006 refuse taken directly to Central Maui Landfill.

The one-way trip to Maui Central Landfill is about 25 miles and takes an estimated 45 minutes one way. At seven tons per load, the average cost of transport of the waste is estimated at $31 per ton. The cost per ton will be lower if more material is in each load.

As shown in the comparison in Table 5-8, the proposed transfer station would move the materials it receives, both waste and recyclables, to the Central Maui Landfill and the single-stream MRF in 53-foot aluminum walking-floor trailers. (The single-stream MRF is discussed in the section on Recyclable Materials Processing Facilities.) Each trailer would be legally capable of carrying 20 to 22 tons of materials per load as opposed to the 5 to 9 tons per load currently hauled. This consolidation would reduce the solid waste traffic on the Honoapiilani Highway to one-third of its current level. Recent proposals by private-sector companies to perform similar work on the mainland have produced proposals with transportation costs of $15.00 to $18.00 per ton for hauls of similar length and time. If a $20 per ton cost is used for the Olowalu transfer operation, the estimated saving is $11 per ton from the current transportation cost. In addition, the transfer operation reduces traffic and will lower emissions.

Table 5-8 – Comparison of Current and Recommended Facilities

	Current	Recommended
Operation	Convenience Center	Transfer Station
Tons to Central Maui Landfill per Load	5 to 9 Tons	20 to 22 tons
Cost per Ton	$31.00	$20.00
Revenue	No	Yes
Traffic, Solid Waste Trips	Increases	Decreases
Personnel Facilities	No	Yes

4. Hana Region: The SWRAC unanimously recommended placing the Hana Landfill on Standby with Permit and transport the waste back to the Central Maui Landfill. The Hana Landfill receives an estimated four tons a day, if that.

   It is possible to construct a convenience center at the Hana Landfill where customers place these four tons into the back of a roll off truck and every two days it is taken to the Central Maui Landfill and unloaded.

   This convenience center would include space for two rear-load trucks, a small office, restroom facilities, and small meeting area. With this facility in place and the Hana Landfill on "Standby with Permit," rear-load containers should be placed at the facility for resident loading and for use when the rear-loader trucks are on collection routes or are shuttling between the Hana Transfer Facility and the Central Maui Landfill.

   When the collection trucks are parked at the facility, citizens can place trash directly into the rear hopper of the rear-load collection truck, which holds three cubic yards of trash. Citizens would load the hopper, and the collection staff would periodically start the truck and compact the trash into the body. The rear-load containers would be emptied into the truck in addition to the route refuse.

When the truck is full, it would be shuttled back to the Central Maui Landfill and dumped. The servicing and maintenance of the vehicles based in Hana would be at the new solid waste campus located near the Central Maui Landfill. When maintenance would require several days, the Hana-based truck would be replaced with a spare based at the new central base yard.

Major changes would occur at the Hana operations.

- Collection trucks would be small with only a single rear axle to navigate the road between Hana and Central.

- A drop-off facility would be added to the landfill site.

Currently, personnel are required for collection of refuse only one day a week and are provided by the Highway Division. Under the new system, they would collect materials two days per week and be shuttling from Hana to the Central Maui Landfill to dump and to the new central base yard for scheduled maintenance. Because there would still be some un-utilized time, it is suggested that the collection group collect refuse and recyclables from County facilities, schools, administrative offices, parks, etc.

Under the new, universal collection system, it is anticipated that the number of residences serviced would double to about 600.

- Containers (rear-load type) would be placed at the drop-off area for residents to deposit refuse and recyclables when the trucks are on route.

- Employees would drive trucks to the Central Maui Landfill and MRF for the disposal of waste and the processing of the recycling materials collected. The maintenance would be done at the Central facilities and spares would be available to swap out for larger maintenance requirements. This shuttle activity is anticipated to be twice per week for the refuse collection vehicle and once per week for the recycling and green waste collection vehicles.

- The County would provide a cart for refuse collection, which would be collected by a semi-automated, rear-loader vehicle operated by two employees out of the Hana Landfill. This same vehicle, as it is making its refuse collection, would also collect any bulk waste materials that might be placed out for service.

- A vehicle, knuckle-boom or flatbed with a liftgate, should be located at the Hana Landfill also to collect any metals set out for collections.

- On non-collection days, staff not utilized in shuttle activity would be applied to the staffed convenience center at the Hana Landfill. Operation hours and personnel schedules would need to be developed.

Table 5-9 – Hana Universal Collection Routes

Route Area	Number of Stops	Average On-route Time	Projected Quantity (tons)	Weekly Projected Set-out (lbs)
Refuse-1	600	8 Hrs	6.3	42 lbs

5. White goods would be scheduled for curbside collection on an ongoing basis. Trucks collecting white goods would be a driven back to the solid waste campus or directly to a processor.

5.9.1.2 Island of Lanai

1. The landfill can be placed on Standby with Permit and have its daily household garbage shipped off island. This can be done with a fixed compactor compressing the garbage into the container to be shipped.

   The Lanai Landfill is not equipped with truck scales so the County estimated the total quantity of waste disposed at Lanai Landfill from July 1, 2005 through June 30, 2006 to be 5,127 tons. This is equivalent to 14.0 tons per day (365 day/year basis) or 19.7 tons per operating day (the site is open 5 days a week).

   This compacted material will be shipped to a disposal point off island either by Young Brothers or storing the containers before moving them off site at one time.

2. The landfill would become a convenience center where self-hauls place their material into recycling or garbage containers. Each would be shipped off island for processing and disposal respectively.

3. Each landfill would have trained, certified personnel and equipment to perform removal of Freon from white goods.

4. A knuckle-boom truck would be provided to the Lanai crew to perform both bulky waste and white good collection on a regular basis. These items will be triaged at the landfill for possible reuse and recycling on Lanai.

5.9.1.3 Island of Molokai

1. A possible option is to place this landfill on Standby with Permit and have its daily household garbage shipped off island. This can be done with a fixed compactor compressing the garbage into the container to be shipped.

2. Based on current estimates by the County, the average daily volume during calendar year 2006 was 6,421 tons, or 17.6 tons per day on a 365-day/year basis. It is important to note, however, that there is uncertainty in the estimated weights. Although scales are at the site, only commercial waste hauling vehicles (51 percent of estimated volume) are weighed. County collection vehicles, residential self-haul vehicles and bulky waste deliveries are estimated using population and estimated weights of typical deliveries.

   This compacted material would be shipped to a disposal point off island either by Young Brothers or storing the containers for a while and moving them off site at one time.

3. The landfill would become a convenience center where self-hauls place their material into recycling or garbage containers. Each would be shipped off island for processing and disposal respectively.

4. A knuckle-boom truck should be provided to the Molokai crew to perform white good collection on a regular basis. These items will be triaged at the landfill for possible reuse and recycling on the island. The remainder will be sent off island to be processed.

5. Each landfill would have personnel trained, certified, and equipment to perform evacuation of Freon from white goods.

6. The Landfill can provide the space for a reuse facility.

5.9.1.4 Customer Service Center

A customer call center could be placed on the solid waste campus servicing all three of the County's inhabited islands. It would have people trained in the services, locations, rules and regulations for which the Division is responsible.

Customer service involves both the frontline interaction of crews and also handling resident/citizen calls and requests. The County currently does not have a customer call center or a single number for a citizen to call for information. Seven phone numbers are listed in the phone book. When one calls any of these numbers, there is no assurance that the phone will be answered or the request tracked to completion.

Customer service technicians would be trained to treat residents calling in with the utmost professionalism. The County should want callers to feel that they are a hundred percent satisfied.

The County should obtain an off-the-shelf software system which manages calls, generates work orders, tracks work order status, and closes them out when completed. The County may currently be looking to engage a single call number for all of its services, so the software that is chosen should be agreed to by the project manager of this long-range customer service consolidation and MIS.

To achieve the goal of a hundred percent customer support, the customer service technicians must first be trained in how best to respond. Excellent customer service skills are critical in maintaining and increasing customer satisfaction. It takes skill in making even the most difficult caller feel that the interaction has been a positive one. Such skill in positive interaction will reduce repeated calls.

The supervisor of the customer call center would have to continually motivate the customer service technicians to provide the customer support anyone would want: courteous, helpful, and quick to prevent a problem.

All collection, as well as other, programs shall have the same number publicized on all of the Division's media releases, brochures, radio messages, location signage, and website.

During times when new collection programs are implemented, the number of people available should significantly increase, i.e., double, as should the time during the day the customer call center is operational.

Customer service technicians are as good as the training and the equipment provided to them. The system for the center should have adequate number of phone lines, broadband internet access, and any modifications the off-the-shelf software that is needed to interconnect operations with the call center. Customer service technicians should have the ability to look up addresses and provide quick information on collection day, white goods collection appointments, and any other activity.

All calls should be tracked by type (work asked for), location, date and route of service. These reports will enhance the County's ability to refine services to the residents.

5.10 Plan Recommendations

5.10.1 Goal

To divert materials away from landfilling and illegal dumping in an efficient and pragmatic manner and to collect all materials in a manner that promotes recycling and cost efficiency.

5.10.1.1 MSW

Manual collection should be discontinued and replaced with automated collection and semi-automated collection where fully automated is not possible.

5.10.1.2 Bulky Waste/White Goods

Citizens meeting the County's requirements should have services available to them for bulky waste and white goods collection.

5.10.2 Strategies to Meet Goal

5.10.2.1 Island of Maui

The SWRAC recommended that the County implement a universal curbside collection. "Universal" collection specifically means for all residences served by streets and roads meeting County standards, and that this collection service includes the following:

- Refuse collected once per week in a cart;
- Bulky waste collection on call-in (appointment) basis within ordinance limits; and
- White goods collection, expanded to include all metals, on a call-in basis.

Implementing this activity so as to minimize cost, the central area on the Island of Maui will require some infrastructural and organizational changes. The latter, of course, will need to be discussed and negotiated with the Union.

5.10.2.1.1 Wailuku

The plan calls for the Division to discuss with the Union combining the Wailuku and Makawao base yards at one centrally-located solid waste campus. This would provide for a greater utilization of equipment and personnel.

5.10.2.1.1.1 MSW

The Division will implement once a week garbage collection using only automated collection vehicles and carts and, if needed, semi-automated collection vehicles with carts. The Division will also transform the existing Olowalu Convenience Center into an enclosed Transfer Station whereby garbage will be consolidated into large solid waste transfer trailers and transferred to the Central Maui Landfill thereby lowering transportation costs. This Transfer Station will be used as a base yard for the Lahaina collection operations.

5.10.2.1.1.2 Bulky Waste/White Goods

Both bulky waste and white goods shall be collected by appointment. The citizen will call in and place a request for collection of a specified number of goods. The Division will inform the citizen of the day of the collection and the manner in which the material is to be placed for collection. A collection vehicle will travel to the address and collect the material. Collection of material will be in one of the following vehicles: knuckle-boom truck can collect both bulky waste and white goods; rear-load compactor collection vehicle collect just bulky materials; flat-bed truck with a liftgate collects both types of materials.

5.10.2.1.2 Makawao

The ISWMP calls for the Division to discuss with the Union combining the Wailuku and Makawao base yards at one centrally located solid waste campus. This would provide for a greater utilization of equipment and personnel.

5.10.2.1.2.1 MSW

The Division will implement once-a-week garbage collection using only automated collection vehicles and carts and, if needed, semi-automated collection vehicles with carts.

5.10.2.1.2.2 Bulky Waste/White Goods

Both bulky waste and white goods shall be collected by appointment. The citizen will call in and place a request for collection of a specified number of goods. The Division will inform the citizen of the day of the collection and the manner in which the material is to be placed for collection. A collection vehicle will travel to the address and collect the material. Collection of material will be in one of the following vehicles: knuckle-boom truck can collect both bulky waste and white goods; rear-load compactor collection vehicles collect just bulky materials; flat-bed trucks with a liftgate collect both types of materials.

5.10.2.1.3 Hana

5.10.2.1.3.1 MSW

The Division will implement once-a-week garbage collection using only semi-automated collection vehicles with carts.

5.10.2.1.3.2 Bulky Waste/White Goods

Bulky waste shall be collected by rear-loading collection vehicles. The number of collection units is small enough to allow citizens the privilege to set out bulky waste on any collection day. Since the garbage collection is and will continue to be performed by rear-loading trucks, bulky waste can be collected simultaneously.

White goods, however, shall be collected by appointment. The citizen will call in and place a request for collection of a specified number of goods. The Division will inform the citizen of the day of the collection and the manner in which the material is to be placed for collection. A collection vehicle will travel to the address and collect the material either in a knuckle-boom or flat-bed truck with a liftgate.

5.10.2.1.4 Island of Lanai

5.10.2.1.4.1 MSW

The Division will continue to collect garbage in a cart using only automated collection vehicles.

5.10.2.1.4.2 Bulky Waste/White Goods

Both bulky waste and white goods shall be collected by appointment. The citizen will call in and place a request for collection of a specified number of goods. The Division will inform the citizen of the day of the collection and the manner in which the material is to be placed for collection. A collection vehicle will travel to the address and collect the material. Collection of material will be in one of the following vehicles: knuckle-boom trucks can collect both bulky waste and white goods; rear-load compactor collection vehicles collect just bulky waste; flat-bed trucks with a liftgate collect both types of materials.

5.10.2.1.5 Island of Molokai

5.10.2.1.5.1 MSW

The Division will implement once a week garbage collection using only semi-automated collection vehicles with carts.

5.10.2.1.5.2 Bulky Waste/White Goods

Bulky waste shall be collected by rear-loading collection vehicles. The number of collection units is small enough to allow citizens the privilege to set out bulky waste on any collection day. Since the garbage collection is and will continue to be performed by rear-loading trucks. Bulky waste can be collected simultaneously.

White Goods, however, shall be collected by appointment. The citizen will call in and place a request for collection of a specified number of goods. The Division will inform the citizen of the day of the collection and the manner in which the material is to be placed for collection. A collection vehicle will travel to the address and collect the material either in a knuckle-boom or flat-bed truck with a liftgate.

5.11 Implementation

5.11.1 Implementation Items

The Division will submit a request for capital funding to Council.

Changes to the ordinances in Chapter 15-108 will have to be made. These should be done prior to implementation. The changes include the following:

- Definition of semi-automated collection;

- Definition of Bulky Waste that limits material to large, inorganic items, such as furniture and mattresses;

- Eliminate references to manual collection; and

- Eliminate all references to garbage collection of more than once a week. There will be no bags allowed to be set out, but there can be two wheeled carts set out for weekly collection.

The Division will procure the necessary collection vehicles and equipment to provide collection in all areas of the County. These will include automatic side-loaders, knuckle-boom trucks, flat-bed collection vehicles, lifters for existing rear-load collection vehicles, and carts.

Carts need to be provided to all those residents who currently place their MSW in privately-owned trash cans and bags. Place lifters on the rear-load collection vehicles. Implement a work-order system for white good and bulk item collections. Begin collecting bulky waste and white goods in all areas of the universal collection area specified by the SWRAC.

The Division will procure the services of an architect and engineer to assist in the transformation of the Olowalu Convenience Center into an enclosed transfer station. The following tasks will need to be performed:

- The Division will create a conceptual design with cost estimates to provide to Council for funding approval;
- After funding approval, the Division will produce a request for proposals procurement package for the construction of the transfer station;
- After contract negotiations have been completed, the contractor and the Division will work through the permitting process and traffic study; and
- Final construction documents will be developed and implemented.

5.12 Summary

This chapter reviewed the tools and strategies commonly used in the collection of MSW, bulky waste, and white good collections. The Division plans to implement the SWRAC's recommendation to provide universal service for citizens living on streets and roads meeting County standards for once-a-week garbage collection on all islands within the County. The Division also plans to provide white good collection by appointment on all islands in the County. The Division will provide bulky waste collection by appointment in Central Maui and Lanai and during regular MSW collection in Hana and Molokai.

6. Education Strategy

6.1 Purpose

Education programs are important to environmental programs because they educate citizens as to the proper and safe procedure to handle such items as household garbage, recycling, yard waste, white goods, automobiles, household hazardous waste, tires, and in ways to diminish the amount they use. Education programs also inform people of services provided by the County and other entities that can help individuals in handling their waste.

This chapter reviews key elements that both Maui and other communities have used to make and implement effective education programs. There are extensive examples from other communities with one detailed break-down of an education program developed to support the inauguration of new collection programs. These details are meant to illustrate the steps that the County will have to take in order to implement a successful campaign.

Finally, the chapter reviews the course of action decided upon by the County and how it is to be implemented.

6.2 Review of 1994 ISWMP

The 1994 ISWMP reviewed the County-sponsored program supporting waste reduction and recycling. The County had implemented an educational program in schools designed for kindergarten through fifth grade using aluminum as an educational tool.

The plan also described a partnership with local volunteer groups, specifically the Maui Recycling Group, to increase recycling and reduction awareness in the schools. The Maui County Council had formally resolved to support the educational program through Resolution No. 93-137.

The 1994 ISWMP recommended that the County of Maui continue and expand recycling education programs in coordination with source reduction programs. The recommendation called on the County to provide broad educational programs; distribute written materials; use television, radio, and newspapers, press releases, and articles; continue to work with school-age children; and business associations.

6.3 Environmental Social Marketing

Within the environmental movement, there is perhaps no more famous commercial than the television advertisement showing a proud Native American who sees a car pass by and the people inside tossing litter along the roadside. A tear runs down the Native American's face. It was a powerful and important commercial that made, and still makes, people think about this personal impact on the environment.

Approximately 35 years later, a documentary is released about former Vice President Gore who travels around the world giving a devastating slide show on the climate perils human pollution has created. The documentary won an Oscar and Vice

President Gore won a Nobel Peace Prize. As calamitous as his message is, it is a message not of guilt, but of hope that every action each person takes can correct this dangerous situation.

Both examples of environmental marketing focus on individuals making a difference. Local environmental education campaigns have moved to implementing a social marketing campaign to influence social behavior. Social marketing has been at the core of health-related goals to change habit and has been a key strategy in fighting breast cancer, drug abuse, and heart disease.

The Social Marketing Institute, for instance, lists the following central principles of this educational strategy:

- The goal is to influence action;
- If audiences believe that the benefits they receive will be greater than the costs they incur, they will take action;
- Successful programs are those based on the target audience's perceptions of the proposed exchange;
- Target audiences are not always monolithic so one message does not fit all people in the target group;
- Marketing efforts must incorporate all of the "4 Ps:"
    - *"Product:"* must be enticing (i.e., the package of benefits associated with the desired action);
    - *"Price:"* minimize the cost to the target audience;
    - "*Places*:" make the exchange and its opportunities available in places that reach the audience and fit its lifestyles;
    - *"Promote:"* maximize desired responses with creativity;
- Understand that recommended behaviors always have competition and these should be understood and addressed;
- The marketplace is constantly changing and so program effects must be regularly monitored and management must be prepared to rapidly alter strategies and tactics.

Herbert Spencer, the 19th century author of The Principles of Psychology, wrote what could easily be today's credo for social marketing: "The great aim of education is not knowledge, but action."

6.4 Trends

6.4.1 In Hawaii

County of Kauai: The County's educational efforts focus on radio programs as the best means to educate the public on environmental matters. It has a staff of one person but its solid waste management plan has recommended the hiring of two additional people for environmental education. Currently, the County's Recycling Coordinator appears on the Mayor's television program one to two times a year to discuss the County's environmental management programs. The County has a Web site, as well, and places information in the newspaper at critical points during a program's operation, e.g., special collections. The County is moving toward a social marketing education strategy as it implements the new recommended programs.

County of Hawaii: Radio and newspaper ads "work best." Most of the public education that exists, other than the ads, is done by Recycle Hawaii, a nonprofit organization funded, in part, by the County, as well as local businesses, individuals and organizations (See www.recyclehawaii.org). The County does community outreach on recycling to schools and organizations. The County hopes to do more in 2008 to promote the zero-waste initiative.

City and County of Honolulu: The City and County of Honolulu provide access to items from video clips, recycled art, PowerPoint presentations, songs about recycling, videos about recycling produced by community groups, and graphical arts on its Web site. Information pertaining to what, where, and how to recycle/dispose of almost any item for use by the community is also provided (www.envhonolulu.org/solid_waste/media/Graphics_Library.htm). The program targets community groups, environmental groups, and teachers to build on their ability to reach individuals. The following is a partial list of items on this jurisdiction's Web site.

- Data and resources for citizens to use to educate themselves and others on the jurisdiction's waste stream and how it can benefit recycling;
- "Partnership for the Environment," a coalition of businesses coordinated by the City and County of Honolulu, offering technical assistance, peer consulting, and a certification that includes listing the businesses;
- A detailed calendar of events where the public can learn about upcoming events;
- As in Maui, a 'Tour de Trash' that provides tours for residents of City and County solid waste facilities;
- A comprehensive program targeting school children with a multilevel approach, including recycling projects, field trips, teaching partners, and many resources (videos, PowerPoints, etc.); and
- Recycle Hawaii Teacher Education Kit which includes curriculum guides, videos, slide shows, and interactive CDs.


Recycle Maui!

Maui Recycling Group's guide for Maui's residents, businesses and visitors • January 2008

The future of Maui's garbage

Solid Waste Resource Advisory Committee studies our trash.

Joy of Worms

Turn food scraps & waste paper into valuable compost

County of Maui: Members of the GBB consultant team remarked on many occasions how well versed citizens of Maui are in recycling. There has been a lot of information disseminated on recycling since the last ISWMP was published in 1994, which is coordinated by the Recycling Section through the use of the County's Web site. The County Recycling Section staff has developed a network of recycling-oriented citizens, nonprofits and businesses that all assist in education. One example is Maui Recycling Group, a private nonprofit with a specialized Web site and newspaper. The paper is published twice a year with 30,000 going in the Maui News as an insert and another 5,000 distributed throughout the County at banks, stores, restaurants and such.

Web site: The Division's Web site maintains current information on how, when, and where to recycle. It provides up-to-date information on recycling grants, E-cycling collection events, phone book recycling, and motor oil recycling. It also provides information on "who", "what", "when" and "how." It also provides educational information on automated collection and MSW route collection. See www.mauicounty.gov/recycle.

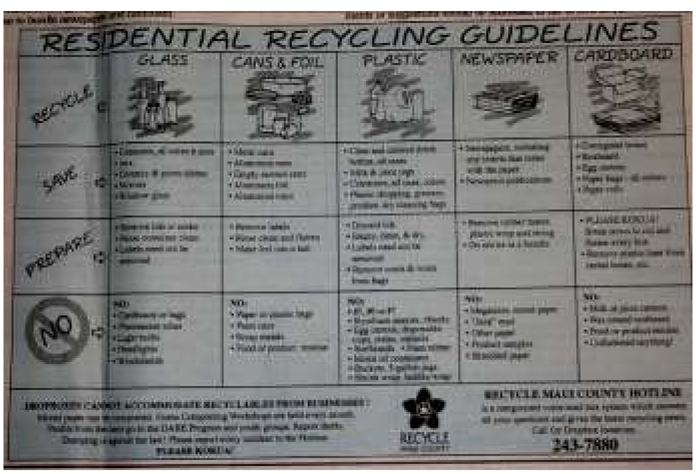
Recognition: The Division has received national recognition for its recycling activities, especially in the area of composting its biosolids.

Gold Medal For Composting Is Only One-Third The Story

With facilities in Montana, Idaho and Hawaii, a company takes stock of its accomplishments, challenges and opportunities — while getting ready to accept an award for excellence.

RECYCLE
MAUI COUNTY

Instructional Information: The Division provides citizens with instructional material to learn what and where items are recycled.



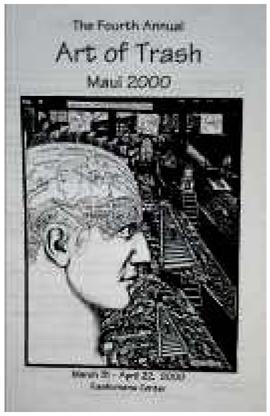
RESIDENTIAL RECYCLING GUIDELINES

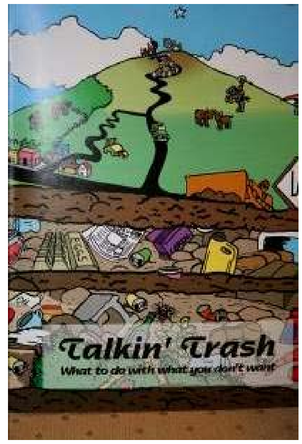
	GLASS	CANS & FOIL	PLASTIC	NEWSPAPER	CARDBOARD
RECYCLE					
SAVE					
PREPARE					
NO					

RECYCLE MAUI COUNTY HOTLINE

243-7880

Youth: The Division has sought ways to attract the youth to recycling by sponsoring Art of Trash and providing colorful print material to attract readership.





Information: The Division currently annually sponsors "Talking Trash" a 13 week radio show beginning in January. This is a radio talk show where citizens can call into and get information about recycling, reuse and other waste management subjects. The Division also has information tables at various events throughout the year, especially those with an environmental focus, including four days at the County Fair. Citizens can come and retrieve information on the County's programs as well as meet representatives in the County who are knowledgeable on recycling and solid waste issues.

Grants: The Division is responsible for directly supporting and assisting in the start-up of programs conducted by volunteer and for-profit groups through the use of financial grants. These grants have created operations to recycle latex paint, E-cycling, and, most recently, the development of diverting commercial food waste from the landfill to hog farms.

Personnel: The Division has a Recycling Coordinator and three Recycling Specialists who field the recycling calls coming in through the hotline, stay abreast of diversion issues on all three islands of the County, and work to account for tons recycled in both the County's and the private sector's programs.

6.4.2 Examples of Education Material

The following are examples of tactics jurisdictions are pursuing to educate their respective public.

Logos**:** Jurisdictions are placing on its brochures, collection vehicles, Web sites, carts, and signage a designed logo to develop a brand of service.

Metro Nashville,TN

Anne Arundel County, MD

City of Kansas City, Missouri

Philadelphia, PA, rewards recycling with discount coupons.

Plano, TX, redesigned its solid waste operations to be service oriented.

<u>Brochures</u>: Brochures placed at recycling drop-offs, with civic groups and in other governmental institutions where the public frequents must catch the eye of citizens and be written in a language that the majority of the populace can read.

Fort Worth, TX, provided bilingual brochure of the City's new curbside PAYT, single-stream, three-cart residential recycling program.

SPSA in Virginia developed a brochure explaining the recycling dos and don'ts.

Chittenden, VT, announced its new single-stream recycling in this brochure.

<u>Contests</u>**:** There have been communities that have attempted contests to increase diversion. The research is inconclusive whether this strategy universally obtains its goal. However, there are some preliminary success stories.

- Polk County, FL. "Recycle Man" rewards residents who recycle with $20 grocery gift cards. This has resulted in an increased request of bins.
- Kansas City, MO. Partnered with Price Chopper and Ace Hardware to distribute free bins and provide citizens with a 60 percent redeemable coupon for a bin. Diversion has increased from 25 to 35 percent with a 54 percent recycling participation.
- Philadelphia, PA: RecycleBank created a rewards program whereby 400 retailers provide discount goods to people who recycle. The pilot program of 2 neighborhoods after 2 months saw an increase in diversion of 100 percent with a 90 percent participation rate.

New York Recycles!
Pledge Card and Entry Form

Here is how I am renewing my commitment to recycling in the coming year.
(Check all appropriate boxes)

[ ] I will recycle at home, work and/or school.
[ ] I will buy recycled-content products and packaging.
[ ] I will purchase environmentally friendly products.
[ ] I will try composting at home.
[ ] I will return my deposit cans & bottles.
[ ] I will encourage others to reduce, reuse and recycle.

Please enter me in the NY State Drawing to promote recycling and buying recycled
that will be held on or about December 1.
One entry per person. No purchase necessary.
Your name will be kept confidential, it will not be sold to a mailing list.

Name_______________________________________

Daytime Phone (__________)____________________
Please include your Area Code
[ ] Please check here if you are under the age of 18.
For contest rules, write to the address below or check out our website. www.dec.ny.gov/chemical/294.html
Return entry form by 11/20 to: NY Recycles!,625 Broadway, Albany, NY 12233-7253

Pledge Cards: The case study above discussed pledge cards. This has shown to motivate people to actually take part in a recycling program. Below is an example of a pledge card from New York.

Slogan: Marketing is telling a story in an immediate phrase. The longer and more involved the recycling education campaign, the greater the risk of losing the reader's attention. Here are some examples of slogans:

- "Recycle All Ways" – Anne Arundel County, MD
- "Take it to the Curb, Orlando" – Orlando, FL
- "Bin there. Done That!" – Indian River, FL
- "ReTh!nk Recycling. Easier Than Ever" – Denver, CO
- "Reduce, Reuse, Recycle" – Jackson Hole, WY
- "Recycling: It's O! So Easy" – Omaha
- "Recycling: It feels good to do good"—Central Virginia Waste Management Authority
- "Get on the Recycling Cycle" – Albuquerque, NM

6.4.3 Best Practices

The following is a list of best practices that have proven effectiveness in recycling programs throughout the U.S. See Appendix H, Public Education Case Studies, for some examples.

6.4.3.1 The Best Practices of Other Cities

- Block leaders recruited to serve as neighborhood contacts
- Calendars of pick-up dates
- Close supervision of cart delivery
- Courtesy letters to the residents not recycling
- Direct mailings ("A change is coming")
- Grassroots outreach
- Informational hotlines
- Interactive Web sites

- Leave-behinds in grocery stores
- Live remote of the first cart being delivered
- Magnets
- Maps of convenience centers
- Master Recyclers (volunteer ambassadors)
- Meetings with apartment managers
- New resident packets for anyone moving in the recycling district
- News conferences to unveil program, logo, billboards, etc.
- Newsletters
- Newspaper ads
- Oops tags
- Packets of instructions with carts
- Postcards
- Presentations at neighborhood meetings and in school assemblies
- Public Service Announcements
- Recycling mascots
- Recycling videos
- Regular updates on success of program
- Series of booklets on different elements of recycling
- System of school materials that follow the children as they move up in grades
- Traveling exhibits

6.4.3.2 Recommendations from Other Cities

- ALL of the materials should be made from recyclable materials.
- Anticipate many calls to the hotline, especially before the carts are delivered.
- Be consistent with ALL of your messages.
- Constantly remind the residents of the city's recycling goal.
- Don't tell people too early about the delivery of carts. You shouldn't notify them more than three weeks out.
- Emphasize how and why to recycle.
- Frame your messages around focus group results.
- Grassroots outreach, while labor-intensive, is essential.
- It is difficult to coordinate direct mail pieces to be in sync with the phase-in of the cart distribution. Make sure you have thought everything through.
- Keep everything clear and simple.
- Public education is a continual process; keep reminding people about recycling.
- Push environmental benefits.
- Set reasonable recycling goals.
- Show the mayor separating his/her own recyclables at home.
- Solicit as many sponsors as you can.
- Stay in touch with the community.
- The recycling and garbage collection should be on the same day.
- The Web site should be fully functional before initial notification of the carts.
- Use well-known (or easily identifiable) locals in your ads.
- Work closely with educators on classroom materials.
- You MUST research before you create the campaign and DURING the implementation.
- Web sites to review:
    - www.austinrecycles.com
    - www.cityofseattle.net/util
    - www.memphiswaste.org
    - www.wipeoutwaste.com

6.5 Alternatives for Maui

Maui is looking to add new programs to its Solid Waste Division. Unlike the collection of trash, new programs, such as curbside recycling and yard waste collections and household hazardous waste programs, need significant educational support to be launched properly and sustained going forward. What follows are the consultant's recommended elements that are commonly seen in successful educational programs.

Recommended Educational Elements (REE) are:

1. The County should recognize that the education component of solid waste is encompassing of all aspects of solid waste and environmental management. This includes recycling as well as litter abatement, landfill practices, HHW collection, drop-off recycling, and composting. In other words, a successful education campaign cannot have just a niche focus but one that combines the Division's activities and objectives under the aegis of integrated solid waste management.

   To further this goal, a summary of the ISWMP that is easy to follow should be developed and provided and be a working document for citizens, political leaders, and media personnel to get acquainted with the features of the overall plan.

2. The County must decide whether it wishes not only to place the resources in education to initiate programs but to sustain them. The dollar span of an environmental campaign for new programs is from $2 per capita to $2 per household. If the education campaign is to maintain existing programs, its budget should be between $1 per capita to $1 per household.

3. The County must decide whether or not to have professional assistance on the development of the education. Professional assistance will help in researching of the specific social market in Maui, developing images and slogans that will be imprinted on each and every solid waste facility and activity. Such a professional service may not have had experience in environmental issues but should have a strong research and development background and graphics design capability. Many of the successful education programs have used professional support.

4. Members of the solid waste staff and professional education firm should hold a day long brain-storming session where all can be educated on the plan to be implemented, the scope of the work before them, and on specific ideas for education. The session should be attended by members of SWRAC, Maui Recycling Group (the nonprofit), and some of the County's solid waste and recycling vendors and grant recipients. Social marketing education works best when founded on real knowledge of the activities being promoted and bringing in stakeholders and staff for this is an important element.

5. Develop a research paradigm that includes survey questions, focus groups, and intercept interviews at existing County solid waste facilities such as the landfill and recycling drop off sites.

6. From research, develop an overarching image for the division with integrated images for individual programs. Individual programs should be color specific with personalized messages. Brochures, for example, will be specific just not in words but in color. An HHW brochure may, for instance, have an orange design to it which will coordinate with the orange designed signs on the HHW facility. But recycling operations may have a blue design that corresponds to the blue designed signs at recycling facilities.

   Develop a message that provides the following:

   - *"Product:"* must be enticing (i.e., the package of benefits associated with the desired action);
   - *"Price:"* minimize the cost to the target audience;
   - *"Places:"* make the exchange and its opportunities available in places that reach the audience and fit its lifestyles;
   - *"Promote:"* maximize desired responses with creativity;

   Each spokesperson for the program being implemented must articulate the four bulleted points above. A booklet explaining these items and providing talking points should be given to each policy maker before the program rolls out so they are prepared.

   The overarching logo and slogan should be designed. For example, an idea for such a saying could be: "*Paradise Sustained*" capitalizing on the already prevalent belief that Maui is Paradise and juxtaposing it to John Milton's popular title: *"Paradise Lost"* and current sustainability green theme. Another idea is to continue with the current theme but extending it for the new period: *"Maui Recycles Again and Again."*

7. Programs to be implemented will need advance education. Curbside recycling, as an example, will need information fact sheets, brochures, radio spots, and designated people ready to discuss this new program with editorial boards, on radio programs, and civic and environmental groups.

   Many successful curbside collection program rollouts include integrating the cart manufacturer into the educational campaign. Cart manufactures have vast experience in roll-out programs and can provide insight into ways to maximize educational opportunities. Such opportunities may include providing a logo to place on a specifically colored cart for just recycling; a single, laminated bi- or tri-folded brochure explaining both the curbside recycling and the County's solid waste programs placed at the household hanging from the new cart; inside the cart and underneath its lid can be a sticker telling the citizen the proper items to put into the cart and the day of that resident's collection.

   A blanket mailing should be sent to every home receiving a recycling cart. Two weeks before the cart arrives, a second mailing should go to those homeowners who will be receiving the cart. This helps to build excitement for the new program.

   The education material with the cart should have easy to follow instructions for the placement of the cart.

The first delivery of the cart should be a media event. The County should do advance work to find a positive receiver of the first cart and have the media there when the household takes control of the new service. The first collection should, as well, be another free media event by which the press is well informed of the location that it will take place so that camera and print media will be available.

8. Old signage should be traded out for new ones at every facility and on every collection vehicle. The signage must correspond to the uniform theme of the marketing image and color.

9. Provide training on the message and all the programs to the Customer Service Personnel, discussed in Chapter 5, who can provide that information through the Division's single number customer call center.

10. Develop a tabloid information piece to be inserted into the newspapers which displays the services of the division but highlights the new programs being implemented. On the islands of Molokai, Lanai and in the Hana Region, local papers should be used to provide information on solid waste activities and programs. Radio ads, interview shows, and public service announcements are productive for providing information to the public.

11. Utilize SWRAC as both an advisory board for education and as the center piece of grass roots network to not only foster support for the programs but to relay problems about them back to the Staff. The SWRAC board should continue to be a viable advisory committee for the County.

12. After developing marketing material, meet with the business and sports community to develop sponsorships whereby the County gets in-kind services or bartering to boost the visibility of the program.

13. Point of Entry/Purchase education should be expanded. As visitors come into the County, whether by plane, cruise ship, or ferry, all should be educated on the County's desire to abate litter and recycle. When a person registers a vehicle, that person should be educated on the proper way of handling cars that are no longer wanted or in demand. When retailers sell new or used appliances, the purchaser should provide educational material to them on how to properly dispose of used appliances. Approaching the consumer or the visitor at the point of entry/purchase helps to prevent disposal problems later.

14. Personalize the education program by having Division staff help spread the message. Citizens identify with staff in the field whom they see at their curb and drop-off locations. This recognition also generates enthusiasm among the members of the crews. Managers sometimes are resistant to use crew members for education because of a fear that something wrong may be said. But when such a person is fully briefed on the message, the enthusiasm he/she shows far outweighs any possible minor verbal mistake made.

15. The success of an education campaign depends on the support of citizens, government agencies, and elected officials at both the County and State levels.

16. Provide additional hands-on outreach by staff to educate K – 12 students on recycling. Supporting this program is important. Education activity will be

focused on creating an awareness and enthusiasm in the youth at school to recycle at home.

6.6 County of Maui Solid Waste Resource Management Education Plan

6.6.1 Goal

Education is to inform the people of this County and to change habits in how they handle their waste resources.

6.6.2 Strategy to Reach Goal

The Division should develop a sense that it is a single entity moving toward a goal of enhancing the County's resources, providing top service to the citizens, and promoting a green ethic. A coordinated education strategy on all activities the Division does is important to maximize the learning opportunities in its brochures, web site, radio ads and shows, public forums, and speeches by its elected officials. This demands a coordinated effort among managers within the Division to discuss the educational ramifications of activities so that education can support the operations from the beginning of the implementation to long after an activity has been operating. This strategy takes the view that education is not a "one-shot" deal but a long-term partnership with operators, the media, and the public.

6.6.2.1 Tools

A key to developing a long-term education campaign is research. A firm should be contracted so as to find the common elements among the County's populace that will tip an education campaign into being a success. Focus groups performed early on covering a plethora of topics will be useful for years to come as the components of this plan get implemented.

A second tool is a coordinated message integrated with graphic design material. Signage, brochures, radio, classroom exhibits, and messages on the sides of trucks must be thought out and integrated into the overarching message.

6.6.2.1.1 Human Resources

The Division currently has three individuals who work on environmental education. Although the Division feels this is an adequate number, the Division looks to improve its coordination between operations and the education section of the Division.

6.6.2.1.2 Marketing

Chapter 14 has timelines for implementing a number of activities that include an educational component. Every activity the Division implements should be coordinated in a similar fashion so as to compound the benefits of an education campaign. The plan recommends that the Division contract for the services of a marketing firm to facilitate the research and graphics work.

6.6.2.2 Funding

The plan calls for a funding level of two dollars ($2.00) per household, in 2007 numbers, during the years of implementing the various components of the plan. After the implementation has been completed, the funding will drop to one dollar ($1.00) in 2007 value.

6.7 Implementation Plan

Chapter 14 outlines the integration of education with the specific operations being implemented as part of this plan.

6.8 Summary

This chapter reviewed the concept of social marketing where the goal is to educate for the purpose of changing habits. It then reviewed examples of educational campaigns from other communities and lessons learned by other jurisdictions when implementing programs. Finally, the chapter lists the recommendations from the consultant on items to add to the educational tool chest.

7. Source Reduction and Reuse

7.1 Purpose

The purpose of this chapter is to explain the principles of source reduction and reuse. This chapter also reviews the 1994 ISWMP, summarizes what the County has done to implement the plan, and provides alternatives for the County moving forward. Then, the chapter will review the Plan that the County has chosen with a timeline for implementation.

This chapter also views source reduction as a County-wide activity and recommends the initiation of a program that lowers the local stress on energy and the emission of greenhouse gasses. As Chapter 12 discusses, energy costs are high in the County, and this ISWMP looks at waste as an option for new sources from which to generate energy.

7.2 Background

Source Reduction refers to the reuse of products and the change in the design, manufacture, purchase, or use of materials or products to reduce their amount or toxicity before they become municipal solid waste. Source reduction also refers to the **reuse** of products or materials.

Source reduction is waste prevention. It is the practice of designing, manufacturing, purchasing, or using items (such as products and packaging) in ways that reduce the quantity or toxicity[1] of trash created. Engineers and architects, such as William McDonough, design products and production systems with a cradle-to-cradle design philosophy.[2] This is an innovative approach to sustainability that models productive development on the integrated processes of nature's productive ecosystems. In such a system, products can be developed for closed-loop systems in which every ingredient is safe and beneficial -- either to biodegrade naturally and restore the soil, or to be fully recycled into high-quality materials for subsequent product generations, again and again. By taking a biological approach to technical development, a company can reduce the amount of waste that is acceptable and recover value rather than creating a future solid waste problem.

The USEPA lists source reduction as its first priority in combating municipal solid waste issues as shown in the USEPA waste hierarchy in Chapter 1. The National Recycling Coalition (NRC) and the Environmental Defense Fund (EDF) also view source reduction as a viable means to reduce municipal solid waste. Recently, the NRC broadened its mission statement to include source reduction. It states that "ton for ton, source reduction is more valuable to society than recycling." The EDF has stated that eliminating excessive layers of packaging is one of the most obvious and important forms of source reduction, and that source reduction has the potential to alleviate natural resource depletion.

[1] Toxicity is the degree to which a particular item may produce a chemically and/or biologically produced illness to an exposed organism due to the use of some ingredient. For example, mercury levels in dry cell batteries.

[2] McDonough, Will and Braungart, Michael. Cradle to Cradle: Remaking the Way We Make Things, Farrar, Straus and Giroux, 2002.

Within the strict confines of a single company's micro-economy, source reduction is measurable; it is definable, quantifiable, and valued. The reduction in the weight of packaging is under the company's control and measured by lower material purchases. Within a macro environment, such as a County's jurisdiction where no physical product may be manufactured for profit, source reduction is very difficult to measure. When the County conducts a source reduction information program, what is the performance measure for success? People may consume less during this time, but it may be for other reasons. This level of difficulty in quantifying the results of a program causes people to lose interest in maintaining consistent support and promotion of the strategy. It is also difficult to sustain the promotion of source reduction because it is such a qualitative shift in mindset and habits of both the public and the managers of integrated solid waste systems.

Source reduction is often thought of in terms of mass, the amount of volume reduced at the source. Source reduction, however, is also the activity that reduces, substitutes, or eliminates the generation of harmful products or components that become hazardous waste at the source.

Source reduction also includes the evaluation of a product through its entire life. Life-cycle methodologies are available that look at a product not as the sum of its parts but the parts themselves to see the balance of materials and energy used or discharged during the entire life of the product/package.

And, finally, source reduction includes the elimination of products that, once used, fall into the post-consumer waste stream. Replacing plastic grocery bags with a reusable cloth bag would be an example.

Source reduction, including reuse, can help reduce waste disposal and handling costs, because it avoids the costs of recycling, municipal composting, landfilling, and combustion. Source reduction also conserves resources and reduces pollution, including greenhouse gases that contribute to global warming.

7.2.1 Source Reduction and Reuse Facts

The USEPA provides some facts on reducing and reusing:

- 55 million tons of MSW were source-reduced in the United States in 2000.
- 28 percent of the materials source-reduced in 2000 were containers and packaging.
- In 1983, one pound of aluminum made 21.75 12-ounce cans; in 2007, one pound of aluminum made 31.92 cans.
- There are more than 6,000 reuse centers around the country.
- Between 2 and 5 percent of the waste stream is potentially reusable according to local studies in Berkeley, California, and Leverett, Massachusetts.
- Since 1977, the weight of 2-liter plastic soft drink bottles has been reduced from 68 grams each to 51 grams. That means that 250 million pounds of

plastic per year has been kept out of the waste stream and were not transported around the country with the products they contained.

7.2.2 Source Reduction and Reuse Benefits

Three major benefits can be derived from the application of source reduction and reuse, as follows:

- **Saves natural resources.** Waste is not just created when consumers throw items away. Throughout the life-cycle of a product—from extraction of raw materials to transportation, processing and manufacturing facilities and end use—waste is generated. Reusing items or making them with less material decreases waste dramatically. Ultimately, fewer materials will need to be recycled or sent to landfills or waste combustion facilities.

- **Reduces toxicity of waste.** Selecting nonhazardous or less hazardous items is another important component of source reduction. Using less hazardous alternatives for certain items (e.g., cleaning products and pesticides), sharing products that contain hazardous chemicals instead of throwing out leftovers, reading label directions carefully, and using the smallest amount necessary are ways to reduce waste toxicity.

- **Reduces costs.** The benefits of preventing waste go beyond reducing reliance on other forms of waste disposal. Preventing waste also can mean economic savings for communities, businesses, schools, and individual consumers. For example, reducing the weight of a product or its packaging will result in lower shipping and transportation costs.

7.3 Legislative

Source reduction is the County's and the State's preferred method for managing solid waste. See Sections 7.7.2 and 7.7.3 for possible changes to the Maui County Code.

The State is promoting source reduction in the form of preference for recycled products (Section 103D-105 and Chapter 3-129) and energy efficiency as stated in state code [§196-9]: Energy efficiency and environmental standards for state facilities, motor vehicles, and transportation fuel. Each agency is directed to implement, to the extent possible, a number of goals during planning and budget preparation and program implementation. The goals that could impact the Maui program include:

1. Incorporate principles of waste minimization and pollution prevention, such as reducing, revising, and recycling as a standard operating practice in programs, including programs for waste management in construction and demolition projects and office paper and packaging recycling programs;

2. Procure environmentally preferable products, including recycled and recycled-content, bio-based, and other resource-efficient products and materials complying with the state preference regulations.

7.4 Review of 1994 ISWMP

The 1994 ISWMP focused on education to change consumer habit. The 1994 ISWMP called for roadside signs, flyers, bill inserts, videos, and discussion on radio shows. The 1994 ISWMP also focused on backyard composting and mulching as a way of reducing the material going to the landfill.

7.5 Implementation of 1994 ISWMP

The Division carried through on the 1994's ISWMP and educated people on reduction and reuse, expanded in-house reduction efforts by getting County offices to reuse its office paper, and developed a County procurement policy that gave evaluation points to products made with post-consumer grade material.

The County attempted to create a price incentive for people to recycle by placing a fee on self-haulers at the County's landfills. However, this policy was revoked. The process of collecting money at the Landfill was believed to be too slow and, therefore, traffic backed up on Pulehu Road. Yet, this is a procedure practiced by public and private landfills around the world. There are a number of solutions in general practice: locate the scales in a manner to allow for adequate queuing; provide additional scales to handle traffic; electronically scan commercial vehicles to reduce time on scales; charge a flat fee for pick-up trucks and cars and trailers so that the line keeps moving.

Where the plan had a major effect, however, was in implementing a government in-house campaign to double-side photocopy paper and reuse photocopy paper. Office after office of the County is practicing this procedure 13 years later.

7.6 Current Activities

7.6.1 In-house Actions

The current activities regarding in-house actions are described in Sections 7.4 and 7.5.

7.6.2 Residential and Commercial Actions

The County's grants have helped to pay for programs by volunteers to reuse computers and other electronics for both residential and commercial entities. The County also provides grants for volunteer groups to reuse paint, and educate and support the effort to create and maintain the habit of shopping with reusable shopping bags.

7.6.3 Education

The County has continued to educate the public on resource reduction and reuse especially through face-to-face education at community events and festivals and the efforts of the volunteer activities referenced in Subsection 7.6.2.

The County has implemented a public education program around an anti-litter theme and a well-known local comedian, Tita. The program, "Listen to Tita, NO LITTAH," includes illegal dumping, old appliance pick-up and recycling hotlines, as well as a number of outreach activities. The program ties in with the State's Adopt-a-Highway program, as well.

7.7 Alternatives

7.7.1 County Purchasing

The County can use its purchasing power to influence change. The County can advance its 1994 decision to have the Division of Purchasing and other departments implement a County Energy and Environmental Program for energy conservation and environmental stewardship. Among other things, this would place the purchasing of goods under a life-cycle analysis, as well as costs and other variables per the individual purchasing need.[3]

This new scale of purchasing would help entice the private sector to reduce the environmental impact of a product because of the way the item was manufactured, transported, stored, and packaged. This would advance the purchasing scope to look for products that do not harm human health, are less polluting, and that minimize waste, maximize use of bio-based or recycled materials, conserve energy and water, and reduce the consumption or disposal of hazardous materials. This new purchasing guideline will favor durable and long-lasting goods; oblige suppliers of electronic equipment to take back equipment for reuse or recycling; and to encourage the use of recycled packaging when possible. A net value cost evaluation will take into account energy savings. The purchase price and operational cost over the life of the product will be evaluated so that a net cost to the County is more accurate.

The Purchasing evaluation should take into account toxins and pollutants when estimating value for the County and its workers. Chemicals listed by the EPA or the National Institute for Occupational Safety and Health on the Toxics Release Inventory should not be purchased by the County. Material used to maintain buildings should use the lowest amount of volatile organic compounds, the highest recycled content, and little to no formaldehyde. This should include carpet, adhesives, and furniture.[4]

The SWRAC research tour met with the Department of Environment for the City of San Francisco and spoke with officials who led the City to implement green purchasing procedures as well as diminish the toxins the City purchases. In 2005, the City passed legislation that established green purchasing procedures including an "approved alternative product list" to eliminate toxins and waste. This can be viewed at the following website:

> http://orf.od.nih.gov/Environmental+Protection/Green+Purchasing/GreenPurchasingFAQ.htm.

[3] There is a growing number of Green Purchasing training for purchasing agents. http://www.ofee.gov/gp/training.asp; http://www.federalsustainability.org/initiatives/eps.htm; http://www.federalelectronicschallenge.net/

[4] For further information on Green Purchasing and toxic management please see the following:
http://www.epa.gov/tribalcompliance/prevandpurch/pppreventiondrill.html;
http://www.ci.nyc.ny.us/html/nycwasteless/html/at_agencies/green_purchasing.shtml;
http://www.ofee.gov/gp/greenjanitorial.html;
http://orf.od.nih.gov/Environmental+Protection/Green+Purchasing/GreenPurchasingFAQ.htm

7.7.2 Reuse Facilities

A reuse facility would be sited at solid waste campus, to be located near the Central Maui Landfill, as discussed in Chapter 5. A MRF for both recyclables and C&D would be operating; bulk, white good, and HHW materials would be processed at this site as well. The reuse facility would receive materials and items that can be sold at a reduced cost to the public or donated to charities to take to sell or give away. In addition, the expanded facilities at Hana, Lahaina, and on the Islands of Lanai and Molokai will provide additional reuse potential.

The SWRAC tour made a visit to the Last Chance Mercantile in Monterey, California, which is operated by the Monterey Regional Waste District. The district services a population in size and scope similar to the County. Such a facility is a viable option for the County.

The facility could be contracted out to a non-profit organization to manage and work the facility each operating day of the week. The facility can provide building material, material segregated from the HHW facility, white goods, and bulky items. Perfectly good material heading into the landfill, such as furniture, would be directed to the reuse facility by the employees of the landfill.

Photo 7-1. County of Hawaii's reuse center in Keani. It has construction materials for people to purchase

Photo 7-2. General store in County of Hawaii's reuse center in Keani

The County of Hawaii has a similar program with a non-profit group. It has one large and well used facility and several smaller locations around the island. The photos (Photos 7-1 & 7-2) show a customer purchasing sliding glass doors for a chicken coup he is building and a type of general store area of the same facility.

Hawaii County provides a grant to the Hawaii Recycle Group to operate this facility and it also received funding from EPA and other entities. The group sells the material cheaply. The pictures are of the staffed facility near Hilo called Keani. The facility has a Reuse Book Library, a bulky item reuse area, paint reuse area, and a soon-to-be formed C&D area.

On the Island of Maui in Puunene, Friends of the Library have operated a used book store for the last ten years. The book store is in the old Puunene school and accepts donations of $0.10 for most of its books, see Photo 7-3.

In addition to the book store, there are several non-profit organizations that operate reuse centers and stores. Further, there are some for-profit businesses, including thrift stores and consignment shops, which contribute to the level of reuse in the County and divert potential wastes from disposal. The County assists these organizations with a program of grants. Some of these are listed in Table 7-1, along with some descriptive elements.

Photo 7-3. Friends of the Library Used Book Store

Table 7-1 - Reuse Options in Maui

Organization	Location	Reuse Services
Aloha Shares Network	On line and by phone	All items, matches donors with organizations in need
A-1 Recycled Appliances		Working appliances
Friends of the Library	Puunene	Used book store
Community Work Day	Puunene	Paint recycling Computer recycling
Habitat For Humanity	Wailuku	Restore, building materials
Buyers Paradise		Building materials
Big Brother/Big Sister		Clothing
Kidney Clothes		Clothing
Puaa Food Waste	Liana and Haiku	Collects food waste to feed pigs

7.7.3 Public Education and Messaging

In its public education and messaging, the County should also promote combined messaging to residents and visitors that address reduce, reuse, recycle anti-litter along with energy and water conservation encouragements. This would be most efficient in an integrated campaign where common themes, colors, music, markets, etc., are employed. The County should also encourage similar approaches by others and could offer tie-ins that would multiply effectiveness.

7.8 Possible Programs

The County could establish a similar consumer waste reduction campaign. With the cooperation of area grocery retailers, the County could distribute informational materials in the County's grocery stores that promote:

- Bulk purchase;
- Purchasing concentrates;
- Purchasing only the perishable items that will be consumed before spoilage;
- Minimizing purchases in single-serving containers;
- Considering recyclability of purchases;

- Purchasing nontoxic alternatives to common household chemicals; and
- Buying reusables versus disposables.

The County could also develop a series of waste reduction demonstrations using common grocery store items (larger packages of potato chips versus single-serving bags, large boxes of raisins versus individual mini-boxes, etc.). The demonstrations would be designed to show the value associated with purchases that generate less waste. (In the potato chip example, chips in the larger bags tend to have less breakage and frequently taste fresher. This can be demonstrated through "blind" taste tests by volunteers from the audience.)

Depending on the retailer, grocery stores may be willing to allow such demonstrations in their stores; however, the needs of grocers to satisfy the demands of their suppliers should not be overlooked. If grocery stores are not willing to allow in-store displays or materials that favor one product over another, they may be willing to assist waste reduction efforts in other ways, such as providing a discount to customers who use reusable grocery sacks or bring their own bags/boxes.

It is important to remember many consumers are more concerned with value for their money than the environmental impacts of their purchasing decisions. Therefore, messages that promote value may be more effective in encouraging waste reduction than messages that focus on waste concerns. For example, when Procter & Gamble began marketing Downy fabric softener in concentrate form, they used an advertising strategy that emphasized a "cut down on packaging" message. The campaign was not deemed successful. Subsequently, a follow-up campaign was initiated that featured a "Less Money, Less Waste" theme. This message was effective.

The County could also develop seasonal promotions to support waste-conscious consumer purchases. Examples include:

- Spring messages could emphasize nontoxic alternatives to "Spring Cleaning" products;

- Summer messages could promote reusables for picnics and other summer activities;

- Fall messages could promote cloth lunch bags instead of disposables and other Back to School waste reduction tips; and

- Winter messages could focus on alternatives to wasteful gift wrapping and disposable household batteries for the holiday season.

As mentioned in Section 7.7.3, commercial tie-ins with merchants would increase the effectiveness of these measures.

One way that the County can help de-toxify the waste stream and help reduce the amount of hazardous waste generated in the County is through continued promotion of alternatives to toxic products. For example, the County currently distributes a fact sheet describing substitutes for commercial cleaners. This publication could be expanded into a consumer guide, with helpful hints for using nontoxic approaches to solving common household cleaning and pest problems. If specific approaches were readily available on the County website, a resident with a difficult clean-up problem could find an effective and environmentally friendly solution rapidly. In addition, the County could work with the maintenance departments at area schools and colleges, hospitals, health centers, and other institutional settings to promote environmentally friendly cleaning products.

Division can provide technical assistance to businesses in evaluating existing waste practices and developing waste reduction strategies. The technical assistance could include:

- Waste audits for businesses and institutional establishments. These waste stream audits would identify current waste generation rates (as a baseline) and identify waste reduction methods that could be employed within the basic operation of the firm or organization;

- Examination of existing procurement practices, including encouraging life-cycle cost strategies when evaluating product purchases that take into account replacement costs and processing and disposal costs; and

- Suggestions for changes to operational practices to reduce waste and increase recyclability of the waste stream.

7.8.1 Plastic Bags

The major source reduction program the County is currently promoting is the "Reuse Your Bag" program. Approximately 15,000 thousand reusable shopping bags have been purchased in the past two years, with more to come. With input from SWRAC members, each island - Maui, Molokai and Lanai - has its own individual design, based upon the flower for that island. Educational information is printed on one side of the bag. The bags are made available, one per person, to all who sign a pledge designed to educate the public about plastic bag reduction, reuse, and proper disposal, "knot your bag," to prevent the bags from blowing out to sea.

Citizens have taken up the campaign and worked with members of the County Council to draft a "ban the bag" ordinance for consideration. The State legislature is also considering plastic bag legislation.

Paia became the first town in the County to go "bag free." Most businesses in Paia Town do not provide plastic bags to customers anymore.

7.9 Plan Recommendations

7.9.1 In-house

The Division will continue to reuse its materials, such as double-siding copy paper, and reusing paper for note pads.

7.9.1.1 Actions

The Division will develop and/or enhance education material on items to substitute for toxic materials. It will utilize the new HHW program recommended in this ISWMP as a focal point for educating citizens on using substitutes for toxic material.

7.9.1.2 Environmental Purchasing

The Division will continue to urge the County to require material purchased by the County to be "green." It can require that all suppliers that provide documents or other materials to the County have a high recycled content level. For example, all documents, such as proposals, use paper with a minimum of 50 percent recycled material.

7.9.2 Residential and Commercial Actions

The County will continue to support and motivate private reuse ventures through the use of its grants. These monies can be distributed to non-profit as well as profit-making organizations that wish to use the material the County or the private concerns make available for reuse. The HHW facility will provide material for reuse.

7.9.3 Education

The Division will enhance its website and education material to promote reduction and reuse activities. It will provide forums for toxic material substitution so that the public can learn about products. It will motivate children in kindergarten through twelfth grade on the benefit of reducing and reusing, and will have curriculum materials available for use by schools.

7.10 Implementation

7.10.1 Short-term

In the short-term, the Recycling Section will work to develop an educational strategy targeting source reduction and reuse through the use of research data gained from focus groups as described in Chapter 6. Educational material will be based off of this research and developed into brochures, advertisements, and storylines.

7.10.2 Long-term

Through the use of grant monies and materials diverted from the Division's operations, such as the C&D MRF, facilities will develop whereby people can purchase, at a low cost, materials to reuse.

7.11 Summary

This chapter reviewed the concept of source reduction and the Division's long history of implementing reduction habits within the County agencies. The chapter calls for using grant monies, which must be secured through the annual budget, to foster private-sector reuse programs that will ultimately reduce the amount going into the landfill and provide used products to citizens at a reduced cost. Finally, the chapter will build upon the implementation of an HHW program to both reuse material and substitute non-toxic for toxic material.

8. Construction and Demolition Debris

8.1 Purpose

The purpose of this chapter is to discuss the situation in Maui County related to construction and demolition debris (C&D). A private landfill currently receives C&D, but the owner has projected approximately six years of permitted life remaining at the facility.

This chapter looks at the legislative requirements for this specific waste stream, the impact of the closing of the private C&D landfill on the County's controlled waste stream, and the goals and tactics to meet those goals for the County.

8.2 Legislation

8.2.1 Federal Government

Construction and demolition debris fall under the Non-Hazardous Waste subject to EPA Subtitle D RCRA Regulations.

8.2.2 State of Hawaii

The State promotes recycling of its own projects on construction sites under [§196-9] so that they incorporate principles of waste minimization and pollution prevention, such as reducing, revising, and recycling as a standard operating practice in programs, including programs for waste management in construction and demolition projects and office paper and packaging recycling programs. The State's regulations, however, do not specifically mandate, at this time, that the Counties do the same level of activity in C&D construction.

8.2.3 County of Maui

Maui County's permit process and estimated timeline for securing such permits for construction, renovation, and demolition projects falls under one of four permit types.

1. "Residential Build" currently takes a minimum of three months to process and receive approval.

2. "Commercial Alteration" currently has a minimum process time of six months before approval.

3. "Demolition" has a normal process and approval time of six months. If the building is older than 50 years the approval time may be extended.

4. "New Commercial Building" is currently a 12-month process before possible approval.

The County has a requirement that a recycling plan be submitted to the Recycling Section for demolition projects; however, none of these four permits mandates the homeowner or developer to recycle or reuse any of its waste material.

8.2.4 Local Ordinances: Examples

Jurisdictions are increasingly making the recycling of construction and demolition waste a part of their permitting process. The following sections describe such ordinances from North Carolina, Illinois, and California. Most of these kinds of regulations provide a cost and/or square footage threshold of the construction and/or demolition project at which the ordinance is to be applied. This helps to limit onerous expense applied to those who undertake small projects. Some of these types of ordinances require security bonds/deposits that the contractor and/or owner will not get back until satisfactory completion of the recycling/reuse requirements.

8.2.4.1 Orange County, North Carolina

In the late 1990s, Orange County officials recognized that the Construction & Demolition (C&D) landfill was going to be filled sometime in 2003. The Orange County Board of County Commissioners agreed to build a new C&D landfill but only if certain bulky materials (those materials that take up the most room in the landfill) were required to be recycled. As a result, the Regulated Recyclable Materials Ordinance went into effect on October 1, 2002. The following highlights elements of this ordinance:

Table 8-1 - Orange County Ordinance Highlights

Who It Affects?	What It Does?
Contractors and individual home owners.	Requires the recycling of certain C&D materials: corrugated cardboard, clean wood (that is, wood that has not been painted or treated) and scrap metal. Construction and demolition projects must have a waste management plan in place, waste haulers must be licensed, and these requirements will be enforced.
Solid Waste Enforcement Personnel inspects and cites business and individuals.	Loads going into the landfill that contain wood, metal, pallets, and/or corrugated cardboard will be charged **double the tip fee**. Individuals found to be conducting building activities without the appropriate Recyclable Material Permit will be issued a civil citation.

8.2.4.2 Chicago, Illinois

Chicago initiated an ordinance for construction or demolition site waste recycling. It includes the following:

Table 8-2 – Chicago Ordinance Highlights

Who It Affects?	What It Does?
Contractors who fail to meet the recycling percentages identified in subsection (2) shall be subject to the following fines: For construction projects or demolitions involving 10,000 square feet or more of renovated, newly constructed, or demolished space	$1,000 for each percentage point of difference between the amount required by this section to be recycled or reused and the amount actually recycled or reused
For construction projects or demolitions involving less than 10,000 square feet of renovated, newly constructed, or demolished space	$500 for each percentage point of difference between the amount required by this section to be recycled or reused and the amount actually recycled or reuse

8.2.4.3 Santa Monica, California

Santa Monica, California implemented a 60 percent recycling plan for demolition and construction projects valued above $50,000. The table below summarizes the ordinance.

Table 8-3 – Santa Monica Recycling Plan Highlights

Who It Affects?	What It Does?
Private Projects $50,000 and greater	Divert 60%
City-sponsored projects	
All Projects	Waste Management Plan Submitted
All Projects	Only 20% of 60% can be from inert material
All Projects	Must Use City’s Conversion Rates
Private Projects	Security Bond of 3% of total or $30,000

8.2.4.4 San Mateo, California

A Waste Management Plan is necessary to demonstrate compliance with San Mateo County, California Ordinance 04099 that requires covered projects to salvage, reuse or recycle 100 percent of inert solids (asphalt, brick, concrete, dirt, fines, rock, sand, soil, and stone) and at least 50 percent of the remaining construction and demolition debris generated by the project.

Table 8-4 – San Mateo Ordinance Highlights

Who It Affects?	What It Does?
Demolition Work Valued at $5,000 and above	100% recycling of inert solids e.g. asphalt, brick, concrete, dirt, fines, rock, sand, soil, and stone
Demolition Work Valued at $5,000 and above	50% of remaining demolition debris
Renovation and Remodeling valued at $250,000 and above	100% recycling of inert solids e.g. asphalt, brick, concrete, dirt, fines, rock, sand, soil, and stone; 50% of remaining demolition debris
Construction of new structure equal to or greater than 2,000 square feet	100% recycling of inert solids e.g. asphalt, brick, concrete, dirt, fines, rock, sand, soil, and stone; 50% of remaining demolition debris

8.3 Review of the 1994 ISWMP

The 1994 ISWMP did not speak specifically to this waste stream except to say that 11 percent of the County's waste stream is made up of C&D.

The County has, however, been interested in finding ways to divert the C&D material away from the landfill. One example of such a diversion program was the 'Give-away-Days' where material brought in could be taken by others. This grass-roots marketing helped to divert material away from the landfills.

Another example occurred in 1998 when the Maui Recycling Group (MRG) initiated a demonstration project for an on-site source separation program on construction of 26 housing projects located at Liholani Golf Village. With assistance from the Division, MRG and the contractor, Dilloway Construction Company, implemented a program whereby drywall, cardboard, and plastic were diverted from the landfill.

MRG placed six-yard containers at the construction site to collect the three designated materials. Construction began in 1998 and finished in April 1999. A total of 18 tons of drywall was diverted to a local commercial compost yard as a feedstock to its compost. The project diverted 1,000 pounds of plastic away from the landfill and to Aloha Plastic Recycling in Kahului. The cardboard diverted totaled two tons and was sent to market. In addition, five tons of treated lumber was diverted to over 150 individuals who attended a "Giveaway" day.

The pilot program the County and MRG conducted resulted in a net reduction of 35 percent. In other words, 35 percent of the waste generated by weight was diverted away form the landfill to be reused or recycled. The cost of hauling and disposal was 20 percent less than originally expected creating a net reduction in overall costs.

8.4 Private Landfill Capacity

8.4.1 Background

Mr. Chic Decoit owns, manages, and operates the C&D Landfill. The site had been the location of a 150-feet-deep pit that was mined for cinders during World War II. The land the site is on is owned by the Alexander & Baldwin Company (A&B), and Mr. Decoit was in the trucking business and knew of the cinder pit and saw a business opportunity. Decoit approached and negotiated a lease contract with A&B for the 14.8

acres to use, first, for clean fill and, starting in 1996, started using it as a C&D landfill. Effective in 2005, commercially collected C&D was banned from the CML,[1] and Decoit started to receive approximately 200-300 TPD on average, including getting loads from commercial stores. This private facility pulls out metal and ships it to Hawaii Metal Recycling (owned by Schnitzer Steel Hawaii Corporation) on Oahu. The facility also segregates green waste and hauls it to the Maui EKO co-composting operation at the CML.

The facility charges $40 per ton for mixed C&D and $20 per ton for inerts loads. The facility gets all the lumber and the drywall from current demolition projects; however, large operations, such as the Marriott, often have the concrete crushed and used on site.

The private landfill allows some customers to stockpile large amounts of metal material from specific demolition projects at the site. This material is cut up and sold to such processors as Big Island Recycling and Hawaii Metal Recycling.

8.4.2 Local Current Tonnage at Private C&D Landfill

The Decoit C&D landfill in Maui County receives and buries approximately 50,000 tons per year. The table below compares material going into the private C&D Landfill with that going into the CML. The private landfill takes in approximately 19 percent of what the CML receives. The CML, however, diverts 22 percent of its material, whereas data supplied by the private C&D landfill indicates a diversion of just 1.3 percent of its total.

Table 8-5 – Annual Comparison of Maui Landfill Use, FY2006

	CML	C&D Landfill
Population Served	131,640	N/A
Households Served	46,530	N/A
Total Received (tons)	268,246	49,984(1)
Total Materials Received TPD (Average)	735 (basis: 365 days/yr.)	165 (basis: 300 days/yr.)
Materials Diverted (tons)	60,362	655
Waste Landfilled (tons)	207,884	49,329

(1) Tonnage includes inerts and recyclables; carpets and tires pulled.

The private landfill owner and its consultant believe that it has received 443,000 cubic yards of material over the past 11 years and estimates a site capacity of 407,000 cubic yards remaining. Depending upon the compaction of this C&D material, the site may have as little as six years and as long as ten years of space remaining.

8.4.3 Recent Waste Activity

Generation rates depend on the amount of building and refurbishing done. Maui Island has seen significant construction activity over the past five years. In discussions with

[1] Chapter 15-3, Rules for Maui County Landfills (as amended).

developers, it appears that the rate will continue into the foreseeable future. The Ritz Carlton in Kapalua and the Kobayashi project in Wailea are examples of current large projects that have generated a lot of C&D material.

Aloha Waste Systems, a waste hauler, estimates that they transport 40 roll-offs a day of C&D material to the Decoit C&D landfill.

When Northwest Demolition has had demolition jobs on Maui, it fills its own large, 50-cubic-yard open-top containers and continuously hauls to the Decoit landfill.

Maui Disposal estimates that it sends 20 open-top roll-off boxes, most of which are 30 cubic yards in size, to the private C&D landfill.

Photos 8-1 and 8-2. The Ritz Carlton and the Kobayashi project in Wailea

8.4.4 Future Local Generators

Based on projected development in the County and the recent history of C&D generation, C&D waste is projected to increase from the current 50,000 tons a year. C&D waste is projected to comprise approximately 15 percent of Maui's growing waste generation. Examples of construction projects in the near future are as follows:

A&B Properties has several large projects in the queue, including:

- 150 homes in Haliimaile
- 100-acre parcel for single-family homes in Kihei
- 800-acre development over a 20-year period in Makawao
- 672 acres that would include building up to 2,000 homes, a school, fire station, and golf course on and around the site of the current privately-owned landfill for C&D
- 270 acres near the current C&D landfill
- 710 acres of residential development on the west side of the highway from the C&D landfill up to the mountains

Of the material currently going into the private C&D landfill, a certain portion of it can be recycled and reused, but because it is currently privately controlled, the percentage is difficult to quantify. The County-sponsored case study performed by the Maui Recycling Group in 1998, however, diverted 35 percent of the new construction material from the landfill to beneficial uses.

Currently, contractors on Maui have no financial or regulatory incentive to separate the inert material from cardboard and metal. The material is tossed together into a roll-off or transfer trailer and sent to the private landfill. If separated, these can be diverted, thereby saving space at the landfill. The pictures below show the material at the privately-owned C&D landfill in Maui.

Photos 8-3, 8-4, 8-5, 8-6, and 8-7 (clockwise, starting at top left). Inert material (bricks, concrete, rock) could be pulverized into gravel for new construction. Cardboard could be recycled into new paper. Metal could be recycled into new metal. The plastic pipe could be reused or recycled. Instead, it is currently being buried in Maui at private C&D landfill.

8.5 National Trends

8.5.1 C&D Recycling

8.5.1.1 Recycling Rates

Increasingly, states are moving toward capturing a greater percentage of the C&D waste stream. GBB completed a study for the National Demolition Association (NDA) and compiled recycling data from over 100 NDA members nationwide. The data indicated that six states recycle over 70 percent of their demolition waste.

Table 8-6 – Examples of State Recycling Rates, Demolition Materials

State	Percent Demolition Material Recycled in the State
CA	90%
FL	90%
WA	86%
MN	77%
IL	74%
NJ	72%
TX	49%
Ave. other 43 States	19%
Total	**73%** (Nationwide)

8.5.1.2 Processing

A few jurisdictions own and operate their own construction and demolition debris materials recovery facility (CDMRF) as a means of diverting and recycling material away from their landfill and preserving capacity and extending the time before another landfill has to be constructed. Fauquier County, Virginia, developed such a CDMRF that has the ability to process up to 130,000 tons per year of C&D. This facility has 1 spotter/screener to manage incoming trucks and check waste contents before dumping; 3 to 4 equipment operators; 7 to 10 people who pick through the material and sort them into categories; and 1 to 2 roll-off truck drivers depending on volume of material.

The facility uses processing equipment and various machines to move the materials. The main conveyer that feeds the system is 72 inches wide by 56 feet long. The rest of the equipment includes: a finger screen; a picking conveyor 72 inches wide and 122 feet long; a conveyor that transfers “unders” material to another picking stage, 48 inches wide and 16 feet long; a magnetic separator; an inclined conveyor that transfers material to a “star screen” and then to the second sorting belt. To feed C&D to this CDMRF, the County uses a CAT 320 excavator for loading operations with a CAT 312 excavator used for the presorting operation and backup. A rubber tire loader

CAT 966 class is used for pushing material with another rubber tire loader CAT 950 class for backup.

The processing of this material typically occurs between Monday and Friday of each week. Incoming waste vehicles are weighed and checked. If the material is mixed C&D waste the transport vehicle is directed to dump its contents at the processing facility. As the truck approaches the facility, the spotter directs the vehicle to unload into a specific spot.

Photo 8-8. Fauquier County, Virginia, C&D operation ready to process material

At the stockpile point before the material is conveyed up to the picking line, the material that can be reused is pulled from the pile and segregated from the CDMRF process.

An excavator with a large bucket scoops and pushes the material onto the in-feed conveyor where it travels up and dumped onto a primary screen which sorts materials by size. Material that is greater than 6 inches continues along the conveyer. Material smaller than 6 inches falls through the holes in the screen and are sorted by a second screen into a greater or less than 2-inch size. The 6-inch and greater material is transferred up to the sorting conveyor where sorters pick through the material. The sorter picks the material up and drops it into a bunker of like-kind material.

Photo 8-9. Fauquier County's C&D recovery system in operation

The less than 2-inch "fines fraction" is discharged into a holding bay for eventual use as alternative daily cover. The greater than 2-inch material is conveyed for further hand sorting. Residuals from this sort are combined with the larger sized residuals and are placed in the landfill for burial.

8.5.2 C&D Recycling Examples Seen on SWRAC Tour

Members of the SWRAC made tours of three locations that recover C&D material. Two of these jurisdictions use material recovery facilities (MRF) to take in C&D and separate the material out for reuse or recycling with success.

One of these locations is the Monterey Regional Waste Management District in Monterey, California. It services a geographic area and population that is similar to Maui. In 1996, it built a 95,000-square-foot building to house a system of conveyors and sorting stations where workers recover various materials such as wood, yard waste, sheetrock, carpet padding, metal, bottles, cans, cardboard, paper, reusable items, concrete, asphalt, and other inert materials such as soil and gravel. Built at a cost of $9.6 million, the MRF was designed to process 600 tons of waste per day: 400 tons of mixed waste from commercial drop-boxes, construction and demolition debris, and self-haul waste; and 200 tons per day of yard waste and wood waste. In FY 2005-2006, approximately 132,262 tons were processed through the MRF, and a 61 percent recycling rate was achieved. This exceeds the original target recycling goal for the facility. Residential garbage and wet commercial waste are not processed in the MRF; they are sent directly to the landfill. The following pictures show Monterey's MRF.

Photo 8-10. Tipping floor spotter

Photo 8-11. Pre-sort items removed on tipping floor

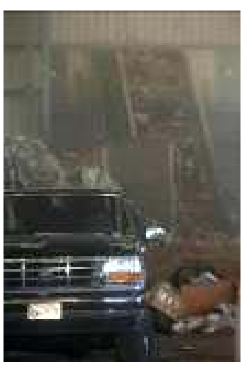


Photo 8-12. Tipping floor showing inclined conveyor

Photo 8-13.Sorting area

8.6 Alternatives for the County

The SWD, and the County of Maui as a whole, are faced with a potential of having the CML capacity used up two years earlier than projected if no alternative to C&D disposal is found. Alternatives for the County to consider are:

1. Do nothing. This will use up the County's landfill capacity quicker. On the other hand, it will be a simple initiative to once again incorporate burying C&D waste.

2. Integrate C&D processing to the MRF discussed in Chapter 4. By combining the operations in one facility with a reuse and landfill facility on the same solid waste campus, both capital and transportation costs will be reduced. Reusable construction materials that are recovered could be offered for sale at the reuse facility to citizens for home repair and improvement projects.

3. Once a CDMRF is operational, the County could implement a C&D recycling ordinance similar to the ones reviewed in Subsection 8.2.4 in this chapter.

4. The County could coordinate a meeting of interested private sector parties, e.g., haulers of C&D, developers, contractors, owner of the existing private landfill, for the purpose of planning for the management of C&D waste by the private sector. This may result in a joint effort to conserve capacity in the privately owned C&D landfill, a private C&D separation facility, and a private reuse facility.

5. Implement C&D recycling ordinances to promote and enforce C&D recycling as discussed in Section 8.2.4 of this chapter.

8.7 Plan Recommendations

8.7.1 Goals

The Division will implement operational and legislative actions to minimize C&D material flowing into the landfill for disposal and encourage recycling.

8.7.2 Strategies to Meet Goals

8.7.2.1 Island of Maui

The Island of Maui has a private landfill for C&D that is expected to have six years of capacity left. The Division intends to inquire as to the plans of the owner of the landfill and investigate opportunities to extend private capacity through greater diversion.

8.7.2.1.1 C&D MRF

The Division plans to procure a design, build, and operate facility located centrally and to be operational by the time the private landfill's capacity is completed. This is expected to be a three-acre site to accommodate a 40,000-square-foot, open-air facility is added in the selected scenario for the purpose of processing C&D waste so that reusable and recycled material can be diverted from the landfill. The capital cost of the C&D facility is estimated to be $8.7 million in 2007 dollars. It is planned to process 170 TPD initially and expand in later years. The annualized capital cost is estimated at $0.7 million per year (20-year term, 5% interest), and the annual operations and maintenance is estimated at $2.8 million per year (2007 dollars), as shown in Exhibit 13-4. Revenue from the sale of recovered products is estimated at

$40 per ton net of transportation and generates $1.3 million per year. This results in an estimated cost per ton of $67.

8.7.2.1.2 Local Ordinances

The County shall pass and enforce an ordinance establishing C&D recycling requirement of 50 percent for all commercial and residential demolition and construction projects. Estimated implementation timeframe is 2013.

8.7.2.1.3 Reuse of Material

The Division will rely on the private and non-profit sector to utilize material that the Division's waste management system diverts to the reuse market place. Grant opportunities from the Division will be made available to assist start-up of such operations and support when needed.

8.7.2.1.4 Hana Region

8.7.2.1.4.1 MRF

The Division will transport C&D waste under its control to its facility in Central Maui for processing. The material will be loaded into a roll-off container and transported when full to the C&D MRF.

8.7.2.1.4.2 Local Ordinances

The County shall pass and enforce an ordinance establishing C&D recycling requirement of 50 percent for all commercial and residential demolition and construction projects. Estimated implementation timeframe is 2013.

8.7.2.1.4.3 Reuse of Material

The Division will rely on the private and non-profit sector to utilize material that the Division's waste management system diverts to the reuse market place. Grant opportunities from the Division will be made available to assist such operations in both start-up and operations as determined on a case-by-case basis.

8.7.2.2 Island of Lanai

8.7.2.2.1 Local Ordinances

The County shall pass and enforce an ordinance establishing C&D recycling requirement of 50 percent for all commercial and residential demolition and construction projects. Estimated implementation timeframe is 2013.

8.7.2.2.2 Reuse of Material

The Division will rely on the private and non-profit sector to utilize material that the Division's waste management system diverts to the reuse market place. Grant opportunities from the Division will be made available to assist such operations in both start-up and operations as determined on a case-by-case basis.

8.7.2.3 Island of Molokai

8.7.2.3.1.1 Local Ordinances

The County shall pass and enforce an ordinance establishing C&D recycling requirement of 50 percent for all commercial and residential demolition and construction projects. Estimated implementation timeframe is 2013.

8.7.2.3.1.2 Reuse of Materials

The Division will rely on the private and non-profit sector to utilize material that the Division's waste management system diverts to the reuse market place. Grant opportunities from the Division will be made available to assist such operations.

8.8 Implementation Plan

8.8.1 C&D MRF

The Division will procure a C&D processing facility. This facility will be used to process C&D material to diminish the tons of such material going into the landfill. SWRAC had advised the Division that such operations should be procured as a design, build, and operate. The Division, under such a procurement, would work with one entity that is responsible for the overall development and operations of each facility. The Division, however, is expected to provide the land for such a building and have ownership of the building and its equipment at the end of the contract term.

Under such a procurement, a partnership would be developed whereby the Division and the contractor work together to assure completion of tasks. Engineering studies needed for the approval and building of the facilities may be shared by both. The procurement of equipment and erection would be the responsibility of the Contractor and must be equal to or above the standard of quality set by the County.

Essentially, the County must implement the following:

- Create a conceptual design of the facility's operations and purpose with an overall cost estimate to submit to the County Council for funding approval;

- After funding approval, create procurement documents for design, build, and operate and release them in a request for proposal format;

- After funding approval, earnestly set about to procure needed property;

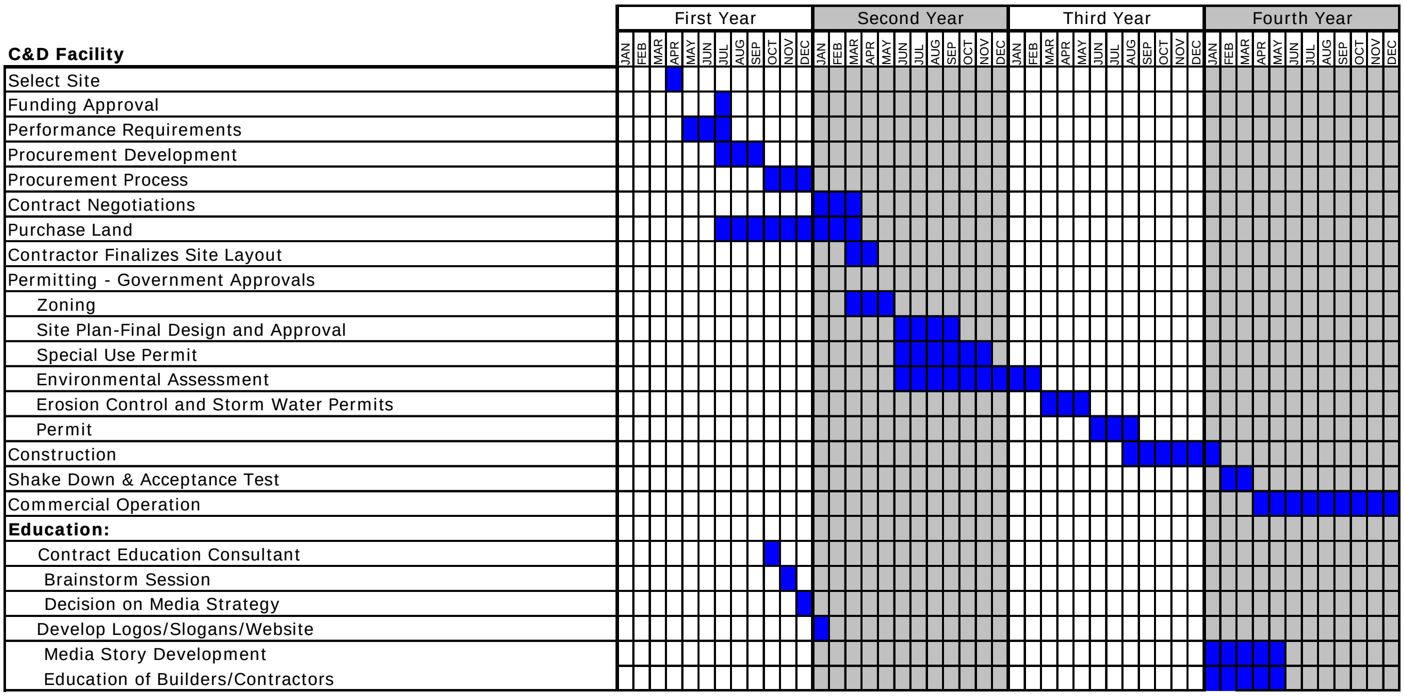
- After the County has completed the contract with the winning proposer and begin to work together to determine final layout of the site and receiving permitting approvals;

- As many of the permit approvals are in process, the Contractor finalizes construction documents and then awards; and

- Education strategy begins during the last half of construction. The Division and the Contractor would brainstorm on the nuances involved in creating a media strategy so as to better inform the citizens as to each MRF's purpose, to develop media coverage, and educate targeted users such as contractors and builders for the C&D MRF.

Total Time: 42 months from initiation of project.

8.8.2 Conceptual Implementation Timeline for C&D Facility



8.9 Summary

This chapter reviewed and compared C&D ordinances in Hawaii with selected locations on the mainland, the private C&D landfill capacity on Maui, potential developments that will continue to produce C&D material, recycling and reuse options for this material and a plan for the County to address these C&D concerns.

9. Organic Waste

9.1 Purpose

This chapter is about the handling and management of organic matter, otherwise called composting. Humans have been purposely composting since forming civil societies and little has changed for 2,000 years. The process has advanced technologically only within the last few decades.

The purpose of this chapter is to provide a brief review of composting processes, legislation, Maui activities and alternatives for the County. Those readers familiar with this background may wish to move directly to Section 9.3 which provides examples of how other jurisdictions handle their organic matter. Section 9.4 summarizes pertinent legislation. Section 9.5 summarizes the findings of the 1994 ISWMP. Section 9.6 summarizes organic waste operations, both public and private, occurring in the County. Section 9.7 summarizes a university's finding on the amount of animal manure production in Maui. Section 9.8 provides tonnage figures for organic waste, projected out to 2030. In Section 9.9, alternatives and recommendations are provided for the handling of organic waste on all three islands.

9.2 Background

Compost is the product of a controlled biological decomposition of organic material that generates enough heat to kill pathogens. Roger Haug defines the compost process as:

> "The biological decomposition and stabilization of organic substrates under conditions that allow development of thermophilic temperatures as a result of biologically produced heat, to produce a final product that is stable, free of pathogens and plant seeds, and can be beneficially applied to land."[1]

Bioconversion, however, is essentially the same process, but its product, or one of them, is energy. Bioconversion tends to be technologically advanced and is discussed in Chapter 12, along with other technologically oriented disposal/processing options for the County.

The aerobic (with air) composting process takes a mix of feedstock that is high in carbon (e.g., dry leaves, paper, wood chips), high in nitrogen (e.g., sewage sludge, wet grass, food waste), and applies moisture and oxygen to these materials to generate consistent heat of 140 degrees F. for a duration of time to kill pathogens and seeds. Microorganisms (e.g., bacteria, fungi, actinomycets) break down the organic matter and produce humus known as compost. Figure 9-1 is a diagram illustrating this aerobic composting process.

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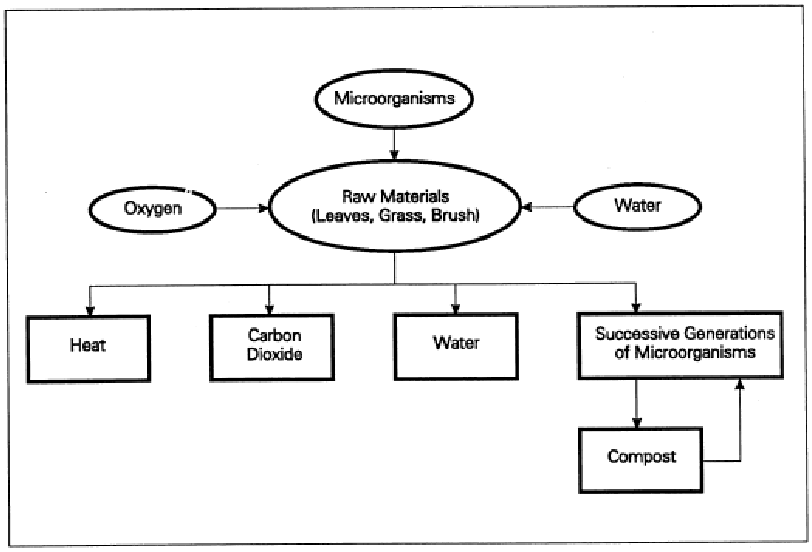
[1] Roger T. Haug, The Practical Handbook of Compost Engineering CRC , 1993; also see USEPA website for information on compositing: http://www.epa.gov/epaoswer/non-hw/composting/basic.htm#org

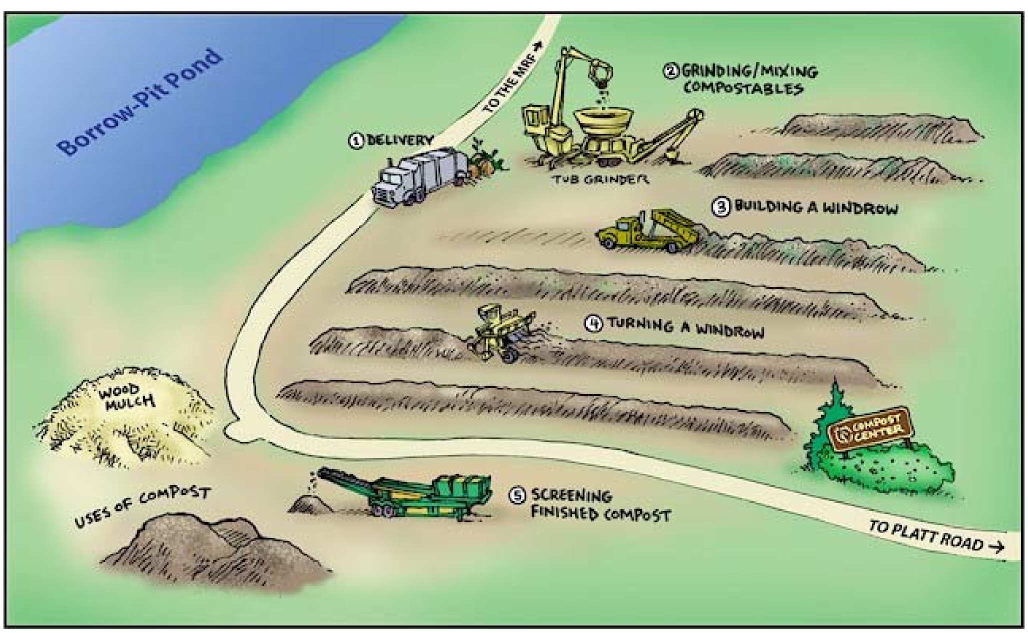
Figure 9-1 - Aerobic Composting Process



Compost is also created by biological decomposition that eliminates oxygen (anaerobic). Advanced anaerobic processes digest the green waste in tanks, capturing the biogas made from methane and carbon dioxide. This biogas can be used as a substitute for petroleum-based fuel. The remaining physical material, compost, can be used as a soil supplement. This bioconversion process is discussed in Chapter 12.

Compost processes can be either high tech in-vessel, or low tech, in piles or rows. Figure 9-2 shows a large-scale composting facility that does not use in-vessel techniques; rather, outdoor open windrows, long narrow rows of green waste, are used to cure the green waste into compost.

Figure 9-2 - Windrow Operation



The following explains the numbered activities in more detail.

1. The green waste is delivered in a rear-load collection vehicle.

2. The fresh green waste is placed in a tub grinder and then mixed with other material to balance carbon and nitrogen-containing materials.

3. A dump truck takes this mixed batch and spreads into a straight row, or windrow.

4. A specialized piece of equipment, windrow turner, straddles the windrow and, moving forward, turns and mixes the material so that oxygen adequately gets to all material.

5. After the windrow material has cured for the desired length of time to meet quality standards of the operation, the contents of the rows are processed through a screen to separate compost from non-compostable items such as rocks.

The windrow process takes up a significant amount of acreage and often is placed on pavement, thereby increasing the site development costs substantially. In-vessel processes take less space, shorten the curing time and are capital intensive.

Photo 9-1. Example of Ag-Bag

In-vessel composting processes grind and mix the material, as is done in the windrow process noted above, before the material is placed into a vessel. Some jurisdictions have chosen to use an agricultural bag, Photo 9-1, which is made of thick plastic, and stuff its ground and mixed green waste into it. A system of blowers is connected to the sealed bag so that air circulates through the material. These bags cannot be reused and become a waste product after the curing process is completed.

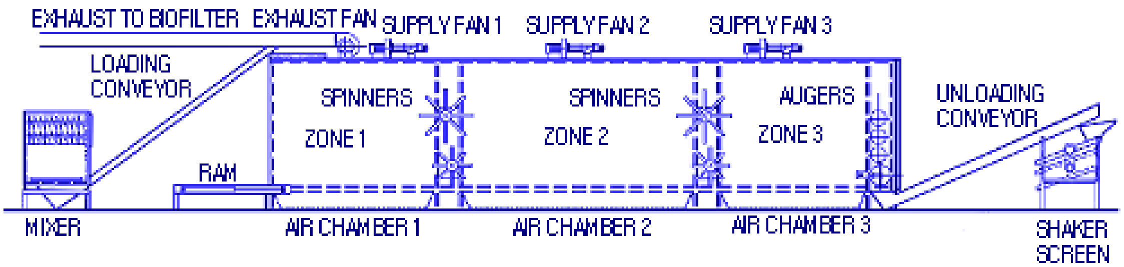
Some jurisdictions cure the compostable material in containers similar to those used for shipping that provide the manager with the ability to move them around as needed. Photo 9-2 shows a row of such containers each in different stages of curing. This is a modular system that can be expanded by adding containers.

Photo 9-2. Modular compact container system

In-vessel composting machines shortens the curing time to approximately a month. Figure 9-3 shows a schematic for a modular system consisting of a series of connected metal boxes with a ram, or tray conveyer, propelling the material from one box to the next. Each box, or zone as it is called in the schematic, has a mechanism that spins the material to increase air flow and generate heat. Each zone has its own air supply and a biofilter exhaust fan to minimize odor. The configuration of airflow and temperatures kills the pathogens in a 14-day cycle and the material then comes out of the machine. The product must then be stockpiled to cure for another 30 to 90 days, depending upon the quality of compost desired. Photo 9-3 is of the modular system located at the Virginia Powhatan Correctional Institute, which started operation in 2000 and processes two tons of food waste a day.

Photo 9-3. Self-Contained Machine in Virginia

Figure 9-3 – Self Contained System



9.3 What Other Communities Have Done

In 2006, 12.9 percent of the total MSW generated in the U.S. was yard waste. Of that total, 62 percent was collected and recycled.[2] Jurisdictions vary as to how they collect green waste. Some receive it at drop-off sites and have it transported to a facility where it is ground and used as an aggregate in a composting operation and/or provided to the public as mulch.

The timing of the collection varies based on budget and climate. Jurisdictions, such as Fairfax County, Virginia, collect green waste bundled at the curb each month. Nashville, Tennessee collects it at the curb five times a year with a knuckle-boom grapple hook vehicle. The City of Los Angeles collects green waste in carts on a weekly basis, while other jurisdictions collect on an appointment basis.

[2] "Municipal Solid Waste Generation, Recycling, and Disposal in the United States: Facts and Figures for 2006," USEPA, 2007. pp. 3 and 6.

Photo 9-4. Green carts for food waste, blue for recycling, and black for trash

When the material gets to the location where it is ground for mulch or processed for composting, the processor wants minimal to no time spent sifting through the green waste to remove contaminants. The material goes through a grinding process, and contaminants will be shredded, also. This expands the number of contaminated particles through a greater volume of the material and lowers the value of the product.

SWRAC toured San Francisco's Fantastic 3 collection program. This system collects trash in one cart, dry recyclables in a second cart, and food and green wastes in a third. Photo 9-4 shows the Fantastic 3 carts set out in front of Macy's Department Store in San Francisco's fashionable Union Square. The SWRAC followed the food and green waste to Vacaville, California, where workers grind, mix, and place the material into windrows (Photo 9-5). Originally, Ag-bags were used, but recently, the operation switched to a reusable Gore-Tex-covered tarp.

Photo 9-5. Windrows of food and yard waste from San Francisco

The SWRAC also visited Portland, Oregon, where food waste is collected and shipped from the transfer station to a private processor in King County, Washington. Portland, as does the City of Seattle, attempts to quantify the tons diverted by residential backyard composting. It does this by tracking the number of backyard compost bins it provides to households, assumes how many pounds of food waste are placed in them each day and then multiplies that number by 365 days a year. This total is made a part of the diversion rate for the jurisdiction.

Monterey, California, another stop on the SWRAC tour, is similar to the County of Maui in land size, resident population, and division between tourism and agriculture. It takes in green waste and chips the material into mulch for citizens to use. Photo 9-6 shows the green waste before and after it is ground. The green waste is placed in the conveyer (photo background) to be fed to the grinder.

Photo 9-6. Monterey, California Mulch Grinding

9.4 Green Waste in Hawaiian Counties

Hawaiian Counties differ in their policies toward green waste. The following reviews their collection and processing strategies.

Photo 9-7. A citizen unloading green waste into the MSW transfer station at Puako

Photo 9-8. EKO grinding at the Hilo Landfill

<u>County of Hawaii</u>: The County contracts with EKO Compost (EKO) to grind the green waste brought into the landfill. Citizens can take the green waste to the landfill and separate it so that it can be ground (Photos 9-7 and 9-8).

Once ground, citizens can load up and take the chipped green waste for free. If the citizen does not choose to take it to the landfill, the citizen can mix it in with the MSW at the transfer stations around the island. The County does not perform any curbside collection, and there is no private separate yard waste collection on the island. The County's transfer stations do not handle yard waste separately. Citizens place their green waste into MSW transfer trailers, and the County buries it into a Subtitle D landfill.

<u>County of Kauai</u>: In 2005, Kauai County recycled 11,648 tons of green waste from the landfill, achieving an overall green waste diversion of 69 percent. The County provides 5 locations for residents and businesses to drop off green wastes at no charge. The County contracts with two private firms to grind the material and produce mulch. The mulch is made available to the public free of charge.

Photo 9-9. City and County of Honolulu's curbside collection of green waste

<u>City and County of Honolulu (Oahu)</u>: The jurisdiction generates 200,000 tons of green waste annually and collects 80,000 to 85,000 TPY of this green waste which is recycled. The jurisdiction collects green waste from 150,000 homes twice per month, allowing the customer to set out green waste in bags or 35-gallon containers for collection or, as Photo 9-9 illustrates, leave the green waste at the curb to be collected by a rear-load truck. This service has been available to households for years. Also, trees and branches are cut to three-foot lengths and bundled. Bundles must weigh less than 50 lbs.

In 2007, the City began a new automated green waste collection system, providing carts to the customer. The jurisdiction's goal is to expand the green waste cart system islandwide over the next two years and increase greencycling by an additional 65,000 tons.

9.5 Legislation

9.5.1 Federal

There are no U.S. federal regulations that apply to bioconversion of MSW or a fraction of MSW, such as yard waste. However, there are regulations that apply to biosolids (sewage sludge). The Clean Water Act (40 CFR Parts 122, 123, and 5.0) outlines requirements that apply to composting of biosolids. A co-composting facility, like the EKO facility on Maui, must comply with these regulations. When composting of green waste or mixed MSW, however, most operators and state and local regulators rely on these federal requirements as guidance and best practices for biosolids. The USEPA and the U.S. Department of Agriculture have developed guidelines for quality, content, and acceptable levels of contaminants. The RCRA Subtitle D Landfill Criteria promulgated by USEPA bans bulk liquid wastes from landfills. These regulations apply to liquid organic wastes which are biodegradable. Composting in conjunction with shredded green waste provides an alternative method of disposing of and recycling these materials which is acceptable to the USEPA. Many jurisdictions apply the biosolid standards to composting of yard waste and/or MSW.

9.5.2 State of Hawaii

Bioconversion programs are covered by HRS Chapter 342G which includes compost and the uses of compost. A permit is required, as specified by Title 11 of the Administrative Rules, for composting and other bioconversion facilities which are issued by the Department of Health. The permit requirements include: a site analysis, specific design requirements and an operations plan.

9.5.1 County of Maui

The County of Maui Code, Chapter 15-108, provides rules for refuse collection. These rules allow the mixing of yard waste in the general category of "Rubbish." The rules provide for bundles of branches, tree trunks, and similar materials, including wooden boxes and cardboard.

9.6 Review of 1994 ISWMP

The 1994 ISWMP called for the County to advance composting for green waste and biosolids. Recommendations from the 1994 ISWMP include:

- <u>Recommendation 4-5</u>: Continue landfill diversion research and demonstration projects.
    - o Expand composting/recycling projects including co-composting with biosolids.

  - o Implement full line of testing.
  - o Develop new landfill diversion projects as feasible.
- Recommendation 4-6: Develop green waste satellite collection program.
  - o Develop locations (Wailuku, Makawao-Pukalani, and Kihei) in addition to Olowalu.
  - o Collect green waste five days per week.
- Recommendation 4-9: Continually investigate local markets.

9.7 Implementation of 1994 ISWMP

Since 1993 and before the 1994 ISWMP recommendations were made, the County had established a comprehensive program to dispose of biosolids (sewage sludge or the solid materials removed in treating wastewater) from County wastewater treatment plants as a way of reducing the amount of materials going into the County landfill.

Co-composting, which involves treating sludge in a natural decomposition process with green wastes, was cleared by the state Department of Health after a 1994 pilot project established that the process eliminated pathogens that may be in the sludge.

Figure 9-4 - Gold Medal Winner

Gold Medal For Composting Is Only One-Third The Story

With facilities in Montana, Idaho and Hawaii, a company takes stock of its accomplishments, challenges and opportunities — while getting ready to accept an award for excellence.

After a pilot project of co-composting, the County entered into a contract with EKO for full-scale co-composting of biosolids and green waste on land at the Central Maui Landfill. In 2004, this relationship won the Solid Waste Association of North America's Gold award for Excellence for its "commitment to achieving the highest standards in the solid waste industry." Nearly 50 percent of the Central Maui Landfill's diversion is the direct result of this public-private partnership.

9.8 Maui's Current Programs

9.8.1 EKO Partnership

Photo 9-13. Composting operation at Central Maui Landfill

The County of Maui and EKO entered into a contract in 1995 where the County agreed to pay EKO on a per ton basis to receive and process the biosolids with green waste. EKO does not charge the County for accepting green waste The County provides a site for EKO at the Central Maui Landfill for co-

composting. EKO is responsible for the marketing of the resulting products (Photo 9-13).

Central Maui Landfill is located on the isthmus between West Maui and Haleakala, approximately 14,000 feet southeast of the Kahului Airport. The Tax Key Map identification for the site is TMK (2) 3-8-03:4, 19, 25. The facility is currently at capacity, and if green waste recycling is to be increased by the County and processed by EKO, the County will need to help EKO expand the size of its facility by allowing it to expand by approximately 20 acres.

EKO began in June 1977 and has developed markets in the Pacific Northwest and Hawaiian Island areas. It has facilities on Maui and Hawaii Islands. EKO processes approximately 25,000 tons of biosolids and other wastewater products a year at its facility located at the County's Central Maui Landfill. The 22,000 tons of biosolids are delivered to the facility and mixed with approximately 30,000 tons of shredded yard waste and wood pallets to biodegrade into compost.[3] Citizens and commercial entities bring their green waste to the landfill and are directed to a location managed by EKO. This green waste is unloaded by the customer, and EKO personnel process the waste by placing it into a tub grinder where it is ground into smaller sized particles. These particles are then mixed with the biosolids and composted (Photo 9-14).

Photo 9-14. Close-up of EKO compost piles and equipment

The resulting compost is screened to remove large particles and sold as soil conditioner. Residential self-haul yard waste is not weighed.

Each batch of compost is tested by an independent laboratory as required by the USEPA 40 CFR 503 Guidelines, and EKO is a participant in the U.S. Composting Council's Seal of Testing Assurance Program.

EKO markets the finished product in both bulk and bagged form through Pacific Agricultural Sales & Service and Hawaii Grower Products. A variety of products are produced depending on application and blending, including compost, lawn topdressing and mulch. Bagged compost costs $7.00 for a 1.5 cubic foot bag. The County receives, as part of its contract, a certain amount of compost each year at no additional cost.

9.8.2 Pacific Biodiesel

Pacific Biodiesel builds scalable plants to process fats, oil and grease (FOG) into biofuel. In 1995, the company entered into a contract with EKO and established a plant at the Central Maui Landfill. It has a facility to take FOG and convert approximately 5,000 tons into 200,000 gallons of fuel for diesel engines. On February 23, 2006, the USEPA Administrator and other officials toured the facility because of

[3] EKO Annual Report for the period July 2005 – June 2006.

Pacific Biodiesel's product and the interest that the nation is now paying toward alternative fuels.[4]

9.8.3 Islands of Lanai and Molokai

Nothing similar to the activities on the Island of Maui occurs on the Islands of Lanai and Molokai. Lanai currently buries its green waste in the landfill; however, the County and the Lanai Company are exploring establishing a composting program. Molokai separates green waste at the landfill, grinds it, and makes it available for citizens to take for free.

9.8.4 Backyard Composting

In 1997, the County awarded a grant to the Maui Recycling Group (MRG) to purchase and distribute residential compost bins and to do home composting workshops, thereby establishing the Home Composting Education Project. The County provided a second grant to develop a home composting manual and to continue providing workshops for the community.

The County has provided compost demonstration projects at public locations, such as the Maui Community College, where citizens can view a range of home composting bins and chippers. In 2003, the County worked with MRG to initiate vermi-composting (worms) workshops where citizens were educated on vermi-composting and provided the opportunity to purchase a home system called "Joy of Worms."

The County currently contracts with a former MRG officer to conduct composting and vermi-composting workshops throughout the community and schools.

9.8.5 Private-sector Operations

Photo 9-15. Windrows at Maui Earth Compost

Maui Earth Compost (MEC) has two facilities on the Island of Maui. One is located on the corner of Hansen Road and Pulehu Road in Puunene, and the second is in central Kihei, off Piilani Highway behind the County wastewater treatment facility. The Puunene facility is open Monday through Saturday from 7:30 am to 4:00 pm. The Kihei facility is open Monday through Friday from 7:30 am to 4:00 pm, and Saturday and Sunday from 8:00 am to 12:00 noon. A typical windrow operated by MEC is pictured in Photo 9-15.

Photo 9-16. Compost product

Customers can buy either bagged products, such as worm castings for $45 per fifty pounds, or bulk products priced by the cubic yard on a sliding scale. The more bulk purchased, the less the price is per cubic yard. Compost ranges from $47 to $57 per cubic yard; mulch from $36 to $39; compost blended with sand fluctuates between $45 and $55 per cubic yard; and compost blended with soil falls within $43

[4] http://www.biodiesel.com/News%20Archives/EPAvisit.doc regarding the USEPA's tour.

and $48 per cubic yard. Photo 9-16 shows finished, high-quality compost product for sale at Maui Earth Compost.

9.8.6 Food Waste

Much of the commercial food waste on the Island of Maui has been diverted from the landfill by using it as feed for hogs in hog farms. The economic incentive to the hog farmer has been the avoidance of a $60 per day grain cost per hog. Also, the generator of the food waste avoids the landfill disposal fee. The impact of this alternative food waste disposal system was seen in November 2007, when a hog farm was closed because it was evicted by the landowner. Companies that had depended upon the farm as a disposal point were left with tons of food waste to be disposed. One company, Puaa Foodwaste Service, was forced to take between two to four tons a day to the landfill due to this temporary closure. This amounted to 730 to 1,460 tons a year that normally would have been reused as food for the hogs. The Division worked with the Puaa family to find a solution to this problem. It provided a grant of $125,000 to expand a family hog farming business. The commercial waste was diverted away from the landfill and to this hog farm.

Currently, much of the commercial food waste in Lahaina and a portion of it in Kihei are collected and taken to these hog farms. The hog business appears to be stable and growing in Maui. Tourism has increased to its pre 9/11 numbers which supports the Luau performances that are significant clients to the hog businesses.

The Islands of Lanai and Molokai have no formal food waste collection and processing operations.

The County is considering formal food waste collection to divert additional material from the landfill. In addition some of the commercial waste, once food is removed, can be processed in the MRF to recover additional recyclable materials.

9.8.7 Animal Manure

As part of HRS Chapter 342G-26 C-3 requirement, animal manure must be considered as a viable waste stream for possible bioconversion. The University of Hawaii's School of Ocean and Earth Sciences and Technology prepared a study for the State quantifying the animal manure generated in the State. Table 9-1 summarizes these biomass resources in the State, generally, and in Maui, specifically.[5]

[5] "Biomass and Bioenergy Resource Assessment: State of Hawaii" by State of Hawaii Department of Business, Economic Development and Tourism, December 2002, p. 1.

Table 9-1 - Summary of Biomass Resources

Summary of biomass resources and their degree of utilization in the State of Hawaii by County.

	tons yr^{-1}	Hawaii	Maui	Kauai	Honolulu
Swine Manure	dry	410	540	180	1,560
Dairy Manure	dry				8,300
Poultry	dry	1,520[1]			4,830
Bagasse Fiber	dry		275,000 (275,000)[2]	74,000 (56,000)[2]	
Molasses	as-received		80,000	15,000	
Cane Trash	dry		137,000	37,000	
Pineapple Processing Waste	dry		7,500 (7500)[2]		
Macadamia Nut Shells	dry	19,000 (18,000)[2]			
Municipal Solid Waste	as-received	110,000	96,000	56,000	668,000 (600,000)[2,3]
Food Waste[4,5]	as-received	24,000	15,000	5,800	90,000
Sewage Sludge[5]	dry	183	3,352 (3,352)[2,3]	246	16,576 (891)[2,3]
Fats/Oil/Grease[6]	dry	1,850	1,850	800	10,000

[1] combined poultry waste estimate for Hawaii, Maui, and Kauai.
[2] amount currently used.
[3] tipping fee associated with utilization.
[4] amount entering landfills.
[5] included in municipal solid waste value.
[6] processed grease, contains minimal moisture

Maui has no known problem in handling its current manure generation.

9.8.8 Green Waste Projections

In 2006, the amount of compostable material received into the County's solid waste system totaled 56,998 tons, as shown in Table 9-2. This included 21,705 tons of biosolids, as well as pallets, other wood and Christmas trees received at the Central Maui Landfill. The material received at the Olowalu Convenience Center was transferred to EKO at the Central Maui Landfill for processing.

Table 9-2 – Compostable Materials by Location, FY2006

Recycled Materials	Hana	Lanai	Molokai	Maui	Olowalu	Total
Compostable	75	0	2,670	51,927	2,326	56,998

Maui's organic waste will grow by an estimated 37 percent between 2005 and 2030. As Table 9-3 shows, green and food waste, along with biosolids, make up the material in these projections. Biosolids stay constant, while food waste jumps 41 percent, and green waste increases by 52 percent between 2005 and 2030.

Table 9-3 - Projected Organic Materials

	2005	2010	2015	2020	2025	2030
Green Waste	39,642	44,022	47,447	51,613	55,970	60,309
Biosolids	22,511	23,172	23,387	23,394	23,394	23,387
Food Waste	34,709	37,630	40,134	42,991	45,976	49,004
Total	96,862	104,824	110,968	117,998	125,340	132,700

9.9 Options for the County

Options for County collection include expansion of the current collection of green waste and other biomass. Currently, residents and businesses are able to self-haul green waste to several County facilities, including the landfills. These facilities can be expanded. In Chapter 5, there are recommendations for every-other-week collection of green waste using carts, bags and bundles. Bundles are addressed in the current Maui collection rules, and green waste is allowed in with rubbish. If the County adopts universal collection, including green waste, it should also consider a ban on the inclusion of green waste in with the rubbish.

9.10 SWRAC Recommendation

The SWRAC advised the Division to provide universal curbside collection for all residences served by streets and roads meeting County standards and that these services include yard and large green waste collected in cans, paper bags, or bundled, called in by route drivers if within volume and size restrictions and collected every other week.

9.10.1 Island of Maui

9.10.1.1 Green Waste Collection

There are several options available to achieve SWRAC's recommendation. One variation has been discussed in Chapter 5 with Bulky Waste and White Goods. Discussed here is the concept where the customer can set out green waste material on the appointed day. The normal refuse collector will spot the green waste material at the address and note the location either by a Global Positioning System (GPS) on the truck or by communicating the address back to base by way of radio, phone, or email. A GPS, however, works more efficiently and is becoming a less expensive and more efficient manner by which to designate pickups.

A second option is to provide a cart to each household and run specified routes every other week with an automated side-loader (ASL) which the County currently uses to collect curbside trash from many of its customers.

A third option is to have customers call in to the Customer Call Center and make an appointment for the green waste collection. The service area could be sectored into general routes. After the appointments are made, point-to-point routes will be created for collection. The benefit of this type of route is that it is a minimal capital expense in comparison to the second option and similar in expense to the first.

9.10.1.2 Green Waste Processing

Currently, green waste is processed at EKO's facility adjacent to the Central Maui Landfill. If more green waste is to be processed at this site and composted with biosolids, then EKO will need to reduce the time it takes to process the biosolids by accelerating the process and/or expanding the land it uses by a projected amount of 20 acres.

9.10.1.3 Composting

The Division should continue to encourage backyard composting and vermi-composting. It should also develop pilot projects to study what a typical household would compost in a year's time and provide an estimate of tons composted, as the City of Seattle does, and apply it to the County's diversion rate.

A key element to successful backyard composting is to educate school-age children in composting and provide, at reduced cost, backyard composters to citizens who complete a composting class. The Division should continue to provide workshops and education to schools and help these schools implement composting operations on site. Many jurisdictions provide backyard composting units free or at reduced rates as an incentive to residents.

9.10.1.4 Food Waste

The Division has a valuable business solution to commercial food waste with the hog farms. The Division should continue to foster the growth of this approach to handle more of the food waste generated. The recent redirection of food waste to the landfills gave the Division a sense as to what is being diverted, but it should implement a once-a-year audit of this waste going to the hog farms and extrapolate an annual estimate from these results. This estimate should be applied to the County's diversion rate. Additional separate collection of food waste should be investigated.

9.10.2 Hana Region

9.10.2.1 Green Waste

To comply with the SWRAC's recommendation, the County can do any one of the following:

1. Have the rear-loader collection vehicle and crew described in Chapter 5 make a collection run every other week to collect green waste.

2. Have an appointment collection system set up in the same manner as discussed for the more densely populated parts of the Island of Maui.

3. Evaluate providing green waste drop-off at the Hana Landfill facility. Alternatives to be considered are (1) periodic grinding to mulch for local use

and (2) truck the material back to CML for processing, bulking with sludge, and/or providing to citizens for mulch.

The population in the Hana region, however, does not warrant collection by an ASL.

9.10.2.2 Composting

Compost education, as described in Section 9.8.2, should also be implemented in the Hana region.

9.10.2.3 Food Waste

At this time, there does not appear to be enough of a supply of commercial food waste to warrant the development of a separate collection and processing of this waste stream.

9.10.3 Island of Molokai

9.10.3.1 Green Waste

1. Continue the current resident drop-off of green waste at the landfill.

2. Have the rear-loader collection vehicle and crew described in Chapter 5 make a collection run every other week to collect green waste.

3. Have an appointment collection system set up in the same manner as discussed for the more densely populated parts of the Island of Maui.

9.10.3.2 Composting

Compost education, as described in Section 9.8.2, should also be implemented on Molokai.

9.10.3.3 Food Waste

At this time, there does not appear to be enough of a supply of commercial food waste to warrant the development of a separate collection and processing of this waste stream.

9.10.4 Island of Lanai

9.10.4.1 Green Waste

The collection of trash on Lanai is currently performed with an ASL. To implement the SWRAC's recommendation, a second cart should be provided to the residents and another route for the collection of green waste should be initiated. Also, containers for green waste drop-off should be provided at the facility at the Lanai Landfill.

9.10.4.2 Composting

Compost education, as described in Section 9.8.2, should also be implemented on Molokai.

9.10.4.3 Food Waste

The Division can implement a pilot program for food waste collection in Maui County on the Island of Lanai. The Lanai Company, which owns a grinder, has shown interest in providing its equipment and services in grinding food waste that the Division employee would collect, in an ASL, once every other week and deposit at the landfill or an alternative site. The material would be ground, placed in windrows, and screened for compost. This would be a low-cost pilot program to gauge the set-out amount, the processing time, and the demand for the product at minimal cost to the County.

9.11 Plan Recommendations

9.11.1 Goals and Strategies

The Division's goal is to build upon its strategy of handling organic waste in a pragmatic and cost-efficient manner. Its use of composting biosolids has been environmentally applauded and a financially beneficial activity for over sixteen years.

9.11.2 Island of Maui

- The Division will continue to support the composting of its biosolids with green waste;
- It will develop and implement pilot collection programs of green waste to see the viability of collecting on a full time basis;
- Backyard composting program will be enhanced with a class provided by composters and backyard composting machines provided, at cost, to graduates of the class. This program will be evaluated for inclusion into the recycling rate of the County; and
- Commercial food waste collection shall continue to be supported through the Division's grant programs for the purposes of reusing the material as food for hogs.

9.11.2.1 Hana Region

- The Division will gauge the demand and need for green waste collection in the Hana Region and develop collection pilot programs for those needs; and
- Backyard composting program will be enhanced with class provided by composters and backyard composting machines provided, at cost, to graduates of the class. This program will be evaluated for inclusion into the recycling rate of the County.

9.11.3 Island of Molokai

- The Division will continue to have a drop-off location for green waste and have it ground and provided back to the public; and

- Backyard composting program will be enhanced with class provided by composters and backyard composting machines provided, at cost, to graduates of the class. This program will be evaluated for inclusion into the recycling rate of the County.

9.11.4 Island of Lanai

- The Division will develop and implement pilot collection programs of green waste to see the viability of collecting on a full-time basis; and

- It will also look into a pilot program where it co-collects green waste and food waste and processes it on the island as compost. The hope is to partner with a private entity where the public sector provides the collection, and the private sector grinds the material and processes it into compost.

9.12 Implementation

9.12.1 Short-term

The pilot programs for green waste collection will occur when a processing outlet becomes available. The education of backyard composting will take four months from the time of initiating the plan to implementation. This will involve coordinating with compost vessel vendors, developing a course outline, and securing locations to hold the class(es). Additional food waste collection and processing will be added in areas where feasible.

9.12.2 Long-term

The Division will work with its contract processor of green waste to secure an additional 15 to 20 acres of land for processing. Any pilot program for the collection of green waste must be done in conjunction with a processor to handle the material.

10. Metal Recycling

10.1 Purpose

The purpose of this chapter is to examine the policies and programs for recycling metal commodities. There are two primary types of metal commodities that this chapter reviews: first, typical household items known as "white goods" which are such things as stoves, washing machines, and hot water heaters; and second, abandoned vehicles. Also included are smaller and more diverse metal items which need to be collected and processed for recycling including lead acid batteries, aluminum siding, scrap copper wire and plumbing. The collection of white goods is discussed in Chapter 5. This chapter looks primarily at the processing of white goods and abandoned vehicles.

10.2 Legislation

Abandoned vehicles are covered under Chapter 290 of the State Statutes. Under Title 20, Chapter 20.20 of the County Code, a derelict and abandoned vehicle abatement program is established and administered by the Department of Finance. The purpose of this program is to proactively reduce, through education, assistance and enforcement, the number of abandoned vehicles left on public and private property throughout the County. Under this Code, the definition of what constitutes an "abandoned vehicle" and "derelict vehicle" are summarized as follows:

Abandoned Vehicle: A vehicle that is left unattended for a continuous period of more than 24 hours and is unlawfully parked on public or private property.

Derelict Vehicle: A vehicle from which major parts have been removed or material damage to the vehicle has rendered the vehicle inoperable and one of the following conditions exists:

1. The vehicle is registered for the current registration period and the registered and legal owners no longer reside at the addresses on record;

2. The vehicle has been registered for the current or previous registration period and the registered and legal owners disclaim ownership;

3. The vehicle identification number and license plates have been removed so as to nullify efforts to locate or identify the current registered and legal owners;

4. The vehicle has not been registered for the current or previous registration periods;

5. The Department of Finance has no records indicating that the vehicle has ever been registered in the county; or

6. The vehicle is 10 years old or older.

Any abandoned or derelict vehicle on public or private property without authorization of the owner or occupant of the property may be towed away at the expense of the owner of the vehicle.

HRS Chapter 342H—37, makes it a class C felony to knowingly dispose of solid waste equal or greater than 10 cubic yards in volume. Fines up to $50,000 for each separate offense may be imposed. HRS Chapter 290-11 discusses vehicles left unattended on private and public property and the process for the disposition of abandoned vehicles.

10.3 Review of 1994 ISWMP

The County's 1994 ISWMP was reviewed for this subject. The following are specific discussions and recommendations from the 1994 Plan:

- Recommendation 7.9 – 1: Encourage reuse.
- Recommendation 7.9 – 2: Implement program to ensure the capture of Freon from white goods through purchasing Freon capturing equipment and place a disposal fee on white goods.
- Recommendation 7.9 – 3: Require end disposal sites to only accept white goods if they are certified as having Freon removed.
- Recommendation 7.9 – 4: Increase enforcement of illegal dumping by implementing an illegal dumping hotline.
- Recommendation 7.9 – 5: Establish biannual collection events where the County charges half price for collection with publicity in the local media.

Derelict Vehicles: At the time of the 1994 ISWMP, derelict vehicles were a problem. There was a review of the Buy-Back pilot program whereby the County purchased such vehicles for $50 each. Once the appropriated $30,000 was distributed, the pilot ended. The program was deemed a success, but lack of funding discontinued it.

The 1994 ISWMP also recommended the following:

- Recommendation 7.10 – 1: Establish a roundtable to discuss derelict vehicle disposal which would analyze the then current disposal practices and review alternatives to streamline the process.
- Recommendation 7.10 – 2: Implement the Buy-Back program as permanent.
- Recommendation 7.10 – 3: Place an advanced disposal fee on all vehicles purchased on Maui. The plan suggested $50 per vehicle at time of initial registration.
- Recommendation 7.10 – 4: Develop an education program to inform residents and visitors about disposal options.

10.4 Implementation 1994 ISWMP

Various entities have handled scrap metal in the County. They separate non-ferrous metals from cars and appliances and market them individually. They will accept and purchase metals such as copper based on market conditions. The following lists those activities:

- Maui Scrap Metal held a valid permit from March 31, 1996 until March 31,2001;
- Maui Foreign Auto Wrecking/ Maui Auto Wrecking had a valid permit between November 15, 2000 and November 15, 2005;
- Kitagawa's Towing has a valid permit since April 25, 2005, with an expiration date of April 24, 2010; and
- SOS Metals Island Recycling, a current contract operator, obtained a valid permit on November 21, 2005.

Unfortunately, these operations were not operating consistently in the past. In 2004, one major private metal processor was shut down because of improper zoning and permits while a second closed its doors as part of a business decision.

With two facilities closed, metal items, especially abandoned vehicles, began to litter the roadsides of the Island of Maui. Like the Islands of Lanai and Molokai, Maui had no direct means to process metal, so people abandoned such items as cars and appliances illegally. To alleviate this situation, the Governor signed an emergency proclamation on July 29, 2005, to temporarily allow the County to tow abandoned cars to a site at the old Puunene Airport for which the zoning requirement for the storage was temporarily waived.

The County's Department of Public Works and Environmental Management began planning for the possibility of owning and operating a scrap metal processing facility in order to assure that the County would not find itself in this same position, again. The County's proposed project included the construction of a new metals facility to process abandoned and derelict vehicles, scrap metal, and white goods located at the Puunene site. Such a facility would receive, store, and auction abandoned vehicles after notification. Those that remained would be processed and shipped to market. The facility would also process the white goods and ship them off to market.

As these plans were developed, the County entered into a contract with SOS Metals Island Recycling to process the white goods from residents only. Currently, this facility receives white goods from residents directly and from the County's white goods collection crews.

The County had also released a Request for Proposals (RFP) from contractors to collect, transport, and process abandoned and derelict vehicles at the landfill on the Island of Molokai. The selected contractor, Schnitzer Steel Hawaii on Oahu, is scheduled to complete the cleanup in 2008. The County has completed an RFP process for the same work for the scrap metal and automobiles stored at the Hana landfill and awarded the contract to SOS Metals.

The situation, as it now stands, is that the private sector appears able to meet the demand for the processing and recycling of white goods and derelict/abandoned vehicles in Central Maui. However, the County cannot ensure continued collection of metal material in the Hana Region and the Islands of Lanai and Molokai.

The County, with approval from the State, has attached a $5 fee to each auto registration which goes into the Highways Beautification Fund. It is estimated that 130,000 vehicles are registered each year. Sixty percent of these funds go into the Abandoned Vehicle Program. The remaining 40 percent go to the Parks Department. Of that, a $175,000 grant is directed to a non-profit group to pick up appliances by the side of the road, condos, and other places where the County refuse crews do not service.

The Department of Public Works and Environmental Management[1] had begun the process of recouping the County's costs for picking up abandoned and derelict vehicles left on Maui roads. On April 4, 2006, the Department issued 23 letters demanding that the last registered owner or transferee of an abandoned vehicle reimburse the County for the towing, storage, and processing charges associated with disposing the vehicle. The letters demand payment from owners in amounts ranging from $305 to $651. Payment would be made within 30 days. Nonpayment would result in the matter being referred to a collection agency and the imposition of a fine of up to $1,000.

There were close to 2,000 vehicles towed from Maui's roads between October 2005 and April 2006. The County decided to start sending letters to registered owners of vehicles that were abandoned in perennial "dumping grounds." Other letters were sent to individuals who were identified as the registered owners of more than one abandoned vehicle. The remaining letters were chosen at random.

10.5 Programs

10.5.1 Island of Maui

Abandoned or Derelict Vehicles: Any abandoned or derelict vehicle on public property without authorization of the owner or occupant of the property may be towed away at the expense of the owner of the vehicle. Such vehicle would then be processed under the following procedures:

- The Maui Police Department (MPD), upon observing an abandoned vehicle or upon receipt of a complaint, inspects the vehicle and determines if it is derelict or abandoned;
- The police tag the vehicle if it is deemed to be a derelict, then a tow order can be issued for the vehicle;

[1] As of July 1, 2007, the Department of Environmental Management was created independent of the Department of Public Works. The Abandoned Vehicle Program is part of the new department.

- If it appears to be abandoned, an orange-colored notice is placed on its windshield that notes that it will be towed to a County yard after 24 hours; the owner must contact the County within 24 hours or the owner will have to pay the costs of all fees;

- Most of these vehicles are towed to a contractor storage site at the Central Maui Base Yard and stored;

- Upon taking custody of the vehicle, a written notice is sent to the legal and registered owner of the vehicle containing a brief description of the vehicle, location, of custody and intended disposition of the vehicle if not repossessed within 10 days of the notice;

- If unclaimed during that period of time, it is stored at the County contractor's yard, and the vehicle will then be advertised for auction;

- Those vehicles not sold at auction, which is the majority, are sent for processing[2] at an appropriate facility (SOS Metals); and

- Processed vehicles are then sent to Hawaii Metal Recycling Company on Oahu for final processing and shipping to metals recycling markets on the U.S. mainland and in Asia.

White Goods: Residents in single-family homes call the Residential Refuse Collection Section directly to have their white goods collected at the curb. A day is set by appointment, and a County crew, in a flat bed truck, collects the material placed out at the curb. The crew then takes the collected material to a white goods processor (SOS Metals). Residents can also take the material directly to SOS. At the entrance booth, an employee for SOS Metals asks questions of the resident, puts the information into an Excel spreadsheet and provides that spreadsheet to the SWD with the invoice for those particular items brought in. Processing of white goods is similar to that for autos. The County also provides a grant to Community Work Day to collect white goods that are dumped on County roads or located in places County employees cannot enter.

10.5.2 Hana Region

In the Hana region, the derelict and abandoned vehicles have been stored at the Hana Landfill for an indefinite time. Residents have no curbside collection of white goods and no local facility to take them. They are left at the landfill with the abandoned vehicles. The County issued an RFP for the removal and scrapping of these accumulated materials periodically, and a contract was entered into with SOS Metals Island Recycling, Inc. to remove these materials. This is planned for 2008.

[2]Processing on Maui includes removal of fluids, including CFCs, gas tanks, batteries and radiators. The vehicles are then crushed in a crusher designed for the purpose and loaded onto racks for shipment.

10.5.3 Island of Molokai

On the Island of Molokai, the derelict and abandoned vehicles have been stored at the Molokai Landfill for an indefinite time. Residents have no curbside collection of white goods and no local facility to take them. They are left at the landfill with the abandoned vehicles. The County issues an RFP for the removal and scrapping of these accumulated materials periodically. The County contracted in 2007 for cleanup of the Molokai Landfill metal items, such as appliances, cars, and propane tanks.

10.5.4 Island of Lanai

On the Island of Lanai, residents currently have no curbside collection of white goods and no local facility to take them. In the past, autos, appliances and other metals were dropped off and stored at the Lanai Waste Company but that practice was discontinued in 2006. In June of 2007, the County partnered with Community Work Day Program to conduct a clean-up project for the removal and recycling of appliances, tires and batteries that had accumulated at the landfill, various illegal dumping sites on the island and provided a 2-day curbside collection of the same from residents. The County and Lanai Company are discussing plans for future metals recycling options for the Lanai community.

10.6 SWRAC Recommendation

The SWRAC looked at the issue as to how best to process the metals, especially derelict and abandoned cars. As stated in Section 1.3.2.5 of this document, SWRAC came to a consensus recommendation that reads as follows:

County-operated Scrap Yard vs. Contracted Out:

> Contract with the private sector to receive, store and process abandoned autos and discarded appliances rather than the County initiating its own operations on the Island of Maui. The County, however, may be a member in the development of such operations in the Hana region and on the Islands of Molokai and Lanai.

There was a sense among the SWRAC that if the private sector is now doing the work adequately, then it should continue to do it without competition from the County. However, the SWRAC fully recognized that a problem currently exists away from the more densely populated areas on the Island of Maui, and that a regular and routine process needs to be developed to process the metal items on the Islands of Lanai and Molokai, and at Hana.

10.7 Alternatives

10.7.1 Island of Maui

Clearly, there are two options before the County for handling automobiles and white goods. The first option is for the County to leave the work in the hands of the private sector. The second is for the County to build and operate a fully operational scrap yard to process these kinds of items.

10.7.2 Hana Region

The Hana region is difficult to service because the road to and from the area is narrow, with many curves and many old bridges to cross. These limitations make services difficult for this area of the island. The transportation time and the amount of material that can be hauled to and from the Hana region are all factors to be considered. Some possible options for the region are as follows:

1. Transport automobile bodies one at a time on an as-needed basis. The County's roll-off trucks can be outfitted with a flat bed to hoist up and stabilize a vehicle and transport it to a processor. White goods can be placed into roll-off containers at the convenience center described in Chapter 5 and hauled back to the processor.

2. The County can continue to store the automobiles at the landfill site and have them removed one to two times a year by a contractor.

3. White goods and smaller scrap metal items, such as batteries, can be placed in a roll-off container and transported by the Division to the processor.

10.7.3 Islands of Lanai and Molokai

The County has allowed citizens to bring in their automobiles to the Molokai Landfill, but not the Lanai Landfill for many years; however, State DOH has prohibited the County from accepting automobiles at the landfills without the proper permits. The County has not, however, provided consistent options for these items to be processed. The County should initiate a plan that is consistent and timely in handling these items. The following are options for the County to consider:

Photo 10-1. Mobile car crusher

1. The County could purchase a mobile car crusher (current prices range from $180,000 to $220,000, Photo 10-1 is an example) and transport it by way of Young Brothers between each of these two islands. Its employees could process the stored material twice a year on each island and then ship the material off island for further processing. As with all operational aspects in this document, the County would have to negotiate the new work details with its employees' Union.

2. The County could procure for this service and possibly see a reduction of costs because, presumably, the equipment's capital cost would be spread over more customers.

3. The County could, in its next procurement for the processing of metals on the Island of Maui, make the mobile processing and handling of other metals on these islands a part of the contract. Having all elements of the metal collection and processing system in one long-term procurement versus piecemeal may provide the County with a better contract rate.

4. The County could procure for a partnership whereby the County purchases the capital items, such as the crusher, while the private sector provides the management and operations. The private partners would be responsible for a detailed business plan and, as a shareholder of any company, the County would hold the private partners accountable for repayment of capital costs and full disclosure of operating data, operational personnel, and operational funds.

5. Finally, the County can issue a single procurement with all the alternatives listed in it and let the private sector provide proposals to compete in a request-for-proposal method. In addition, the Department of Environmental Management would develop a proposal submitting its plan to build and operate a scrap metal facility. The two sectors would compete in a managed competition. A managed competition, such as this, would need to be overseen by the County to ensure no conflicts of interest during the procurement evaluation. This managed competition of the business plans from a public agency and private firms may provide the County with the most advantageous solution.

10.8 Plan Recommendations

10.8.1 Island of Maui

The County has contracts with private service providers to collect, store, process and market scrap autos, white goods, and other metals. This system is currently working well. The continuation of this public/private partnership is recommended.

10.8.2 Hana Region

The Division plans to provide regular removal of ferrous and non-ferrous metals from the Hana region. It will provide a roll-off at its new convenience center for scrap metal; it will make arrangements for the collection of curbside white goods by appointment; and the Division will implement a plan, in conjunction with its processor, to remove automobile scrap from the area on an interval of not less than once a year.

10.8.3 Island of Molokai

The Division plans to provide regular removal of metals from the Island of Molokai. It will receive appliances at its facility and prepare them for shipment to a processor off island. It will make arrangements for the collection of curbside white goods by appointment; and the Division will implement a plan, in conjunction with its processor, to remove automobile scrap from the area on an interval of not less than once a year.

10.8.4 Island of Lanai

The Division plans to provide regular removal of ferrous and non-ferrous metals from the Island of Lanai and may partner with local private businesses to provide these services. It will receive appliances at its facility and prepare them for shipment to a processor off island. It will make arrangements for the collection of curbside white goods by appointment; and the Division will implement a plan, in conjunction with its processor, to remove automobile scrap from the area on an interval of not less than once a year.

10.9 Implementation

10.9.1 Short-term

The Division will develop a procurement package for the handling and processing of appliances, scrap metal, and auto bodies on the Islands of Molokai and Lanai. Once a contract has been finalized, the Contractor and the Division will refine the procedure that best meets the citizens' needs and the County's budget.

10.9.2 Long-term

The Division will utilize, as much as possible, the private sector to handle and process the metal items on the island that can be recycled. The Division will coordinate the collection activities of appliances in all areas that meet the definition of universal collection.

10.10 Summary

This chapter reviewed the history of the County's handling of heavier metal items from scrap automobiles to white goods. It reviewed the trouble the County found itself in when the private sector failed to supply an outlet for such material. Finally, the chapter reviewed various measures that could be undertaken by the Division to minimize the risk of the County having a second scrap metal crisis.

11. Household Hazardous, Specialty, and Electronic Waste

11.1 Purpose

This chapter reviews the need for programs related to household hazardous waste (HHW), electronic waste, and sharps collection. It reviews the current legislative activity regarding these categories of waste and what the County said about them in its previous ISWMP. Current County programs will be described and compared to programs in other jurisdictions.

New goals and strategies for the County and the tactics to achieve these goals are addressed. Finally, an implementation timeline is provided at the end of this chapter.

11.2 Legislative Background

11.2.1 Federal

- HHW is exempt from regulations as a hazardous waste under the Resource Conservation and Recovery Act (RCRA) rules of the Code of Federal Regulations (40 CFR Part 261.4).

- Conditionally Exempt Small Quantity Generators (CESQGs). The federal government exempts CESQG generators of 220 pounds or less in a calendar month from obtaining an EPA identification numbers. This exempts those generators from much more stringent and costly guidelines (40 CFR 261.5).

- Universal and Special Waste. Federal universal waste regulations began in 1995 and are found in Title 40, Code of Federal Regulations 273 that list batteries, pesticides, mercury-containing equipment, and lamps. These are less stringent than RCRA and allow for the creation of standards that are different. However, with regard to batteries, the regulation demands the phasing out of mercury in batteries, implements a uniform labeling on batteries, and encourages recycling of used nickel-cadmium, small sealed lead-acid batteries (Public Law 104-142 May 13, 1996).

11.2.2 State of Hawaii

- The State of Hawaii's rules (HAR 11-273-5) list the same items as the federal government with more stringent requirements on lamps containing lead and mercury.

- The Hawaii Administrative Rules (HAR), Title 11, Department of Health Chapter 261 exempts household hazardous waste from the hazardous waste regulations.

- The State of Hawaii also exempts CESQGs under HAR 11-261-5.

11.3 Review of 1994 ISWMP

In the June 1994 ISWMP, the County's objectives (8-3) for HHW were as follows:

- To promote reduction, reuse and recycling, detoxification, treatment or destruction, and proper disposal of HHW;
- Assure operational and cost flexibility in the HHW collection program to address changing requirements or needs within the County;
- Improve opportunities to more cost-effectively manage HHW; and
- Encourage citizens to take an active role in helping the County reduce the quantities of toxic material that require disposal.

The 1994 ISWMP also addressed automobile batteries through the State's take-back program. This is a regulatory requirement that retailers must accept, at a minimum, the same number of lead acid batteries for recycling as they sell.[1] This is a form, generally speaking, of product stewardship. Household batteries, however, were "not the focus of this [1994] discussion." (7.6.1)

The 1994 ISWMP discussed the State's 1991 regulation (Act No. 200) which prohibits all motor oil from being placed in "sewers, drainage systems, surface or ground waters, watercourses or marine waters, or onto the ground." (7.5.1) The plan set, as a goal, the continuation to promote used oil collection, establish used oil collection points on Molokai and Lanai, and provide technical assistance to farmers, boat owners and other parties within Maui County.

Electronic and other special waste were not discussed in the 1994 ISWMP.

11.4 Implementation of 1994 ISWMP

Starting in 1988, the State has held HHW collection events through its contractor EnviroServices. Contrary to the direction of the 1994 ISWMP, the State stopped holding HHW collection events as of 2000.

The County, however, has diligently followed other aspects of its 1994 ISWMP by implementing reuse programs for both latex paint and electronic waste.

The County has provided public drop-off sites for used motor oil at some of its own facilities. The oil must be generated by home mechanics only, be drained from cars and trucks, and not be mixed with other fluids. This oil is collected at the Central Maui Landfill seven days a week, the Olowalu Recycling & Refuse Convenience Center seven days a week, the Hana Landfill six days a week, and at the County's Molokai Landfill seven days a week. The County has also partnered with nine private entities where the public can take its used motor oil.

[1] County of Maui ISWMP, Section 7, page 20, item 7.6.1; HRS Chapter 342I; http://hawaii.gov/health/environmental/waste/sw/pdf/oldcbats.pdf fact sheet on lead acid batteries.

The County has partnered with non-profit groups, such as Community Work Day and Habitat for Humanity, to undertake the CompuSwap program.[2] During these two day events, the public can bring their own broken, obsolete or working electronics (e.g., televisions, DVD players, stereos, computers, and printers) to a single-day event, days designated per business and resident customers, and drop them off to volunteers who then either place them into overseas containers for shipment to the mainland or direct the electronics over to a separate group of volunteers to see if the computer can be donated to programs for reuse in the County. The County recently expanded the event-based collection, now called E-cycling, to include acceptance of any electronic systems with a circuit board, such as televisions, stereos, anything attaching to those items, copiers, fax machines, POS systems, and cell phones.

The County also promotes the reuse of latex and oil-based paints by educating citizens that they can take their latex paint to Community Work Day (CWD) Program or Habitat for Humanity for reuse. The public is instructed to call first. For paint that cannot be reused, the County educates people to solidify it by mixing it with an absorbent, such as Kitty Litter, that will make it inert, place it in a triple thick garbage bag and deposit it in the landfill. CWD also provides solidification for small quantities of HHW that are brought to the site.

The County has a de facto program on Molokai where citizens can bring their latex and oil based paints and have it soaked up and dried in old mattresses before the mattresses are placed into the landfill. There is also a reuse swap shop located at the landfill with HHW items sometimes placed among the furniture and other items placed in the facility.

11.5 Generation Rates

11.5.1 HHW

Determining a generation rate for HHW material is problematic because people have a tendency to store this material for years before discarding it into the waste stream. Nationally, HHW in the waste stream ranges from 0.1 to 1.0 percent by weight per year.[3] The 1994 waste stream composition study at the Central Maui Landfill places the figure also at 1 percent.

Nationally, generation estimates have been at four pounds per person per year. However, in 2006, the County of Kauai, estimated its generation of HHW material to be 9.25 pounds per person per year. Using these generation rates provides a range of projected HHW for the County of Maui in 2010 between 300 and 700 tons generated. Some potential HHW materials, such as used motor oil and vehicle batteries, are being recycled.

11.5.2 Electronics

Electronic products grow in number every year. The National Safety Council estimated that more than 300 million computers alone became obsolete in the U.S. in 2004. The

[2] Community Work Day has over 2,000 volunteers for a host of environmental and community beneficial activities. http://www.hear.org/volunteer/maui/cwd.htm

[3] http://www.epa.gov/reg5rcra/wptdiv/p2pages/hhw.pdf; http://www.epa.gov/superfund/students/clas_act/haz-ed/ff_07.htm

Electronic Industries Alliance estimates that the average U.S. citizen produces 2.5 pounds of used monitors, TVs, cell phones, chargers, and CPUs annually.

11.6 Background

11.6.1 HHW

HHW operations are expensive on a per-unit basis, such as cost per pound, compared to other activities in waste management. There are some possibilities for revenue from the sale of collected material, but they are limited; there also may be reuse outlets for material collected, but this would be for a fraction of the total collected. A jurisdiction enters into the HHW collection because the material needs to be handled in an environmentally safe manner.

The days have passed when it was acceptable to drain the oil from one's car and dump it onto a shrub one wanted dead. Emptying oil-based paint onto the ground or pouring it into landfills has proven too hazardous to our groundwater and too costly to treat years down the road. HHW can also be ignitable (e.g., household cleaners), corrosive (e.g., automotive batteries), reactive (e.g., explosion when combined with ignitable source), and toxic (e.g., oil-based paint). Individuals generate an estimated average of four pounds a year of this material, nationally, adding up to 530,000 tons annually. When this material collects and mixes in the compactor of a trash truck, fires can ignite, causing harm to the workers and pedestrians, as well as damage to the equipment. These materials can contaminate septic tanks and wastewater treatment systems if poured down the toilet. If leaked into storm drains or allowed to migrate out of landfill cells, they can contaminate the wildlife, drinking water, and the ocean.

11.6.2 Exempt Generators

Local governments have latitude in the type of programs implemented and materials collected because HHW is exempt from the rigorous hazardous waste rules and regulations. Jurisdictions can also collect hazardous material from two types of generators that the USEPA has exempted from certain regulations. Termed conditionally exempt hazardous waste generators (less than 220 pounds of hazardous material generated per month) and small quantity hazardous waste generators (220 to 2,200 pounds) these two groups have been provided dispensation from certain regulations so as to encourage the proper disposal of potentially harmful material.

The fact that these generators are exempt from hazardous regulations does not alter the following points that jurisdictions need to consider before deciding upon how to collect this category of material.

1. When a local jurisdiction collects HHW from households and then releases the material for bulk transportation, that jurisdiction becomes a hazardous waste generator subject to hazardous waste management regulations.

2. Bulked hazardous waste, regardless of its source, must be transported and managed by a regulated hazardous waste transporter and management facility, which means it must be manifested with a chain of custody and handled by certified employees.

3. If a jurisdiction receives material from conditionally exempt and small quantity generators, then that jurisdiction increases its liabilities and costs, that should then be passed on to the generators who bring the materials to the jurisdiction's facility.

11.7 Collection Methods

The following describes the strategies various jurisdictions use to collect HHW from the public.

11.7.1 Single Day Event

Single day events are the norm among the counties in the State of Hawaii. Single day events used to be the norm on the mainland but are increasingly being phased out for more service-oriented collection methods discussed below.

Jurisdictions initiated the collection of HHW tepidly through the use of single day collections. A jurisdiction would hire a firm that specializes in HHW collection. A site would be selected, usually at a landfill or a paved parking lot located at a utility company. The event would be publicized, for example, on a Saturday morning for anyone living in the jurisdiction sponsoring the collection to come and drop off a prescribed list of materials. Vehicles often would line up waiting to unload their inventory of material. Each customer would be greeted, checked for residence, and perhaps given a flyer to explain the virtues of replacing toxic items with non-toxic material. One of the technicians working for the specialty firm would wave for the next car to drive up so its materials could be withdrawn from the vehicle.

Stacks of material would be around the contractor's processing tables waiting to be carefully examined. The scene at these events was often chaotic and costly in terms of the expensive labor it took to handle limited volumes of material that may not be in the quantity needed to make shipping of the material efficient. Half drums of batteries or pesticides, for example, would be shipped and the sponsoring agency would be charged for the disposal of a full drum of material.

Single day events necessarily provide a limited chance to reuse the material brought in simply because of the narrow window of time within which the event is conducted. At the end of the day, all the material has to be processed, packaged, and manifested for shipping.

11.7.2 Permanent HHW Facilities

In the 1990s, jurisdictions increasingly moved from collection events to fixed facilities in order to handle smaller amounts of material on a daily basis and throughout the course of the year. Permanent facilities allow the jurisdictions to accumulate enough material to decrease the unit management cost. Public labor began to replace the more expensive contracted labor. These public employees were trained to interact with customers, separate the material into the appropriate categories, segregate materials that can be recycled from those that need to be destroyed, and pack the remainder of the material with larger quantities for more cost efficient transportation. Transportation of this material, however, was still conducted by a specialized HHW firm.

A permanent facility provides significant options to a jurisdiction, and can, in the end, lower overall costs of the program. A permanent facility extends storage of material thereby increasing opportunities for consolidation of like material. A permanent facility allows for the potential to recycle and reuse material that would otherwise be destroyed. The cost aspects are discussed in more detail in 11.9.2.

A permanent facility also provides a consistent service to the public by providing more dependable and regularly available times to drop material off.

Photo 11-1. HHW facility in Metro Portland, Oregon

11.7.3 Mobile Collection

A mobile HHW collection program is designed for the collection service within a prescribed geographic area. Generally, these are made up of a crew of trained workers, in a single box truck or a truck and trailer, who travel to certain locations at publicized times and dates to receive material from citizens who otherwise would not drive into the fixed facility. This is the "bookmobile" form of HHW collection most widely used as a supplement to fixed facility collection programs. The County's Solid Waste Resource Advisory Committee (SWRAC) toured Metro Portland's fixed facility, which also operates a mobile collection unit.

As with the single day event form of collection, a jurisdiction must find a site with adequate space and public accessibility. It must provide advertising and public education so that the users will know the time and location of the events. Crews must be trained and have the tools to handle any spills that may occur at the site.

A new trend of mobile HHW collection is the "door-to-door" service. By appointment, a resident can set a time for a crew to come to their house and collect the HHW material directly. Sometimes there is a fee for this special and personal collection activity.

11.8 SWRAC Tour

Members of the SWRAC and County staff toured three HHW facilities: the Metro Regional Authority in Portland, Oregon; the City and County of San Francisco, California; and Monterey, California. The following section reviews the findings of the site visits of these three different jurisdictions.

11.8.1 Metro Portland Regional Authority in Oregon

The Metro Portland Authority (Metro) has been operational since 1979 and is charged with the area's comprehensive regional planning, conservation policies, operating the area's zoo, convention center, and the disposal of the area's solid waste. Its membership is made up of 25 cities and three counties.

Metro's strategy to collect HHW material from the public is a combination of permanent and mobile collection. It has two permanent facilities, each located at transfer stations, collecting 4.5 million pounds (2,250 tons) of HHW a year from approximately 58,000 customers. This represents nearly 10 percent of the jurisdiction's households. Each of the permanent facilities is open 312 days a year. Metro conducts 35 mobile events with an average of 159 customers per event.

Photo 11-2. Metro's recycled paint facility

Customers drive in under the canopy where Metro employees ask the customer the nature of the materials. These employees take the materials out of the vehicle, place them on a cart, and wheel them into the facility where they are processed and bulked for shipment.

Photo 11-3. Paint at the HHW facility

Photo 11-4. Filling of recycled paint into Metro's five-gallon can

In 2004, each customer brought in, on average, 78 pounds. The cost for Metro to operate the collection, processing, and transportation of each pound was $0.85. The annual total gross cost of the program for 2004 was $3,484,800.

One of the distinctive features of Metro's HHW program is its strategy for handling latex paint. This commodity amounts to approximately 30 percent of most HHW programs' material, is not hazardous, and is the most costly of the material to handle simply because of its volume. Metro made the decision in 1992 to begin recycling its own paint products into new paint and to market these commodities.

Photo 11-5. Mixing colors of paint at Metro Paint

The facility now processes approximately 1.9 million gallons of latex paint a year. Over 1.1 million gallons are donated to various community projects. The response to the products made Metro decide to move its operations into a custom-designed facility in August 1999, and then into an expanded facility in the spring of 2005.

The SWRAC toured Metro's latex paint facility and saw the Metro employees sort the variety of colors and filter the paint, and observe the quality controls in place to assure consistent color and viscosity.

The Metro paint program has 51,000 paying customers for the 740,000 gallons sold, capturing an estimated five percent of the Portland area latex market. These sales have yet to cover Metro's full cost of the program but do help to reduce the overall costs of the program.

11.8.2 San Francisco, California

Photo 11-6. A San Francisco contractor collecting HHW from a residence

San Francisco City and County (SF) services the HHW needs of approximately 800,000 people. The jurisdiction provides one drop-off facility operated by a contractor and partners with 100 private entities for type-specific drop-off service such as batteries and motor oil.

The unique feature of SF's program is its home collection of material. Residents can have used motor oil, oil filters, and latex paint picked up at home at no charge. For $35, residents can have a home collection of typical HHW material such as oil-based paint, pesticides, solvents, and antifreeze. If the resident is disabled or elderly, the $35 fee is waived and the collection occurs at no charge to the resident. All collection work is done by contractor.

11.8.3 Monterey, California

Photo 11-7. Monterey's reuse facility

The Monterey Regional Waste District (District) was formed in 1951. It services the needs of 18 incorporated and unincorporated areas for a total population of 170,000 people. It operates numerous waste handling facilities on a 475-acre property.

Its HHW facility is open Monday through Saturday from 8 am to 4:30 pm and is operated and managed by the District's employees. It takes 62,248 gallons of material from over 9,000 customers a year. Over a third (21,955 gallons) of the material is reused, with 11,202 gallons of oil, 1,121 gallons of antifreeze, and 42 tons of car batteries recycled. Over 60 percent of the material collected is diverted from disposal.

The unique feature of the District's HHW operations is its reuse of the material that is brought in by the public. The HHW facility is located across from the District's Last Chance Mercantile which is a facility that has material for customers to purchase that otherwise would have gone into the landfill. HHW products that have the potential to be reused are placed in the Last Chance Mercantile for people to take and use in their homes and businesses.

11.9 HHW Trends

11.9.1 HHW in Hawaii

There are four counties in the State of Hawaii. Only Maui County does not have a broad, multi-material HHW collection program that is County-sponsored. Three Counties (Hawaii, Kauai, and Honolulu) have implemented event collection strategies with the same contractor, EnviroServices. The contractor performs all related work for these collections except educating the citizens as to the time, date, and location. These are the responsibilities of the respective Counties. Table 11-1 compares the programs among the four Counties.

Table 11-1 – Comparison of HHW Program in Hawaii (FY 2006)

Program Elements	Hawaii County	Kauai	Honolulu	Maui
HHW Collection	Yes	Yes	Yes	No
Type	Event	Event	Event/Fixed	None
Number of collections	5	4	6	0
In-house/Contractor	Contractor	Contractor	Contractor	Neither
Contractor's Name	EnviroServices	EnviroServices	EnviroServices	None
Amount Spent	$186,760	$75,000	Unknown	None
Fixed Facility	No	Developing	Yes	No
Small Quantity Generator Program	No	Developing	No	No

EnviroServices is located on Oahu and uses its location as a drop-off point for the City and County of Honolulu. For Kauai and Hawaii Counties, the contractor travels to those locations, sets up collection events staffed with its people, and packs the material using pallets, barrels, and shrink wrap to ship back to its facility on Oahu. The material is then further processed and economically packed for shipping in an overseas container to Portland, Oregon, where it is sent to a disposal point.

An estimated 40 percent of the contractor's fees to the jurisdiction is allocated to setting up for the events. The remaining portion of the fee is for processing the material, lab packing, and shipping to a final disposal point.

11.9.2 HHW on the Mainland

Metro Portland conducted a study[4] of 25 communities across the country regarding their respective HHW operations. Some general observations can be made from the results:

- The median percentage of households served was 7 percent.
- The median level of pounds per participant was 75.

[4] "Comparison of HHW Programs" by Metro Solid Waste and Recycling Department, Fall 2005; also reviewed was "Sonoma County HHW Programs Benchmarking and Program Evaluation" by Sonoma County Waste Management Agency, January 2007. The latter examines targeted facilities within California and the former examines targeted facilities across the country.

- The median number of permanent facilities is two, operating 250 days a year, with 79 participants per day.
- More than two-thirds of HHW programs offer mobile collection events with a median of 17 operation days per year and 161 participants per day.
- Median costs were $55 per participant and $0.67 per pound.
- The ten most cost-efficient programs were operated in-house with public (as opposed to contracted) labor.

The data from the survey shown in Table 11-2 below suggest that those programs that are operated by in-house employees rather than contracted employees are more efficiently operated.

Table 11-2 - Annual Cost Comparison of In-house and Contractor-operated HHW Programs

Program Type	Median Total Program Cost	Median Cost Per Pound HHW	Median Cost Per Participant	Median Pounds Per Participant
In-house	$465,320	$0.48	$39	78
Private Contractor	$1,635,816	$0.82	$72	72

Table 11-3 illustrates the general assertion that HHW programs with public in-house labor are more efficient than contractor-operated HHW programs. The ten lowest (cost-per-pound) programs in the table below are in-house operated. Also, the largest programs are not always the cheapest or the most effective.

The programs that have a lower cost per pound and a relatively high percentage of households served are generally managed by hands-on managers. For example, the Big Lakes Regional HHW Program in Kansas was formed by Pottowatami, Riley, Marshall, and Morris Counties to combine their efforts to collect HHW under the umbrella of the Big Lakes Regional Council. Governed by a board made up of three elected officials from each participating county, the Regional Council assesses fees on participating counties and is eligible for grants. The organization determined that it would be less expensive, through economies-of-scale, to perform the HHW tasks as a single entity.[5]

This rural regional program in northeast Kansas maintains a multi-county program through 25 mobile collection events and fixed drop-off points with a central HHW facility where the material is consolidated and prepared for shipment by in-house labor and shipped via a single contractor. Mr. Gary (Red) Yenzer has been doing the mobile collection and consolidation since the program's start in the early 1990s. He manages all procurements for shipment, materials packing, and culling material out of the HHW waste stream that has a revenue source or local reuse value. He has kept costs to $0.21 a pound, the lowest in the survey.

[5] Joining Forces on Solid Waste Management: Regionalization Is Working in Rural and Small Communities, United States Environmental Protection Agency, October 1994: PP: 27-28.

Table 11-3 – Benchmarking Study Listed in Order of Cost per Pound

2004 Data						
Program Location	**Service Area Population**	**Estimated Households**	**Program Type**	**Total Participants**	**% HH Served**	**Cost Per Lb**
Big Lakes Regional HHW Program, KS	184,000	74,000	In-house	4,979	7%	$0.21
Spokane, WA	480,000	195,000	In-house	34,632	18%	$0.22
Larimer County, CO	283,000	112,000	In-house	16,319	15%	$0.23
Alachua County, FL	240,000	103,000	In-house	24,380	24%	$0.28
Sedgwick County, KS	500,000	198,000	In-house	14,413	7%	$0.36
Palm Beach County, FL	1,300,000	556,000	In-house	68,160	12%	$0.39
Sarasota County, FL	340,000	160,000	In-house	9,523	6%	$0.45
Pinellas County FL	1,000,000	350,000	In-house	15,737	4%	$0.48
Snohomish Co., WA	638,000	241,000	In-house	16,483	7%	$0.53
Shawnee County, KS	171,000	72,000	In-house	1,589	2%	$0.56
Los Angeles Co., CA	4,000,000	1,342,000	Contractor	62,800	5%	$0.57
Orange County, CA	3,056,865	1,013,842	Contractor	90,100	9%	$0.63
Ada County, Boise, ID	350,000	135,000	Contractor	17,000	13%	$0.67
San Bernardino County, CA	1,786,187	567,000	In-house	36,720	6%	$0.69
Dane County, WI	400,000	169,000	In-house	8,621	5%	$0.71
Hennepin County, MN	1,139,837	477,000	Contractor	99,596	21%	$0.73
Anchorage, AK	260,000	90,000	Contractor	16,245	18%	$0.80
Chittenden Solid Waste District, VT	150,000	61,000	In-house	10,371	17%	$0.83
Metro Portland, OR	1,400,000	553,000	In-house	52,813	10%	$0.85
King County (except Seattle), WA	1,173,626	491,000	Contractor	30,385	6%	$0.85
Regional Solid Waste Association, CA	720,000	264,000	Contractor	10,841	4%	$0.90
Santa Clara Co., CA	1,600,700	594,000	Contractor	23,861	4%	$1.15
Montgomery County, MD	1,000,000	376,000	Contractor	11,530	3%	$1.23
Santa Barbara Co., CA	312,700	112,000	Contractor	10,665	10%	$1.28
Seattle, WA	600,000	288,000	In-house	16,400	6%	n/a

11.9.3 Case History: Metropolitan Government of Nashville and Davidson County, Tennessee

HHW programs can realize significant cost reductions. A case in point is the Metropolitan Government of Nashville and Davidson County (Metro) that services a population of 570,000 people. Although larger than the County of Maui, the tactics used to bring costs down may be implemented in any new program the County should institute.

The Metropolitan Government of Nashville and Davidson County in Tennessee had an HHW operation that closed its doors before the middle of fiscal year 2000 because it had gone drastically over budget and spent its budgeted $293,000 in 24 operating hours.

The facility reorganized by, first, training its Metro employees to take over the work of the contractor. It designated one manager of the facility to evaluate, search, and implement tactics to lower costs. The manager sought materials and supplies from competitive sources instead of through the HHW contractor. Employees were trained in HHW so they could help off set times of the week when the flow of material was heavy and thereby keep overtime to a minimum. Incoming materials were packaged in bulk so as to maximize shipping space.

These changes resulted in a lower cost per vehicle (from $185 down to $21), total cost dropped from $293,000 to $150,000, annual days of service went from 6 to 361, and tons collected rose from 100 to nearly 400 per year (bringing the cost per pound down from $1.45 to $0.26).

11.10 Resource List

Table 11-4 presents a list of useful resources for future reference.

Table 11-4 – HHW Resource Contacts

Resource Contacts of Programs	Web Address
North American Hazardous Materials Management Association	http://www.nahmma.org/index.cfm
Office of Waste Management, University of Missouri Extension	http://outreach.missouri.edu/owm/hhw.htm
United States Geological Survey for information on contaminants	http://toxics.usgs.gov/regional/emc/
Dept of Toxic Substance Control listing of websites	http://ccelearn.csus.edu/mercurylamp/content/resources5.htm
Product Stewardship Institute	http://productstewardship.us/
Product Policy Institute	http://productpolicy.org/
Latex Paint Information	http://www.ciwmb.ca.gov/ConDemo/Paint/
Amazon Environmental, Inc. Latex Paint Recycling	http://www.nvo.com/amazon
Rechargeable Battery Recycling Corporation	http://www.rbrc.org
International Metal Reclamation Company	http://www.inmetco.com/
ReCellular for used cellular phone recycling	http://www.recellular.net
Curbside Inc.	http://www.curbsideinc.com/

11.11 Electronic Waste (E-Waste)

11.11.1 Background

Used electronic products are the most rapidly growing waste problem in the world, due to their quantity, rapid obsolescence, and toxicity. The National Safety Council estimated that more than 300 million computers became obsolete in the United States in 2004. The International Association of Electronics Recyclers projects that 1 billion computers will be scrapped worldwide by 2010, at a rate of 100 million units per year. Further, the federal legislation overseen by the FCC requires conversion of all television broadcasting to high definition by February 2009. This will make obsolete most analog television sets if they are not connected to a cable system with a converter.

Electronic wastes contain toxic substances, including lead, mercury, cadmium, lithium, brominated flame retardants, and phosphorous coatings. These toxic materials can be released upon disposal, posing a threat to human health and the environment. Inconsistencies in worker safety and environmental protection mean potential liability concerns for those sending electronics to recycling facilities – especially if these facilities are located in developing countries. In addition, domestic recycling markets for some collected materials are not fully developed.

Since the late 1970s, electronic items are increasingly being discarded. Cell phones, televisions, and computers, to name a few products in this category, are being disposed of in landfills. Many of these items have material in them that is hazardous to our environment. Cathode ray tubes (CRTs), for instance, are used in color computer monitors and televisions. CRTs contain lead that is hazardous and can be released when the monitor and television is compacted and broken up. Lead is but one example of a hazardous element used in electronics. They also can contain mercury, beryllium, cadmium, nickel, and zinc. Together, these items can fail the Toxicity Characteristics Leaching Procedure (TCLP) test for heavy metals. For these reasons of environmental health, communities are implementing electronic collection systems even though they can be costly and not a regulatory requirement.

Consumer demand for electronics has reached such heights that local and state jurisdictions are seeking collection and disposal methods to handle this growing commodity.

11.11.2 E-Waste Collection in Hawaii

None of the counties in Hawaii has an E-waste collection that is operated and managed by County employees. Instead, these counties coordinate E-waste collection activities as a partner with non-profit entities, as follows:

- The County of Hawaii has a twice-a-year program where citizens can bring old computers, monitors, keyboards, and other computer equipment as well as televisions, VCRs, and stereos. The program is called CompuCycle. The material is placed in overseas containers and shipped to a processor in California.

- The County of Kauai has no electronic recycling program for computers, televisions, cell phones or any electronics. It does accept these materials generated by both households and commercial entities for disposal in its landfill

- The City and County of Honolulu banned large quantity commercial generators from disposing E-waste in the landfill. Large quantity commercial generators must seek recycling alternatives while household and small quantity generators are exempt from that provision and may, if they choose, dispose of electronic waste in their trash.

  Although the County and City of Honolulu has no program for collecting and recycling E-waste, there are many non-government entities that will take E-waste either for free or for a fee. Some of the entities below will collect electronic material at the home or business for a fee.

  - Pacific Commercial Services LLC: 808-545-4599
  - EnviroServices & Training Center: 808-839-7222
  - Haztech Environmental Services: 808-671-1985
  - Island Recycling: 808-845-1188
  - Lenox Resources, Inc.: 808-682-5539
  - SD Systems Inc.: 808-836-7950
  - Hawaii Open Source Education Foundation: 808-689-6518 www.hosef.org
  - Aloha Computers for Education in Samoa: (no phone number) www.aces-somao.org
  - Computers to Classrooms: 808-521-2259
  - T&N Services: 808-371-0281

- The County of Maui partners with non-profit groups with grants of money for the collection of computers and other electronics that contain circuit boards from households and businesses. The program has been successful both in the quantities of material and in the volunteer activism.

The County of Maui partners with non-profit groups with grants of monies for the bi-annual collection of computers from households and businesses. The program has been successful both in the quantities of material and in the volunteer activism. These collection days are located on Maui Island using approximately ten overseas containers whereby non-reusable items are shipped to a processor on the mainland. Volunteers will often greet the customers coming into the site, ask survey questions, and direct the customers to off-loading points. Volunteers triage then unload the material and segregate out the items that can be rebuilt or that work at the time. These are taken over to an adjacent facility where volunteer technicians work on the machines as the event proceeds. The non-profit group has a distribution system to transport reusable computers to organizations or individuals in need.

11.12 Trends

Waste managers are increasingly concerned about electronics in the waste stream. There appear to be three developing trends: First, professional associations joining together to foster new policies; second, banning of material from landfills; and third, product stewardship. Each trend is discussed below.

11.12.1 Joining Together

Several professional associations dealing with this waste have joined together to call for 100 percent electronic recycling in 10 years and tax credits to consumers, manufacturers, retailers, and recyclers to assist in this activity. The associations are: the Integrated Waste Services Association, National Recycling Coalition, National Solid Waste Management Association, and the Solid Waste Association of North America.

11.12.2 Banning

In the last few years, several states have begun to ban material from being disposed in landfills within their borders. Massachusetts banned E-waste in the year 2000. Maryland has a temporary ban of material for five years which ends in 2010. Here is a list of the bans by state:

- Arkansas banned E-waste from being disposed in 2008.
- California banned Cathode Ray Tubes in 2001 and E-waste in 2006.
- Maine banned E-waste in 2006.
- Maryland banned E-waste in 2005.
- Massachusetts banned E-waste in 2000.
- Minnesota banned E-waste in 2006.
- New Hampshire banned E-waste in 2007.
- Rhode Island has slotted E-waste to be banned in July 2008.

11.13 Product Stewardship

Members of the SWRAC tour made visits to both Portland, Oregon, and San Francisco, California, to see firsthand examples of jurisdictions representing a growing number of communities that want to see states pass product stewardship legislation. Such legislation is an outgrowth of a growing partnership among manufacturers, retailers, environmental groups, federal agencies, as well as state and local governments, which, at its core, directs all participants involved in the life-cycle of a product to take shared responsibility for the impacts to human health and natural environment that results from the production, use, and end-of-life management of the product.

Product stewardship has helped manufacturers assume responsibility for the impacts of a product and its packaging, the energy and materials consumed, air and water emitted, the amount of toxics in a product, worker safety, and waste disposal in product design and end-of-life management.

Some manufacturers demand this kind of product stewardship among its subcontractors. Henry Ford had such consumer leverage with a company that made his transmissions for the Model T that he could demand that they be delivered in a box made of tongue and groove pine wood of a certain length, width, and thickness. Although the contractor could not understand the demand, the contract was so important that he complied. Ford used the wood as the floor boards for his car. Ford, in other words, managed the packaging and product design for reuse.

As of October 2007, nine states have implemented various forms of product stewardship. Eight of the nine, as Table 11-5 shows, emphasize producer responsibility, whereby the producers provide for the means to fund for a portion of or all the cost associated with collection, transportation, and disposal. California, however, has chosen to implement an advanced recycling fee directly to consumers on products such as televisions and monitors.

Table 11-5 – Brief Comparison of State Laws on Electronics Recycling

	Maine	California	Maryland	Washington State	Minnesota	Texas	Oregon	Connecticut	North Carolina
Type of Program	Producer Responsibility	Advanced Recycling Fee (Consumer Fee)	Producer Responsibility	Producer Responsibility	Producer Responsibility Based on market share	Producer Responsibility	Producer Responsibility Based on return share	Producer Responsibility Mostly return share	Producer Responsibility
When law passed	2004	Sept 26, 2003	2005	2006	**Signed on May 8, 2007**	**Signed on June 15, 2007**	**Signed on June 7, 2007**	**Signed on July 6, 2007**	**Aug 31, 2007**
Program Start Date	January 2006	January 2005	January 2006 Expires 2010.	January 2009	August 2007	Sept 1, 2008	Jan 1, 2009	Jan 1, 2009	Jan 1, 2009
Scope of Products Covered	TVs, monitors, Laptops. Doesn't cover CPUs unless attached to monitors.	TVs and Monitors only. NOT CPUs or other products. Bill in play currently to add CPUs.	Monitors, computers (CPUs), laptops. **Televisions were added in 2007.**	TVs, monitors, laptops, and desktop computers	Scope for figuring mfgr obligation: video display devices (TVs, monitors, laptops). Scope for free collection: TVs, monitors, laptops, desktops, printers, keyboards; fax machines; and DVD players	Desktops, laptops, monitors, but NOT televisions	TVs, monitors, personal computers, laptops	TVs, monitors, personal computers, laptops	Desktops, laptops, monitors, keyboards, mice NOT televisions In 2011, the State will look at adding printers to the scope.
Whose products are recycled for free?	Households only	All owners – consumer and business	Not specified	Consumers, charities, small businesses, schools and small governments.	Consumers	Consumers	Households, small businesses, small non-profits and anyone dropping off 7 items or less to collection points	Consumers or any resident dropping off 7 or fewer products at once	Not specified.
Who pays for collection, transportation, recycling?	Producers pay for transport and recycling and some collection costs. Municipalities pay for some collection costs.	Consumers pay a fee at purchase. Fee money goes to state, used to reimburse recyclers and collectors.	Counties pay for everything. They can apply for local grants from the state program. This is a modest 5 year pilot program.	Producers pay for collection, transportation, and recycling.	Producers pay for collection, transportation, and recycling.	Producers pay for collection, transportation, and recycling.	Producers pay for collection, transportation, and recycling.	Producers pay for transportation and recycling. Municipalities arrange for collection and transportation to recyclers. Recyclers bill the manufacturers	Producers must pay for transportation from collection sites (run by govt, retailers, or non-profits) as well as recycling costs. They don't pay for collection.
Goals or targets for collection	None	Bill set goal to eliminate electronic waste stockpiles and legacy devices by December 31, 2007	None	None	Year 1: Manufacturers must recycle amount equal to 60% of what they sold by weight in previous year Year 2+: 80% of previous year sales	None	None	State will establish statewide collection goals By Oct 2010	None
Language on Toxic Materials?	None	Comply with RoHS Directive on heavy metals. Companies can't sell laptops, monitors, TVs, portable DVD players that exceed RoHS levels for Lead,Mercury, Cadmium, and Hexavalent chromium.	None	None	Disclosure. Companies must report on display devices sold to households if they exceed the maximum ROHS levels for lead, mercury, cadmium, hexavalent chromium, (PBBs),(PBDEs)	None	None	None	None
Prohibition on use of prison labor?	No	No	No	Yes	Yes, except for non-profit refurbishment and reuse activities	Indirectly.	No	No	No
Disposal ban?	Yes	Was already in place	No	Not in bill, but some counties have passed bans	Was already in place	No	Yes	Yes, landfill ban effective 2011	Yes, landfill and incinerator ban as of Jan 2012

Source: Computer TAKEBACK Campaign, www.computertakeback.com, Sept. 19, 2007

Several of the states in the table belong to the Northwest Product Stewardship Council (NWPSC) which is an alliance of government organizations that works with businesses and nonprofit groups to integrate product stewardship principles into policy and

economic structures in the Pacific Northwest. 13 federal, state and local government representatives comprise its steering committee from Oregon and Washington.
Besides electronics, the NWPSC advances a program of pharmaceutical take-back projects as well as paint and mercury take-back initiatives.

Out of NWPSC's initiative, Washington State passed an Electronic Product Recycling Law where the product manufacturers self-fund recycling services throughout the state at no charge to the production owner. There is no state tax or fee charged to the consumer at the point of purchase or end life of the product. The products covered, as stated in the table, are computers, monitors, laptop computers, and televisions. The law will be implemented in January 2009.[6]

The time needed for Washington to implement this plan spanned two years. In January 2007, the manufacturers had to register and pay fees to the state for overhead and enforcement costs. In June 2008, these same manufacturers had to either combine their efforts in the Materials Management and Financing Authority where monies are pooled together to pay for collection, transportation, and disposal, or each company had to submit their own respective plan on how it would carry out the program and fulfill the goals of the legislation.

Every approved plan under the Washington law must provide free collection, transportation, and processing to any household, charity, school district, small business, or small government located in the state. There must be one collection point in every county and, at minimum, one in every city where the population is 10,000 or more.

A unique element to the Washington plan is its encouragement of high performance. The companies that recycle more of their products will be compensated by the under performing plans when the program goes through a financial reconciliation at the end of the year. This is seen as an equalization that creates an incentive to those manufacturers that have not achieved a high level of recovery.

11.14 Sharps

11.14.1 Background

Sharps refer to needles, syringes, and lancets. There are three billion needles placed in the trash each year by nine million consumers of these products in the U.S. As the country's population continues to age, these numbers are expected to increase.

In 2004, EPA recommended that sharps be handled separately from MSW because of the possibility of waste industry workers getting injured from these items. Sharps also become a problem when discovered in the recycling stream by unaware workers who may get jabbed and possibly infected by the needles.

Waste Management Inc., a garbage and recycling collection firm, contracted with the Product Stewardship Institute to begin, in November 2007, a project involving government agencies, medical professionals, Veteran Associations, sharps

[6] Washington Law 70.95N RCW; website for the Materials Management and Financing Authority is www.wammfa.com .

manufacturers, and the waste hauling community to develop an action plan to find solutions to this growing problem.[7]

11.14.2 Sharps Programs in Hawaii

The State of Hawaii recommends that all sharps be placed in rigid, strong plastic or metal containers with a screw-on or tightly secured cap, such as a laundry detergent bottle. The container must be marked "Do not recycle" and "Household sharps." The container should then be filled with one part bleach solution to ten parts water and let the sharp soak for 20 minutes. The fluid is poured out and the bottle sealed. No county in Hawaii has a specific sharps collection program, and sharps are currently landfilled.

11.14.3 Mainland Programs

Communities have begun to provide public drop-off points for sharps. These are at public facilities or at the location of partners, usually medical in nature, such as pharmacists or community medical assistance agencies, and the jurisdiction has a collection route that switches out the container and takes the contents to the landfill.

1. Marin County, California, has a program with County-supplied containers where citizens can dispose of sharps that are in a rigid container. Marin County partners with the following entities for both locations for collection and financial support:

    - Marin County Pharmaceutical Association
    - City of San Rafael Fire Department
    - Marin Recycling Center
    - Marin's Household Hazardous Waste Program
    - Kaiser Permanente
    - Marin General Hospital
    - Novato Community Hospital
    - American Diabetes Association
    - American Association of Diabetes Educators
    - Marin County Health & Human Services
    - Marin County Environmental Health Services
    - Marin County Solid & Hazardous Waste JPA
    - Marin Medical Society
    - PMX Medical
    - California Integrated Waste Management Board

[7] PSI has an 11-member governing board made up of seven representatives from state environmental agencies and four representatives from local environmental agencies. Scott Klag, who spoke to the SWRAC Research Tour members in Portland, Oregon, is a member of this board.

2. Kitsap County, Washington, also provides containers at public locations such as its HHW facility. The County's solid waste personnel maintain a collection route where the container is switched out. Citizens go to these public facilities, place their sharps in a rigid container, and deposit it into the designated bin.

Photos 11-8 and 11-9. The containers for the sharps program are not expensive but must be highly visible so as to reduce accidents.

11.15 Plan Recommendations - HHW

11.15.1 Goal

The Division's goal is to develop long-term facilities and collections to receive toxic substances from households and small quantity generators in a cost-efficient manner.

11.15.2 Strategy

The Division will implement a strategy that will see the hiring of a HHW manager, building of a permanent HHW facility, the contracting of a HHW disposal company, and event collections in the Hana region and the Islands of Lanai and Molokai.

11.15.3 Description of Recommended Strategy

The Division will implement a household hazardous waste collection program for all three inhabited islands and the Hana region in the County. A fixed facility will be centrally located on the Island of Maui; the Division will fund a full HHW manager who will oversee the development of this program. The HHW program will have event collections on the Islands of Lanai and Molokai as well as in the Hana region. The fixed or permanent facility will be open daily for people to use on a regular basis.

As the personnel become more efficient with the handling of this material, the facility will progress from being open three days a week to six. At a point to be determined by the HHW manager, the permanent facility will begin to receive material from small quantity generators by appointment and for the full cost of the services.

The HHW services will be fully supported with education which will also advance the substitution of non-toxic material for the hazardous material. The fixed facility will develop a reuse function to it so as to divert as many materials as possible away from disposal.

11.15.3.1 Tactics to Achieve the Strategy

- Hire a trained and experienced individual as an HHW manager;
- Procure for a HHW disposal firm;
- Site and build HHW facility;
- Train a core of Division employees to assist in HHW activities;
- Conduct annual collection events in the Hana region, Lanai, and Molokai;
- Open permanent facility three days a week using Division employees to process the material and get it ready for shipping; and
- Augment operating days to six per week and begin receiving material from small quantity generators on an appointment basis charging them for the full cost of the services.

11.15.3.2 Implementation Timeline

Household Hazardous Waste	First Year												Second Year											
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Funding Approval							X																	
Develop Job Requirment for HHW Mgr.					X	X																		
Approve Position							X																	
National Search / Hire								X	X	X	X	X												
Procurement Development													X	X	X									
Procurement & Contract for Contractor																X	X							
Land Purchase (if necessary)														X	X	X	X	X	X					
Permitting - Government Approvals																								
Zoning																		X	X	X				
Site Plan-Final Design and Approval																		X	X	X	X			
Special Use Permit																		X	X	X	X	X		
Environmental Assessment																						X	X	
Erosion Control and Storm Water Permits																						X	X	
Permit By Rule																							X	X
Final Construction Document Preparation																		X	X					
Bidding and Award																				X	X	X		
Construction																								
First Event Collections:																								
Lanai																X								
Molokai																	X							
Hana Region																		X						
Education:																								
Contract Education Consultant										X														
Brainstorm Session											X													
Decision on Media Strategy												X												
Graphics															X									
Develop Logos/Slogans/Website															X									
Education Material															X									
HHW Technicians																								
Develop Job Requirments																								
Approve Position Hiring/Transfers													X	X										
Train Personnel														X	X									
Call Center Operators Trained/In Place															X									
Operate Permanent Facility																								

Household Hazardous Waste	Third Year												Fourth Year											
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Funding Approval																								
Develop Job Requirment for HHW Mgr.																								
Approve Position																								
National Search / Hire																								
Procurement Development																								
Procurement & Contract for Contractor																								
Land Purchase (if necessary)																								
Permitting - Government Approvals																								
Zoning																								
Site Plan-Final Design and Approval																								
Special Use Permit																								
Environmental Assessment																								
Erosion Control and Storm Water Permits																								
Permit By Rule	X																							
Final Construction Document Preparation																								
Bidding and Award																								
Construction		X	X																					
First Event Collections:																								
Lanai			X												X									
Molokai				X												X								
Hana Region					X												X							
Education:																								
Contract Education Consultant																								
Brainstorm Session																								
Decision on Media Strategy																								
Graphics																								
Develop Logos/Slogans/Website																								
Education Material																								
HHW Technicians																								
Develop Job Requirments																								
Approve Position Hiring/Transfers																								
Train Personnel																								
Call Center Operators Trained/In Place																								
Operate Permanent Facility				X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

11.16 Plan Recommendations - Electronic Waste

11.16.1 Goal

The Division desires to work with non-profits, other Hawaiian counties, the State, and the producers of electronic material to develop cost-efficient methods to handle and process electronic waste.

11.16.2 Strategy

The Division will continue to support the non-profit sector in handling the E-waste material as it currently does. As the HHW facility further develops, the volunteer effort may grow to receive material at that facility. The Division will work with other Hawaiian counties, the producers of electronic items, and the State to develop and pass product stewardship legislation whereby the producers must work and financially assist in the efforts of the counties to receive, process, and transport this material to an end user.

11.16.3 Implementation Timeline

The E-waste grant program to non-profit groups is an ongoing operation. After the Council endorses this plan, the Division should begin networking with representatives from other Hawaiian counties and the State to build a coalition supporting product stewardship. It should seek the assistance of established organizations on the mainland to aid in this endeavor. This will be an ongoing process to draft statewide legislation for producer responsibility of E-waste.

11.17 Plan Recommendations - Sharps

11.17.1 Goal

Educate the public on the proper disposal of sharps so as to minimize the risk of accidents.

11.17.2 Strategy

The Division will develop an education awareness campaign to place on its website, at its HHW facility, and distribute to medical facilities.

11.17.3 Implementation Timeline

The Division can implement this education campaign within four months of initiation. When the HHW facility is open to the public, brochures can be provided to that location and be handed out during collection events in Lanai and Molokai as well as the Hana region.

12. Alternative Resource Conversion

12.1 Purpose

The purpose of this chapter is to brief the solid waste professionals, decision-makers and citizens on the state-of-the-art waste processing technologies, potential emerging technologies and their applicability to the local needs, and the potential of these technologies to contribute to the County's overall solid waste management system. There has been a re-emergence of alternative resources conversion technologies over the last few years. The consultants canvassed traditional and emerging companies to understand the viability of these technologies, their costs, and where they are being considered.

This chapter will review alternative conversion technologies that can divert material away from traditional landfill disposal to a process whereby the selected waste stream can be converted to a beneficial product. Both on the research tour and in its meetings, SWRAC learned about waste-to-energy (WTE), gasification, and anaerobic digestion. During the field research phase of the County's investigations, meetings occurred between the County and Maui Electric Company to discuss the area's long-term energy demands and how Maui's waste stream may play a part in supplying some portion of those demands. The findings of this discovery are reviewed in this chapter. Further, SWRAC made specific recommendations to initiate a feasibility study with specific parameters. This is discussed in this chapter. Finally, a timeline to achieve SWRAC's recommendation is provided below.

12.2 Legislation

This section summarizes the legislation that applies to WTE and alternative conversion technologies. Also, some of the substantial reductions in environmental impacts of these technologies because of recent legislation are described. Energy-related legislation is very active and should be monitored by the County for applicability to the economics of alternative resource conversion technologies in Maui County.

12.2.1 Federal Legislation

Federal legislation which applies to WTE facilities addresses the air emissions and the disposal of ash. The main laws include the Clean Air Act which sets standards that apply to emissions, the Clean Water Act that covers any liquid discharges, and RCRA which addresses testing and disposal of any solid residues. Each of these has regulations that are administered by U.S.EPA. Alternative energy facilities using waste as a feedstock must be assumed, until proven otherwise, to fall under these same regulations. These subjects are discussed in some detail in Section 12.6.

12.2.2 State Legislation

Renewable Portfolio Standard

Incentive Type: Renewables Portfolio Standard
Policy Level: State
Province/Territory/State: Hawaii

On June 2, 2004, with the signing of SB2474 SD3 HD2 (Act 95, Session Laws of Hawaii 2004), Hawaii's existing renewable portfolio standard (RPS) goal was replaced with an enforceable standard.

Under Hawaii's original RPS goal, which was established by Act 272, SLH 2001, electricity from renewable resources were to be generated as follows:

1. 7% of its net electricity sales by December 31, 2003;
2. 8% of its net electricity sales by December 31, 2005;
3. 10% of its net electricity sales by December 31, 2010;
4. 15% of its net electricity sales by December 31, 2015; and
5. 20% of its net electricity sales by December 31, 2020.

"Renewable energy" means electrical energy produced by wind; solar energy; hydropower; landfill gas; waste-to-energy; geothermal resources; ocean thermal energy conversion; wave energy; biomass, including municipal solid waste; and biofuels, or fuels derived from organic sources, hydrogen fuels derived from renewable energy, or fuel cells where the fuel is derived from renewable sources.

Source: http://www.dsireusa.org/

Interconnection Standards

Incentive Type: Interconnection
Policy Level: State
Province/Territory/State: Hawaii

Eligible Renewable / Other Technologies: Solar Thermal Electric, Photovoltaics, Wind, Other Distributed Generation (DG), Biomass, Landfill Gas, Hydro, Geothermal Electric, Municipal Solid Waste, Cogeneration, Fuel Cells

Applicable Sectors: Industrial, Commercial, Residential, Federal Government, Nonprofit, Schools, State Sector

Hawaii has established both simplified interconnection rules for small renewables and, more recently, separate rules for all other distributed generation (DG). Simplified interconnection and net metering are available for solar, wind, biomass and hydroelectric systems up to 50 kilowatts (kW) in capacity.

The state's largest electric utility, Hawaii Electric (HECO), which also owns Hawaii Electric Light Company (HELCO) and Maui Electric Company (MECO), uses a set of simple "how-to" interconnection guidelines. HECO also uses a two-page net-metering agreement. A manual, lockable disconnect is required for net-metered systems. There are no additional liability insurance requirements, and a provision for mutual indemnification is included. The state's only other utility, Kauai Island Electric Cooperative, has a similar set of net-metering and interconnection rules.

The interconnection of DG systems is governed by Rule 14, instituted in Hawaii Public Utilities Commission (PUC) Order No. 19773, issued in 2002 and modified in 2003. Rule 14 includes, by reference, the utilities' technical interconnection standards (Appendix I), interconnection agreement (Appendix II) and interconnection procedures (Appendix III). The rules cover all DG technologies.

Appendix I states that a manual disconnect is required for all installations, and a dedicated transformer may be required by the utility depending on the short circuit contribution of the DG device. Interconnection with network distribution systems (as opposed to radial systems) is addressed, although it is unclear when additional studies would be needed to address such interconnections.

In October 2003, the PUC initiated a new proceeding (Docket No. 03-0371) to review and improve the state's DG interconnection rules. This proceeding is still under way.

Source: http://www.dsireusa.org/

2008 Regular Session Bills

The Hawaii State Legislature shall be reviewing a number of house and senate bills in the 2008 Regular Session related to renewable energy. Theses bills have been carried over from the 2007 Regular Session. Below are some of the Senate and House Bills that will be scheduled for the 2008 Regular Session related to renewable energy:

Senate Bill 986
Measure Title: RENEWABLE ENERGY TECHNOLOGY; INCOME TAX CREDIT.
Report Title: Renewable Energy Technology; Income Tax Credit
Description: Establish that all energy technology systems must be installed and placed in service in the State of Hawaii to obtain energy tax credit.

Senate Bill 1065
Measure Title: RELATING TO RENEWABLE ENERGY.
Report Title: Renewable Energy; Fossil Fuel Plants; Prohibition
Description: Prohibits new construction of power plants that produce energy by using fossil fuels.

Senate Bill 1076
Measure Title: RELATING TO RENEWABLE ENERGY.
Report Title: Renewable Energy;
Description: Amends the definition of renewable energy to remove the fossil fuel quotient from renewable energy in determining the amount of energy that counts as renewable energy.

Senate Bill 1375
Measure Title: RELATING TO RENEWABLE ENERGY.
Report Title: Renewable Energy; Increased Use; Public Utilities Commission
Description: Requires the public utilities commission to consider the need for increased renewable energy use. (SD1)

Senate Bill 1395
Measure Title: RELATING TO FORMATION OF A RENEWABLE ENERGY FACILITIES SITING COUNCIL.
Report Title: Renewable energy council
Description: Creates a state renewable energy facilitates siting council.

House Bill 46
Measure Title: RELATING TO RENEWABLE ENERGY.
Report Title: Renewable Energy Electric Generation Cooperatives

Description: Provides for the organization of renewable energy cooperatives to generate, transmit, and sell electricity to their membership. Authorizes issuance of revenue bonds to finance costs related to constructing, upgrading, and acquiring transmission facilities. Exempts cooperatives from Public Utilities Commission regulation, except for interconnection agreements.

House Bill 640
Measure Title: RELATING TO ENERGY.
Report Title: Hawaii Energy Enterprise Zones
Description: Establishes energy enterprise zones to encourage the development of renewable energy resources.

House Bill 737
Measure Title: RELATING TO ALTERNATE ENERGY DEVELOPERS.
Report Title: Taxation; Tax Credit; Alternate Energy
Description: Provides a tax credit to developers of alternate energy.

House Bill 1289
Measure Title: RELATING TO RENEWABLE ENERGY.
Report Title: Renewable Energy Technology; Income Tax Credit
Description: Establishes that all energy technology systems must be installed and placed in service in the State of Hawaii to obtain the State's income tax energy tax credit; changes tax credits applicable to shareholder pro rata shares in S corporations. (SD3)

12.3 Review of Previous Plan

The 1994 ISWMP that the County submitted to and was accepted by the State does not discuss the topic of alternative resource conversion.

12.4 Implementation of Previous Plan

Since no programs on this subject were proposed in the previous plan, the County has not implemented anything regarding alternative resource conversion.

12.5 Summary of Alternative Resource Conversion

12.5.1 Waste-to-Energy (WTE)

12.5.1.1 Background

The WTE industry in the United States represents $14 billion of productive assets from a total of eighty-nine (89) WTE facilities. These U.S. facilities handle up to 15 percent of the country's MSW. Both the geographically large continent of Europe and the relatively small country of Japan exceed these numbers as Table 12-1 below illustrates.

Table 12-1 – WTE Facilities by Location

Location	Number of Facilities	Amount of MSW Managed by WTE as a Percent of Total MSW Generated
USA	89	8-15% based on EPA & *BioCycle* data
Europe	400	Varies from country to country
Japan	100	70 to 80%
Other Nations (Taiwan, Singapore, China, etc.)	70	Varies from country to country

From the mid-1970s to the mid-1980s, WTEs developed in the U.S. primarily out of an expectation of increasing energy costs derived from the 1973-1974 energy crisis in the U.S. The Federal Government initiated tax incentives to stimulate growth in the development of non-fossil fuel energy alternatives. These tax incentives provided accelerated depreciation on plants and equipment, a 10 percent energy tax credit, and investment tax credits that could amount to 40 percent of the cost of a facility. These initiatives, however, were done away with under President Ronald Regan's 1986 Tax Reform Act.

The reasons vary as to why other parts of the world have chosen to pursue WTE as a waste management alternative to disposal more than the U.S. One cause may simply be a lack of space. Both Europe and Japan, for example, have less land from which to develop a landfill, let alone a mega-landfill that can accommodate three or more thousand tons per day and have adopted policies opposing this type of land use. Land in the U.S. is relatively inexpensive, with respect to Europe and Japan, but also abundant in supply. The difference in capital cost between a WTE and cheap, abundant land is a significant factor in U.S. jurisdictions choosing to landfill; a benefit the County of Maui does not share with most of the U.S.

A second cause for U.S. jurisdictions not choosing WTE was the loss of ordinance-based flow control with the 1994 U.S. Supreme Court decision in Carbone versus Clarkstown. This decision effectively eliminated many a jurisdictions' sense of security in having the waste resources to efficiently operate a WTE. Since the capital expense is high for a WTE, a jurisdiction had to be concerned about controlling the correct amount of resources to feed it in a cost-efficient fashion.

The Federal Government imposed more stringent air quality standards on WTE, making WTE facilities more capital intensive compared to the much cheaper option of landfill disposal and other energy generators that did not have to meet the new standards. The Federal Government instituted guidelines for municipal combustion residue monitoring, sampling, and testing that, given the growing risk in supply of waste to feed a WTE, caused municipality policy makers to shy away from WTE as a viable option.

Within the U.S., the business of WTE diminished drastically since the 1994 U.S. Supreme Court decision, and many companies stopped building WTE plants. Those companies now left that have experience building such facilities are Covanta Energy, Energy Answers, Montenay Power (now Veolia), Barlow Projects, and Wheelabrator Technologies.

Since 2005, interest in building WTE facilities in the U.S. has fomented for several reasons. First, the cost of oil has increased and currently hovers around $100 per barrel. The higher the cost of energy, the more cost competitive a WTE facility. The combination of sale of electricity and tipping fees can make a WTE facility profitable. A power sales agreement between a jurisdiction and the electric utility purchasing the electricity produced by a WTE facility is important to the economic well-being of a WTE facility.

Interest in building WTE facilities in the U.S. has also increased with the Supreme Court's recent reversal, or, at least, new statement on the Carbone decision. In the Supreme Court's 2007 affirmation of the U.S. Court of Appeals for the Second Circuit's ruling in the case of United Haulers Association Inc. et al. versus Oneida-Herkimer Solid Waste Management Authority et al., the Court concluded, in a split decision, that the counties' flow control ordinances, which treat in-state private business interests exactly the same as out of state ones, do not discriminate against interstate commerce.

Jurisdictions, such as the Counties of Kauai and Hawaii, are looking more closely at the possibility of implementing a WTE strategy to handle their respective post-recycling waste streams. Communities on the mainland, such as King County, Washington and Los Angeles County, California, are also reviewing WTE options. Several locations are in the midst of procurements for WTE such as Carroll, Frederick and Harford Counties in Maryland. Two locations with WTE facilities, Lee County and Hillsborough County, Florida, have recently approved and started construction on an additional process line to their facilities. Additionally, the City and County of Honolulu has announced it will pursue the expansion of its H-Power WTE facility.

The following sections describe proven technologies which have been in commercial use for decades.

12.5.1.2 Mass-Burn/Waterwall Combustion

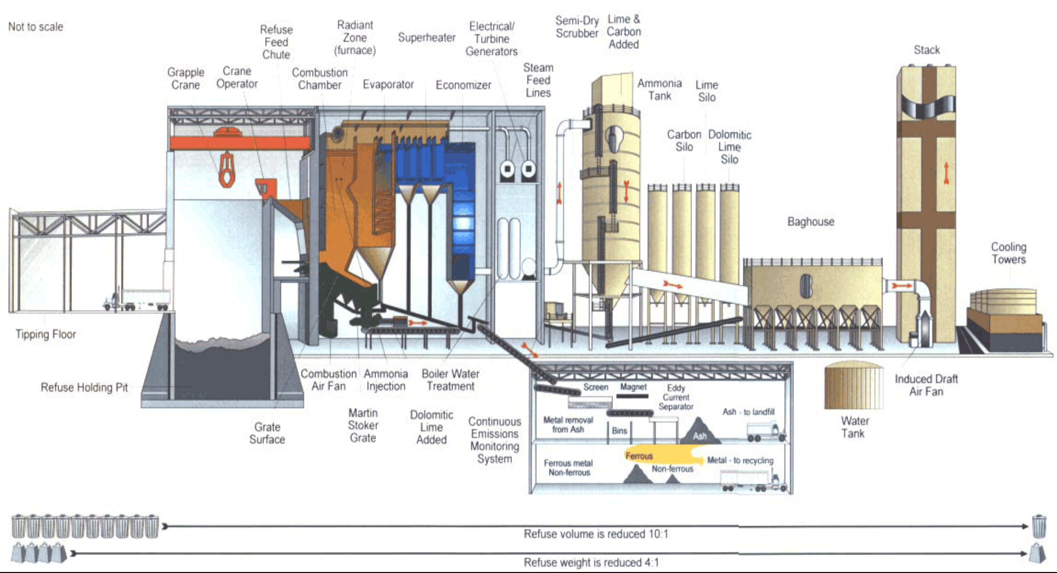
12.5.1.2.1 Process Description

In mass-burn waterwall combustion, MSW is placed directly into the system for incineration with no pre-processing, except for removal of large identifiable non-burnable items (refrigerators, washing machines, microwave ovens, etc.). Waste is placed onto a grate at the bottom of a combustion chamber in a furnace with walls built of water tubes, as shown in Figure 12-2.

Figure 12-1 - Waterwall Furnace Section[1]

Half the heat generated from the burning waste is absorbed by the water walls and the balance heats water in the boiler, as shown on the illustration in Figure 12-3.

Figure 12-2 - Typical Mass-Burn Waterwall System[2]



The off-gas exiting the boiler passes through an air pollution control system where the majority of pollutants is removed with the processed gas discharged through a stack to the atmosphere. Waste is burned out to an ash in the furnace. Heat extracted

[1] Source: Babcock and Wilcox.

[2] Source: Fairfax County, VA.

from the waterwalls and the boiler section generates steam, which, in most facilities, is directed to a turbine generator for electric power production.

Waterwall systems are fabricated on-site. They are generally applied to larger systems, 200 TPD, up to 750 TPD, and multiple units are used when higher capacity is required. They are forgiving in their operation, and are reasonably efficient in the burnout of waste and in the generation of energy.

12.5.1.2.2 Worldwide Experience and Vendors in U.S.

No new greenfield mass-burn WTE facilities have been built in the United States since 1997, although there have been acquisitions and ownership and operator changes at certain existing facilities, as well as some plant expansions. As a result, the firms associated with mass-burn WTE are either operators or owners of existing facilities. As shown in the Table 12-2, Covanta and Wheelabrator own and operate the majority of privately-owned WTE facilities. Most of the WTE plants, both public and private, are operated by Covanta, Montenay/Veolia or Wheelabrator.

Table 12-2 – Ownership of U.S. Mass-Burn / Waterwall Facilities[3]

Entity	Owned	Operated
Public	39	12
Covanta	11	27
Montenay/Veolia	2	9
Wheelabrator	10	16
Other	3	1
Total	65	65

Some of the mass-burn technology had been purchased from American firms such as Detroit Stoker, Combustion Engineering and Babcock & Wilcox, but the majority of these existing systems are of European design. The two leading suppliers of WTE grate systems in the United States and overseas are The Martin Company of Germany and Von Roll of Switzerland.

While new WTE facility procurements have declined in the United States, the market for this equipment has increased in Europe and in Eastern Asia, with European and Japanese systems suppliers actively marketing their systems, and consistently improving their performance. This technology is well tested and is used more than any other for large WTE facilities in the United States and overseas.

12.5.1.3 Mass-Burn/Modular Combustion

12.5.1.3.1 Process Description

Modular combustion is a similar incineration process. Unprocessed MSW is placed directly into a refractory lined chamber. The primary chamber of the incinerator includes a series of charging rams which push the burning waste from one level to another until it burns out to an ash and is discharged to a wet ash pit, as shown below.

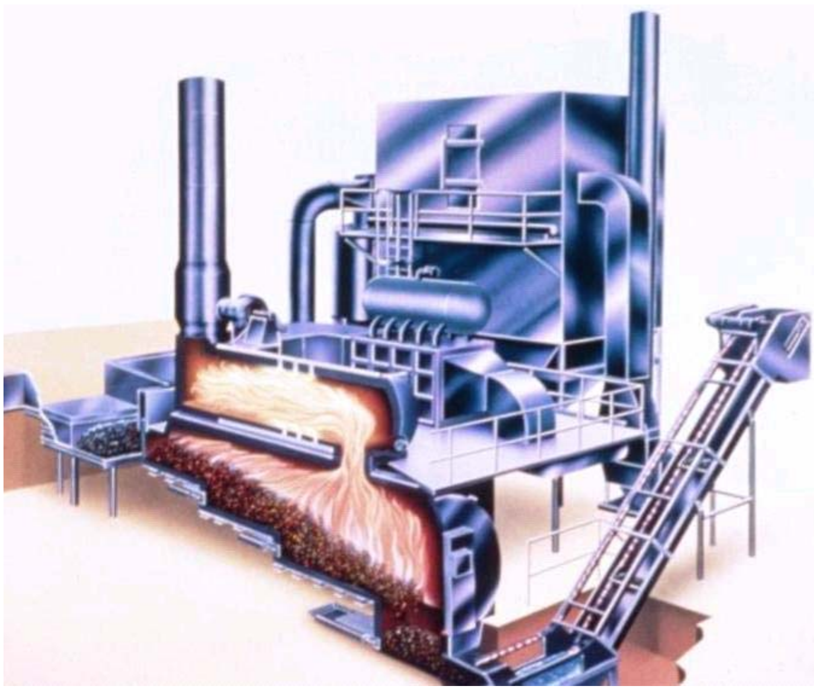
Less than the ideal amount of combustion air is injected into the primary combustion chamber, and the gas from the burning waste does not fully burn out at this location.

[3] Integrated Waste Management Services Association, 2004 Directory of WTE Plants.

It is directed to a secondary combustion chamber where additional air is added to complete the burning process. Hot gases pass though a separate waste heat boiler for steam generation, and then through an air pollution control system, before discharge through the stack to atmosphere. A schematic of a modular system is shown in Figure 12-4.

A major advantage of this system is injection of less air than ideal in the primary combustion chamber. With less air, the fans can be smaller and the chamber itself can be smaller than with other systems. Also, with less air flow, less particulate matter (soot) enters the gas stream and the air pollution system can be sized for a smaller load.

Figure 12-3 - Typical Modular Combustion System[4]



Modular systems are factory built and can be brought to a site and set up in a relatively short period of time. They are less efficient than waterwall units in waste burn-out and in energy generation. They have been built in unit sizes up to 150 TPD.

12.5.1.3.2 Worldwide Experience and Vendors in U.S.

Modular systems are used for smaller WTE facilities and for industrial applications. Unlike Mass-burn/waterwall systems, there are a number of American firms supplying such systems in the United States, and they are very competitive in overseas markets as well. The more active of these suppliers are Consutech Systems of Richmond, Virginia, Enercon Systems, Inc. of Elyria, Ohio, and Basic Environmental Engineering of Chicago. They have each been supplying incineration systems for MSW and other wastes for over 25 years.

Other U.S. firms, such as Energy Answers of Albany, NY, and Covanta Energy of Fairfield, NJ, are marketing management services for WTE modular facilities.

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[4] Source: Consutech Systems, Richmond, VA.

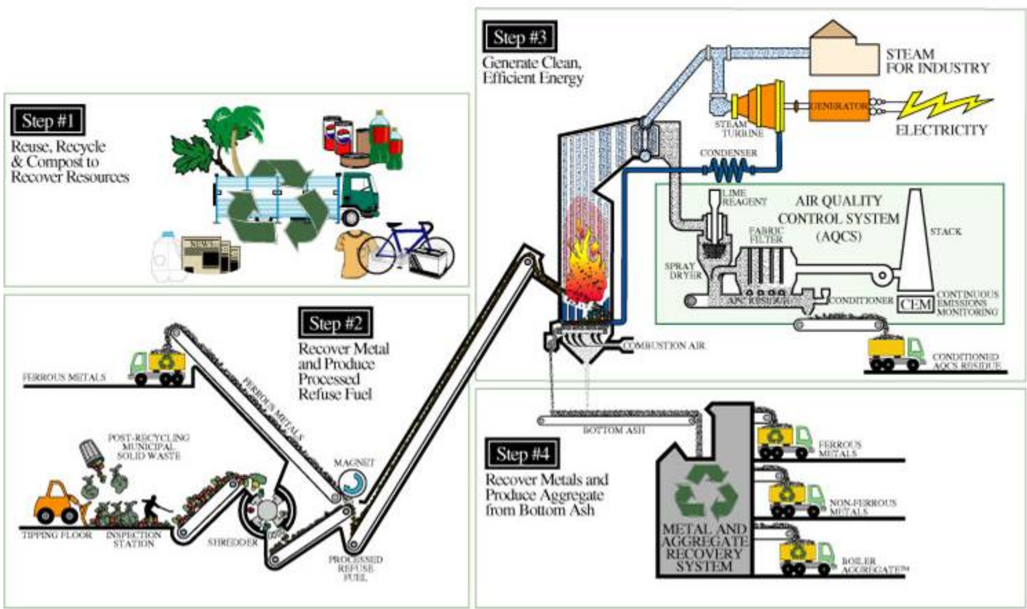
12.5.1.4 Refuse-derived Fuel/Dedicated Boiler

12.5.1.4.1 Process Description

Refuse-derived Fuel ("RDF"), in its simplest form, is shredded MSW with ferrous metals removed. Additional processing can be applied to the incoming waste stream, such as removal of glass and aluminum, or additional shredding stages can be placed in the processing line to match RDF particle size to firebox residence time.

As shown in Figure 12-5, RDF is blown into the furnace from the left, above the grate. What does not burn in suspension (above the grate) will burn on the grate, and the hot gases generated will pass through a waterwall section and then a boiler section. This system is similar to the Mass-burn waterwall facility except in the nature of waste charging and burnout.

Figure 12-4 - Typical RDF Combustion Facility[5]

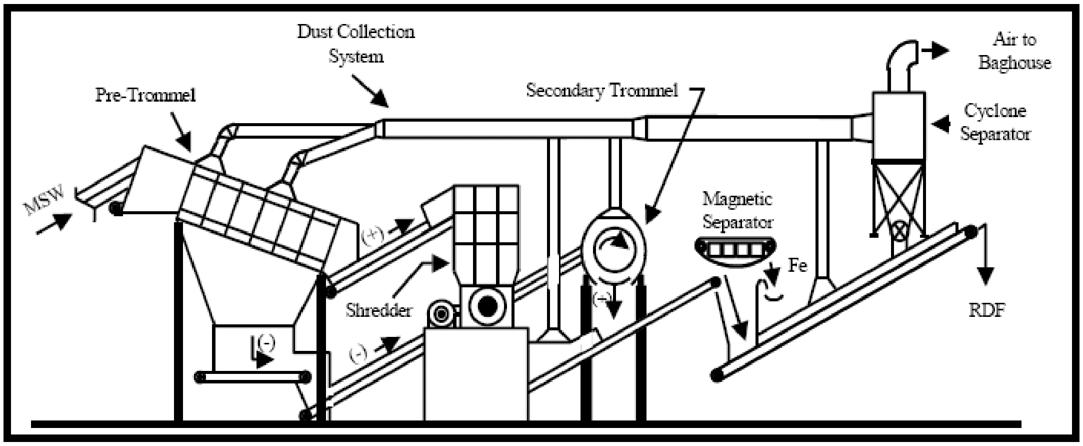


The unique feature of RDF systems is in the pre-processing of waste. As seen in the following diagram of a typical RDF processing facility, MSW enters the facility and then passes through a pre-trommel, where bags of waste are broken open. Materials dropping out of the pre-trommel pass through another trommel, but the majority of waste go through a shredder. A magnetic separator removes ferrous metals and the balance of the material is fired in the furnace.

Other configurations may include additional separating equipment, or may not use any trommels, but the RDF generated is always shredded, so that it is capable of being blown into a furnace. Figure 12-5 shows the processing flow of an RDF facility.

[5] Source: Energy Answers Corporation.

Figure 12-5 - Typical RDF Processing Facility[6]



An advantage of this system is in the removal of metals and other non-combustible materials from the waste stream. While not all these facilities include this step in the processing line, those that do can realize revenue from the sale of recovered metal. With the removal of non-combustibles, the specific heat content of the RDF can be increased by 10 percent over the original MSW, thereby generating more electricity per ton processed for conversion.

12.5.1.4.2 Worldwide Experience and Vendors in U.S.

As with Mass-burn systems, there have not been any new RDF systems constructed in the United States in the past decade because of the reasons already listed (e.g. loss of tax credits, low oil cost, cheap land). Of the 12 RDF WTEs currently in operation, Xcel and Covanta Energy are the operating contractors of most of these systems. One of these facilities is in Hawaii; the City and County of Honolulu contracts with Covanta to operate its H-power RDF WTE facility located in the Campbell Industrial Park. The facility, which began operation in 1990, processes 600,000 tons of waste annually, producing 7 percent of Oahu's electricity.

However, this technology is the mainstay of coal-fired electricity generation plants, and there are many established U.S. system and equipment suppliers, such as Foster Wheeler, Riley, Babcock and Wilcox and Combustion Engineering.

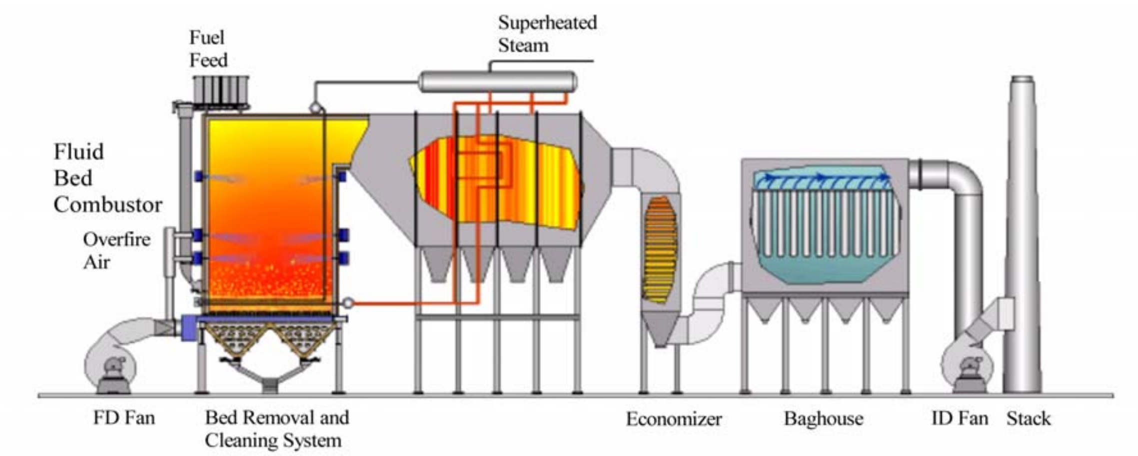
12.5.1.5 Refuse-derived Fuel/Fluidized Bed

12.5.1.5.1 Process Description

In this incineration process, MSW is shredded to less than four inches mean particle size (the same as with the RDF process described above) but is blown into a bed of sand in a vertical cylindrical furnace. Hot air is also injected into the bed from below, and the sand has the appearance of a bubbling fluid as the hot air agitates the sand particles. Moisture in the RDF is evaporated almost instantaneously upon entering the bed, and organics burn out both within the bed and in the freeboard, the volume above the bed. Steam tubes are embedded within the bed and a transverse section of boiler tubes captures heat from the flue gas exiting the furnace, as shown in the illustration in Figure 12-7.

[6] Source: generic.

Figure 12-6 - Typical RDF Fluid Bed System

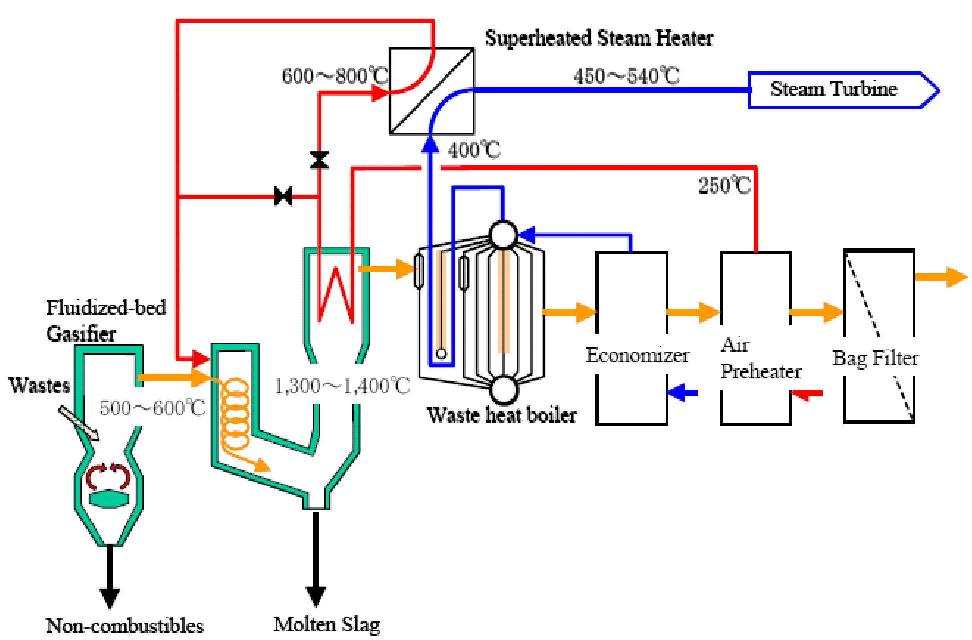


Fluid bed incineration is more efficient than grate burning-based incineration systems. The bed is very effective in waste destruction and requires less air flow than mass-burn or modular systems. The fluid bed, however, does require relatively uniform sized material, and RDF preparation is necessary.

A variation of the fluid bed system described above is the fluidized-bed gasifier, shown in Figure 12-8.

Although this system is described as gasification technology, it does not export a burnable gas. RDF is charged to the fluid bed and the gas generated is directed to a combustion chamber, shown above, with molten slag dropping out to a water-cooled sump. The molten slag solidifies into a glass-like material which can be used as a construction material or fill. Heat from the gas fired in the combustion chamber will be captured in hot water tubes to generate steam which can be used for electric power generation.

Figure 12-7 - RDF Fluidized Bed Gasification System[7]



[7] Source: Ebara Corporation, Tokyo.

12.5.1.5.2 Worldwide Experience and Vendors in U.S.

While there are several RDF/fluid bed systems operating in Europe (particularly in Scandinavia, where a number of fluid bed incinerator manufacturers are located), there is only one such facility in operation in the United States: French Island, WI. It is owned and operated by Xcel Energy of Minneapolis. The equipment was supplied by Energy Products of Idaho in Coeur d'Alene, the only U.S. firm currently manufacturing furnaces for RDF firing.

The RDF-gasification technology described above is a product of Ebara Corporation of Tokyo. They have four such systems in operation on MSW in Japan, ranging in size from 185 TPD to 460 TPD.

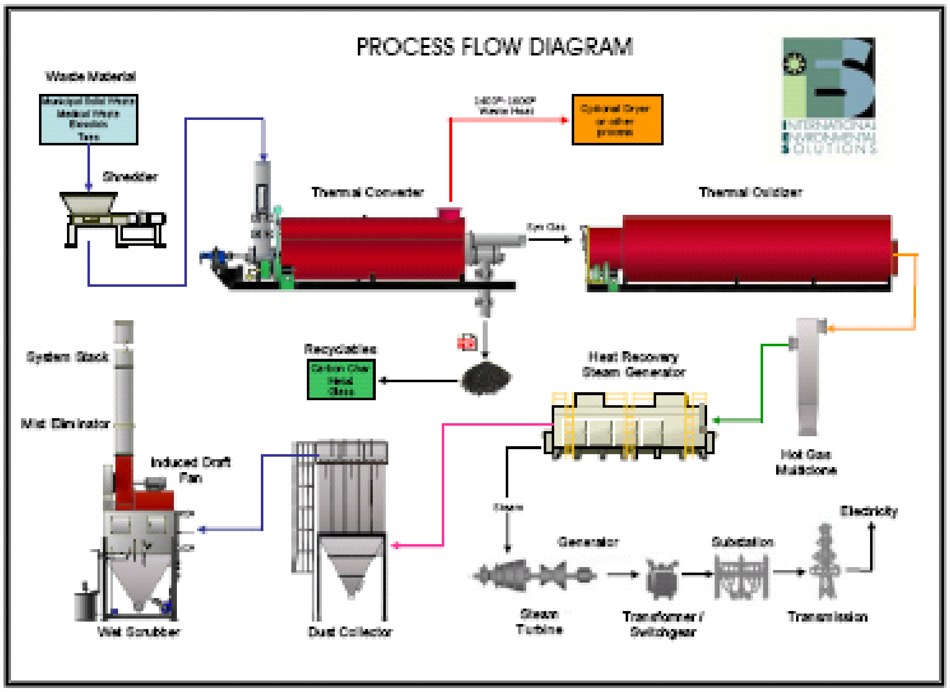
12.5.2 Emerging Waste Technologies

12.5.2.1 Pyrolysis

In pyrolysis, an organic waste (MSW) is heated without oxygen (or air), similar to the generation of coke from coal or charcoal from wood. Both a char and a gas are generated. The gas is burned out in a gaseous phase, requiring much less oxygen than incineration, and the char will usually melt at the temperatures within the pyrolysis chamber and will be discharged as a black gravel-like substance, termed frit. Advantages of this process are in the lack of air entering the chamber and the resulting smaller size of system components. Without air, there is little nitrogen oxides generation, and low particulate (soot) formation. There have been many attempts to develop this technology outside a laboratory or a pilot plant. In past demonstrations in the 1970s, it was difficult to maintain a sealed chamber to keep air out, and waste variability creates problems in maintaining consistent operation. When the pyrolysis gas is fired in a combustion chamber that is part of the system, the system is classified as an incinerator. Currently, there are no full-scale pyrolysis systems in commercial operation on MSW in the United States.

A pilot demonstration system has been operating in southern California for a number of years. It was built and is operated by International Environmental Solutions, of Romoland, CA. As shown in Figure 12-9, it shreds MSW down to a uniform size capable of feeding into the thermal converter, or pyrolysis chamber. The pyrolysis gas generated is fired in a secondary combustion chamber, or thermal oxidizer, and passes through a waste heat boiler for heat recovery. Char drops out the bottom of the pyrolysis chamber for disposal or further processing for recovery of metals and other constituents. Although this system is marketed as a pyrolysis system, a combustion chamber is necessary for its operation (for destroying organics in the off-gas) and the presence of this chamber classifies the system as an incinerator.

Figure 12-8 - Process Diagram of a Pyrolysis System[8]



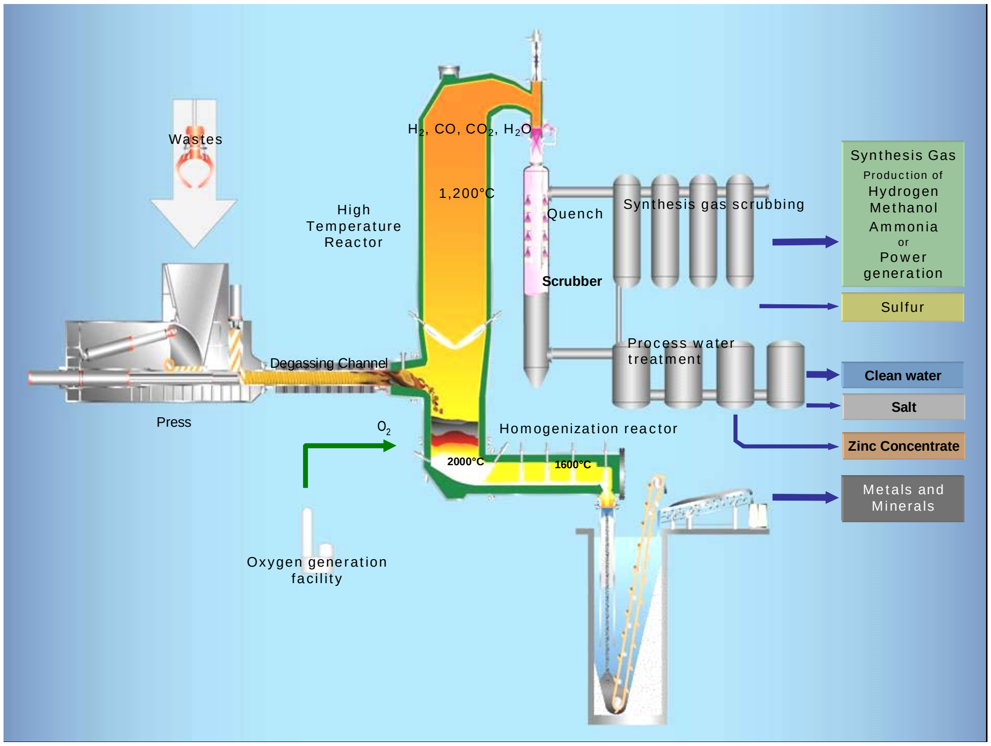
12.5.2.2 Gasification

In times of fuel shortages, gasification approaches become popular. During World War II, for instance, over a million vehicles in Europe ran on gasification by making fuel from wood and charcoal. The rubric heading "gasification" describes processes that use heat to transform solid biomass into a clean burning, carbon neutral, natural gas like flammable fuel. The following reviews some of the key processes that work under the umbrella classification called gasification.

Gasification is the heating of an organic waste (MSW) to produce a burnable gas (approximately 85% hydrogen and carbon monoxide mix) for use off-site. While pyrolysis systems are primarily focused on waste destruction, a gasifier is designed primarily to produce a usable gas. As shown in Figure 12-10, Thermoselect, a European firm represented in the U.S. by Interstate Waste Technologies of Malvern, Pennsylvania, has developed a system composed of 400 TPD modules processing MSW.

[8] Source: Integrated Energy Systems, Inc., Romoland, CA.

Figure 12-9 - Typical Gasification System[9]



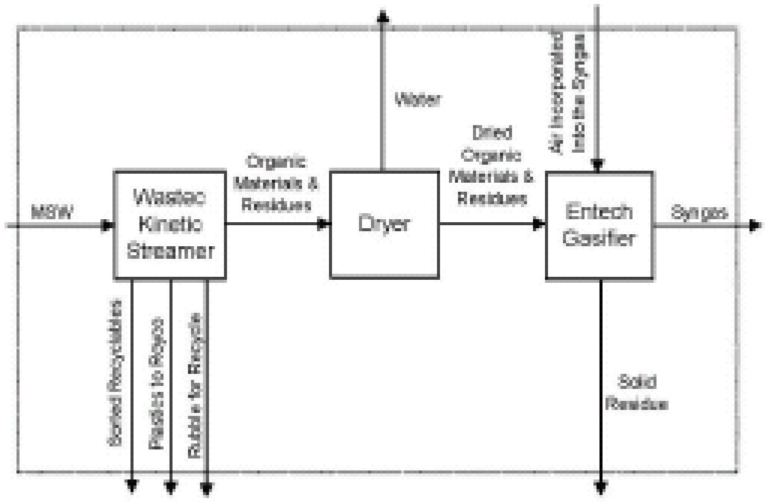
Waste is fed into a gasification chamber to begin the heating process, first having been compressed to remove entrapped air. Some oxygen, sufficient only to maintain the heat necessary for the process to proceed, is injected into the reactor, where temperatures in excess of 3,000°F are generated. At this high temperature, organic materials in the MSW will dissociate into hydrogen, methane, carbon dioxide, water vapor, etc., and non-organics will melt and form a glass-like slag. The gas is cleaned, water is removed, and it can be used for power generation, heating or for other purposes. The glass-like slag can be used as fill, or as a building material for roads, etc.

Seven plants with this technology are currently operating in Japan, with at least two of them firing MSW. Their largest facility fires up to 700 TPD of MSW.

Another gasifier marketed for MSW is built by EnTech of Devon, England, and its schematic is shown in Figure 12-11.

[9] Source: International Waste Technologies, Malvern, PA.

Figure 12-10 - EnTech Process Schematic[10]



This is a complex system which generates, in addition to a salable gas (synthetic natural gas, or syngas), recyclable plastics and other potential revenue streams. As shown above, MSW is classified by a combination bag breaker and gravity separator process, termed by EnTech as a Kinetic Streamer. Oversize materials, which are basically inorganic, are directed either to a plastics recycler or a non-plastics recycling station, while the majority of waste (presumably organic) is directed to a dryer to remove entrained moisture. The dryer utilizes the latent heat inherent in the organic content of the waste to produce the heat necessary to drive the gasification process. The syngas can be fired in a waste heat boiler for steam and subsequent electric power production.

Approximately 20 of these facilities using MSW are in operation in Europe and Asia. Most of them are relatively small (less than 10 TPD), with none designed for more than 70 TPD throughput.

12.5.2.3 Anaerobic Digestion

Anaerobic Digestion (AD) has been used for a century to reduce and stabilize biosolids and produce combustible gas in wastewater treatment plants. The process uses waves of microorganisms to do the work. The first wave of microorganisms breaks down the materials in an acidic environment. This process is called hydrolysis. The second wave breaks down the output of the first wave by transforming the fatty acids, acetate, hydrogen, and C02. This second wave is what finally produces the methane biogas.

These microorganisms are reliable and can work within AD systems whether they are wet or dry and hot (thermophilic) or not so hot (mesophilic). Generally the wetter and more mesophilic the system the less energy produced by the AD system. Wet and mesophilic AD systems take 15 to 30 days to process the material while dry and thermophilic AD systems take between 12 and 14 days to process the contents. Finally, AD systems vary in the number of tanks used from both waves working in one tank or multiple tanks.

The microorganisms process biodegradable waste but not items like plastic plates, tires, metals, and a plethora of items found in the MSW. After the biodegradable

[10] Source: www.entech.net.au.

waste is processed and the organic remainder can be composted to produce a marketable product, then the material should be screened to capture such inorganic items and produce a clean consistent product. The premium feed stock, then, for anaerobic digestion, is biodegradable material with a small percentage of inorganic items in the waste stream.

The use of MSW in AD systems has been slow in coming because the processes are more costly than landfilling. But over the past fifteen years as the cost of landfilling MSW has increased in Europe, AD systems have increasingly become operational. The European Union Landfill Directive, for instance, demands the stabilization of organic material, hence has added to the cost incentive as well as creating a legislative fulcrum to advance AD MSW processing. In 1999, 53 AD plants processed about 1 million tons a year of mixed MSW or source separated organics. In 2006, the number of AD facilities jumped to 124 processing 4 million tons of mixed MSW a year.[11]

In North America, only two full-scale AD facilities operate and both are located near Toronto, Ontario, Canada. Toronto organics are taken from 500,000 residential units and 20,000 businesses to the Dufferin Organics Processing Facility. The second facility operates in the same manner but is located outside of Toronto.

In July, SWRAC made a site visit to the only AD facility for source separated organics in the U.S. Onsite Power Systems Inc. has a biogas energy test project where eight tons a day of organic waste from homes and restaurants are conveyed into a system of multiple tanks. Each ton of food waste Onsite Power processes can generate enough bioenergy to power and heat ten homes over a 24-hour period.

In Hadera, Israel, the ArrowBio Facility is an AD plant that processes 100,000 tons per year of mixed MSW. This is a 320-TPD facility operating six days per week. The facility is a wet system which separates the recyclables off the top and produces 23,000 tons of compost product and 19,000 tons of residue annually.

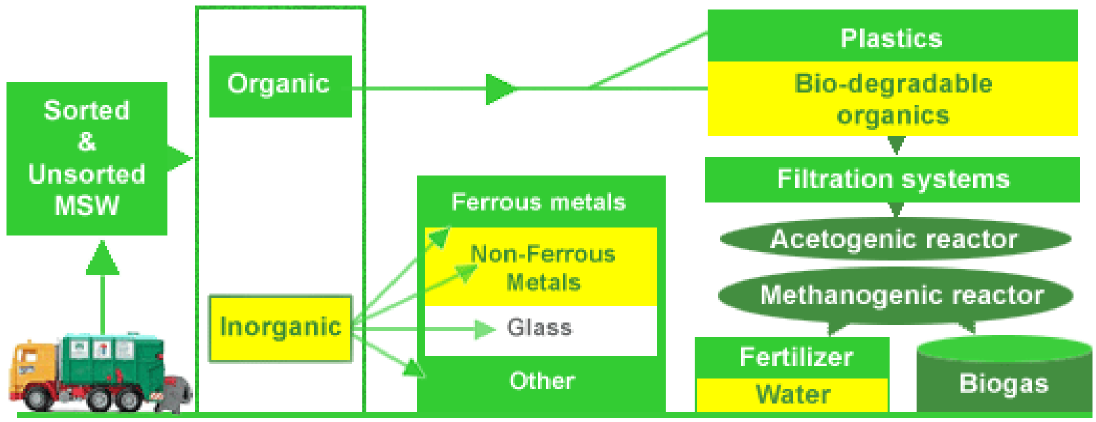
As applied to the processing of MSW, anaerobic digestion is a wet treatment process where waste is first pre-sorted and then fed into water tanks. Using agitators, pumps, conveyors and other materials handling equipment, MSW is wetted and dissolved. Metals, glass and other constituents of MSW that have no affinity for water are eventually discharged from the system into dedicated containers for recycling, further processing or final disposal. The paper, garbage, soluble components, etc., generate a "black water" which has a relatively high organic content. This stream is taken to a series of digesters where the time it sits in the chamber, the residence time, will be sufficient to generate an off-gas. This gas is rich in methane and other organics, and can be burned as a fuel for heating or for electric power generation. Solid residual from the digestion process can be used as a soil amendment. The process also separates recyclable materials such as glass and metals.

One of the anaerobic technologies, the ArrowBio Process from Haifa, Israel, is operating in a 300 TPD full-scale MSW demonstration process line in Tel Aviv, illustrated in Figure 12-12.[12]

[11] "Anaerobic Digestion Outlook for MSW Streams," BioCycle, August 2007, Vol. 48, No. 8, p. 51.

[12] Source: ArrowBio, Haifa, Israel.

Figure 12-11 – ArrowBio Process Schematic



The system operates without high temperatures or pressure. In theory, it is extremely simple, relying on non-specialized mechanical equipment (pumps, screens, macerators, tanks, conveyors, etc.) for operation. Digestion occurs through the presence of natural microorganisms in MSW, and charging with specialty or unique bacteria is not necessary. It has a high resistance to upsets because of the scale of its operation, i.e., with hundreds of tons of MSW entering the system per day, any poisons that might threaten the digestion process (as has been experienced with sewage treatment plant digesters) are likely to be of such small fraction that it will have no significant effect on digester cultures.

The system is equipment and labor intensive. Although redundancy is normally built into the system, with multiple process lines and duplication of critical pumps, conveyors, etc., additional equipment adds to the number of separate process and associated equipment necessary for operation. To date, no operating facility processes more than a few hundred TPD. The Tel Aviv installation of Arrow has thus far experienced many shut-downs due to the presence of troublesome components in the input waste stream. To combat this, a higher level of pre-processing is being implemented for more reliable operations.

12.5.2.4 Mixed Waste Composting

Composting is a natural process that depends on the action of microscopic organisms to break down organic matter. Composting has been used for hundreds of years to process a variety of agricultural wastes. There are two types of micro-organisms that digest the organic materials: aerobic and anaerobic. The first need oxygen or air to function and the latter work without oxygen. Anaerobic composting produces combustible biogas as a byproduct. There are five factors that influence the composting process: (1) moisture, (2) oxygen or air, (3) temperature, (4) chemical balance of carbon and nitrogen and (5) particle size.

Large scale mixed waste composting facilities are industrial plants which receive waste and grind the material in large shredders, removing inert materials by screening and other processes. The feed material is then moved to the composting vessel where the organic materials are digested by the micro-organisms. The process and factors 1 through 3 are controlled by computer. After initial processing the resulting compost product is stored to "cure" and then it is ready to be sold. Using California post-recycling waste composition data[13], it is estimated that aerobic composting would reduce the waste landfilled to 25 percent of the initial feed. There would be 43 percent recovered as compost and material products and 32 percent released to the atmosphere as gases (mainly CO_2 and water vapor).

There are several hundred mixed waste composting plants in Europe, both aerobic and anaerobic. The trend seems to be toward segregating bio-wastes and then composting to produce biogas. In the United States, composting is used primarily to process yard waste and sewage sludge, and there are thousands of successful projects. BioCycle reports[14] that there are 14 mixed solid waste composting facilities operating in the United States in 2006. These are generally small units processing less than 120 TPD, with two facilities processing 200 to 250 TPD. Large-scale plants have been built in Portland, OR, Baltimore, MD, Miami, FL, Atlanta, GA, and Pembroke Pines, FL, all of which failed for technical reasons, generally odor control or financial difficulties. A key problem has been that the quality of the product produced was lower than expected, which reduced the revenues and made the projects too costly and/or non-competitive with other available alternatives.

12.5.2.5 Plasma Arc

Plasma arc gasification was developed in 19th Century Germany. NASA utilized it in the 1960s to simulate re-entry temperatures to test heat shields on spacecrafts. Dr. Lou Circeo, of Georgia Tech's Construction Research Center in Atlanta, began testing it on garbage in the 1970s.

The General Motors (GM) facility in Defiance, Ohio has been using a plasma arc gasification process developed by Westinghouse since 1989 to create high temperatures to recycle scrap metal. As of 1999, Hitachi Metals Ltd. has utilized a smaller version of the Westinghouse system to process 25 TPD of MSW at a plant in Yoshii. In 2002, the Japanese cities of Mihama and Mikata commissioned the building of a 28-TPD plasma arc gasification facility.

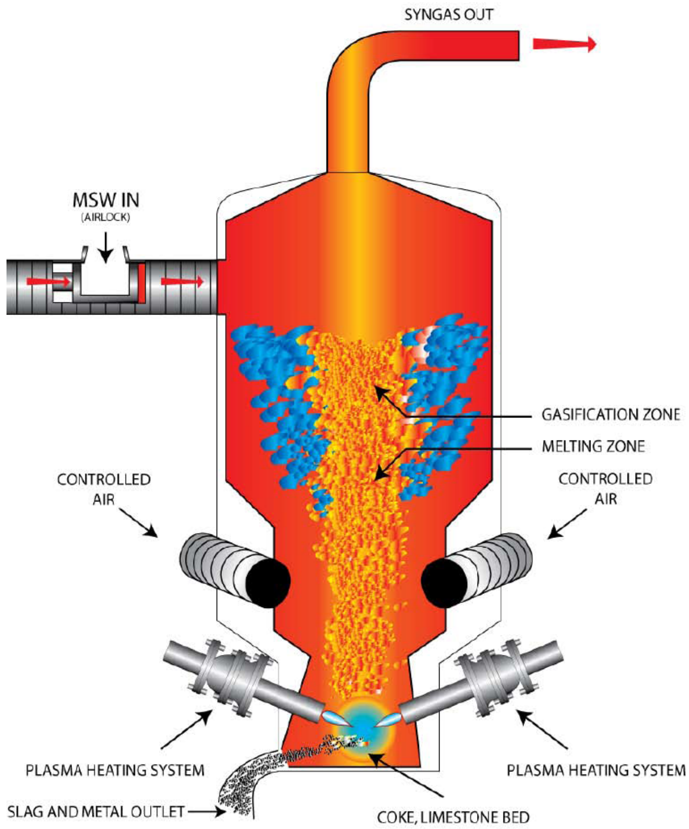
Plasma arc technology is the destruction of MSW using the intense heat generated by a plasma torch. It is a pyrolysis-related process where little or no oxygen is injected into a reactor. A typical unit is shown in Figure 12-13.

Electric current is passed though a series of torches at the bottom of a reactor, which heat a process gas (not shown) to a temperature in excess of 5,000°F. This hot gas stream heats waste within the reactor to over 3,500°F and, as air is provided to the system at a low controlled rate, some of the waste will burn to help

13 Statewide Waste Characterization Study, California Integrated Waste Management Board, December 1999.

14 BioCycle Magazine, JG Press, Inc., November 2006.

Figure 12-12 - Cross-Section of a Plasma Arc Furnace[15]



maintain reactor temperature. At this high temperature, organics within the waste will form elemental compounds such as hydrogen, oxygen and carbon and some of this carbon will convert to carbon monoxide or methane. The gas flow will have a high enough heat content to be able to sustain its own combustion and be used as a fuel gas external to the system.

The inorganic portion of the waste will form a liquid slag which eventually drops from the reactor into a water bath. As soon as it hits the water it will shatter into a glassy-looking residue. That may be suitable for fill or use as a construction material.

There are no commercial-scale plasma arc systems firing MSW in the United States. There are pilot plants in Japan used for ash vitrification, and a smaller Japanese facility firing MSW, but attempts to apply this process in the United States have not been successful. The electric power requirements for the torch are significant, and maintenance of torches and reactor refractory materials is also a significant expense item.

Few, if any of the plasma arc pilot facilities have been able to generate a fuel gas (synthetic natural gas, or syngas), and air emissions have been found to be no better than conventional incineration systems. The firm Geoplasma, from Atlanta, is negotiating a contract for construction of a large plasma arc facility for MSW in St. Lucie County, Florida, which will also to be used for processing mined landfill waste.

[15] Geoplasma, Atlanta, GA

12.5.2.6 Chemical Decomposition

Chemical decomposition, also referred to as depolymerization, is a process whereby waste is directly liquefied into useful chemical feedstocks, oils and/or gases. The oils are a replacement for fuel oil and the gases consist of carbon monoxide, hydrogen and methane. The process generally utilizes medium temperature and pressure to break large complex molecules into smaller ones. If higher temperatures are employed, chemical decomposition becomes indistinguishable from gasification.

The solid waste feedstock for chemical decomposition will generally be pre-processed to remove recyclable and inert materials and to reduce the particle size. Moisture is favorable to the process and may need to be added to create steam reforming reactions. The process is multi step: gas recovery, liquid separation to isolate the oil product, and processing the solids to separate carbon char from inerts. Chemical decomposition processes require an external energy source to make the reactions take place.

Changing World Technologies (CWT) offers a chemical decomposition process that they indicate can be applied to mixed solid waste. Currently, they have a plant operating on poultry waste in Carthage, MO, which was commissioned in 2005. CWT was selected for further consideration by the City of Los Angeles.

One form of chemical decomposition is used to break cellulose into sugars for fermenting to produce ethanol. This is the hydrolysis process, of which two types have been applied to the organic components of solid waste: acid hydrolysis and enzyme hydrolysis. They have also been used in combination. The National Renewable Energy Laboratory developed and has operated pilot processes which have demonstrated to be technically feasible. No production plants, however, have been built to date. The City of Los Angeles received nine submissions for hydrolysis processes, including those from Arkenol and Iogen, a DOE demonstration and commercialization project contractor. No hydrolysis process was selected by the City of Los Angeles.

Microwaves can be used as the external heat source for chemical decomposition or depolymerization. Microwave systems have been built to decompose some special wastes, particularly tires. Goodyear obtained a patent to “de-vulcanize” tires and built a facility to process in-plant scrap in the late 1970s. Several small units have been operated on tires. The application of microwaves to drying and decomposition of various wastes, including medical waste and nuclear waste, is proven, but its application to municipal solid waste has not been proven but is being promoted by Molecular Waste Technologies, Inc. Global Resource Corporation also proposes microwave plants for MSW, but has not constructed one.

12.5.3 Recent Procurements for Alternative Resource Conversion Technologies

Over the past four to six years, several local government and/or regional authority groups have conducted studies and requested information, and initiated procurements for considering alternative resource conversion technologies to be added to their integrated waste management systems. Table 12-3 provides a listing of the locations and the various vendors that have responded to these initiatives. Reviews of those efforts conducted by the City of Los Angeles and Los Angeles County are specifically highlighted, as requested by SWRAC.

Table 12-3 - Alternative Resource Conversion Technologies Vendor List

Technology	Jurisdiction / Vendors	New York City	City of Los Angeles - Phase I	City of Los Angeles - Phase II	Los Angeles County - Phase I	Los Angeles County - Phase II	Frederick/Carroll County, MD	Harford County, MD	City of Sacramento, CA	Broward County, FL	St. Lucie County, FL	Pinellas County, FL	Total Times Evaluated/Proposed
Advanced Thermal Recycling	Global Environmental Technologies	X											1
Advanced Thermal Recycling	Consutech Systems LLC		X										1
Advanced Thermal Recycling	Basic Envirotech Inc.		X										1
Aerobic composting	Wright Environmental Management Inc. (Wright)		X		X								2
Aerobic composting	American Bio-Tech		X										1
Aerobic composting	Horstmann Recyclingtechnik GmbH		X										1
Aerobic Digestion	Mining Organics	X											1
Aerobic Digestion	Real Earth Technologies	X											1
Aerobic Digestion	American Bio-Tech				X								1
Aerobic Digestion	HotRot Exports Ltd, or Outspoken Industries				X								1
Aerobic Digestion	International Bio Recovery Corporation (IBR)				X								1
Anaerobic Digestion	Arrow Ecology and Engineering	X			X	X							3
Anaerobic Digestion	Canada Composting	X			X								2
Anaerobic Digestion	Kame/DePlano	X											1
Anaerobic Digestion	New bio	X											1
Anaerobic Digestion	Orgaworld	X											1
Anaerobic Digestion	Organic Waste Systems	X			X								2
Anaerobic Digestion	VAGRON	X											1
Anaerobic Digestion	Valorga S.A.S. (Valorga)/Waste Recovery Systems	X	X		X					X[1]			4
Anaerobic digestion	Canada Composting, Inc. (CCI)		X										1
Anaerobic digestion	Organic Waste Systems N.V. (OWS)		X										1
Anaerobic digestion	ISKA GmbH		X										1
Anaerobic digestion	Arrow Ecology Ltd. (Arrow)		X										1
Anaerobic digestion	Citec		X										1
Anaerobic digestion	Global Renewables/ISKA		X		X								2
Anaerobic Digestion	Waste Recovery Seattle, Inc. (WRSI)		X	X					X	X			4
Anaerobic Digestion	Urbaser			X[1]					X	X[1]			3
Composting	Zanker								X				1
Composting	RRI - Switzerland								X				1
Gasification	BRI Energy	X			X								2
Gasification	Dynecology	X											1
Gasification	Ebara	X	X		X								3
Gasification	Ecosystem Projects	X											1
Gasification	Emerald Power/Isabella City	X											1
Gasification	GEM America	X											1
Gasification	ILS Partners/Pyromex	X											1
Gasification	Interstate Waste Technologies/Thermoselect (IWT)	X	X	X	X	X				X			6
Gasification	Jov Theodore Somesfalean	X											1
Gasification	Kame/DePlano	X											1
Gasification	Taylor Recycling Facility	X	X		X								3
Gasification	Thermogenics	X											1
Gasification	Primenergy (RRA)		X		X								2
Gasification	Omnifuel /Downstream Systems (Omni)		X										1
Gasification	Whitten Group /Entech Renewable Energy System		X		X	X							3
Gasification	Energy Products of Idaho (EPI)		X										1
Gasification	Brightstar Environmental		X										1
Gasification	Omnifuel Technologies, Inc.				X								1
Gasification	Green Energy Corp				X								1
Gasification	Envirepel								X				1
Gasification	Zia Metallurgical Processes, Inc.			X									1
Hydrolysis	Arkenal Fuels	X											1
Hydrolysis	Biofine	X											1
Hydrolysis	Masada Oxynol	X											1
Mass Burn	Covanta Energy Corporation		X	X			X	X	X	X		X	7
Mass Burn	Wheelabrator Technologies Inc.			X			X	X		X		X	5
Mass Burn	Veolia Environmental Services											X	1
Mass Burn	Seghers Keppel Technology, Inc. (Seghers)		X	X[1]									2
Other Thermal (Microwave)	Molecular Waste Technologies, Inc.				X								1
Plasma Gasification	Global Energy Solutions	X			X					X			3
Plasma Gasification	GSB Technologies	X											1
Plasma Gasification	Peat International/Menlo Int.	X											1
Plasma Gasification	Rigel Resource Recovery and Conversion Company	X			X								2
Plasma Gasification	Solena Group	X											1
Plasma Gasification	Startech Environmental	X											1
Plasma Gasification	Geoplasma LLC				X						X		2
Plasma Gasification	Plasma Environmental Technologies, Inc.				X								1
Plasma Gasification	Plasco Energy Group			X									1
Plasma Gasification	USST								X				1
Pyrolysis	Entropic Technologies Corporation	X											1
Pyrolysis	Pan American Resources	X	X		X								3
Pyrolysis	WasteGen Ltd. /TechTrade (WasteGen)		X		X								2
Pyrolysis	Conrad Industries				X								1
Pyrolysis	Graveson Energy Management				X								1
Pyrolysis	International Environmental Solution				X	X			X				3
Steam Classification	BLT/World Waste Technologies								X				1
Thermal Depolymerization	Changing World Technologies	X			X	X							3
Thermal Oxidation	Zeros Technology Holding	X											1

12.6 Environmental Ramifications

Solid waste incinerators, which EPA refers to as Municipal Waste Combustors, are regulated under the federal Clean Air Act (CAA), originally passed by Congress in 1963 and updated in 1967, 1970, 1977, and 1990. EPA has promulgated a number of regulations under the CAA since 1990. Numerous state and local governments have enacted similar legislation, either implementing federal programs or filling in local gaps in federal programs.

Section 111 of the federal Clean Air Act directs EPA to establish pollution control requirements for certain industrial activities which emit significant "criteria air pollutants." These requirements are known as new source performance standards (NSPS) and regulate pollutants. For thermal destruction of solid waste, the NSPS control particulate matter (PM), sulfur dioxide(SO_2), carbon monoxide (CO), nitrogen oxides (NO_x), hydrogen chloride (HCl), dioxins/furans, cadmium, lead, mercury, fugitive ash and opacity. NSPS are detailed in Chapter 40 of the Code of Federal Regulations, Part 60 (40 CFR Part 60), and are intended primarily to establish minimum nationwide requirements for new facilities.

Section 112 of the pre-1990 federal Clean Air Act directed EPA to establish standards to reduce emissions of hazardous air pollutants (HAPs). These pollutants include asbestos, benzene, beryllium, inorganic arsenic, mercury, radionuclides, and vinyl chloride. National emission standards for hazardous air pollutants (NESHAPs) are detailed in 40 CFR Part 61 and establish minimum nationwide requirements for existing and new facilities.

The post-1990 NESHAPs require the maximum achievable control technology (MACT) for a particular industrial source category, and are often referred to as "MACT standards." The pre-1990 Clean Air Act prescribed a risk-based chemical-by-chemical approach. The 1990 Clean Air Act Amendments outlined a new approach with two main components. The first component involves establishing technology-based source category standards, and the second component involves addressing any significant remaining risk after the national standards are in place. The NESHAPs promulgated under the 1990 Clean Air Act Amendments can be found in 40 CFR Part 63 and establish nationwide requirements for existing and new facilities.

EPA may implement and enforce the requirements or EPA may delegate such authority to state or local regulatory agencies. Sections 111 and 112 of CAA allow EPA to transfer primary implementation and enforcement authority for most of the federal standards to state, local, or tribal regulatory agencies. In general, EPA does not delegate to state or local agencies the authority to make decisions that are likely to be nationally significant, or alter the stringency of the underlying standard.

The Section 111 and 112 emissions limits applicable to new Municipal Waste Combustors are:

Dioxin/furan (CDD/CDF)	13 nanograms per dry standard cubic meter
Cadmium (Cd)	10 micrograms per dry standard cubic meter
Lead (Pb)	140 micrograms per dry standard cubic meter

Mercury (Hg)	50 micrograms per dry standard cubic meter
Particulate Matter (PM)	20 milligrams per dry standard cubic meter
Hydrogen chloride (HCl)	25 PPM or 95 percent reduction
Sulfur dioxide (SO_2)	30 ppm or 80 percent reduction
Nitrogen Oxides (NO_x)	180 ppm dry volume, and 150 ppm dry volume after first year of operation

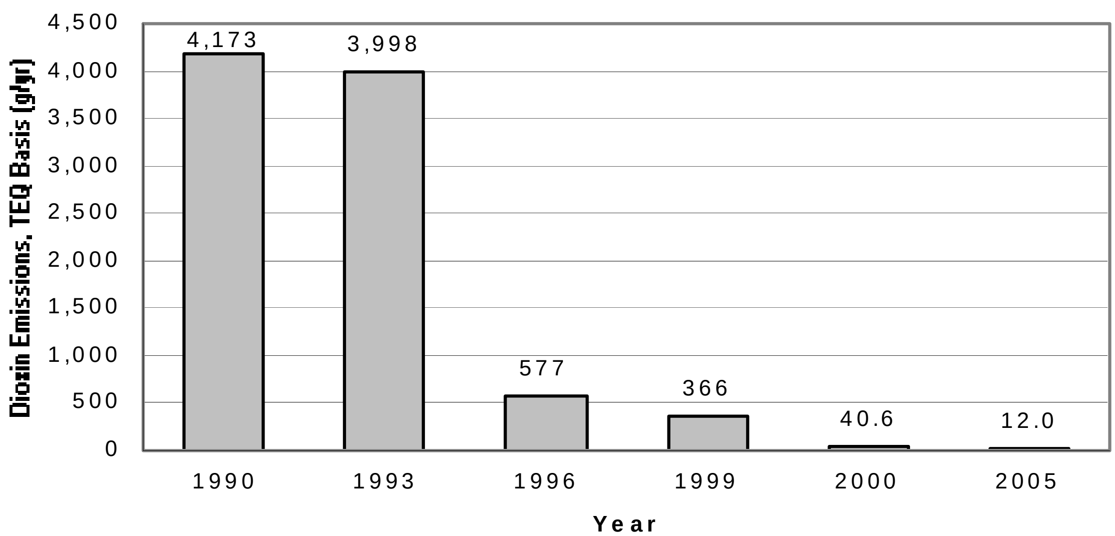
A new source review (NSR) permit is required for a new municipal waste combustor and, in addition, depending on its size and emission quantities, it must meet the prevention of significant deterioration (PSD) permit requirements. The PSD permit conditions require an analysis of existing (ambient) air quality in the area surrounding the proposed facility.

12.6.1 Air Quality Impacts

In the early 1980s, dioxins were discovered in the exhaust of a WTE facility on Long Island, NY. This chemical, toxic to animals in even very small quantities, was a major concern. Other WTE plants were tested, as well as other types of facilities, and were found to be a major dioxin source. In 1995, amendments to the CAA were enacted to control the emissions of dioxins, as well as other toxins, such as mercury, hydrogen chloride, and particulate matter.

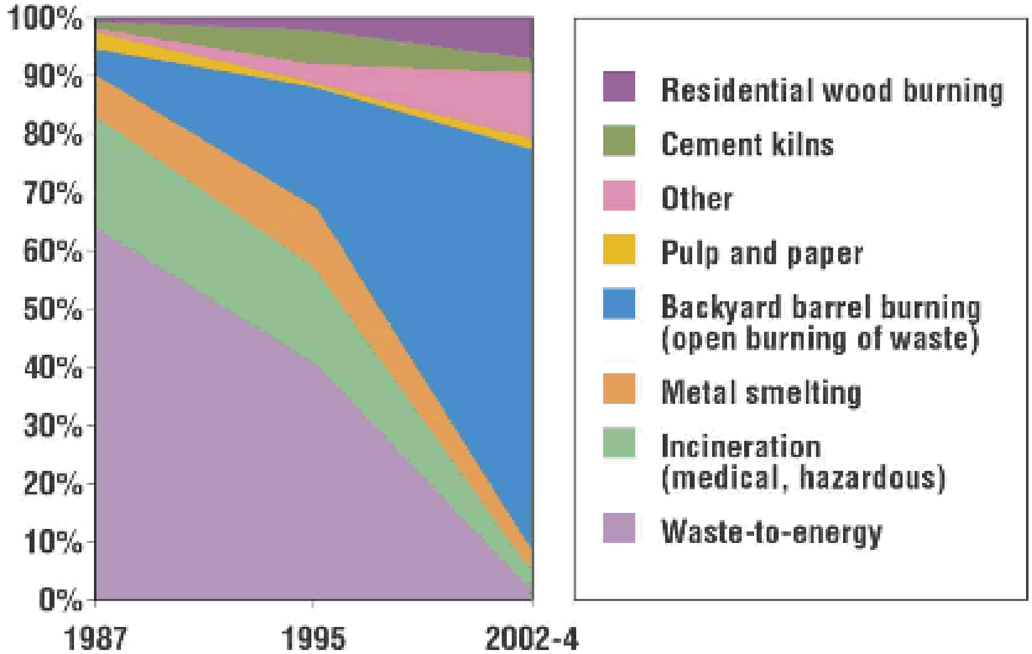
With the implementation of the CAA requirements in the following years, dioxin emissions from WTE decreased significantly, as shown in the chart in Figure 12-14 (from "Dioxins from WTE in the USA: 4,260 grams in 1990 to 12 in 2000," J. O'Brien, Comparison of Air Emissions from Waste-to-Energy Facilities to Fossil Fuel Power Plants, SWANA, 2005):

Figure 12-13 – Dioxin Emissions, TEQ Basis



While WTE plants had been a major source of dioxins in 1987 as shown in the chart in Figure 12-15, it has not been considered a significant dioxin source since 2002. EPA has stated that "Waste-to-Energy is no longer a major contributor of dioxin emissions." (see USEPA Docket A-9045, VIII.B.11, Office of Air Quality and Standards, 2002)

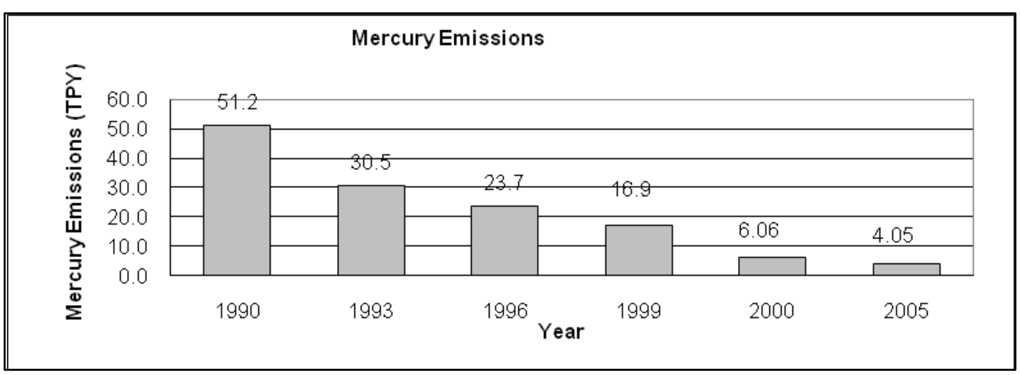
Figure 12-14 – Changes in Dioxin Sources



Mercury is another toxin that was found in WTE exhaust and was addressed in the CAA amendments. By modifications in the burning process and the use of activated carbon injection in the air pollution control system, dioxins and mercury, as well as hydrocarbons and other constituents, have effectively been removed from the gas stream.

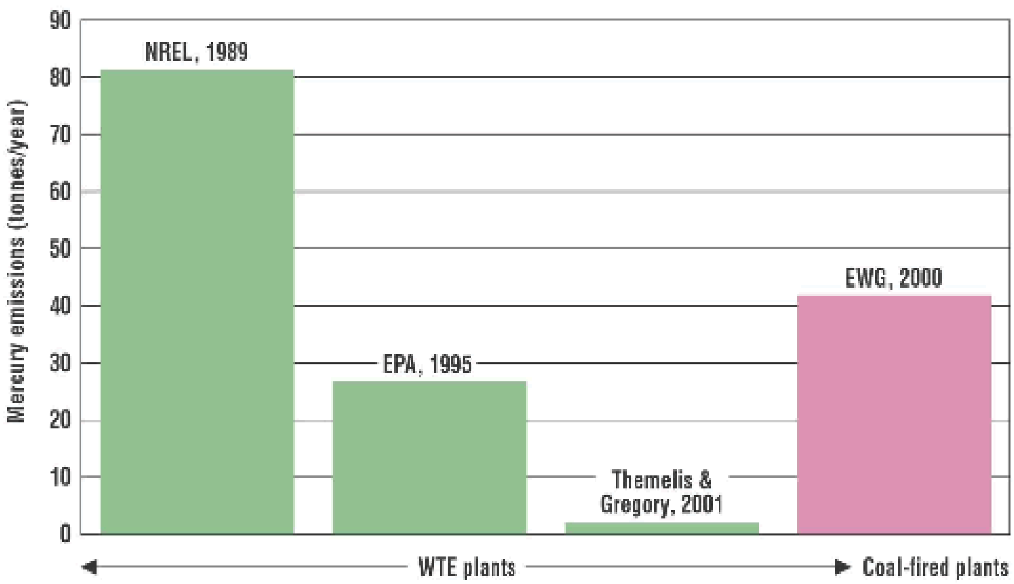
Mercury emissions from WTE have been reduced from 1990 levels, as shown in the chart in Figure 12-16 (from the Environmental Working Group, http://www.ewg.org , 2006). This chart shows a 91.2 percent reduction in 2005 from 1990 levels.

Figure 12-15 – WTE Mercury Emissions



Overall emissions of mercury in the United States from both WTE and fossil fuel-fired electric power plants are shown in the chart in Figure 12-17 (From: Mercury Emissions from High Temperature Sources, N. Themelis, A. Gregory, ASME Solid Wastes Processing Division Proceedings, May 2002, and the Environmental Working Group, http://www.ewg.org).

Figure 12-16 – Mercury Emissions from WTE and Coal-fired Plants



Whether reviewing dioxin data or mercury emissions, it is clear that WTE facilities have made a concerted effort to reduce these emissions to insignificance. These two pollutants have been identified by the public as the surrogate for all WTE emissions, but other emissions have decreased correspondingly as well, such as carbon monoxide, hydrogen chloride, nitrogen oxides and particulate matter (soot).

12.6.2 Greenhouse Gases

The "greenhouse" effect results from sunlight striking the Earth's surface and, when it gets reflected back towards space as infrared radiation (heat), it gets absorbed by gases trapping the heat in the atmosphere. Many chemicals that are present in the Earth's atmosphere act as "greenhouse gases (GHG)." These gases allow sunlight to enter the atmosphere freely, but prevent transmission of the reflected sunlight back to space. Many gases exhibit these "greenhouse" properties. Some of them occur in nature (water vapor, carbon dioxide, methane, and nitrous oxide), while others are exclusively human-made, such as chlorofluorocarbon compounds.

Prior to large scale industrialization the level of greenhouse gases in the atmosphere had remained reasonably constant for a long period. Since industrialization, however, the levels of several important greenhouse gases have increased by 25 percent. Carbon dioxide (CO_2) is a key green house gas. During the past 20 years, about three-quarters of human-made carbon dioxide emissions were from burning fossil fuels.

The greenhouse gases that are generated in solid waste processing and disposal that are of concern are: carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (NO_2).

Each of these gases can be divided into two categories, based on the source of the materials in the waste: (1) biogenic sources and (2) fossil sources.

In 2007, a King County, Washington study[16] compared the GHG for five technology options:

1. Mass-burn, waterwall facilities;
2. RDF with dedicated boiler;
3. Advanced thermal recycling (gasification/pyrolysis);
4. Landfilling with landfill gas capture and flaring; and
5. Landfilling with landfill gas combustion, using internal combustion engine.

The study examined the direct emissions from each process and fugitive emissions[17] but did not include the emissions associated with transportation of waste to the disposal facility.[18] The emission values in the King County report also included those that are avoided by replacing existing electricity generation emissions. The result of the King County study is that the GHG emissions from any of the conversion approaches are double that of landfilling with landfill gas utilization (Option 5), including landfilling without gas utilization (Option4).

In the case of King County, the electricity replaced is generated by hydro and natural gas. Further, the State of Washington does not recognize either all or part of refuse as a renewable fuel.

12.6.3 Water

Mass-burn and RDF incineration technologies require a water supply and all types of projects have a wastewater discharge. Besides domestic water for workers, potable water is required for the waste heat boilers.

Non-potable water may be used as cooling water for the steam condensers, but the large cooling water supplies necessary for condenser cooling are normally not available, and cooling towers or cooling water ponds are provided as part of the facility.

If a steam customer is the energy market, the water requirement may be increased significantly from that needed for electricity generation, assuming that the customer generally does not return condensate. Some projects may cogenerate steam and electricity for sale, such as district heating/cooling projects or those with a significant steam user in proximity of the WTE facility site.

Gasification and anaerobic digestion technologies will not necessarily use a boiler. They may generate a gas stream for use off-site and not require a condenser cooling water system.

[16] Comparative Evaluation of Waste Export and Conversion Technologies Disposal Options, King County, Department of Natural Resources and Parks, Solid Waste Division, June 2007 (Draft).

[17] Landfill gas capture in all landfills is never total. R. W. Beck, the author of the report, estimated an 80 percent capture and 20 percent fugitive emissions.

12.6.4 Residue Disposal

Another consideration is ash disposal. For all but the high-temperature thermal options and the anaerobic digestion system, an ash will be generated. Bottom ash will be discharged from the bottom of the furnace chamber, and fly ash will be collected by the air pollution control system.

Generally, the bottom ash will not be classified as a hazardous material, subject to ash testing and analysis. Fly ash, however, will have a higher concentration of heavy metals, and may also contain residual organics. As such, it would likely be classified as a hazardous material if it fails toxicity testing, unless it is combined with bottom ash, as is the current U.S. practice.

The fly ash can be treated with a fixative to prevent the leaching of hazardous constituents, so as to be classified as a non-hazardous material. There are a number of fixatives, which have achieved the regulatory requirements. The cost of a fixative must be compared to the options for ash disposal to determine the cost-effective solution for the ash. Part of this analysis would be determining if a market exists for the bottom ash, or for ash that has been treated with a fixative.

The solids residual from high temperature systems, such as plasma-arc or pyrolysis, may have a better opportunity for end-use applications and marketing. These glassy-type granules may be classified as non-hazardous and used in construction materials, or as a fill.

The residue from anaerobic digestion is nothing more than stones, glass or similar items, which is normally directed to a solid waste landfill.[19]

12.6.4.1 WTE and Ash

All incineration produces ash. WTEs produce two kinds of ash. The first residue coming off the grates in the boiler or fire box is referred to as bottom ash. Second, the solid particulate material removed from the combustion gases is referred to as fly ash. Bottom ash and fly ash contain heavy metals such as lead, cadmium, copper, and zinc, but in different concentrations. The two ash fractions can be combined or removed from the facility separately. All ash residue - bottom ash, fly ash or combined ash - must be tested, using the Toxicity Characteristics Leaching Procedure (TCLP), to determine if the levels of heavy metals render it hazardous under RCRA regulations. The vast majority of ash - bottom ash, fly ash or combined ash – disposed over the last 20 years from WTE facilities in the U.S. has tested nonhazardous. The combined ash amounts to 15 to 20 percent by weight and 4 to 10 percent by volume of the original quantity of waste going into a WTE facility.

The SWRAC research tour made a site visit to an ash monofill in Marion County, Oregon in July 2007. The monofill is only used for ash so there is no organic material to decay and so no methane is produced.

There have been processes applied to the Fly Ash so that it can be safe to use in certain types of construction. One example of such a process is the WES-PHix. This is a proprietary process that adds phosphoric acid to the fly ash to promote the formation of lead phosphate in order to limit the solubility of lead in the ash. Generally, the ash is transported from the WTE to a facility where then it is mined by being scooped up, placed on, and run through a series of conveyers, screens, and vibrating panels. The finds, material pulled out of the ash, are valuable in that they

[19] "Evaluation of Emissions from Burning of Household Waste in Barrels," USEPA, November 1997.

are metal, which is sold to scrap dealers, and coins which are sold back to the U.S. Mint. The remainder is ash that is sprayed with the WES-PHix process of Wheelabrator Technologies Inc. that, essentially, binds the material so that it will not leach the heavy metals.

Processes, such as the WES-PHix, create a product that is a substitute for gravel and can be used as a sub-base for the construction of roads or use in construction blocks, artificial reefs, and shoreline erosion control. States, however, are cautious about allowing this material used as a substitute for virgin material. State regulations demand that such material pass the TCLP requirements.

TCLP tests on ash were conducted over nine years at the Honolulu WTE facility known as H-Power. Two noticeable findings occurred. First, arsenic, cadmium, chromium, mercury, lead, selenium, and silver tested below the EPA limits and therefore were not considered hazardous. Barium, however, did not meet the TCLP requirements. Second, all the constituents, except for barium, saw concentrations go down over time. H-Power had done little removal of items, other than ferrous metals, from the waste stream that may account for this downward trajectory.[20] Should the County implement a WasteTEC facility or any other concentration process for refuse, the concentrations of metals will probably be lower than Honolulu because of Maui's small industrial sector.

Although ash generated from WTE in the U.S. is generally buried in a monofill, countries that have used WTE as a significant waste management tool are utilizing more of the ash for beneficial use. Germany uses 50 percent of the bottom ash in road bases and sound barriers on its autobahns. The Netherlands has a goal of using 80 percent of WTE residues. Currently, it uses 40 percent of the fly ash in its asphalt. Denmark began using its bottom ash in a beneficial way in 1974 in such things as sub-base for parking lots, bicycle paths, and paved roads.[21]

Binding processes, such as WES-PHix, are not solely used to develop products. If managers of WTEs can process fly ash so that it is not considered a hazardous material then it, like the bottom ash, can be placed into a Subtitle D, part 258, municipal solid waste landfill. This lowers the cost of disposal considerably.

One of the longest studies of leachate generation at an ash monofill was conducted at the ash monofill in Marion County, Oregon, where the Maui SWRAC members made a site visit to this facility. The EPA selected the site in 1986 to evaluate the amount and character of the leachate, the aging of the ash, and of the surrounding soils.

Table 12-5[22] shows the results of these tests. The first section reviews the findings from Cell 1, which was used as an interim ash fill and was only partially closed in 1990 but finally closed in 1997, and the second section contains the findings from Cell 2 which was opened in 1990.

[20] Wiles, Carlton & Phillip Shepherd.

[21] "Municipal Solid Wastes: Problems and Solutions," by Robert E. Landreth & Paul A Rebers: 185; also see EPA PowerPoint On uses of ash in other countries: http://www.epa.gov/region2/cepd/pdf/6frankroethelspresentation.pdf.

[22] Roffman, H.K. & Jeff Bickford, "Effects of Municipal Waste Combustion Ash Monofills Longterm Monitoring." Proceedings, Tenth International Specialty Conference on Municipal Solid Waste Combustor Ash Utilization, Arlington, VA, June 21-23, 1997; also summarized in H. Lanier Hickman Jr., American Alchemy: The History of Solid Waste Management in the United States, Forester Press, 2002, pp. 320-321.

Table 12-4 – Marion County WTE Leachate Tests

Cell 1: Constituent	1988 (5)	1989 (2)	1990 (5)	1991 (4)	1992 (1)	1993 (2)	1996 (4)	1997 (1)
Al	NA	810	ND	225	100	ND	ND	ND
Arsenic	218	53	1,044	1	ND	ND	ND	ND
Barium	NA	ND	ND	797	630	570	450	360
Cadmium	0.6	1.4	ND	1.8	2.5	8.6	16.5	ND
Chromium	19	ND	ND	2.5	6	2.5	ND	ND
Cu	ND	ND	ND	18	70	20	48	ND
Lead	31	13	ND	ND	79	ND	6	ND
Mercury	ND	ND	ND	ND	ND	ND	0.3	ND
Zn	200	250	2	20	510	30	215	ND

Cell 2: Constituent	1992 (1)	1993 (3)	1994 (5)	1995 (1)	1996 (4)	1997 (1)
Al	2,000	ND	680	350	ND	ND
Arsenic	ND	8	ND	ND	ND	ND
Barium	2,300	3,010	991	1,800	1,075	5,620
Cadmium	92	465	215	261	73	ND
Chromium	60	0.7	ND	ND	ND	ND
Cu	140	410	99	140	42	ND
Lead	41	63	20	100	5	ND
Mercury	ND	1	0.6	ND	0.2	ND
Zn	420	833	219	300	330	1,900

The numbers enclosed in parentheses (#) show the number of tests performed that specified year. “ND” stands for “not detected” while “NA” represents “not analyzed.”

The results of these tests are as follows:

- Metal concentrate in the leachates were all below EP-Toxicity and TCLP maximum allowable levels;
- Dioxin levels in all soil samples were below the 1-ppb recommended levels for residential soils;
- Metal contents of the soils were within regional and national levels;
- Concentration of metals in the soils near the monofill did not exceed those found in the background samples;
- Major constituents in the leachates were dissolved salts, primarily of chloride, sulfate, cadmium, potassium, and sodium.

When the ash is removed from the WTE facility, the scrubber residue from the air pollution control devices is also taken to the ash monofill with the ash. This residue is primarily gypsum (unreacted lime, calcium oxide, and calcium sulfate) that, once compacted with the ash in the monofill, will further react and immobilize heavy metals. When compacted, gypsum creates a near impermeable surface as SWRAC members experienced when walking atop Marion County’s closed cell of ash.

The studies on ash and the placement of ash in monofills have led to a general consensus among solid waste professionals that "…landfilling ash is really a no-brainer and its potential impact on the environment is essentially nonexistent."[23]

12.6.4.2 Recycling and WTE

Recycling and WTE have been considered at the opposite ends of the spectrum by many. EPA does not consider WTE a recycling process notwithstanding it transforms MSW into a beneficial energy product. The ash can be processed to recover metals and even coins and jewelry that otherwise would rest in landfills. Yet, a perception remains in the U.S. that WTE facilities slow rather than advance recycling activities.

In 2002, a survey of U.S. WTE facilities by the Integrated Waste Services Association took a look at the effect WTE facilities have had on local recycling efforts. "According to the U.S. Environmental Protection Agency," write the authors of this study, "the current municipal recycling rate in the U.S. is 28%. By comparison, 57% of the 98 WTE communities contacted for this investigation have a higher recycling rate. Further, the average recycling rate for all U.S. WTE communities is 33%. Ten years ago, WTE communities had an average recycling rate of 21% versus the national rate of 17%."[24] Simply stated, the balance among recycling and WTE is a matter of local choice, policy decisions, and program decisions. There does not have to be a perceived conflict; they can be implemented to coexist and support an overall goal of minimizing what ends up in a landfill and not wasted for some other beneficial use. Local public policy, programs, and practices need to be put in place which allocate how MSW is managed.

12.6.4.3 WTE and Maui County

Field research was conducted to see if the County would benefit from implementing a WTE process. One half of the evaluation was on the advantages and disadvantages of generating electricity which will be reviewed in this chapter. The second half of the investigation looked at developing significant recycling operations in conjunction with a WTE strategy.

The County's waste stream, both current and projected out to the year 2030, could sustain a WTE facility and a 54 percent recycling rate. Table 12-6 projects out the population in five-year increments, using 2005 as the base year, the MSW stream, the amount recycled and MSW available to go into a WTE facility. The table projects achieving the 54 percent recycling rate in 2010. The results were that the WTE facility with a rated capacity of 575 TPD at 90 percent availability would produce 144 TPD of ash and 14 megawatts of electricity.

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[23] H. Lanier Hickman Jr., American Alchemy, 2002: pg. 321. Mr. Hickman was the executive director of the Solid Waste Association of North America for 20 years and, before that, the director of operations for the Office of Solid Waste, USEPA.

[24] "Recycling and Waste-to-Energy: The ongoing compatibility success story," MSW Management Magazine, May/June 2003.

Table 12-5 – Current and Projected Waste Stream

	2005	2010	2015	2020	2025	2030
MSW Generated	339,241	366,921	389,219	414,617	441,128	467,864
Materials Recycled	122,313	197,599	207,576	218,880	230,669	242,386
MSW Disposed	216,928	169,322	181,644	195,737	210,459	225,478

12.7 Economic Characteristics of Waste Processing Technologies

The economic characteristics of a WTE facility include capital and operating costs and revenues. Table 12-7 provides an estimate of expected cost figures and associated performance data. Note that the costs are mainland U.S. costs and not adjusted for Maui.

A significant factor in the net operating costs is revenue from the sale of recovered energy and recyclables. The energy revenue is a function of negotiations between the facility operator and the energy markets, typically a utility, and may include, besides a power rate, revenue for capacity and a requirement for standby power. Capital equipment necessary for utility connections can also be part of the negotiations, and the listed figures are estimates that have to be developed and refined for specific sites and requirements during a procurement/development and negotiation process.

Table 12-6 - Facility Cost* and Performance Factor Estimates

Cost/Performance Parameter	Modular WTE (100 to 400 TPD)	Mass-burn WTE (200 to 750 TPD)
1. $ Capital Per Installed Ton	$120,000 to $150,000	$200,000 to $275,000
2. O&M Cost, not including ash disposal costs	$50 to 60 per ton	$45 to 50 per ton
3. Availability (net of scheduled and unscheduled downtime)	80-90%	90-95%
4. Steam production; assumes 5,200 BTU per LB waste feedstock	5,000 pounds per ton MSW input	6,000 pounds per ton MSW input
5. Electricity production; assumes no steam extracted and sold	➢ 350 kWh per ton net of in plant usage ➢ 0.012 to 0.016 MW per ton sold of daily capacity	➢ 470-550 kWh per ton net of in plant usage ➢ 0.02 to 0.027 MW per ton sold of daily capacity
6. Energy Revenue Sharing	10 percent typically; sometimes more for generation above guaranteed amounts	
7. Metals removal, primarily ferrous; assumes mixed MSW	2-5%, primarily ferrous	
8. Materials Revenue Sharing	50 to 80 percent; less value here so more given away	
9. Ash generation	30 to 35 percent by weight; 10 -15% by volume	25 to 32 percent by weight; 10 percent by volume
10. Ash Disposal Costs	$15 to 60 per ton; lower if landfill self-owned; higher if market facility used	

*Mainland numbers.
Source: GBB, September 2007; $ shown are costs estimated for U. S. mainland – costs here not adjusted for Maui.

12.8 Energy Market in County of Maui

12.8.1 Cost of Energy

The cost of energy in Hawaii and on Maui is generally related to Number 2 fuel oil costs. Fuel costs for electricity in Hawaii and on Maui are the highest in the United States. These costs will continue to rise as the world price of oil increases. Maui Electric (MECO) uses this fuel in its two diesel engine generator facilities on the Island of Maui which cost, in 2007, about $2.85 per gallon without road use taxes. The average retail cost of electricity in Hawaii in 2006 was $0.2072 per KWh. However, a WTE facility would not sell power at the retail rate unless it had a dedicated customer. Generally, electricity sales contracts to utilities like MECO are priced at the avoided cost rate, which for MECO is between $0.07 and $0.09 per KWh. Since WTE should be considered firm power, it is reasonable to expect MECO to also include in its purchase price a component to value capacity. In so doing, the value of electricity from a firm renewable source should increase to, perhaps, $0.15 per KWh.

12.8.2 Long-term Plan of Power Company

MECO has filed the required Hawaii Public Utilities Commission report that addresses its long-term plan to meet future energy needs. The state renewable portfolio standards require that 10 percent of the energy generation be renewable by 2010 and 15 percent by 2015. MECO will meet these by the addition of 10 MW of wind power in 2011. MECO is also investigating the addition of more distributed generation and conventional generating units between 2009 and 2026. The plan includes the possibility of a waste-to-energy or biomass facility. In discussions with MECO, they were receptive to purchasing electricity from a WTE facility as well.

12.9 Plan Recommendation for Feasibility Study

12.9.1 SWRAC Recommendation

The SWRAC voted unanimously for the County to pursue the feasibility of commercial technology alternative resource management. This recommendation is specifically for the advancement of a Maui County feasibility study utilizing established data and best practices.

The intent of this advice was for the County to review the alternative technologies by using the research that others, including Los Angeles County and City of Los Angeles, have recently amassed to save the County time and money. The County and its contractor should digest this new research and then do a feasibility study projecting County costs and revenue.

12.9.2 Feasibility Study

The feasibility study would:

1. Review viability of alternative conversion technologies using, at a minimum, the recent Los Angeles studies discussed below. The purpose is to consolidate new evaluations into a matrix of cost, viability for Maui, and review the environmental and economic risks/benefits.

2. Review market feasibility for WTE and any process acceptable to Maui from the developed matrix in item 1.
3. Develop a design/permit/build/operate timeline and cost estimate on the process chosen by County of Maui.
4. Provide an environmental impact study of the chosen process.
5. Provide an Energy Balance review of the chosen facility.

When performing a feasibility study for such a significant infrastructure development, the scope of work should include certain project development building blocks for the project to be advanced toward procurement, contractor selection, permitting, design/construction/start-up/acceptance testing and eventual commercial operations. These building blocks are summarized as follows:

- Limited and high alternative disposal costs
- Waste supply assured recognizing selected reduce/reuse/recycling/diversion goals and expected growth looking forward for at least 20 to 30 years
- Energy market(s) interested and ready to advance contract with known terms, conditions and pricing
- Assessment of energy savings gained by installation and use of WTE plant
- Estimation of amount of energy to be produced by WTE, kilowatts per year, percentage of Maui County needs, amount saved in oil consumption.
- Site for facility with good logistics for waste receipt, energy market(s), and residue disposal; site needs to be able to be permitted and be acceptable to neighbors
- Landfill for ash and by-pass secured and costs for same understood for at least 20-30 years forward
- Experienced contractor to advance proven technology and facility concept through project development, permit, design, construction, start-up, acceptance testing and long-term operations under fixed priced and performance-based long-term service agreements
- Capital to finance the cost for the development and implementation process; public ownership preference so asset remains in the public control and flow control assured
- Financability so that a high rating is received for the bonds and low interest rate achieved; establish assured revenues for paying for costs of the project net of revenues from the sale of energy and materials recovered from the ash residues
- Compatibility with a high level of recycling so that overall program in compliance with State law and local desires for diversion; recycling and reduction can be programmed to address waste stream growth looking forward as well
- Public support to accept adding this to the infrastructure
- Political will to carry out this major infrastructure improvement for the long-term sustainability of having this element as part of the County's integrated solid waste management system

12.9.2.1 City of Los Angeles and Los Angeles County Studies

SWRAC advised the County to not "re-invent the wheel" when doing the feasibility study on alternative disposal systems. It, SWRAC, advised the County to cull from a recent and exhaustive study performed by Los Angeles City and County to find out the standards and viability of the "unproven" technologies for transforming MSW.

12.9.2.1.1 City of Los Angeles

Phase I[25]

In 2004, the City of Los Angeles Bureau of Sanitation (Bureau) began a study to evaluate MSW alternative treatment technologies capable of processing Black Bin material (curbside-collected residential MSW) to significantly reduce the amount of such material going to landfills. The Bureau's overall objective was to select one or more suppliers to develop a facility using proven and commercialized technology to process the Black Bin material and produce usable by-products such as electricity, green fuel, and/or chemicals.

The first step of this project was to develop a comprehensive list of potential technologies and suppliers. About 225 suppliers were screened, and 26 suppliers were selected to submit their detailed qualifications to the City. In order to screen the technology suppliers, they were sent a brief survey based upon the technology screening criteria. The criteria applied were as follows:

- Waste Treatability: The supplier was screened on whether they have MSW or similar feedstock processing experience.
- Conversion Performance: The supplier was asked if their facility would produce marketable byproducts.
- Throughput Requirement: This criterion was already met because the technology passed the technology screen.
- Commercial Status: This criterion was already met because the technology passed the technology screen.
- Technology Capability: The supplier was asked if their technology had processed at least 25 tons/day of feedstock.

Of the 26 suppliers requested to submit qualifications, 17 provided responses. These suppliers and their technologies were thoroughly evaluated and an evaluation report was published in September 2005 with the findings and ranking of the 26 suppliers' technologies that had met the criteria.

A Request for Qualifications (RFQ) was prepared and provided to the suppliers that met the screening criteria. A detailed technical and economic evaluation of the suppliers that responded to the RFQ was completed. This resulted in the development of a short list of alternative treatment technology suppliers. In 2006, several suppliers were added to the short list, based on additional screening and a supplemental RFQ process.

Phase II[26]

On February 7, 2007, the City of Los Angeles released a Request for Proposals (RFP) soliciting competitive proposals for a development partner(s) for processing MSW utilizing alternative technologies premised on resource recovery. The development

[25] Request for Proposals for a Development Partner(s) for Processing Municipal Solid Waste Utilizing Alternative Technologies premised on Resource Recovery for the City of Los Angeles, February 5, 2007

[26] Ibid.

partner's(s') responsibilities were to finance, design, build, own, and operate (with the option to transfer to the City after 20 years) the resource recovery facility at a throughput rate of 200-1,000 TPD. The facility was expected to provide diversion from landfill of no less than 80% of the Black Bin material delivered to the facility. In addition, the City considered proposals from emerging/experimental technologies that could process less than 200 tons/day as a potential second facility for testing emerging technologies. The emerging/experimental technology suppliers were to meet requirements outlined by the City in the RFP in order to be considered for the potential testing facility. Proposers of emerging/experimental technologies that did not meet those requirements were not evaluated further.

12.9.2.1.2 Los Angeles County, CA

Phase I – Initial Technology Evaluation[27]

Beginning in 2004, Los Angeles County conducted a preliminary evaluation of a range of conversion technologies and technology suppliers and initiated efforts to identify material recovery facilities (MRFs) and transfer stations (TSs) in southern California that could potentially host a conversion technology facility. A scope of investigation beyond Los Angeles County itself was considered important, as stakeholders in the evaluation extended beyond the County, and the implications of this effort would be regional.

In August 2005, the evaluation report was adopted. Phase I resulted in identification of a preliminary short list of technology suppliers and MRF/TS sites, along with development of a long-term strategy for implementation of a conversion technology demonstration facility at one of these sites. The County intentionally pursued integrating a conversion technology facility at a MRF/TS site in order to further divert post-recycling residual waste from landfilling and take advantage of a number of beneficial synergies from co-locating a conversion facility at a MRF.

Phase II – Facilitation Efforts for Demonstration Facility[28]

In July 2006, the County further advanced its efforts to facilitate development of a conversion technology demonstration facility. The approach was multi-disciplined, including environmental analysis and constructability. Key Phase II study areas included:

- An independent evaluation and verification of the qualifications of selected technology suppliers and the capabilities of their conversion technologies;
- An independent evaluation of candidate MRF/TS sites, to determine suitability for installation, integration and operation of one of the technologies;
- A review of permitting pathways applicable to each technology and site combination;
- Identification of funding opportunities and financing means;
- Identification of potential County incentives (i.e., supporting benefits) to encourage facility development among potential project sponsors; and

[27] Los Angeles County Conversion Technology Evaluation Report ~ Phase II – Assessment, October 2007.

[28] Ibid.

- Negotiation activities to assist parties in developing project teams and a Demonstration project.

The report described progress to date on Phase II and represented a culmination of approximately one year of work conducted by the County. As of November 30, 2007, four companies have been selected to be issued a Request for Offers (RFO) early in 2008 for a demonstration to be constructed at any one of four sites by the selected vendor.

12.10 Summary

This chapter reviewed the current status of the alternative conversion technologies for transforming MSW to electricity or other consumable fuel. It reviewed the residual ash product from the process, the current status of the City and County of Los Angeles' study, and outlined the parameters of a feasibility study for the implementation of a WTE facility.

13. Funding, Organization, and Alternative Scenarios

This chapter provides the County an overview of alternative methods available to fund the County's solid waste services, organize itself to do that, and options to consider implementing for the future. Also, this chapter has an overview of funding options for the County to choose from when implementing a new ISWMP. It also explains the concepts of Full Cost Accounting (FCA) used both in the analysis of the financial data and in how this can be used by managers. There is a description of the types of financial material reviewed for the Full Cost Accounting FCA evaluation of the County's Solid Waste Division.

There are several topics that bear on the County's ISWMP as a whole, and on its implementation. These discussions, which are presented prior to the five alternative scenarios, are:

- Plan Funding Options Overview – different methods of paying for solid waste services
- Facility Procurement
- Public-Private Partnerships – methods of contracting and operating facilities and services, and associated risks
- Analysis of Current Costs

These latter topics impact the efficiency and effectiveness of the facilities and services. For example, when public-private partnerships are applied to the more technical facilities, they offer the County the benefit of single point responsibility for design, permitting, construction and operation of a complex project over a long-term period. They can also help minimize the risk the County takes on such a project.

Alternative solid waste management scenarios for the County are examined for their cost and revenue impact over a 20-year-plus planning period. The SWRAC advised the Solid Waste Division staff on these scenarios at its October 18, 2007 meeting. The five scenarios discussed in this chapter are:

Scenario I – Status Quo

Scenario II – Increase Recycling to 60 Percent

Scenario III – Increase Recycling to 60 Percent plus Waste-to-Energy (WTE)

Scenario IV – Increase Recycling Diversion to 60 Percent with Alternative Conversion Technology and place Lanai and Molokai Landfills on "Standby with Permit"

Scenario V – Increase Recycling Diversion to 75 Percent without WTE and place Hana, Lanai and Molokai Landfills on "Standby with Permit"

The goals are stated for each scenario, and the changes in the County programs, facilities and services are described. When new facilities are proposed, they are described briefly, in a conceptual manner, not in any engineering detail. Markets for the materials recovered under the scenarios are also discussed. For each facility and service, a budgetary cost has been developed and is presented. These costs are conservative and include high contingency factors that are estimated to reflect Maui location costs. Detailed costs will need to be developed from detailed engineering and cost analyses or preferably from actual procurement processes. An implementation timeline has been developed which shows the development tasks and approximate schedule for each project in the selected scenario.

The final portion of the chapter consists of the specifics of the scenario chosen by the Solid Waste Division to be implemented.

13.1 Plan Funding Options Overview

The funding of solid waste activities, particularly in older mainland communities, has historically been paid for through the General Fund with little direct connection to the service levels. But environmental legislation, potential liabilities, and rising cost of equipment and land have created situations where policymakers are looking at solid waste funding anew. U.S.EPA and the Governmental Accounting Standards Board have advised communities to move toward a fee for service basis. Such funding must ensure the following:

1. Sufficient and reliable revenues are generated to cover the operations costs, including debt service, of solid waste system programs;

2. Capital is raised to cover the necessary capital investments;

3. Revenues are generated to cover legacy costs such as closure and post-closure maintenance for closed landfills;

4. Equitable distribution of costs among residents and businesses (e.g., customers);

5. Transparency; and

6. Environmentally responsible practices of waste reduction and recycling.

Communities should evaluate their current and projected costs, anticipated growth, capital improvements and schedule, and any sources of revenue when preparing for a new or modified fee system. If possible, they should set assessments and fees at levels that do not require adjustment after the first few years. It is important to determine a fee's longevity in order to assure its political acceptability. Determining the time between fee increases will depend upon accurate cost data and sound revenue projections.

The goal is to establish a system of charges that is both equitable and predictable for all classes of generators. Just as communities have modified their solid waste systems to address the evolution of laws, technology, and public perception over recent years, they must also address the way revenues are raised to support the costs of modern solid waste systems. The current best practice is a fee for service approach so that citizens, or "customers," know exactly what their services are and what they cost is, based on the service actually received.

In the following sections, the various methods used by local governments to fund their solid waste systems are discussed.

13.1.1 Tipping Fees

Tipping fees are unit charges that are typically assessed per ton or per cubic yard at point(s) of disposal and/or processing. These are currently assessed at the Maui County landfills. Tipping fees can be set and adjusted based on revenue needs, waste quantity and system cost projections, and each waste hauler pays strictly for the weighed or measured quantity delivered.

Tipping fees have the advantage of being linked to the quantity of waste disposed; the more waste, the more revenue. They can be adjusted to pay for the costs of the entire solid waste system. This has the advantage of being simple but does not inform users of the cost of system components, such as collection or administration. In systems where there is competition for waste disposal, a tipping fee that includes the total system costs may be uncompetitively high, and waste haulers may leave the system for lower cost disposal.

Jurisdictions sometimes provide reduced tipping fees to recycling businesses and non-profit organizations to compensate for the residue of waste when processing materials. This policy is to encourage and foster recycling processing outlets.

Private waste haulers often criticize tipping fees because they may be sized to subsidize other services being provided by the local system, e.g., for those services offered residential waste generators. This occurs when a substantial share of the waste brought to a facility comes from residential, commercial and institutional sources, and when the municipality collects the residential waste and owns the disposal or processing facilities and recovers a portion of its costs through tax revenues or household assessments. The private sector also is concerned when there is a differential in charges between the private companies and the residential self-haulers who, in the case of the County, pay no tipping fee. In these situations, one set of users, usually the customers of commercial collectors, ends up subsidizing others.

13.1.1.1 Differential Tipping Fees

In order to encourage waste/recyclables to be delivered to a facility in a separated form, different tipping fees can be established for different materials, such as:

- Domestic waste
- Vegetative waste
- Pallets
- Tires
- White goods (appliances)
- Clean wood
- Treated wood
- Other

13.1.2 Utility or Service Fee

Utility fees can be charged to all users of the solid waste system. They can be a simple division of the full cost of the system divided by the number of users and billed monthly, quarterly, semiannually or annually. The utility fee can be billed on a separate bill just for solid waste service, or it can be added to an existing bill for taxes, water, sewage or other utility bill.

The City of Seattle has a city utility with departments for water, wastewater, solid waste and electricity, and issues a single itemized bill for all services. Some jurisdictions break the overall system charge into components so that the customers know the cost of each component.

Montgomery County, Maryland, does this and breaks its charges into:

1. System benefit charge,
2. Disposal charge based on a generator assessment,
3. Residential recycling collection charge,
4. Residential waste collection charge, and
5. Leaf vacuuming fee.

These all appear on individual County annual property tax bills, but are fees, not taxes.

Some communities use a similar system for residential customers and have the collection and/or disposal fees vary with the size of the container. For example, the City of San Jose, California provides containers from 20 gallons to 96 gallons and charges variable fees based on these sizes - the bigger the container, the higher the fee. Because San Jose does not charge for recycling collection, this variable rate structure has the result of helping promote recycling as San Jose also provides residences large recycling and yard waste carts without additional charge.

Increasingly, municipalities are exploring some form of variable rate fees based on the volume or weight of refuse. Such fees are called “Pay As You Throw” and are considered to be the least regressive form of payment. These are based on the concept that one who generates the more waste pays the higher fees.

13.1.3 Generator Assessments

Some communities, such as Palm Beach County, Florida, have implemented generator assessments at the residential and/or commercial level based on the class of generator. Generator classes include:

- Single-family households
- Multi-family households
- Commercial-business
- Office-related
- Retail
- Organics generators
- Industrial
- Construction & demolition contractors
- Other

Generation rates are determined for each class of generators based on local surveys or from an analysis of relevant studies. The fees would then be tied to the generation factors. For example, a restaurant operating seven days per week normally could be expected to have a higher rate of waste generation than a typical single-family home, and, accordingly, the fee to manage the restaurant's waste would be higher. Conversely, condominiums generate less than the typical single-family residence and should have a lower fee. In some cases, the factors will not match certain generators. An appeal process is used to adjust those generators who can make a case that the generation rate should be changed for them.

13.1.4 Sticker Fees

Many local governments have implemented sticker fees to fund part or all of their system. There are two types of sticker fees: (1) for the bag or container and (2) for a vehicle.

The by-the-bag or container system is used by Charlottesville, Virginia to fund a portion of its system. Residents or businesses purchase a sticker that they place on the bag or other container. This is a form of the variable rate or "Pay As You Throw" approach: one bag, one sticker; two bags, two stickers, etc.

In the second approach, the user buys a vehicle sticker that allows the user to enter the disposal facility. The stickers are usually valid for one year. In some cases, the jurisdiction may limit the amount of waste a resident may bring to the facility and/or charge an additional fee (for example, a per-bag fee) for excess waste.

The sticker fees are usually added to other fees, charges or taxes that support the system, and may be set to cover the costs of establishing and maintaining the drop-off or convenience center. Sticker fees help allocate the cost of certain solid waste system components to the users who benefit from the component. Usually, the generator avoids the cost of waste collection and benefits from hauling small vehicle loads without paying a tipping fee for each load delivered.

13.1.5 Improved Lot Assessments

Improved lot assessments are typically charged to the owner of an improved residential or commercial lot. They are usually applied as a flat fee in a special assessment on the annual property tax bill or as a special charge on a municipal utility bill, such as one for water or sewer service. These assessments provide a predictable source of revenue and can be applied in addition to or in lieu of a tipping fee. Predictability is important during periods of economic downturn and when increased tipping fees would be non-competitive in the region and promote waste diversion from the system to lower cost alternatives.

Flat fee assessments are reasonably easy to administer. However, the flat fee is not equitable, since each improved lot owner pays the same fee regardless of the quantity or handling difficulty of waste generated at that improved lot.

13.1.6 Impact Fees

Some communities are using development impact fees – scheduled charges applied to new residential and commercial development - to finance infrastructure in high-growth areas. These fees provide revenue for the construction or expansion of facilities.

Although use of these fees to finance solid waste facilities has been limited, they are being considered more frequently as a way to raise money, particularly in rapidly growing communities. Development impact fees may be assessed at the building permit stage to pay for a portion of landfill expansions, collection equipment, recyclables processing, transfer stations and other capital improvements.

Impact fees typically do not cover the major share of capital cost for new or expanded facilities. In some states, they must be authorized by the state legislature. The courts have ruled invalid impact fees that were found to be unreasonable and unrelated to the benefits received by those who pay the fees.

13.1.7 Franchise or Licensing Fees

In some jurisdictions, private haulers are granted exclusive or non-exclusive franchises to collect waste/recyclables in the community or unincorporated area of a county. The rate the hauler charges the customers can include a pre-set franchise fee set as a percentage of service fees charged to its customers. The percentage/fee can be sized to cover actual costs for administering the franchise as well as providing other services to the franchisee. A community may do the billing on behalf of its exclusive franchisee, which is done in Scottsville, VA. In this case, collection of the franchise fee can be made along with the service fee.

When a community licenses private hauler vehicles, it can apply a greater than nominal fee for each vehicle registered as a method to raise revenue. These fees could be sized to account for a portion of the services provided by the local waste management system. Additionally, the vehicle fees should be tied to the volume of the vehicle, i.e., recognizing the amount of waste/recyclables it can collect.

13.1.8 General Funds and Taxes

Traditionally, general funds and taxes, usually property taxes, are used to pay for services provided by local governments. For solid waste services, this has also been the case in many communities. However, as local governments, or authorities, manage solid waste services on an enterprise basis, the continued use of general funds and taxes becomes more limited or even totally eliminated. Nonetheless, general funds/taxes can continue to provide a portion of revenue requirements. Certainly, if an enterprise fund has a shortfall in revenue, having a general fund make-up or rate covenant may be required to come into play to keep the enterprise fund whole.

13.1.9 Bonding

Jurisdictions generally sell bonds to fund their large capital investments. These have lower interest rates than commercial loans or corporate bonds because they have a lower risk due to the stability in the revenue generated from the jurisdiction’s taxing power. Such bonds are called General Obligation Bonds and are the most prevalent type of bonds utilized by jurisdictions. The bonds from a jurisdiction are rated and the rating impacts interest rates. Jurisdictions with a history of financial problems will have a lower rating for their bonds and, hence, a higher interest rate.

Jurisdictions can also issue bonds to finance specific revenue-producing projects, and the repayment of such bonds is financed by the revenue generated by the project and not by the taxing power of the jurisdiction. These are known as revenue bonds.

13.2 Facility Procurement

The scenarios explained in this chapter have items such as fleet maintenance shops, material recovery facilities, office space, waste-to-energy facilities, and other structures in them. *What methods can the County employ to develop and build such structures?* There are three basic approaches used by local governments to procure facilities:

1. A&E - Architect and engineering firm (A&E) develops bid packages. Under this method, the owner or jurisdiction (County) hires an A&E firm to develop detailed specifications and drawings for the new facility. These detail the thickness of concrete, number of reinforcing rods, exact dimensions, etc. Most road procurements follow this method. These specifications are attached to a standard construction contract and advertised for bids to construction firms that do this type of work. The lowest qualified bidder wins. The owner or its A&E firm is responsible for making sure what is built is what was specified. Once the facility is completed, the owner accepts the risk that it will work and would need to decide who is going to operate it.

2. Turnkey – Under this method, the owner and/or its consultant documents the functional requirements for a facility. An example of functional requirements might be: ”….a materials recovery facility, for example, that is capable of processing 200 tons of recyclable materials in eight hours, receiving and unloading ten collection vehicles per hour, producing salable products for which specifications are provided and resulting in no more than 10% residue….” These functional requirements are documented usually in a request for proposals. The Proposers would provide all design and engineering, equipment and construction in one “turnkey” package. These allow the owner to review the approach proposed to fulfill the functional requirements and evaluate these against the cost of each approach to decide which is the most cost effective. Before the MRF would be accepted by the owner, the turnkey contractor would conduct an acceptance test to demonstrate that the MRF meets the specifications.

3. Full Service – This method is an extension of the turnkey method. Because of the specialized nature of the facility or for other reasons, the owner adds to the turnkey method the requirement that the contractor will operate the facility for the initial operating period. In this case, the proposals submitted to the owner must include not only the capital cost of providing the facility but the annual operating and maintenance costs for each of the years in the initial operating period.

13.3 Public-Private Partnerships and Risks/Rewards

As can be seen in the procurements methods above, different roles and responsibilities are assigned to different members in a public-private partnership. In addition, the risks associated with the facility are distributed differently in each method. For example, under the A&E method, the risk that the facility will work as desired is shared between the A&E firm and the jurisdiction. In the case of the turnkey and full-service methods, the contractor bears the risk that the facility will work when completed. Also, under the full-service method, the contractor accepts the operational risk associated with the facility on a day-to-day basis.

In the solid waste industry, as in other industries, individuals and companies accept risk when they feel that there is an adequate reward. When the reward is too low, the individual or company will go out of business. In other words, the jurisdiction would have to pay its private partner to take any risk involved in a service or facility. Therefore, the jurisdiction will need to evaluate each potential public-private partnership to determine which risks and rewards it wants to accept and which it believes are best assigned to the private partner.

These risks and rewards, as well as other responsibilities, will need to be fully documented in the project contracts. Drafting of these contracts, especially for the more complex projects, generally is done by specialized law firms and consultants. Table 13-1 shows the assignment of various risk elements under the three procurement methods.

For more complicated and technical projects, the full-service procurement is regarded as a best practice. In many instances, e.g., waste-to-energy, the technology is proprietary and owned by the service provider. Using the full-service procurement method, there is a single point of responsibility for the project performance which minimizes the jurisdiction's risk.

Table 13-1 - Risk Assignment under Alternative Procurement Approaches

Risk Element	Risk Assumed By		
	A/E Procurement	Turnkey Procurement	Full-Service Procurement
	Capital Cost Risks		
Capital costs overruns	Owner	Contractor	Contractor
Additional capital investment to achieve required operating performance	Owner	Contractor	Contractor
Additional facility requirements due to new state or federal legislation	Owner	Owner	Owner
Delays in project completion which lead to delays in revenue flow and adverse effect of inflation	Owner	Contractor	Contractor
	Operation and Maintenance Costs Risks		
Facility technical failure	Owner	Contractor	Contractor
Excessive facility downtime	Owner	Owner[1]	Contractor
Underestimation of facility O&M requirements (labor, materials, etc.)	Owner	Owner[1]	Contractor
Insufficient solid waste stream	Owner	Owner/ Municipalities	Municipalities
Significant changes in the solid waste composition	Owner	Owner	Owner/ Contractor
Changes in state and federal legislation which affect facility operations	Owner	Owner	Owner
Inadequate facility management	Owner	Owner[1]	Contractor
Underestimation of residue disposal costs	Owner	Owner[1]	Contractor
	Recovered Product Income Risks		
Overestimation of energy recovery efficiency of technology	Owner	Contractor	Contractor
Significant change in solid waste composition	Owner	Contractor	Owner/ Contractor
Changes in legislation which affect energy production and/or use	Owner	Owner	Owner
Overestimation of solid waste quantities	Owner	Owner	Municipalities
Significant adverse changes in the market financial condition or local commitment	Owner	Owner	Owner/ Market
Downward fluctuation in the price of products	Owner	Owner	Owner
Inability to meet energy market specifications	Owner	Owner[1]	Contractor
	Tipping Fee Income Risks		
Diversion of waste to other competing facilities	Municipalities	Municipalities	Municipalities
Overestimation of the solid waste stream	Owner/ Municipalities	Owner/ Municipalities	Owner/ Municipalities
Adverse changes in participating communities' fiscal condition	Owner	Owner	Owner

[1]Modified turnkey procurements may provide for intermediate or long-term contractor facility operations, which could lead to further risk assumption by the private contractor.

13.3.1 Management Using FCA

The USEPA recommends the Full Cost Accounting system (FCA) for solid waste management as a best practice. The goal of FCA is to capture all costs and revenues associated with providing solid waste services.

The term "accounting" is an unfortunate term because it conjures up the picture of a person counting invoices, pressing a total button, and the job is done. The USEPA's Full Cost Accounting was never seen to be a static, immutable procedure that, once done, should not be used. It is a tool for managers to understand the components of the costs of an operation, to work with supervisors of these operations so they know the cost components as well, and to regularly seek ways to make the system more efficient.

The application of FCA to activity management on an ongoing basis often leads managers to "discover" unnecessary expenses, increased efficiencies, costs created by doing "work" for other departments, and promotes accountability on the part of supervisors and managers. Managers of solid waste operations may hold monthly meetings with each supervisor of an operation under his or her management and go over, line by line, the expenses and revenues (if any) for the previous month. This is often a learning process for both the manager and the supervisor because the manager will see the details of the operation by way of expenditures, and the supervisor will grasp the financial reality of the decisions made and how those decisions are translated into the financial tracking methodology of the department. This confluence of learning, tracking, and accountability will create ideas to make adjustments to the operations so that the cost-to-benefit ratio is better.

Some managers use FCA as the basis for zero cost budgeting. Some jurisdictions are accustomed to taking the previous year's budget and adding or subtracting a certain percentage for the following year. FCA provides the manager with tools to assume that each budget will be built anew each year. The supervisor, who now is trained on FCA and understands the components of his/her operation's cost/revenue, develops a proposed budget from zero and builds it block by block.

Naturally, at first, the supervisors are resistant to taking on this new task. Yet, many thrive on the knowledge it provides them and the chance to have an influence on making their operations function better. The process may allow the supervisor to prove that a certain program has been under-funded even though the work never diminishes, or that, if a different type of equipment were purchased and used, then productivity would go up and cost per unit would go down.

13.4 Analysis of Current Costs

The FCA model was constructed using USEPA guidelines. It examines the Solid Waste Division's Fiscal Year 2006 expenses and revenues. The financial model was constructed with information gathered during the financial research conducted. The consultants received this information from the Division and supplemented it with information from the Department of Finance. The purchase price of major equipment was collected and depreciation/replacement schedules were created.

In addition, all personnel costs were gathered. These included regular wages, night differential, overtime, standby, temporary assignment, premium pay, and the fringe benefits, which include the retirement system's charges, Social Security and Medicare, unemployment, worker's compensation insurance, public employee health fund, and leave. There were discussions with managers from the Highways Division to ascertain the level of solid waste work performed by its personnel but not directly paid for by the Division. The County provided the land value of its properties based on former appraisals and estimated value of existing structures. The County's Comprehensive Annual Financial Report (CAFR) was reviewed. The Division's object accounts were reviewed. These are account code identifiers where expenses and revenue are charged. Considerable time was spent with Division personnel understanding these object accounts and examining specific expenses to assure that they were correctly placed under the right activity and location.

The costs in the model are allocated to the activities and locations for the Division. This structure is not currently used by the County in its budget, thereby creating differences between the two.

The County's FCA model was developed by looking at the final expenses and revenue that occurred in the County's solid waste operations for the Fiscal Year 2006. All expenses related to administration and operations were taken into account and placed both with the activity performed and the location where it was performed. Since the County's current cost tracking does not provide this level of detail, numerous discussions were held with personnel in both the Division of Solid Waste and the County's Finance Department. In addition, every solid waste management facility in the County was visited to make direct observations and take pictures.

Personnel and equipment costs were allocated to the activity performed and the location where that activity occurred. For example, an employee who spends most of his/her time collecting curbside garbage during the week may spend a certain number of hours collecting white goods each week. The total hours worked were then allocated to specific activities. For example, if an employee spends 80 percent of the work week collecting curbside garbage and the remainder (20 percent) picking up white goods, that employee's cost was allocated 80-20 to these specific activities.

In order to maintain a similar look and feel to the budget currently used by the County, the FCA model consists of the same four activities used today: Collection, Diversion, Disposal, and Administration. Managers can use this activity-based management model from the highest level down to the specifics of activities and locations. This provides the manager with the ability to see how changes in specific locations and activities affect not only overall cost and cost per ton of the individual programs but the effect on the whole solid waste budget. The ability to financially zoom in and out of the Division's operations provides the manager with a greater ability to fine-tune operational activities and enhance efficiencies.

The Status Quo scenario provides the foundation for this FCA financial model. At the lowest level, the model has a matrix structure where costs are allocated by activity and location. Table 13-2 shows the activities and locations where these expenses and revenues are generally tracked in the FCA model.

Table 13-2 - FCA Model Activities and Locations

Activities	Locations
Collection	Hana
Diversion	Lahaina/Olowalu
Disposal	Lanai
Administration	Makawao
	Wailuku/Central Maui
	Molokai

13.4.1 Division Costs in FCA Model Format

Table 13-3 looks at the Division as if it were a balance sheet of a business. (In accounting used by local governments, this is referred to as an "Enterprise.") In short, it looks at the Division to see how the revenue it generates compares to its expenditures. In this display, the activity, Administration, has been allocated to each of the three line activities.

This high-level view does not include revenue to the Division from the County's General Fund. The result is a $5.8-million-dollar shortfall in revenue in FY2006 as shown in Table 13-3. In the scenarios evaluating the County's alternatives, this format without the General Fund contribution will be used. It identifies the Division shortfall and makes no assumptions about which funding approach, discussed in Section 13.1, will be used.

Table 13-3 - Full Cost for FY 2006 without General Fund Revenue

FCA FY 2005-06 Without General Fund Revenue	Collection	Diversion	Disposal	Total
Expense	$4,962,290	$5,454,904	$8,407,707	$18,824,901
Revenue	$3,354,457	$2,858,279	$6,766,345	$12,979,081
General Fund Contribution	$0	$0	$0	$0
Excess/ (Shortage)	($1,607,832)	($2,596,625)	($1,641,363)	($5,845,820)
Number of Employees	49.2	4.4	31.4	85
Number of Accounts	24,106	NA	NA	24,106
Number of Tons	$47,685	101,342	201,889	303,231
Expense per Ton	$104	$54	$42	$62
Excess/(Shortage) per Ton	($34)	($26)	($8)	($19)

When a jurisdiction's budget is reviewed and a transfer of monies from the general fund to the Division is made, making the ending balance between expenditures and revenue $0, it is assumed that all the costs have been covered. Government accounting, however, works differently than a household's or a business' budget. The Division's budget does not include various costs such as facility construction, land cost, debt interest, and the work the Highways Division does for the Solid Waste Division. These cost elements were taken into account in Table 13-3. However, Table 13-3 did not include any revenue made by a General Fund contribution. When the General Fund contribution is added, the shortfall between expenses and revenues is reduced to $3.0 million as shown in Table 13-4.

Table 13-4 - Full Cost for FY 2006 with General Fund Revenue

FCA FY 2005-06 With GF	Collection	Diversion	Disposal	Total
Expense	$4,962,290	$5,454,904	$8,407,707	$18,824,901
Revenue	$3,354,457	$1,685,352	$6,766,345	$11,806,154
General Fund Contribution	$913,095	$1,901,930	$1,177,363	$3,992,388
Excess / (Shortage)	($694,737)	($1,867,622)	($464,000)	($3,026,359)
Number of Employees	49.2	4.4	31.4	85
Number of Commercial	24,106	NA	NA	24,106
Number of Tons	47,685	101,342	201,889	303,231
Expense per Ton	$104	$54	$42	$62
Excess/(Shortage) per Ton	($15)	($18)	($1)	($10)

Closure and Post-Closure: Active landfill cells fill up and have to be closed. The cost of the labor, material, and engineering are calculated in the closure cost of that cell. When all the cells at the landfill are closed and no burial activity occurs anymore, then the USEPA requires that care after closure takes place for no less than 30 years. Governmental Accounting Standards Board (GASB) Number 18 "Accounting for Municipal Solid Waste Landfill Closure and Post-Closure Care Costs" requires that the responsible governmental owner of the landfill allocate funds for these post-closure activities in their financial statements. GASB 18 means, then, that a municipal government must recognize the expense of these future expenditures on an annual basis.[1]

The FCA model accounts for the closure and post-closure expense discussed in GASB 18. Table 13-5 shows this by showing both the annual and the 30-year total for each of the active landfills managed by the Division.

Table 13-5 – Post-Closure Care Costs

Landfills	Annual	30-Yr Total
Central Maui Landfill	$407,420	$12,222,600
Olowalu	$64,166	$1,924,993
Makani	$47,153	$1,414,578
Kalamaula	$73,955	$2,218,664

When the Full Cost methodology is applied, the Division neither generates enough revenue through its fee for services nor through the General Fund subsidy to cover the costs.

Table 13-6 shows a comparison of expenses of the Division, by activity, to an estimate of integrated municipal solid waste management systems in the U.S. as a whole. It indicates that diversion activities (collection and processing) of the Division are nearly at the national average. Collection of refuse, however, appears to take up a smaller percentage of the Division's budget than the national average because the County

[1] See http://www.gasb.org/st/summary/gstsm18.html for further details on GASB 18.

only collects a fraction of the residences. This could be accounted for by the current limited service - for example, no curbside recycling collection - which will change when the currently planned universal collection is implemented.

Table 13-6 - Comparison of Maui County to U.S. Average Costs

FCA FY 2005-06	Collection	Diversion	Disposal	Total
Expense	$4,962,290	$5,454,904	$8,407,707	$18,824,901
Percentage	26%	29%	45%	100%
US Integrated MSW Management	42%	28%	30%	100%

Collection has historically been a labor intensive activity, and the competition for staff is keen in Maui County. Table 13-7 shows the distribution of labor among the three activities. Collection utilizes the most labor. The Division has been moving toward automated collection for more efficient application of labor. Administrative costs which were $2.2 million in FY2006, amount to 12 percent of the overall expenses.

Table 13-7 - Full Cost for FY 2006 without General Fund Revenue

FCA FY 2005-06	Collection	Diversion	Disposal	Total
Expense	$4,962,290	$5,454,904	$8,407,707	$18,824,901
Labor	$2,733,386	$305,546	$1,562,430	$4,601,362
Percentage Labor	59%	7%	34%	100%

The non-General Fund revenue received by the Division is primarily from two sources: trash collection fees and disposal tipping fees. The residents who elect to have County curbside collection are billed by the Division for this service. Companies who bring waste to the Central Maui Landfill and the other disposal facilities pay tipping fees at the landfills based upon the quantity. In FY2007, the tipping fee was $51 per ton with a $4-per-ton fee for recycling. In FY 2008, this went to $53 for landfill and $10 for recycling resulting in a tipping fee of $63 per ton.

These fees amount to 64 percent of the total revenue needed to cover solid waste costs. The remaining 36 percent is a subsidy from the General Fund; or from the County's taxpayers generally by way of unencumbered property taxes. Table 13-8 shows the Division's sources of revenue and their allocations to the activities.

Table 13-8 - Allocation of Division Revenues

Revenue By Activity 2006						
Object	Description	Collection	Diversion	Disposal	Admin	Total
Grant Revenue		$0	$0	$0	$0	$0
Revenue						
32	Licenses and Permits	$0	$0	$0	$390	$390
34	Charges for Current Services	$0	$0	$0	$0	$0
341	General Government	$0	$0	$0	$250	$250
344	Sanitation	$3,322,220	$0	$6,745,113	$0	$10,067,333
345	Waste Management	$0	$0	$0	$390	$390
37	Other	$0	$0	$0	$55,388	$55,388
Interfund Transfer - Revenue						
740	General Fund	$0	$1,172,927	$0	$0	$1,172,927
741	Special Revenue Funds	$0	$1,610,000	$0	$0	$1,610,000
Total Revenue		$3,322,220	$2,782,927	$6,745,113	$56,418	$12,906,678

13.4.2 FCA Model Assumptions

When long-range projections are made, financial, social, and environmental conditions must be assumed. With an FCA model, the assumptions also delve into the meaning of specific object codes and allocation of expenditures because jurisdictions have not tracked the expenses down to this specific level. What follows is a listing of the assumptions in the financial model. This is a listing of subjects representing where assumptions were made. The model allows for changes to these assumptions if more accurate information is provided. The assumptions are listed under the categories to which they belong. For example, assumptions made in the collection activities are listed under the category of "Collection."

<u>Administration</u>

- Costs associated with administration are accumulated separately and then allocated to the activities and locations areas based on the labor costs of the activities.

- A fringe factor of 63 percent is used and its components are shown in Table 13-9.

Table 13-9 - Fringe Factor Cost Elements and Percentage

Category	Object	Financial Category	Percent
Retirement	6370	Retirement System Charges	13.3
Health, etc.	6320	Hawaii Public Employee Health Fund	15.1
Leave	5101	Regular Wages	18.3
FICA/Medicare			7.7
Unemployment			5.8
Worker's Comp			3.0
Total			63.2
Total Proposed by Finance			63.0

<u>Capital Improvement Projects</u>

- Fleet Vehicle Replacement is allocated based on quantity (tons).

- Annualized capital cost is spread over the useful life of equipment.
- There are some County equipment with unknown purchase dates. The model assumes, then, the purchase date for such equipment to be 2004.
- The solid waste debt is defined as Capital Improvement Project (CIP) costs for land purchases, construction, and equipment bond fund. It does not include Operations and Maintenance capital costs.

Revenue

- Funds are assumed to be transferred from the Division budget to pay the Highways Division for refuse collection.
- License and Permits (Object Code 32) is assumed for Collection Administration.
- General Government (341) is allocated across activities.
- Sanitation (344) is assumed to be allocated to $6.7 million from landfill tip fees and $3.3 million from refuse collection fees allocated by accounts; landfill tip fees are further allocated based on quantity (tons) and for specific material types;
- Waste Management (345) is allocated across activities.
- Other (37) is allocated across activities.

Interfund Transfer Revenue:

- General Fund (740) transfer is allocated to all activities currently performed by Division based on expenditures.
- Special Revenue Fund (741) is payment by Wastewater for co-composting of sludge and is allocated to Diversion at the Central Maui Landfill.

Land/Building

- The allocation of leased land value for facilities with known acreage based on County land appraisal values.
- Leased land is estimated using known acreage and the average appraisal values escalated to 2006 dollars using the CPI;
- Useful life for furniture and other equipment is 10 years; and
- Land capital cost is amortized over 20 years.

Employees – Full-Time Equivalents (FTE)

FTEs are assigned based on known data from Finance or allocated by activities or quantity (tons). For example, Hana is allocated 3.1 FTE because it includes 2 FTE at the Hana Landfill, 0.6 FTE for Hana Collection and 0.5 FTE for Hana Diversion (based on tons diverted).

Consumer Price Index (CPI)

The consumer price index used is published by the U.S. Bureau of Labor Statistics for Honolulu. For the five-year period, 2002 through 2006, it averaged a 3.27 percent increase per year. This five-year average is used to calculate escalation of expenses in the future projections. When applied in the FCA model, the following formula is used: Ax(1+r)^n, where: A= amount, r=rate and n=term in years.

Closure and Post-closure

When a landfill closes and closure costs are known, annual costs are calculated.

Abandoned Vehicle Program

Administrative time is allocated to this activity as is the time by the abandoned vehicle supervisor, coordinator, and clerk III.

Collection

- Lanai Landfill costs include costs for landfill and collection.
- Lanai collection costs are based on one landfill employee collecting refuse one day per week.
- Allocation of Lanai Landfill costs is to collection activity except for object code 6012 “Construction Materials” which is assumed to be landfill activity.
- Hana and Molokai collections are performed by the Highways Division.
- Costs for Hana and Molokai collection are estimated based on costs for rear-loader collections by the Division.
- Although most financial allocations are made using labor hours, the expenses for rolling stock are made on number of equipment items.

Diversion

- Abandoned vehicle/scrap metal costs were allocated to Central Maui, Hana, Lanai, Molokai, and Olowalu based on quantity (tons).
- Site improvements for scrap metal are allocated by quantity (tons).).
- Central Maui Landfill operation costs include a contract with Maui Disposal to operate the Olowalu Convenience Center. The contract expense is allocated to disposal and diversion based on quantity (tons).
- Molokai Landfill operation costs include a contract with Maui Disposal for diversion. A portion of this contract is for scale house operations, and this is allocated to disposal activities based on quantity (tons) and the rest to diversion.
- Diversion and disposal activities at Lanai and Hana Landfills have costs allocated based on quantity (tons).

- Contract with SOS Metals Island Recycling at Hana is allocated to scrap metal in Hana.

- Both 9172652 and 917286 (Solid Waste Alternatives and Alternative Programs, respectively) are diversion program costs.

Disposal

- Disposal quantity (tons) collected at Wailuku, Olowalu, Lahaina, Makawao are placed in Central Maui Landfill.

- Disposal quantity (tons) collected at Lanai are placed in the Lanai Landfill.

- Disposal quantity (tons) collected at Hana are placed in the Hana Landfill.

- Disposal quantity (tons) collected on Molokai are placed in the Molokai Landfill.

Estimated Fuel Use

The Division provided fuel cost by activity when data were available. Otherwise, it was estimated by the kind of activity and the equipment used.

13.5 Organizational Structure

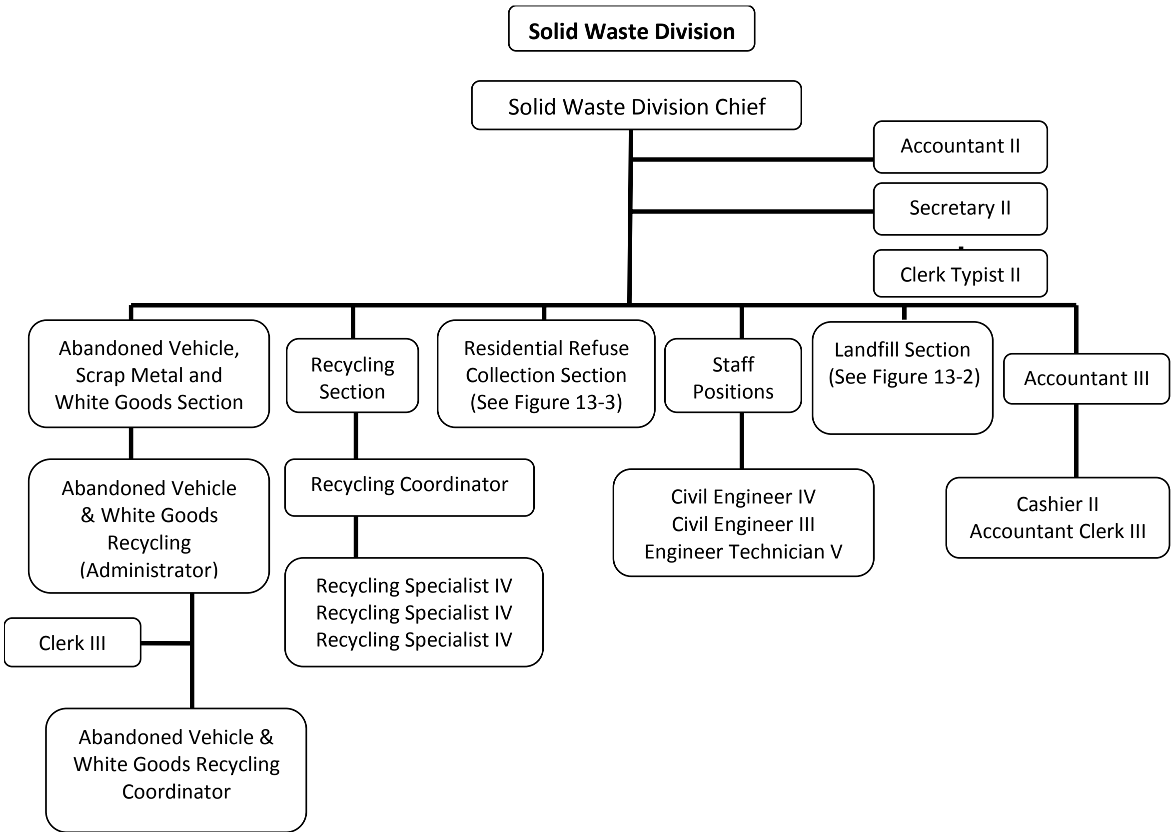
The Solid Waste Division Chief manages the Division and reports directly to the Director of the Department of Environmental Management (DEM). Currently, the Division's and DEM's administrative office is located in leased offices in Wailuku. The Division has five sections:

1. Administration,
2. Recycling Section (Diversion),
3. Residential Refuse Collection Section (Collection),
4. Landfill Section (Disposal), and
5. Abandoned Vehicles.

Each of these sections is described in the following paragraphs, and the linkages are shown in the organization chart in Figure 13-1.

Figure 13-1 - Solid Waste Division Organization

(Source: County of Maui)



Administrative Section: This group includes a combination of diverse positions that support the Chief and Division activities. The engineering group consists of two Civil Engineer positions and an Engineer Technician. There are five remaining positions in the Administrative Section: Accountant III, Secretary II, Clerk, and two Cashiers positions.

The engineering group reports directly to the Division Chief. The engineering group supports the Division Chief in managing all the closed landfills, expansions on the active landfills, and all matters related to the State's Department of Health, with one Engineer housed at the Division's offices and the other at CML. These include the resolution of Notices of Violations (NOV) given to the County by the State Department of Health over the past year and the implementation of corrective action.

The Cashier handles all the payments made by customers for residential refuse collection and landfill disposal. For specified hours each week, residents can come into the Wailuku office and sign up for or discontinue collection services. Representatives of commercial entities can also come in to the office to create or manage their accounts to dump at the landfill.

The Accountant III position handles the invoicing and general account and budget information for the Division.

Recycling Section: The Recycling Coordinator manages this section and reports directly to the Division Chief. Currently, the section staff consists of three Recycling Specialists. One of the Recycling Specialists is responsible for diversion programs on the Island of Lanai and a second for the programs on Molokai. The Section is located in the Division's offices in Wailuku. The responsibilities of the Recycling Section are recycling education, oversight of used motor oil collection sites, oversight and enforcement of ADF glass recycling, contract oversight for drop-off facilities and redemption centers, grants to local groups to benefit diversion, the creation of new recycling programs, the tracking of the quantity of diverted materials by facility both for the County's programs and the private sector. These data are annually used to compute the County's recycling rate.

The Recycling Section provides grants to divert hard-to-divert, post-consumer materials. Examples of such grants include Community Work Day and Habitat for Humanity for electronics recycling and the Puaa family pig farm for commercial food waste. The Recycling Section holds a grant application workshop during the year to help educate the public about the grant program, including application and utilization requirements.

The Recycling Section manages the Recycling Hotline, the recycling website, and answers phone calls and emails from citizens and businesses about recycling and solid waste.

Abandoned Vehicle, Scrap Metal and White Goods Section: This section (Abandoned Vehicles) is included in the Solid Waste Division. The organization chart in Figure 13-1 shows the assignment of Abandoned Vehicles in dashed lines reflecting this status.

Landfill Section: This section manages the active and closed landfills. Figure 13-2 illustrates this section's organization. The engineering group within the Administration provides support on closed landfill monitoring and engineering, as discussed above. The Central Maui Landfill (CML) is assigned a Landfill Worksite Supervisor, Landfill Equipment Operator, Attendant, Laborer, and Cashier positions.

The authorized Hana Landfill staff consists of four positions: a Working Supervisor, Operator, Attendant, and Laborer. These staff report to the Landfill Supervisor at the CML.

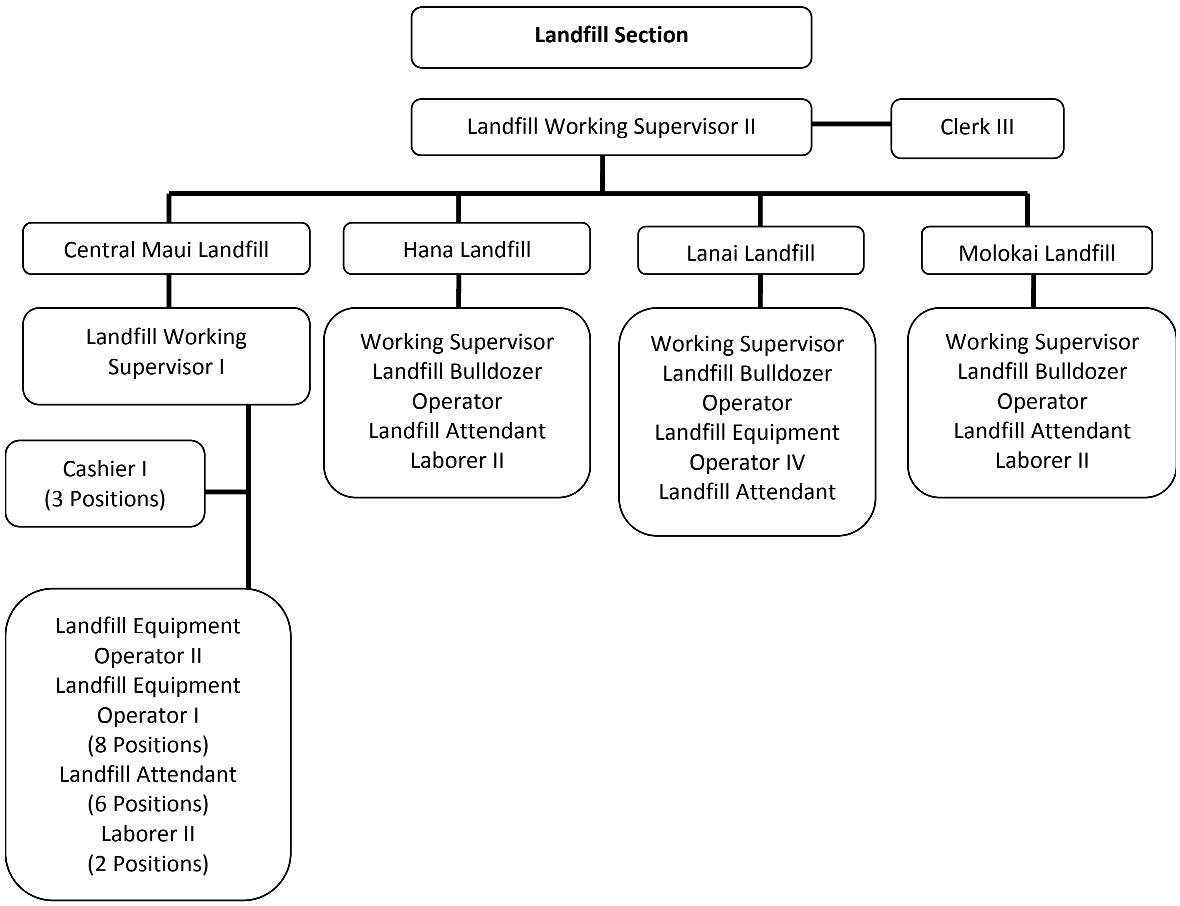
The authorized Lanai Landfill staff consists of three positions: a Working Supervisor, Operator, and Attendant. These staff report to the Landfill Supervisor at the CML. On Lanai, workers under the Disposal Landfill Section perform the curbside collection of garbage.

The authorized Molokai Landfill staff consists of three positions: a Working Supervisor, Operator, and Attendant. However, the Molokai Landfill has a scale and contracts out the scale house activity to a contractor.

The current supervisor of all the landfills is the Landfill Worksite Supervisor of the largest landfill in the County's system, the Central Maui Landfill.

Figure 13-2 - Current Landfill Section Organization Chart

(Source: County of Maui)

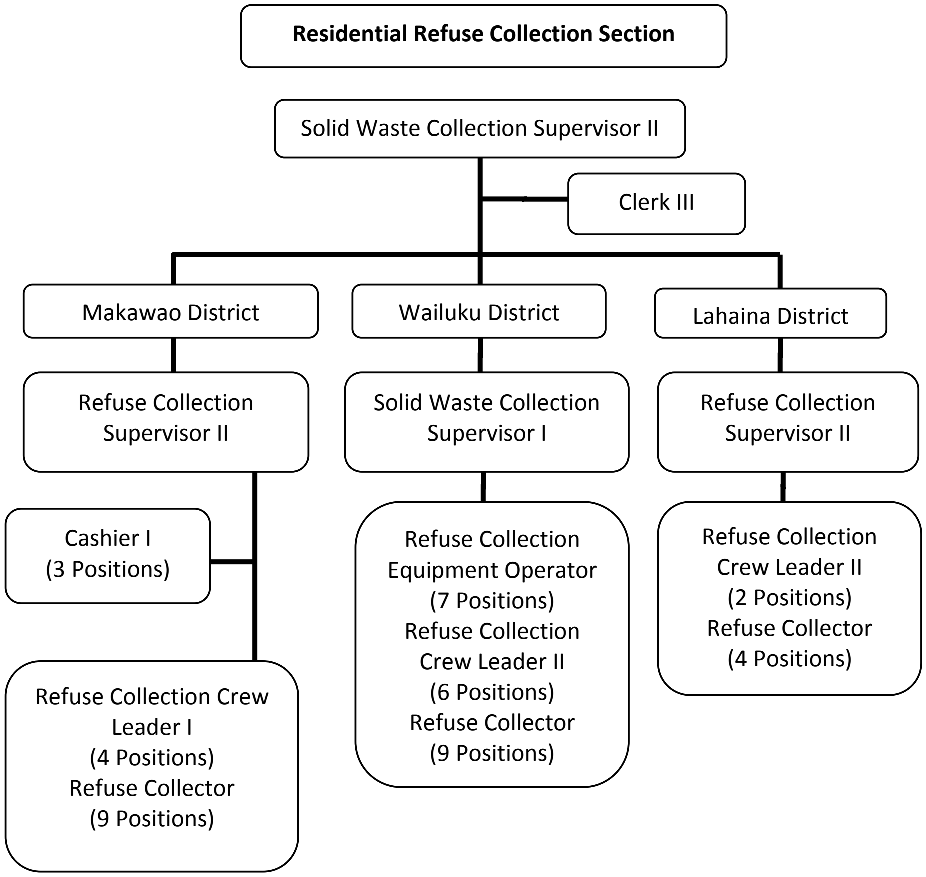


<u>Residential Refuse Collection Section</u>: This Section is responsible for the collection of residential refuse on the Island of Maui with the exception of the Hana region which is collected by Highways Division staff using Solid Waste Division equipment. In addition, the collection of solid waste falls under the Disposal Landfill Section on Lanai and the Highways Division on Molokai.

As illustrated in Figure 13-3, three collection districts are served by the Section: Makawao, Wailuku, and Lahaina. There are Refuse Collection positions in each of these districts with a Refuse Collection Supervisor II in both Makawao and Lahaina. In Wailuku, there is a Solid Waste Collection Supervisor I overseeing the daily work. All three of these districts report to the Solid Waste Collection Supervisor II.

Figure 13-3 - Residential Refuse Collection Section Organization

(Source: County of Maui)



13.5.1 Data Management

> *"I've missed more than 9,000 shots in my career. I've lost almost 300 games. Twenty-six times, I've been trusted to take the game winning shot and missed. I've failed over and over and over again in my life. And that is why I succeed." – Michael Jordan.*

Michael Jordan's quote deftly shows that he tracked results. An MSW operation is no different. Supervisors must be trained and entrusted with the ability to understand budgets, track costs, evaluate performance, and make decisions based on FCA.

The following shows areas that need to be developed and/or enhanced by the Division in order to provide supervisors with the ability to provide quantifiable numbers to evaluate performance.

Route Tracking: Currently, trucks are tracked at the scale house by their truck number. There is no way to track the quantities collected by route, hence, no way to track change over time in the quantities placed out by customers on any specified route. This information can be used to balance routes so work is distributed equally. This lack of information will become more important as the County implements recycling collection routes. For example, by knowing what routes set out less recyclable material, education activities can be targeted in those areas and results of the educational activities can be tracked.

Currently, the collection of white goods is not tracked. There are no data on the number of stops, work load, or number of callers requesting the service. As recommended in Section 13.5.1, all service requests would go through a customer service center where requests are tracked, appointments tracked, and tons and number of items collected tracked to the number of stops on that route.

When curbside recycling collection is implemented, it will be important to track the setout rate of the customers. Again, this will help establish the participation on any specific route so educational activity can be targeted. It also will provide data to the Collection Supervisor on the performance of that route and whether adjustments to routes need to be made. For example, if participation on a route is consistently low, it may be advisable to allocate more stops to that route in order to make the usage of the truck more efficient. In effect, routes could be consolidated, possibly diminishing the number of trucks used each day. On the other hand, if the usage and tonnage continue to rise, the Collection Supervisor can prepare for the addition of a new route by tracking these data.

<u>Labor</u>: The allocation of labor doing different activities is important in understanding costs. Currently, there is little tracking of how employees spend their time. The employees in collection will collect garbage and white goods. Yet, all of their time is placed under garbage collection. The landfill employees on Lanai also collect garbage at the curb, but their time is not tracked and allocated to the activity.

The Division should implement a system where the hours spent on different activities are identified and charged to that activity. The tracking of this should follow through to all financial reports and budget documents.

<u>Supplies</u>: As with labor, all items, such as fuel, should be tracked by equipment and activity. In some cases, this will be too difficult to perform on a specific basis, so the supervisor should allocate such supplies to activities and make the appropriate budget calculation.

<u>Equipment</u>: The majority of solid waste work is a function of labor and equipment. The allocation of equipment to activities should be performed when significant time is spent by a single piece of equipment on more than one activity. For example, collection vehicles used for both garbage and recycling should have capital and operational costs allocated by the percentage of time spent doing the respective activity.

Allocating the capital cost of equipment to activity means that the original purchase price must be kept along with the useful life and the depreciation. Annualized capital costs will need to be calculated and allocated to the appropriate activity.

Fleet repair should track the parts and the labor spent on each piece of equipment. The data received from the Highways Division had parts but not labor applied to the equipment for repair. There are several off-the shelf software applications that allow fleet shops to track labor per job, and these should be used.

Many of the scenarios discussed in this chapter include a fleet garage with a small parts department. The parts department is the lifeblood of a garage. The inventory must be tracked so that there is neither an overstocking of like parts nor an understocking of needed parts. When mechanics come into the parts room for replacement items, the rate of immediately filled orders should be tracked and kept high. The longer a mechanic is without a needed part, the longer a piece of equipment may be out of service. Parts inventory management must also track warranty conditions with manufacturers. Vehicle parts can now be tracked with fleet software so that performance of these parts can be tracked and compared to those manufactured from different sources.

The amount of time a truck stays in the shop also needs to be tracked and compared to industry standards. Such shop hours for specific tasks can be loaded into software packages so that management can compare its shop activities to industry standards.

Strong emphasis should be dedicated to preventive maintenance (PM). The hours and miles of the Division's equipment must be tracked so that PM activities can be performed before mechanical breakdowns occur.

Tonnage: Tons and customers served are the two major elements to track productivity in the solid waste industry. Currently, the Division has no single data base for either category. The tons are fragmented on individual spreadsheets around the Division. Tonnage for all activities should be collected in one data base, allocated to activity, applied to cost of activity so that a cost per ton for the activity can be performed at the end of each month. Reports should be generated by the Deputy Chief of Administration and provided to the Chief, the Deputy Chief of Operations, and to the supervisors of activities.

Customer Service Center: A specialized customer service call center in needed. The reports this center should generate will identify customer service requests and/or complaints by activity and location. Also, missed collections by route should be tracked and customer requests for information by category. These reports can help determine effectiveness of educational activity, successful completion of collections, and general effectiveness of programs.

13.6 Alternative Scenarios

13.6.1 Purpose and Assumptions

As discussed previously, the consultant team developed an FCA model of its the SWD Fiscal Year 2006 operations and developed five scenarios, drawing from recommendations by the SWRAC that would advance the County's goal to recycle and divert more away from the landfill and provide more services to the public.

The ISWMP has a planning period of 32 years; therefore, each of the scenarios was projected out at least 32 years from 2010 through the year 2042, using 2006 actual data as the base year. Then the analysis is extended to 2042 to correspond to the latest date for closing of the Central Maui Landfill. The cost-of-living escalator was developed as discussed in Section 13.4.2, and that average is used to project costs going forward. The population growth rate was taken directly from the County's 2030 Comprehensive Plan and applied to each scenario. Further, the implementation of the facilities and services is staged over the period and brought into the year as noted in the scenario descriptions in the sections below.

Presented in Table 13-10 are key assumptions for each of the scenarios, including revenue assumptions. At the end of this chapter are exhibits which provide detailed estimates of capital and operations costs for the facilities in the scenarios.

Table 13-10 – Key Assumptions per Scenario

(Y = Yes; N = No)

	Scenario				
General Assumptions	**I**	**II**	**III**	**IV**	**V**
FY 2006 as base year	Y	Y	Y	Y	Y
CPI at 3.3%	Y	Y	Y	Y	Y
Expense/Revenue Escalated by CPI	Y	Y	Y	Y	Y
Population growth rates based on Maui 2030 Plan	Y	Y	Y	Y	Y
Increased # of employees, accounts, and tons by population growth rate	Y	Y	Y	Y	Y
C&D goes to Maui facility in 2013	Y	Y	Y	Y	Y
Recycling MRF: no tip fees	N	Y	Y	Y	Y
C&D MRF: Same tip fee as landfill	N	Y	Y	Y	Y
Recycle MRF: net revenue per ton = $55.63	N	Y	Y	Y	Y
Universal collection: service fee increased by CPI, population, and additional households served	N	Y	Y	Y	Y
Revenue from electricity: $0.15 per kWh	N	N	Y	Y	N
WTE: same tip fee as landfill	N	N	Y	N	N
Ash monofill: same tip fee as landfill	N	N	Y	N	N
Gasification: same tip fee as landfill	N	N	N	Y	N
2007 per-acre purchase cost: $150,000	Y	N	N	N	N
2007 per-acre cell development: $93,000	Y	N	N	N	N
Year new landfill development expense is shown	2025	N	N	N	N

13.6.2 Scenario I: Status Quo

Scenario I takes the existing solid waste infrastructure and extends it out to 2042. The key activities for this scenario are the following:

1. Collection remains voluntary and automation is expanded;
2. Four active landfills;
3. Redemption and recycling centers;
4. Co-composting operations of green waste and biodiesel;
5. Biodiesel from fats, oils, and grease;

6. Education activities; and
7. White goods collection and drop-off at contractor's place of business.

This scenario does not include any recommendation of the SWRAC for new programs.

The Status Quo scenario provides the foundation for Scenarios II, III, IV, and V. Table 13-11 shows the activities and locations where these expenses and revenues are tracked.

Table 13-11 – Tracked Scenario Activities and Locations

FCA Activities	FCA Locations
Wailuku/Central Collection	Hana
Makawao Collection	Lahaina
Lahaina Collection	Lanai
Lanai Collection	Olowalu
Hana Collection	Makawao
Molokai Collection	Wailuku/Central
Central/Haiku/Kahului/Kihei Landfill Diversion (co-composting)	Administration
Central Maui Scrap Diversion	Molokai
Central Maui Recycling Center Diversion	
Hana Landfill Diversion	
Hana Scrap Diversion	
Lahaina/Olowalu Convenience Center Diversion	
Lahaina Olowalu Scrap Diversion	
Lanai Landfill Diversion	
Lanai Scrap Diversion	
Makawao Recycling Center Diversion	
Molokai Landfill Diversion	
Molokai Scrap Diversion	
Central Maui Landfill	
Molokai Landfill	
Lanai Landfill	
Hana Landfill	

Table 13-12 is a summary of the Status Quo, where the number of accounts refers to those collected by the Division and the number of tons are the quantity collected from those accounts. It shows results of the scenario for FY 2010 and forward in five-year increments, and projects that the solid waste system goes from a negative $27 per ton in 2010 to a negative $17 per ton in 2042.

Table 13-12 – Scenario I - Status Quo - FY2006

Continue with Current Operations

	2006	2010	2015	2020	2025	2030	2035	2040	2042
Expense	$18,824,901	$24,449,324	$30,401,144	$38,154,612	$49,487,585	$55,694,914	$65,860,301	$79,132,846	$86,194,106
Revenue	$12,906,678	$15,659,197	$24,258,572	$30,132,140	$37,397,104	$46,300,817	$57,358,444	$71,093,609	$77,479,414
Excess/ (Shortage)	($5,918,223)	($8,790,127)	($6,142,571)	($8,022,473)	($12,090,481)	($9,394,097)	($8,501,857)	($8,039,236)	($8,714,692)
Number of Employees	85	91	97	104	112	119	127	136	139
Number of Collection Accounts	24,106	25,769	27,528	29,552	31,666	33,805	36,292	38,743	39,770
Number of Tons	303,231	321,663	394,324	416,770	440,208	463,907	489,223	516,249	527,564
Expense per Ton	$62	$76	$77	$92	$112	$120	$135	$153	$163
Excess/(Shortage) per Ton	($20)	($27)	($16)	($19)	($27)	($20)	($17)	($16)	($17)

13.6.3 Scenario II: Increase Recycling Diversion to 60 Percent

This scenario increases diversion from the 30 percent in 2006 to 60 percent. It has the County upgrading its solid waste services and infrastructure so that more recycled material can be processed, collection activities are made more efficient, and reliance on landfilling can be significantly reduced. The scenario projects a new standard of service for collections which are new services to customers of the County and identifies the non-operational but supportive activities. Infrastructure additions for Scenario II are described briefly and their costs estimated. Each element of the scenario is described in the following paragraphs.

1. Collection Service: A universal collection standard of service will be offered to all residents of single-family dwellings who meet the requirements for service on the Island of Maui. Service standards for Lanai and Molokai may vary slightly because of the much lower population and housing density. The standard of service for universal collection is as follows:

    - Curbside collection for all single-family residences served by streets and roads meeting County standards.
    - Refuse collected once per week in a cart; estimated time: in progress
    - Single-sort marketable recyclables collected once every other week in a cart; estimated implementation timeframe is 2012.
    - Yard and large green waste collected in cans, paper bags, or bundled, on a call-in basis[2] if within volume and size restrictions (Carts may be found to be efficient in this application after a pilot program.); estimated time of pilot programs: 2010.
    - Bulky waste collection on a call-in (appointment) basis based on an ordinance which sets limits on quantity of material, number of pickups per year, etc.; estimated implementation timeframe is 2009.
    - White goods collection expanded to include other metals, such as lawn mowers, auto parts, sports equipment, etc., on a call-in basis. The residences that do not meet the County criteria – this includes condos and gated communities – would receive the same services as County serviced residents but provided by licensed private haulers. Estimated implementation timeframe is 2009.

    As shown in Table 13-13, the expanded fleet needed to provide additional collection service such as recycling and to reach the increased number of households will cost approximately $8 million in 2010, assuming all new

[2] Call-in is a system where the customer calls the Division and makes an appointment to have brush, limbs or other waste collected. The customer describes the appropriate collection. These schedules are monitored using customer service software to assure that no collections are missed.

trucks. The expanded collection staff is shown in Table 13-14. Although all new trucks are assumed, there may be opportunities to continue using a portion of the fleet thereby lowering this estimate.

Table 13-13 – Truck Capital Costs

Type	Automated	Manual	Grapple
Unit Cost	$265,000	$190,000	$135,000
Total Cost	$4,020,698	$3,023,226	$810,000
Total Capital Cost		$7,853,925	

Table 13-14 – Labor Costs County

Category	Rate	FTEs	Cost
Foreman	$50,000	2.0	$100,000
Operator	$35,000	27.0	$945,000
Laborer	$30,000	49.0	$1,470,000
Clerk	$31,000	3.0	$93,000
TOTAL		81.0	$2,608,000

2. Materials Recovery Facility (MRF): This new facility will be for processing recyclable materials collected at the curb or in drop-off centers that require processing to meet the specifications of industrial markets and storage to collect sufficient quantity to ensure economical shipping. The facility is explained in further detail in Chapter 5 and Appendix F-1. The following are key elements of the proposed MRF:

   a. It is assumed that this MRF would be located in the vicinity of the Central Maui Landfill at a Solid Waste Division campus;

   b. The MRF will be operated by a contractor; and

   c. The MRF will accept material from residential as well as commercial entities.

   As shown in Exhibit 13-1, the capital cost of the MRF is estimated to be $18 million in 2007 dollars. It is planned to process 205 tons per day (TPD) initially and expand in later years. The building is 30,000 square feet placed on a seven-acre site. The annualized capital cost is estimated at $1.4 million per year (20-year term, 5% interest), and the annual operations and maintenance is estimated at $3.4 million per year (2007 dollars), as shown in Exhibit 13-2. This results in an estimated cost per ton of $75.

   The recovered commodities produced by this facility will be shipped and sold to markets. The County and/or the MRF operator will be eligible to receive the deposits from the HI-5 program for those containers; these revenues were not included in the FCA model. The FCA model includes estimates of shipping costs and revenues for markets on the west coast. Several brokers who provide services to arrange for the sale of recyclable material and Matson Navigation Company were contacted in order to discern a cost per ton for shipping. Over the past year, the cost for shipping has ranged from $40 to $90 per ton. In the FCA model, the expense for shipping a 40-foot container with 24 tons of post-consumer material separately baled, mixed paper, plastic, aluminum and steel, is $1,785 in 2007 dollars escalated out by CPI.[3] The net revenue per container is $1,335 in 2007 dollars, based upon an average price of $130 per ton delivered to the west coast. This generated an annual net revenue of $3.2 million.

3. C&D MRF: A three-acre site to accommodate a 40,000-square-foot, open-air facility is added in this scenario for the purpose of processing construction and demolition material so that reusable and recycled material can be diverted from the landfill.

   As shown in Exhibit 13-3, the capital cost of the C&D facility is estimated to be $8.7 million in 2007 dollars. It is planned to process 170 TPD initially and expand in later years. The improved area is 40,000 square feet placed on a three-acre site. The annualized capital cost is estimated at $0.7 million per year (20-year term, 5% interest), and the annual operations and maintenance is estimated at $2.8 million per year (2007 dollars), as shown in Exhibit 13-4. Revenue from the sale of recovered products is estimated at $40 per ton net of transportation and generates $1.3 million per year. This results in an estimated cost per ton of $67.

4. Fleet Maintenance Facility: A maintenance facility with four drive-through bays and one bay with a service pit should be built as part of the Central Maui Campus and located adjacent to the Fleet Maintenance facility and operated with mechanics under the management of the Collection Supervisor. There should be one mechanic per ten collection trucks and one mechanic to work on the landfill equipment. One bay must have a floor made of more durable concrete specifically to handle the heavier landfill equipment. There should be a locker and changing room as well as bathroom and showers at the fleet facility and an office for the lead mechanic.

   The purpose of this facility is to perform preventive maintenance and minor repairs. The hours of the facility should be offset from the hours the collection crews are operating on their routes. Having the collection vehicles ready for work in the morning is the primary objective of the maintenance facility. More major repairs such as rebuilding transmissions and engines would be contracted out.

   As shown in Exhibit 13-5, the capital cost of the Fleet Maintenance facility is estimated to be $3.2 million in 2007 dollars. The building is 7,500 square feet placed on a one-and-a-half-acre site. The annualized capital cost is estimated

[3] Personal communication from Matson, December 2007.

at $258,000 per year (20-year term, 5% interest), and the annual operations and maintenance is estimated at $684,000 per year (2007 dollars), as shown in Exhibit 13-6.

5. Central Maui Collection Base Yard. This would result from the recommended consolidation of Makawao and Wailuku base yards and be located adjacent to the Fleet Maintenance Facility at the Central Maui Campus. As with many of these recommendations, there is a level of complexity given the contractual relations the County currently has with the Union workers who handle refuse collection activities. This recommendation to consolidate will save the County money and increase efficiencies, but it must be worked through with the Union. The following outlines the recommendation:

   a. The work forces at both the Makawao and Wailuku base yards would be moved to a single facility located adjacent to the Central Maui-located MRF and Fleet Maintenance Facility. The purpose of this move is to combine work forces and equipment so as to better accommodate the work needs from day to day and to provide direct oversight of each work force.

   b. Since the work conducted is illustrated under "Universal Collection," this portion of Scenario II provides for the new infrastructure, building and offices, to support these workers. It does not include the capital expenditure for the collection vehicles which is also shown under "Universal Collection."

6. Household Hazardous Waste: There should be a central location to process HHW material. Material collected at events on Lanai and Molokai could be shipped to either a contractor or the central HHW facility to be processed. This scenario includes weekly collection at the Olowalu transfer station and Hana regional convenience center. Further information on this scenario may be found in Appendix F, Item 9.

   As shown in Exhibit 13-7, the capital cost of the HHW facility is estimated to be $0.9 million in 2007 dollars. It is planned to process one TPD initially and expand in later years. The building is 720 square feet placed on a half-acre site. The annualized capital cost is estimated at $70,000 per year (20-year term, 5% interest), and the annual operations and maintenance is estimated at $0.3 million per year (2007 dollars), as shown in Exhibit 13-8. This results in an estimated cost per ton of $1,200.

7. Administration: As with the physical infrastructures described above, there also is a need for administrative offices which are included as part of the MRF, see Exhibit 13-1. This infrastructure would help to support the operational staff as well as provide a higher level of customer service. Section 13.5 details these changes. It is recommended that these facilities be grouped into a Solid Waste Campus serving as the headquarters for the Division. Table 13-15 shows the summary of the office space in the complex and where it is located. Table 13-16 shows the estimated parking facility for collection trucks and other vehicles.

Table 13-15 - Land Requirements for Solid Waste Improvements

Facility	Space in Acres	Office Space
MRF/Division Offices	7.0	6,000
C&D Processing	3.0	0
Maintenance Facility	1.5	1,500
HHW Facility	0.5	100
Base Yard	2.5	0
Green Waste Processing	20	0
Total	34.5	7,600

Table 13-16 - Central Maui Parking

	Area per Space	Spaces	Sq. Ft.	Acres
Trucks	600	44	26,400	0.61
Employee Cars	300	97.2	29,160	0.67
Visitor Cars	300	16	4,800	0.11
Buffer Area			24,144	1.11
Total			84,504	2.49

8. Olowalu Transfer Station and Base Yard: This infrastructure improvement will address the lack of facilities in Lahaina for a base yard and will provide more economical transportation of waste and recyclable materials from that area to the Central Maui Landfill or nearby location for processing. This improvement is discussed in more detail in Chapter 5 and Appendix D, Item 2.

   By providing this facility and charging a tipping fee, revenues from the use of the facility by the private sector will help offset the cost of the facility. The tipping fee should be sized to at least cover the cost of adding this infrastructure plus allocable costs for processing and/or disposal at the Central Maui facilities. With the County offering universal collection services for qualified residences in the Lahaina/Westside region, an increase in recyclable material and green waste is projected. This scenario also projects a decrease in self-haul waste as a result of the implementation of universal collection services. It is estimated that this facility would handle 147 TPD.

   Refuse and recyclable materials will be transferred to the single-stream MRF in 53-foot aluminum walking-floor trailers. Each trailer would be legally capable of carrying 20 to 22 tons of materials per load as opposed to the five to nine tons per load currently hauled by route collection vehicles.

   As shown in Exhibit 13-9, the capital cost of the transfer station and base yard is estimated to be $7.1 million in 2007 dollars. It is planned to process 205 TPD initially and expand in later years. The building is 15,000 square feet placed on a five-acre site. The annualized capital cost is estimated at $0.6 million per year (20-year term, 5% interest), and the annual operations and maintenance is estimated at $1.1 million per year (2007 dollars), as shown in Exhibit 13-10. This results in an estimated cost per ton of $56.

9. Hana Convenience Center: This scenario places the Hana Landfill on Standby with Permit. Although the facility would not actively be burying any material, it would handle yard waste and inert material and provide a base for collection vehicles. The following outlines the changes to take place:

   a. A one-acre location at the landfill where citizens and businesses can bring their self-hauled their material for disposal.

   b. Garbage will be placed into the hopper of a rear-loader garbage collection vehicle. (This is discussed in more detail in Chapter 5.)

   c. When needed, the rear-loader will be transported to the Central Maui Landfill and emptied when needed. During these trips, the vehicle can be serviced at the County's fleet maintenance facility while a substitute rear-loader returns to the Hana Convenience Center.

   d. Recyclables will be placed into roll-off containers and, when full, transported to the MRF.

   e. Yard waste would be ground periodically by the County or a contractor or hauled to the compost facility at CML.

   f. The Hana Convenience Center will have a restroom and small office.

   As shown in Exhibit 13-11, the capital cost of the convenience center is estimated to be $0.4 million in 2007 dollars. It is planned to process 6.4 TPD initially and expand in later years. The existing building is planned to be utilized on a one-acre site. . The annualized capital cost is estimated at $28,000 per year (20-year term, 5% interest), and the annual operations and maintenance is estimated at $345,000 per year (2007 dollars), as shown in Exhibit 13-12. This results in an estimated cost per ton of $897.

10. Education: Maui is looking to add new collection programs to its Solid Waste Division, including curbside recycling, yard waste collections, and HHW services. These new programs, will require more educational support to inform residents and businesses of how to handle different materials.

    To provide this educational support for new programs, the budget includes an amount equal to $2.00 per household in 2006 dollars for the year of implementation (escalated forward to the year of implementation) and includes an ongoing budget of $1.00 per household for post-implementation years (also subject to escalation).

11. Ordinances: This scenario implements a package of ordinances that mandates goals and requirements for recycling.

    a. Ordinance to establish the universal recycling requirements for residential generators collected by the private sector. Estimated implementation timeframe is 2012.

b. Ordinance establishing C&D recycling requirement of 50 percent for all commercial and residential demolition and construction projects. Estimated implementation timeframe is 2013.

c. Ordinance establishing recycling mandates on commercial enterprises to ensure 60 percent diversion. This would be implemented in 2013.

Table 13-17 is a summary of this scenario. It shows results of the scenario for FY 2010 and forward in five-year increments, and projects that the solid waste system goes from a negative $30 per ton in 2010 to a negative $28 per ton in 2042.

Table 13-17 – Scenario II - Increase Recycling Diversion to 60% without Waste-To-Energy (WTE)

	2006	2010	2015	2020	2025	2030	2035	2040	2042
Expense	$18,824,901	$25,370,013	$50,558,621	$62,266,624	$76,668,167	$92,365,728	$110,678,436	$136,117,125	$147,654,771
Revenue	$12,906,678	$15,647,615	$31,214,961	$42,457,305	$53,122,394	$66,229,075	$97,909,853	$121,836,264	$132,982,878
Excess/ (Shortage)	($5,918,223)	($9,722,398)	($19,343,660)	($19,809,319)	($23,545,774)	($26,136,653)	($12,768,583)	($14,280,860)	($14,671,893)
Number of Employees	85	93	202	209	217	224	239	255	262
Number of Collection Accounts	24,106	25,769	44,407	47,671	51,081	54,532	58,216	62,148	63,795
Number of Tons	303,231	321,663	394,324	416,770	440,208	463,907	489,223	516,249	527,564
Expense per Ton	$62	$79	$128	$149	$174	$199	$226	$264	$280
Excess/(Shortage) per Ton	($20)	($30)	($49)	($48)	($53)	($56)	($26)	($28)	($28)

13.6.4 Scenario III: Increase Recycling Diversion to 60 Percent with a Waste-to-Energy Facility

This scenario is the same as Scenario II with the addition of a waste-to-energy facility (WTE). That means that all the services and facilities described in Scenario II are also a part of Scenario III, and their costs are added into Scenario III costs. The Central Maui Landfill would be continued as a monofill for ash and a Subtitle D cell to handle the unprocessed waste and bypass materials that do not enter the WTE facility.

The following are some key data points concerning Scenario III and the WTE in Maui:

1. The County's waste stream, both current and projected out to the year 2042, can sustain a WTE facility and a 60 percent recycling rate;

2. A WTE facility would have a waste capacity of 360 tons per day at 90 percent availability producing 90 tons of ash per day which has a volume of approximately 10 percent that of the refuse; and

3. It would produce 14 megawatts of electricity.

As shown in Exhibit 13-13, the capital cost of the WTE is estimated to be $86 million in 2007 dollars. It is planned to process 360 TPD initially and expand in later years. The building is 60,000 square feet placed on a seven-acre site. The annualized capital cost is estimated at $6.9 million per year (20-year term, 5% interest), and the annual operations and maintenance is estimated at $10.6 million per year (2007 dollars), as shown in Exhibit 13-14. This results in an estimated cost per ton of $134. When electricity revenue is added, the net cost per ton is reduced to $80.

Table 13-18 is a summary of this scenario. It shows results of the scenario for FY 2010 and forward in five-year increments, and projects that the solid waste system cost is a negative $33 per ton in FY2010 and goes to a negative $134 per ton in 2042.

Table 13-18 – Scenario III - Increase Recycling Diversion to 60% with WTE

	2006	2010	2015	2020	2025	2030	2035	2040	2042
Expense	$18,812,174	$26,292,447	$76,960,954	$91,777,876	$110,216,837	$129,410,257	$146,485,956	$182,887,833	$203,427,276
Revenue	$12,906,678	$15,647,615	$46,173,897	$48,357,889	$60,532,620	$75,501,616	$97,909,853	$121,836,264	$132,982,878
Excess/ (Shortage)	($5,905,496)	($10,644,832)	($30,787,057)	($43,419,987)	($49,684,217)	($53,908,641)	($48,576,103)	($61,051,569)	($70,444,398)
Number of Employees	85	94	240	247	254	262	279	298	306
Number of Collection Accounts	24,106	25,769	44,407	47,671	51,081	54,532	58,216	62,148	63,795
Number of Tons	303,231	321,663	394,324	416,770	440,208	463,907	489,223	516,249	527,564
Expense per Ton	$62	$82	$195	$220	$250	$279	$299	$354	$386
Excess/(Shortage) per Ton	($19)	($33)	($78)	($104)	($113)	($116)	($99)	($118)	($134)

13.6.5 Scenario IV: Increase Recycling Diversion to 60 Percent with Alternative Conversion Technology and Place Lanai and Molokai Landfills on "Standby with Permit"

The essential operational and organizational changes detailed in Scenario II exist in Scenario IV, but with the following changes:

1. In addition to having the Hana Landfill placed on standby status per Scenario II, the Lanai and Molokai Landfills are placed on standby in this scenario. The landfills will operate periodically to accept inert and other selected materials thereby keeping their permits active. The key functions of these two landfills will become as follows:

    a. There would be short-term storage and ultimate disposal for debris that is a result of storms and other natural disasters on each respective island.

    b. A compactor would be stationed at each of the landfills to compact garbage into a 40-foot container with a volume of 2,400 cubic feet which would hold approximately 18 tons of refuse if compacted to 400 pounds per cubic yard. Once the container is full, it would be stored until the date of the scheduled shipment. The containers would be taken to the harbor and loaded onto the carrier for disposal elsewhere. Approximately six containers per week would transport waste and recyclables from Lanai and 12 containers per week from Molokai.

    As shown in Exhibit 13-15, the capital cost of the Lanai Convenience Center is estimated to be $1.8 million in 2007 dollars. It is planned to process 28 TPD initially and expand in later years. The building is 2,500 square feet placed on a one-acre site. The annualized capital cost is estimated at $145,000 per year (20-year term, 5% interest), and the annual operations and maintenance is estimated at $0.8 million per year (2007 dollars), as shown in Exhibit 13-16. This results in an estimated cost per ton of $105.

    As shown in Exhibit 13-17, the capital cost of the Molokai Convenience Center is estimated to be $1.9 million in 2007 dollars. It is planned to process 42 TPD initially and expand in later years. The building is 2,500 square feet placed on a one-acre site. The annualized capital cost is estimated at $150,000 per year (20-year term, 5% interest), and the annual operations and maintenance is estimated at $1.1 million per year (2007 dollars), as shown in Exhibit 13-18. This results in an estimated cost per ton of $95.

2. The 40 percent of waste that went into the landfills in Scenario II and into a WTE in Scenario III are, in this scenario, being placed into an alternative resource conversion technology known as gasification. No specific technology is selected and generic processing equipment costs are taken from the range presented in the Los Angeles reports. Gasification is discussed in detail in Chapter 12. Essentially, heat transforms solid biomass into clean-burning, carbon-neutral, natural gas-like flammable fuel. A company called EnTech has a gasification process that produces synthetic natural gas and recyclable plastic. Twenty such facilities are in operation and use MSW. They are located in Europe and Asia but are relatively small in size.

The facility is planned to process 200 TPD initially and expand in later years. The building is 45,000 square feet placed on a seven-acre site. As shown in Exhibit 13-19, the capital cost of the alternative energy gasification system estimated to be $53 million in 2007 dollars. This is based on vendor information as presented to various communities that are considering this technology. Because no full scale facility is operating in the United States and therefore the cost numbers contain a considerable risk. No additional cost has been added to cover this risk. The annualized capital cost is estimated at $4.3 million per year (20-year term, 5% interest), and the annual operations and maintenance is estimated at $8.0 million per year (2007 dollars), as shown in Exhibit 13-20. This results in an estimated cost per ton of $167. The energy revenue, $5.2 million per year, is based on a 20 percent higher energy output per ton than was for the WTE in Scenario III. This also has a significant risk that this output will not be met. The net cost per ton. Including energy revenue is $95 in 2007 dollars.

Table 13-19 is a summary of this scenario. It shows results of the scenario for FY 2010 and forward in five-year increments, and projects that the solid waste system cost is estimated at negative $34 per ton in FY2010 and goes to a negative $115 per ton in 2042.

Table 13-19 – Scenario IV -Increase Recycling Diversion to 60% with Alternative Conversion Technology and Place Lanai and Molokai Landfills on "Standby with Permit"

	2006	2010	2015	2020	2025	2030	2035	2040	2042
Expense	$18,824,901	$26,603,894	$69,521,812	$83,627,537	$101,179,483	$120,971,801	$138,523,299	$174,896,532	$191,258,508
Revenue	$12,906,678	$15,634,676	$38,986,602	$42,666,935	$53,385,656	$66,558,500	$96,285,202	$119,803,312	$130,759,189
Excess/ (Shortage)	($5,918,223)	($10,969,218)	($30,535,210)	($40,960,602)	($47,793,827)	($54,413,301)	($42,238,096)	($55,093,220)	($60,499,319)
Number of Employees	85	101	245	252	259	267	285	304	312
Number of Collection Accounts	24,106	25,769	44,407	47,671	51,081	54,532	58,216	62,148	63,795
Number of Tons	303,231	321,663	394,324	416,770	440,208	463,907	489,223	516,249	527,564
Expense per Ton	$62	$83	$176	$201	$230	$261	$283	$339	$363
Excess/(Shortage) per Ton	($20)	($34)	($77)	($98)	($109)	($117)	($86)	($107)	($115)

13.6.6 Scenario V: Increase Recycling Diversion to 75 Percent without WTE and Place Hana, Lanai and Molokai Landfills on "Standby with Permit"

Scenario V has the core functions of Scenario II with additions designed to increase the diversion level to 75 percent. The landfills on Lanai and Molokai would be placed on standby as in Scenarios III and IV; however, no WTE or alternative energy system would be implemented. The planned program elements required to achieve the 75 percent diversion are:

1. Mandatory commercial food waste recycling. Non-residential sources of food wastes in Maui County, and especially on the Island of Maui, have a history of recycling their food waste with local pig farmers who use the material as a substitute for grain. Currently, two such farms receive such food waste. The County has helped assure that food waste recycling continues by providing grant funds to businesses and farms during their early years.

2. The Islands of Lanai and Molokai would begin to recycle food waste from both residents and businesses. In this alternative, the Division would collect this material from residences in a separate route. The material would be taken back to the landfill or to a private processor where it would be composted. The landfill would also accept food waste from commercial generators and process the material into compost. The finished material would be given for free back to the public.

3. Mandatory C&D recycling would be set at 70 percent for both residential and commercial projects. The C&D MRF would handle more material.

4. Mandatory commercial recycling. All businesses would be required to recycle all of their clean and dry paper fiber along with commingled beverage containers. These recyclable materials could be processed at the County's MRF. The businesses would also need to recycle other materials, especially electronics and other materials/durables for which the County provides recycling mechanisms. With these combined efforts, it is expected that businesses will be able to reach a 70 percent diversion requirement. Mandatory reporting by businesses would also be established so that verification to the Division is provided. Waste audits and enforcement would be required. Each hauler would submit weights collected per month, destination of material, and customer list to the Division for the latter to verify recycling activities. Agents of the Division would periodically inspect commercial dumpsters to determine compliance.

5. A routine scrap metal and appliance removal and recycling program for the region of Hana and the Islands of Molokai and Lanai would be implemented. The County would contract for receiving, processing and shipping of scrap automobiles from these three locations. White goods would be handled by the County.

6. The Division would provide free classes to the public to learn how to compost. It would provide everyone who went through the class a compost bin at no cost

to the participant. The County would do an annual survey to project the tons composted by each person who received a compost bin.

All of the above will be a major educational undertaking. The education budget will be $2.00 per capita (escalated out using FY 2005 as the base year) for a period of five years and then be lowered to $1.00 per year per capita, subject to escalation.

The MRF is expanded from that in Scenario II to handle additional material. As shown in Exhibit 13-21, the capital cost of the MRF is estimated to be $24 million in 2007 dollars. It is planned to process 309 TPD initially and expand in later years. The building is 45,000 square feet placed on a seven-acre site. The annualized capital cost is estimated at $2 million per year (20-year term, 5% interest), and the annual operations and maintenance is estimated at $4.8 million per year (2007 dollars), as shown in Exhibit 13-22. This results in an estimated cost per ton of $70.

The recovered commodities produced by this facility will be shipped and sold to markets as in Scenario II. The net revenue per container is $1,335 in 2007 dollars, based upon an average price of $130 per ton delivered to the west coast. This results in net $4.6 million in product revenue.

7. C&D MRF: The C&D facility is expanded to a 45,000-square-foot, open-air facility in this scenario for the purpose of processing the additional construction and demolition material so that reusable and recycled material can be diverted from the landfill. In addition, more revenue is earned from the additional tonnage.

As shown in Exhibit 13-23, the capital cost of the C&D facility is estimated to be $9.8 million in 2007 dollars. It is planned to process 170 TPD initially and expand in later years. The annualized capital cost is estimated at $0.8 million per year (20-year term, 5% interest), and the annual operations and maintenance is estimated at $2.8 million per year (2007 dollars), as shown in Exhibit 13-24. This results in an estimated cost per ton of $66.

Table 13-20 is a summary of this scenario. It shows results of the scenario for FY 2010 and forward in five-year increments, and projects that the solid waste system cost in FY2010 at negative $43 per ton which goes to a negative $65 per ton in 2042.

Table 13-20 – Scenario V - Increase Recycling Diversion to 75% without WTE and Place Hana, Lanai and Molokai Landfills on "Standby with Permit"

	2006	2010	2015	2020	2025	2030	2035	2040	2042
Expense	$18,824,901	$29,968,313	$58,142,460	$70,534,052	$87,087,663	$105,160,085	$125,584,121	$155,500,670	$169,574,128
Revenue	$12,906,678	$16,128,843	$29,201,669	$39,860,807	$49,830,008	$62,076,434	$99,423,017	$123,729,712	$135,053,973
Excess/ (Shortage)	($5,918,223)	($13,839,470)	($28,940,790)	($30,673,245)	($37,257,655)	($43,083,652)	($26,161,104)	($31,770,958)	($34,520,154)
Number of Employees	85	109	225	232	239	247	264	281	289
Number of Collection Accounts	24,106	25,769	44,407	47,671	51,081	54,532	58,216	62,148	63,795
Number of Tons	303,231	321,663	394,324	416,770	440,208	463,907	489,223	516,249	527,564
Expense per Ton	$62	$93	$147	$169	$198	$227	$257	$301	$321
Excess/(Shortage) per Ton	($20)	($43)	($73)	($74)	($85)	($93)	($53)	($62)	($65)

13.7 Scenario Summary

13.7.1 Comparison Matrix

Table 13-21 shows the primary elements of each of the five scenarios in a matrix organized for comparison purposes.

13.7.2 Net Results

Table 13-22 shows the FCA model projected expense, revenues, tonnage, and other parameters averaged over the period FY2006 through FY2042. Also, the table shows the quantity of solid waste landfilled at Central Maui Landfill in both tons and cubic yards and year Phase VI closes.

Table 13-21 – Scenario Comparison Matrix

Note: All scenarios components are based on the assumption that it will be reviewed by stakeholders and will need to take legal, financial and union considerations into account prior implementation.

Activity	Scenario I Status Quo	Scenario II Improved Recycling at 60%	Scenario III Improved Recycling at 60% With WasteTEC*	Scenario IV Improved Recycling at 60% With Gasification	Scenario V Most Recycling at 75%
Diversion Rate In 2042	28 %	60%	83%	73%	75%
Residential Collection	Voluntary, mixed system, no recycling collection Some automated Some manual	Universal, all residences on County standard streets: Refuse, Recycling, Green Waste and Bulk Max Automation	Universal, all residences on County standard streets: Refuse, Recycling, Green Waste and Bulk Max Automation	Universal, all residences on County standard streets: Refuse, Recycling, Green Waste and Bulk Max Automation	Universal, all residences on County standard streets: Refuse, Recycling, Green Waste and Bulk Max Automation
Trash Collection	Continue providing a mixture of once a week and twice a week collection using a combination of automated and manual trucks	Eliminate twice a week collection of residential trash; eliminate manual collection; collect with automated or semi automated on all islands & Hana.	Eliminate twice a week collection of residential trash; eliminate manual collection; collect with automated or semi automated on all islands and Hana.	Eliminate twice a week collection of residential trash; eliminate manual collection; collect with automated or semi automated on all islands and Hana.	Eliminate twice a week collection of residential trash; eliminate manual collection; collect with automated or semi automated on all islands and Hana.
White Good Collection: Operational 2009	Yes: only on Island of Maui excluding Hana; by appointment but work is not tracked	Yes: on all islands and Hana; work goes through call center and is tracked.	Yes: on all islands and Hana; work goes through call center and is tracked.	Yes: on all islands and Hana; work goes through call center and is tracked.	Yes: on all islands and Hana; work goes through call center and is tracked.
Estimate Collection Accounts In 2015	27,000	44,000	44,000	44,000	44,000
Land Disposal	Landfill: 4 active landfills • Central Maui • Hana • Lanai • Molokai	Landfill: 3 active land • Central Maui • Lanai • Molokai Hana on standby	Landfill: 3 active land • Central Maui Evaluate Lanai & Molokai for standby status Hana on standby Ash from WTE land filled at CML	Landfill: Only Central Maui landfill active (Hana, Molokai, and Lanai landfills on standby with permit) Residue from gasification land filled at CML	Landfill: Only Central Maui landfill active (Hana, Molokai, and Lanai landfills on standby with permit)
Year CML Closes	2024	2031	2042	2035	2035
Alternative Disposal	None	None	Waste to Energy County sponsored 360 tons per day; Operational in 2014 Capital Cost - $86M Operations - $133 per ton; net revenue $54 per ton Design, build, operate	Alternative Tech. 200 tons per day; Operational in 2014 Capital Cost - $53M Operations - $167 per ton; net revenue $72 per ton Design, build, operate	None
Other Waste Management Facilities	Olowalu Convenience Center	Olowalu converted to transfer station Hana convenience center	Olowalu converted to transfer station Hana convenience center	Olowalu converted to transfer station Hana, Lanai and Molokai convenience centers	Olowalu converted to transfer station Hana, Lanai and Molokai convenience centers
Recyclable Materials Processing	Reliance on private sector facilities	County sponsored MRF; 205 tons per day; Operational in 2012 Capital Cost - $18M Operations - $75 per ton; net revenue $50 per ton Design, build, operate contract assumed	County sponsored MRF; 205 tons per day; Operational in 2012 Capital Cost - $18M Operations - $75 per ton; net revenue $50 per ton Design, build, operate contract assumed Evaluate need for more land to process increased greenwaste collection Lanai & Molokai: Expand collection & processing	County sponsored MRF; 205 tons per day; Operational in 2012 Capital Cost - $18M Operations - $75 per ton; net revenue $50 per ton Design, build, operate contract assumed	County sponsored MRF; 309 tons per day; Operational in 2012 Capital Cost - $24M Operations - $70 per ton; net revenue $45 per ton Design, build, operate contract assumed
C&D Processing and Disposal	C&D disposed in private landfill until filled - 2012 After 2012 C&D goes to CML Some private recycling	County sponsored MRF; 170 tons per day; Operational in 2012 Capital Cost - $8.7M Operations - $66 per ton; net revenue $24 per ton Design, build, operate	County sponsored MRF; 170 tons per day; Operational in 2012 Capital Cost - $8.7M Operations - $66 per ton; net revenue $24 per ton Design, build, operate	County sponsored MRF; 170 tons per day; Operational in 2012 Capital Cost - $8.7M Operations - $66 per ton; net revenue $24 per ton Design, build, operate	County sponsored MRF; 170 tons per day; Operational in 2012 Capital Cost - $9.8M Operations - $69 per ton; net revenue $24 per ton Design, build, operate
Ash Cell at the CML – dedicated cell.	No	No	Yes	Yes	No
Hana Landfill On Standby: the solid waste permit remains active but there is no active MSW burial.	No: Hana Landfill continues operating with a finite source of dirt cover and only 4 tons a day coming through its gates.	Yes: A convenience center is built at Hana Landfill and the 4 tons of MSW is transported to CML for disposal.	Yes: A convenience center is built at Hana Landfill and the 4 tons of MSW is transported to CML for disposal.	Yes: A convenience center is built at Hana Landfill and the 4 tons of MSW is transported to CML for disposal.	Yes: A convenience center is built at Hana Landfill and the 4 tons of MSW is transported to CML for disposal.

Activity	Scenario I Status Quo	Scenario II Improved Recycling at 60%	Scenario III Improved Recycling at 60% With WasteTEC*	Scenario IV Improved Recycling at 60% With Gasification	Scenario V Most Recycling at 75%
Molokai & Lanai Landfills On Standby: the solid waste permit remains active but there is no active MSW burial.	No: both landfills remain open and active.	No: both landfills remain open and active.	Evaluate each landfill remaining open and active OR putting on standby, thereby processing for shipment to markets or disposal points.	Yes: material is processed/separated to a greater degree that is currently; material is compacted into overseas containers and shipped to disposal points.	Yes: material is processed/separated to a greater degree that is currently; material is compacted into overseas containers and shipped to disposal points.
Solid Waste Division Base Facilities	Scattered and some hosted by Highway Division	Centrally Located Division Campus Maintenance Shop, Base Yard, MRF, C&D, HHF and Adm. 15 Acres, 7,600 sq. ft of office space	Centrally Located Division Campus Maintenance Shop, Base Yard, MRF, C&D, HHF, Composting and Adm. 15 Acres, 7,600 sq. ft of office space	Centrally Located Division Campus Maintenance Shop, Base Yard, MRF, C&D, HHF and Adm. 15 Acres, 7,600 sq. ft of office space	Centrally Located Division Campus Facilities at Convenience Centers Lanai & Molokai 15 Acres, 7,600 sq. ft of office space
Household Hazardous Waste	County collects used oil & batteries	Staffed HHW facility at Division Campus	Staffed HHW facility at Division Campus Lanai & Molokai: HHW event-based	Staffed HHW facility at Division Campus	Staffed HHW facility at Division Campus and Lanai and Molokai Convenience Centers
Customer Call Center: operational 2009	No: Division continues to have 7 numbers for services, no tracking of work, and no reporting capabilities	Yes: call center with one number to handle all request for services and information; work orders are opened and closed with activities being tracked.	Yes: call center with one number to handle all request for services and information; work orders are opened and closed with activities being tracked.	Yes: call center with one number to handle all request for services and information; work orders are opened and closed with activities being tracked.	Yes: call center with one number to handle all request for services and information; work orders are opened and closed with activities being tracked.
Generates Electricity: sell to MECO	No	No	Yes	Yes	No
Policy Level	No new ordinances	New Ordinances Universal recycling: 2012; C&D 50% requirement: 2013; Commercial recycling mandate: 2013	New Ordinances Universal recycling: 2012; C&D 50% requirement completed by: 2013; Commercial recycling mandate with enforcement, completed by: 2013	New Ordinances Universal recycling: 2012; C&D 50% requirement: 2013; Commercial recycling mandate: 2013	New Ordinances Universal recycling: 2012; More enforcement C&D 70% requirement: 2013; Commercial recycling mandate with bans and enforcement
Materials Reuse	Private and non-profit facilities some County grants	Private and non-profit facilities some County grants, increased support	Private and non-profit facilities some County grants, increased support	Private and non-profit facilities some County grants, increased support	Private and non-profit facilities some County grants County facility in addition
Commercial Food Waste	Privately done but use of Grant monies and ordinances to assist	County Assistance, privately done but use of Grant monies and ordinances to assist	County Mandated w/enforcement Privately done but use of Grant monies and ordinances or mandates to assist	County Assistance Privately done but use of Grant monies and ordinances to assist	County Mandated Privately done but use of Grant monies Ordinances to enforce
Average Annual Division Budget 2006-2042	$50 million	$80 million	$109 million	$103 million	$91 million
Cumulative Capital Needed	$76 Million	$104 Million	$200 Million	$162 Million	$123 Million

*Because the acronym "WTE" is frequently assumed to mean specifically or only mass burn WTE technology, the DEM coined the term "WasteTEC" to be broadly interpreted as various waste to energy conversion technologies that might be considered appropriate for the County of Maui.

Table 13-22 - Summary and Comparison of Average per Year for Scenarios I-V

Average per Year (2006-2042)

	Scenario I - Base Case	Scenario II - 60%	Scenario III - 60% with WTE	Scenario IV - 60% with Gasification	Scenario V - 75%
Residential Customers	31,915	47,969	47,969	47,969	47,969
FCA Expense	$49,799,970	$80,056,043	$109,585,734	$102,823,085	$91,152,933
FCA Revenue	$41,398,442	$63,811,892	$67,983,257	$64,109,639	$63,134,571
FCA Excess/(Shortage)	($8,401,529)	($16,244,151)	($41,602,478)	($38,713,446)	($28,018,361)
Tons Generated	430,349	430,349	430,349	430,349	430,349
Expense per Ton Generated	$116	$186	$255	$239	$212
Excess/(Shortage) per Ton Generated	($19.52)	($37.75)	($96.67)	($89.96)	($65.11)
Number of Employees	112	199	229	234	219
Tons Landfilled at Central Maui Landfill until Closure of Phase VI	251,076	180,810	125,931	177,659	151,683
Cubic Yards Consumed at Central Maui Landfill Until Closure of Phase VI	404,961	291,628	203,114	286,547	244,651
Year Central Maui Landfill Phase VI Closes	2024	2031	2042	2031	2035
Cumulative Capital Needed	$76,027,579	$104,408,985	$139,023,598	$113,620,220	$103,024,951
Countywide % Diversion in 2042	#REF!	54%	77%	70%	69%
Cumulative Barrels of Oil Saved	NA	NA	3.2 Million	2.4 Million	NA

Assumptions made in developing these scenarios:

1) Residential Customers refers to the number of customers receiving collection services from the County;
2) FCA Expense includes labor, operations and maintenance, amortized capital costs;
3) FCA Revenue includes a gate rate for disposal, C&D, WTE, and Gasification; it is assumed the same as the current landfill tip fee escalated by CPI; there is assumed no gate-rate at the MRF;
4) Number of employees may be County or contractors;
5) Number of employees escalates with growth in Scenario I;
6) Added net number of additional employees for new operations in Scenario II-V;
7) No additional employees for ash monofill in Scenario III;
8) Tons landfilled and cubic yards consumed at Central Maui Landfill are through closure of Phase VI, the current last planned Phase;
9) Cumulative capital needed is total capital required for 2006 through 2042;
10) Capital includes landfill closure and post-closure, landfill improvement (i.e. land, design, and construction), site improvement (i.e. land and buildings), and fleet;
11) Total percent diversion going to diversion programs in 2042 excludes residual tonnages from the diversion programs;
12) Percent diverted in 2042 includes residual tonnage from the diversion programs;
13) Cumulative barrels of oil saved is applied only to Scenarios III and IV, where electricity is generated; and
14) WTE or gasification facility operates at full capacity each year.

13.8 Full Cost of New Plan

The SWRAC recommended that the County adopt Scenario III, and the Division selected Scenario III to be the basis of the draft ISWMP forwarded to the Mayor and County Council for approval. The average annual cost of Scenario III over the planning period (2006-2042) is shown in Table 13-3. The detail from the FCA model for Scenario III is provided in Appendix J.

Exhibit 13-1 - Central Maui MRF and Base Yard
Capital Cost Estimates

	Size or Number	Cost Factor	Units	Element Cost
Building Size (sq. ft.)	30,000			
Site Size (Acres)	7			
Capacity (TPD, average, 6 days/week)				205
Land (Cost to be Determined)		$150,000	per Acre	1,050,000
Demolition			per sq. ft..	-
Clearing & Rough Grading		$9,000	per Acre	63,000
Site Work, incl. utilities (new)		$90,000	per Acre	630,000
Building & Foundations		$130	per sq. ft..	3,900,000
Mechanical & Electrical		$45	per sq. ft..	1,350,000
Office Building	6,000	$225	per sq. ft..	1,350,000
Scale House	150	$225	per sq. ft..	33,750
Rail Line		$200	per foot	-
A&E Design Engineering & Constr. Mgt		15%	percent	1,099,013
Procurement & Construction Monitoring		5%	percent	366,338
Contingency @ 15%		15%	percent	1,099,013
Subtotal				$10,941,113
Equipment Requirements				
Scale(s), incl. Data Management	2	$90,000	each	180,000
Processing Equipment	1	$4,000,000	each	4,000,000
Front-End Loader(s)	2	$300,000	each	600,000
Grapple(s)	0	$125,000	each	-
Sweeper	1	$115,000	each	115,000
Fork Lift	2	$50,000	each	100,000
Shipping & Misc. Allowance @ 25%		25%	percent	1,248,750
Rolling Stock Units	6			
Subtotal				$6,243,750
Other Capital Costs		5%	percent	859,243
Total Capital Cost				$18,044,106
Annualized Capital Cost, G.O. Bond		20	Year Term	$1,447,906
		5.0%	Interest Rate	

Notes:
1. Costs of siting study are not included.

Exhibit 13-2 - Central Maui MRF and Base Yard
O&M Cost Analysis

		205 TPD		
Labor Category	**Salary**	**Labor No.**		**Labor Cost**
Supervisor	65,000	1		65,000
Operations Foreman	55,000	2		110,000
Scale Operator	30,000	2		60,000
Equipment Operators	35,000	3		105,000
Grapple Operators	35,000	1		35,000
Spotters on Tip Floor	31,000	1		31,000
Sorters	22,000	16		352,000
Laborers	22,000	2		44,000
Subtotal		28		802,000
Fringe Benefits	63%			505,260
Overtime Multiplier			15%	120,300
Subtotal Labor				1,427,560
Fuel (On-site only) @ X gph/Unit	6		$4.00	131,040
Equipment Maintenance	6%			374,625
Site/Building Maintenance (% of Capital)	2%			218,822
Utilities (electric, water, sewage)	120,000			120,000
Insurance	1%			180,441
Miscellaneous Supplies/Services (Allowance)				100,000
Residue Disposal	10%		$51	326,214
Security	50,000			50,000
Subtotal Other				1,501,143
Contingency, all costs (15 %)	0.15			439,305
Total Annual Operating Costs				$3,368,008
Total Tons per Day Handled/Transferred				205
Total Tons Per Year Handled/Transferred	312			63,964
Operating/Maintenance Cost, $ per ton				$52.66
Annualized Capital Cost, $ per ton				$22.64
Total Cost, $ per ton				$75.29

Note: Salaries based on Maui information, 2007

Products are baled, 3x4x5 feet, weight in lb.		1,500
Products to be shipped in tons		57,567
Number of bales		76,756
Number of 40 ft. containers at X bales per	32	2,399
Weight of containers in tons		24
Value of container at an average $130 /T	$130	$3,120
Shipping per container, per Matson quote		$1,785
Net revenue per container		$1,335
Annual revenue		$ 3,202,178

Exhibit 13-3 - Central Maui C&D Processing / Recycling System at Base Yard Capital Cost Estimates

	Size or Number	Cost Factor	Units	Element Cost
Paved Site Area for C&D Equipment	40,000			
Site Size (Acres)	3			
Capacity (TPD, average, 6 days/week)				170
Land (Cost to be Determined)		$150,000	per Acre	450,000
Demolition			per sq. ft..	-
Clearing & Rough Grading		$9,000	per Acre	27,000
Site Work, incl. Electric utilities (new)		$90,000	per Acre	270,000
Foundations/Slabs (No Building)		$60	per sq. ft..	2,400,000
Mechanical & Electrical (In Equipment)		$0	per sq. ft..	
Office Building			per sq. ft..	-
Scale House			per sq. ft..	-
Rail Line			per foot	-
A&E Design Engineering & Constr. Mgt		10%	percent	404,550
Procurement & Construction Monitoring		8%	percent	215,760
Contingency @ 15%		15%	percent	404,550
Subtotal				$4,171,860
Equipment Requirements				
Scale(s), incl. Data Management	0	$90,000	each	-
Processing Plant Equipment, incl. parts	1	$2,500,000	each	2,500,000
Front-End Loader(s)	2	$300,000	each	600,000
Excavator w/Grapple	1	$175,000	each	175,000
Sweeper	0	$40,000	each	-
Yard Truck	0	$90,000	each	-
On-Site Containers for Load-In/Products	10	$6,000	each	60,000
Shipping & Misc. Allowance @ 25%		25%	percent	818,750
Rolling Stock Units	14			
Subtotal				$4,153,750
Other Capital Costs		5%	percent	416,281
Total Capital Cost				$8,741,891
Annualized Capital Cost, G.O. Bond		20	Year Term	$701,472
		5.0%	Interest Rate	

Notes:
1. Costs of siting study are not included.

Exhibit 13-4 - Central Maui C&D Processing / Recycling System at Base Yard O&M Cost Analysis

Labor Category		Salary		170 Labor No.	TPD Labor Cost
Supervisor - Included in MRF		65,000		0	-
Operations Foreman		55,000		1	55,000
Scale Operator - Included in MRF		30,000		0	-
FEL Equipment Operators		35,000		2	70,000
Excavator/Grapple Operators		35,000		1	35,000
Spotters on Tip Floor		31,000		1	31,000
Sorters		22,000		8	176,000
Laborers-General Site Cleanup		22,000		2	44,000
Subtotal				15	411,000
Fringe Benefits		63%			258,930
Overtime Multiplier				15%	61,650
Subtotal Labor					731,580
Fuel (On-site only) @ X gph/Unit		6		$4.00	80,640
Equipment Maintenance		6%			249,225
Site/Building Maintenance (% of Capital)		2%			83,437
Utilities (electric, water, sewage)		60,000			60,000
Insurance		1%			87,419
Miscellaneous Supplies/Services (Allowance)					100,000
Non-Recycled C&D Haul/Disposal	40%		$51		1,081,200
Security (Included in MRF)		0			-
Subtotal Other					1,741,921
Contingency, all costs (15 %)		0.15			371,025
Total Annual Operating Costs					$2,844,526
Total Tons per Day Handled/Transferred					170
Total Tons Per Year Handled/Transferred		312			53,000
Operating/Maintenance Cost, $ per ton					$53.67
Annualized Capital Cost, $ per ton					$13.24
Total Cost, $ per ton					$66.91

Note: Salaries based on Maui information, 2007

Product marketed (tons)	31,800
Net revenue per ton	$ 40.00
Annual revenue net of transportation (2007)	$1,272,000

Exhibit 13-5 - Fleet Maintenance Facility
Capital Costs

	Size or Number	Cost Factor	Units	Element Cost
Building Size (sq. ft.)	7,500			
Site Size (Acres)	1.5			
Capacity (TPD, average, 6 days/week)				
Land (Cost to be Determined)		$150,000	per Acre	225,000
Demolition		$0	per sq. ft..	-
Clearing & Rough Grading		$9,000	per Acre	13,500
Site Work, incl. utilities (new)		$90,000	per Acre	135,000
Building & Foundations		$130	per sq. ft..	975,000
Mechanical & Electrical		$45	per sq. ft..	337,500
Office Building	1,500	$225	per sq. ft..	337,500
Scale House	0	$225	per sq. ft..	-
Rail Line		$200	per foot	-
A&E Design Engineering & Constr. Mgt		15%	percent	269,775
Procurement & Construction Monitoring		5%	percent	89,925
Contingency @ 15%		15%	percent	269,775
Subtotal				$2,652,975
Equipment Requirements				
Data Management System	1	$90,000	each	90,000
Processing Equipment	4	$60,000	each	240,000
Front-End Loader(s)		$300,000	each	-
Grapple(s)		$125,000	each	-
Sweeper		$115,000	each	-
Yard Truck		$50,000	each	-
Shipping & Misc. Allowance @ 25%		25%	percent	82,500
Subtotal				$412,500
Other Capital Costs		5%	percent	153,274
Total Capital Cost				$3,218,749
Annualized Capital Cost, G.O. Bond		20 5.0%	Year Term Interest Rate	$258,281

Exhibit 13-6 - Fleet Maintenance Facility
O&M Cost Analysis

Labor Category	Salary	- TPD Labor No.	Labor Cost
Supervisor	61,000		-
Operations Foreman	50,000	1	50,000
Scale Operator	30,000		-
Mechanics	34,000	4	136,000
Grapple Operators	34,000		-
Spotters on Tip Floor	30,000		-
Sorters	30,000		-
Laborers	30,000	2	60,000
Subtotal		7	246,000
Fringe Benefits	63%		154,980
Overtime Multiplier		15%	36,900
Subtotal Labor			437,880
Fuel (On-site only) @ X gph/Unit		$4.00	-
Equipment Maintenance	6%		24,750
Site/Building Maintenance (% of Capital)	2%		53,060
Utilities (electric, water, sewage)	30,000		30,000
Insurance	1%		32,187
Miscellaneous Supplies/Services (Allowance)			12,000
Security	5,000		5,000
Subtotal Other			156,997
Contingency, all costs (15 %)	0.15		89,232
Total Annual Operating Costs			$684,109
Total Tons per Day Handled/Transferred			-
Total Tons Per Year Handled/Transferred	312		0
Operating/Maintenance Cost, $ per ton			
Annualized Capital Cost, $ per ton			
Total Cost, $ per ton			

Note: Salaries based on Maui information, 2007

Exhibit 13-7 - HHWF
Capital Costs

	Size or Number	Cost Factor	Units	Element Cost
Building Size (sq. ft.)	1,120			
Site Size (Acres)	0.50			
Capacity (TPD, average, 6 days/week)				1
Land (Cost to be Determined)		$150,000	per Acre	75,000
Demolition		$0	per sq. ft..	-
Clearing & Rough Grading		$9,000	per Acre	4,500
Site Work, incl. utilities (new)		$90,000	per Acre	45,000
Building & Foundations		$130	per sq. ft..	145,600
Mechanical & Electrical		$45	per sq. ft..	50,400
Office Building	100	$225	per sq. ft..	22,500
Awing	500	$75	per sq. ft..	37,500
Supply Building	120	$10	per sq. ft..	1,200
A&E Design Engineering & Constr. Mgt		15%	percent	45,825
Procurement & Construction Monitoring		5%	percent	15,335
Contingency @ 15%		15%	percent	46,005
Subtotal				$488,865
Equipment Requirements				
Scale(s), incl. Data Management	0	$90,000	each	-
Fire suppression/containers/etc	1	$140,000	each	140,000
Fork-Lift	1	$35,000	each	35,000
Grapple(s)	0	$125,000	each	-
Sweeper	0	$115,000	each	-
Box Truck	1	$80,000	each	80,000
Shipping & Misc. Allowance @ 25%		25%	percent	63,750
Rolling Stock Units	1			
Subtotal				$318,750
Other Capital Costs		8%	percent	64,609
Total Capital Cost				$872,224
Annualized Capital Cost, G.O. Bond		20	Year Term	$69,990
		5.0%	Interest Rate	

Notes:
1. Costs of siting study and land acquisition are not included.

Exhibit 13-8 - HHWF
O&M Cost Analysis

			1 TPD	
Labor Category		**Salary**	**Labor No.**	**Labor Cost**
HHW Manager		60,901	1	60,901
HHW Assistants		22,000	1	22,000
Scale Operator		30,000	0	-
Equipment Operators		35,000	0	-
Grapple Operators		35,000	0	-
Spotters on Tip Floor		31,000	0	-
Sorters		22,000	0	-
Laborers		22,000	0	-
	Subtotal		2	82,901
Fringe Benefits		63%		52,228
Overtime Multiplier			15%	12,435
	Subtotal Labor			147,564
Shipping Costs				10,996
Contractor Cost				80,500
Fuel (On-site only) @ X gph/Unit		0.75	$4.00	4,914
Equipment Maintenance		6%		19,125
Site/Building Maintenance (% of Capital)		2%		9,777
Utilities (electric, water, sewage)		2,000		2,000
Insurance		1%		8,722
Miscellaneous Supplies/Services (Allowance)				20,000
Security		3,000		3,000
	Subtotal Other			159,035
Contingency, all costs (15 %)		0.15		-
Total Annual Operating Costs				$306,598
Total Tons per Day Handled/Transferred				1
Total Tons Per Year Handled/Transferred		312		312
Operating/Maintenance Cost, $ per ton				$982.69
Annualized Capital Cost, $ per ton				$224.33
Total Cost, $ per ton				$1,207.01

Exhibit 13-9 - Olowalu Transfer Station & Base Yard
Capital Costs

	Size or Number	Cost Factor	Units	Element Cost
Building Size (sq. ft.)	15,000			
Site Size (Acres)	5			
Capacity (TPD, average, 6 days/week)				147
Land (Cost to be Determined)		$150,000	per Acre	750,000
Demolition		$0	per sq. ft..	-
Clearing & Rough Grading		$9,000	per Acre	45,000
Site Work, incl. utilities (new)		$90,000	per Acre	450,000
Building & Foundations		$130	per sq. ft..	1,950,000
Mechanical & Electrical		$45	per sq. ft..	675,000
Office Building	2,000	$225	per sq. ft..	450,000
Scale House	150	$225	per sq. ft..	33,750
Rail Line		$200	per foot	-
A&E Design Engineering & Constr. Mgt		15%	percent	540,563
Procurement & Construction Monitoring		5%	percent	180,188
Contingency @ 15%		15%	percent	540,563
Subtotal				$5,615,063
Equipment Requirements				
Scale(s), incl. Data Management	1	$90,000	each	90,000
Processing Equipment	2	$100,000	each	200,000
Front-End Loader(s)	1	$300,000	each	300,000
Grapple(s)	0	$125,000	each	-
Sweeper	1	$50,000	each	50,000
Transfer Truck	2	$150,000	each	300,000
Shipping & Misc. Allowance @ 25%		25%	percent	235,000
Rolling Stock Units	3			
Subtotal				$1,175,000
Other Capital Costs		5%	percent	339,503
Total Capital Cost				$7,129,566
Annualized Capital Cost, G.O. Bond		20	Year Term	$572,095
		5.0%	Interest Rate	

Notes:

Residential waste	17,500
Commercial waste	28,500
TOTAL Tonnage	46,000
Days of operation per year	312

Exhibit 13-10 - Olowalu Transfer Station & Base Yard
O&M Cost Analysis

Labor Category	Salary	147 TPD Labor No.	Labor Cost
Supervisor	60,000	0	-
Operations Foreman	50,000	1	50,000
Scale Operator	30,000	2	60,000
Equipment Operators	34,000	2	68,000
Grapple Operators	34,000	0	-
Spotters on Tip Floor	30,000	0	-
Laborers	30,000	1	30,000
Subtotal		6	208,000
Fringe Benefits	63%		131,040
Overtime Multiplier		15%	31,200
Subtotal Labor			370,240
Fuel (On-site only) @ X gph/Unit	6	$4.00	170,352
Equipment Maintenance	6%		70,500
Site/Building Maintenance (% of Capital)	2%		112,301
Utilities (electric, water, sewage)	35,000		35,000
Insurance	1%		180,441
Miscellaneous Supplies/Services (Allowance)			30,000
Security	10,000		10,000
Subtotal Other			608,594
Contingency, all costs (15 %)	0.15		146,825
Total Annual Operating Costs			$1,125,659
Total Tons per Day Handled/Transferred			147
Total Tons Per Year Handled/Transferred	312		46,000
Operating/Maintenance Cost, $ per ton			$24.47
Annualized Capital Cost, $ per ton			$31.48
Total Cost, $ per ton			$55.95

Exhibit 13-11 - Hana Convenience Center
Capital Costs

	Size or Number	Cost Factor	Units	Element Cost
Building Size (sq. ft.)	-	Existing		
Site Size (Acres)	1.0			
Capacity (TPD, average, 6 days/week)				6.4
Land (Cost to be Determined)		$0	per Acre	-
Demolition		$0	per sq. ft..	-
Clearing & Rough Grading		$9,000	per Acre	9,000
Site Work, incl. utilities (new)		$90,000	per Acre	90,000
Building & Foundations		$130	per sq. ft..	-
Mechanical & Electrical		$45	per sq. ft..	-
Office Building	0	$225	per sq. ft..	-
Scale House	0	$225	per sq. ft..	-
Rail Line		$200	per foot	-
A&E Design Engineering & Constr. Mgt		15%	percent	14,850
Procurement & Construction Monitoring		5%	percent	4,950
Contingency @ 15%		15%	percent	14,850
Subtotal				$133,650
Equipment Requirements				
Scale(s), incl. Data Management	0	$90,000	each	-
Containers	6	$6,000	each	36,000
Front-End Loader(s)	0	$300,000	each	-
Grapple(s)	0	$125,000	each	-
Sweeper	0	$50,000	each	-
Transfer Truck	1	$125,000	each	125,000
Shipping & Misc. Allowance @ 25%		25%	percent	40,250
Rolling Stock Units	1			
Subtotal				$201,250
Other Capital Costs		5%	percent	16,745
Total Capital Cost				$351,645
Annualized Capital Cost, G.O. Bond		20	Year Term	$28,217
		5.0%	Interest Rate	

Notes:
1. Costs of siting study and land acquisition are not included.

Exhibit 13-12 - Hana Convenience Center
O&M Cost Analysis

Labor Category	Salary	6.4 TPD Labor No.	Labor Cost
Supervisor	60,000	0	-
Operations Foreman	50,000	1	50,000
Scale Operator	30,000	0	-
Equipment Operators	34,000	2	68,000
Grapple Operators	34,000	0	-
Spotters on Tip Floor	30,000	0	-
Laborers	30,000	1	30,000
Subtotal		4	148,000
Fringe Benefits	63%		93,240
Overtime Multiplier		15%	22,200
Subtotal Labor			$263,440
Fuel (On-site only) @ X gph/Unit	1	$4.00	10,920
Equipment Maintenance	6%		12,075
Site/Building Maintenance (% of Capital)	2%		2,673
Utilities (electric, water, sewage)	2,500		2,500
Insurance	1%		3,516
Miscellaneous Supplies/Services (Allowance)			5,000
Security	0		-
Subtotal Other			$36,684
Contingency, all costs (15 %)	0.15		45,019
Total Annual Operating Costs			$345,143
Total Tons per Day Handled/Transferred			6
Total Tons Per Year Handled/Transferred	312		2,000
Operating/Maintenance Cost, $ per ton			$172.57
Annualized Capital Cost, $ per ton			$723.95
Total Cost, $ per ton			$896.52

Exhibit 13-13 - Waste-to-Energy Facility
360-Ton-Per-Day Rated Capacity Modular Technology
Capital Costs

	Size or Number	Cost Factor	Units	Element Cost
Building Size (sq. ft.)	60,000			
Site Size (Acres)	7			
Capacity (TPD, average, 7 days/week)				360
Land		$150,000	per Acre	1,050,000
Demolition			per sq. ft..	-
Clearing & Rough Grading		$9,000	per Acre	63,000
Site Work, incl. utilities (new)		$90,000	per Acre	630,000
Building & Foundations		$120	per sq. ft..	7,200,000
Mechanical & Electrical		$55	per sq. ft..	3,300,000
Office Building	3,000	$225	per sq. ft..	675,000
Scale House	150	$100	per sq. ft..	15,000
Combustion Equipment				17,200,000
Air Pollution Control Equipment				11,000,000
Power Island				9,000,000
Power Interconnect				3,500,000
Balance of Plant				11,000,000
Start Up and Testing				1,654,000
A&E Design Engineering, Permit & Constr. Mgt		8%	percent	4,768,725
Procurement & Construction Monitoring		4%	percent	2,842,243
Contingency @ 10%		10%	percent	7,000,573
Subtotal				$80,898,541
Equipment Requirements				
Scale(s), incl. Data Management	2	$90,000	each	180,000
Front-End Loader(s)	2	$300,000	each	600,000
Grapple(s)	1	$125,000	each	125,000
Sweeper	1	$115,000	each	115,000
Yard Truck		$90,000	each	-
Misc. Allowance @ 20%		20%	percent	204,000
Rolling Stock Units	3.5			
Subtotal				$1,224,000
Other Capital Costs				
Bond Issuance (2%) and Misc. (3%)		5%	percent	4,106,127
Total Capital Cost				$86,228,667.95
Annualized Capital Cost, G.O. Bond		20	Year Term	$6,919,211.41
		5.0%	Interest Rate	

Notes:
1. Costs of siting study are not included.

MRF curbside residue	68,000	7.5%	5,100
Refuse			45,333
C&D Materials			20,000
Tires	11,154	38.5%	29,000
Shredded excess wood from EKO			18,850
TOTAL Tonnage			118,283
Days of operation per year			365

Exhibit 13-14 - Waste-to-Energy Facility
O&M Cost Analysis

	360 TPD			
Labor Category	**Salary**		**Labor No.**	**Labor Cost**
Supervisor	75,000		1	75,000
Engineer	75,000		1	75,000
Operations Foreman	55,000		3	165,000
Scale Operator	30,000		3	90,000
Mobile Equipment Operators	34,000		5	170,000
Grapple Operators	34,000		2	68,000
Spotters on Tip Floor	22,000		1	22,000
Equipment Operators	40,000		10	400,000
Mechanics	40,000		6	240,000
Clerk	30,000		1	40,000
Laborers	22,000		3	66,000
Subtotal			36	1,411,000
Fringe Benefits	63%			888,930
Overtime Multiplier			15%	211,650
Subtotal Labor				2,511,580
Fuel (On-site only) @ X gph/Unit				
Equipment Maintenance	6		$4.00	214,620
Rolling Stock Maintenance	4%			1,488,000
Site/Building Maintenance (% of Capital)	6%			73,440
Utilities (electric, water, sewage)	2%			236,100
Reagents cost base on thruput in tons	600,000			600,000
Ash Disposal, 25% at a per ton cost of			$4.00	525,702
Insurance	90.0	tpd	$55	1,807,101
Miscellaneous Supplies/Services (Allowance	1%			808,985
Security				250,000
	15,000			15,000
Subtotal Other				6,018,949
Management fee and Profit (15%)				
Contingency, all costs (10 %)	15%			1,279,579
	10%			853,053
Total Annual Operating Costs				$10,663,161
Total Tons per Day Handled/Transferred				360
Total Tons Per Year Handled/Transferred				131,426
Operating days per year	365			
Operating/Maintenance Cost, $ per ton				$81.13
Annualized Capital Cost, $ per ton				$52.65
Total Cost, $ per ton				$133.78
Net electrical energy produced for sale at	400	KWHr		47,313,200
Electrical revenue sold at	$0.150	per KWHr		$7,096,980
Revenue Per Ton				$54
Net Cost Per ton				$79.78

Note: Salaries and fringes based on Maui information, 2007

Exhibit 13-15 - Lanai Convenience Center Capital Costs

	Size or Number	Cost Factor	Units	Element Cost
Building Size (sq. ft.)	2500	Existing		
Site Size (Acres)	1.0			
Capacity (TPD, average, 6 days/week)				28
Land (1)		$0	per Acre	-
Demolition		$0	per sq. ft..	-
Clearing & Rough Grading		$9,000	per Acre	9,000
Site Work, incl. utilities (new)		$90,000	per Acre	90,000
Building & Foundations		$130	per sq. ft..	325,000
Mechanical & Electrical		$45	per sq. ft..	112,500
Office Building		$225	per sq. ft..	-
Scale House		$225	per sq. ft..	-
Rail Line		$200	per foot	-
A&E Design Engineering & Constr. Mgt		15%	percent	80,475
Procurement & Construction Monitoring		5%	percent	26,825
Contingency @ 15%		15%	percent	80,475
Subtotal				$724,275
Equipment Requirements				
Scale(s), incl. Data Management	0	$90,000	each	-
Containers	18	$6,000	each	108,000
Front-End Loader(s)	1	$100,000	each	100,000
Compactor	1	$400,000	each	400,000
Sweeper	0	$50,000	each	-
Transfer Truck (2)	1.5	$125,000	each	187,500
Shipping & Misc. Allowance @ 25%		25%	percent	198,875
Rolling Stock Units	2			
Subtotal				$994,375
Other Capital Costs		5%	percent	85,933
Total Capital Cost				$1,804,582.50
Annualized Capital Cost, G.O. Bond		20	Year Term	$144,804.37
		5.0%	Interest Rate	

Notes:

TOTAL Tonnage	8,700
Days of operation per year	312
Tons per day	27.9

Exhibit 13-16 - Lanai Convenience Center
O&M Cost Analysis

		8,700 TPD	
Labor Category	**Salary**	**Labor No.**	**Labor Cost**
Supervisor	60,000	0	-
Operations Foreman	50,000	1	50,000
Scale Operator	30,000	0	-
Equipment Operators	34,000	1.5	51,000
Grapple Operators	34,000	0	-
Spotters on Tip Floor	30,000	0	-
Laborers	30,000	1	30,000
Subtotal		3.5	131,000
Fringe Benefits	63%		82,530
Overtime Multiplier		15%	19,650
Subtotal Labor			233,180
Fuel (On-site only) @ X gph/Unit	6	$4.00	104,832
Equipment Maintenance	6%		59,663
Site/Building Maintenance (% of Capital)	2%		14,486
Utilities (electric, water, sewage)	10000		10,000
Insurance	1%		18,046
Miscellaneous Supplies/Services (Allowance)			10,000
Shipping by barge per container		$500	217,500
Security	3000		3,000
Subtotal Other			437,526
Contingency, all costs (15 %)	0.15		100,606
Total Annual Operating Costs			$771,312
Total Tons per Day Handled/Transferred			27.88
Total Tons Per Year Handled/Transferred	312		8,700
Operating/Maintenance Cost, $ per ton			$88.66
Annualized Capital Cost, $ per ton			$16.64
Total Cost, $ per ton			$105.30

(1) Includes half of driver in Maui to move containers to MRF and CML

Exhibit 13-17 - Molokai Convenience Center
Capital Costs

	Size or Number	Cost Factor	Units	Element Cost
Building Size (sq. ft.)	2,500	Existing		
Site Size (Acres)	1.0			
Capacity (TPD, average, 6 days/week)				42
Land (1)		$0	per Acre	-
Demolition		$0	per sq. ft..	-
Clearing & Rough Grading		$9,000	per Acre	9,000
Site Work, incl. utilities (new)		$90,000	per Acre	90,000
Building & Foundations		$130	per sq. ft..	325,000
Mechanical & Electrical		$45	per sq. ft..	112,500
Office Building		$225	per sq. ft..	-
Scale House	0	$225	per sq. ft..	-
Rail Line		$200	per foot	-
A&E Design Engineering & Constr. Mgt		15%	percent	80,475
Procurement & Construction Monitoring		5%	percent	26,825
Contingency @ 15%		15%	percent	80,475
Subtotal				$724,275
Equipment Requirements				
Scale(s), incl. Data Management	0	$90,000	each	-
Containers	26	$6,000	each	156,000
Front-End Loader(s)	1	$100,000	each	100,000
Compactor	1	$400,000	each	400,000
Sweeper	0	$50,000	each	-
Transfer Truck (2)	1.5	$125,000	each	187,500
Shipping & Misc. Allowance @ 25%		25%	percent	210,875
Rolling Stock Units	3			
Subtotal				$1,054,375
Other Capital Costs		5%	percent	88,933
Total Capital Cost				$1,867,582.50
Annualized Capital Cost, G.O. Bond		20	Year Term	$149,859.65
		5.0%	Interest Rate	

Notes:
(1) Costs of siting study and land acquisition are not included.
(2) Includes half of truck in Maui to move containers to MRF and CML

TOTAL Tonnage	13,000
Days of operation per year	312
Tons per day	41.7

Exhibit 13-18 - Molokai Convenience Center
O&M Cost Analysis

		42 TPD	
Labor Category	**Salary**	**Labor No.**	**Labor Cost**
Supervisor	60,000	0	-
Operations Foreman	50,000	1	50,000
Scale Operator	30,000	1	30,000
Equipment Operators (1)	34,000	2.5	85,000
Grapple Operators	34,000	0	-
Spotters on Tip Floor	30,000	0	-
Laborers	30,000	1	30,000
Subtotal		5.5	195,000
Fringe Benefits	63%		122,850
Overtime Multiplier		15%	29,250
Subtotal Labor			347,100
Fuel (On-site only) @ X gph/Unit	6	$4.00	157,248
Equipment Maintenance	6%		63,263
Site/Building Maintenance (% of Capital)	2%		14,486
Utilities (electric, water, sewage)	10,000		10,000
Insurance	1%		18,676
Miscellaneous Supplies/Services (Allowance)			10,000
Shipping by barge per container		$500	325,000
Security	3,000		3,000
Subtotal Other			601,672
Contingency, all costs (15 %)	0.15		142,316
Total Annual Operating Costs			$1,091,088
Total Tons per Day Handled/Transferred			42
Total Tons Per Year Handled/Transferred	312		13,000
Operating/Maintenance Cost, $ per ton			$83.93
Annualized Capital Cost, $ per ton			$11.53
Total Cost, $ per ton			$95.46

(1) Includes half of driver in Maui to move containers to MRF and CML

Exhibit 13-19 - Alternative: Gasification
360-Ton-Per-Day Rated Capacity
Capital Costs

	Size or Number	Cost Factor	Units	Element Cost
Building Size (sq. ft.)	45,000			
Site Size (Acres)	7			
Capacity (TPD, average, 6 days/week)				200
Land		$150,000	per Acre	1,050,000
Demolition			per sq. ft..	-
Clearing & Rough Grading		$9,000	per Acre	63,000
Site Work, incl. utilities (new)		$90,000	per Acre	630,000
Building & Foundations		$120	per sq. ft..	5,400,000
Mechanical & Electrical		$55	per sq. ft..	2,475,000
Office Building	600	$225	per sq. ft..	135,000
Scale House	150	$100	per sq. ft..	15,000
Installed facility				29,530,179
Start Up and Testing				1,654,000
A&E Design Engineering & Constr. M		8%	percent	2,868,613
Procurement & Construction Monitori		4%	percent	1,752,840
Contingency @ 10%		10%	percent	4,277,079
Subtotal				$49,850,711
Equipment Requirements				
Scale(s), incl. Data Man	1	$90,000	each	90,000
Front-End Loader(s)	1	$300,000	each	300,000
Grapple(s)	1	$125,000	each	125,000
Sweeper	0.5	$115,000	each	57,500
Yard Truck		$90,000	each	-
Misc. Allowance @ 20%		20%	percent	114,500
Rolling Stock Units	3.5			
Subtotal				$687,000
Other Capital Costs				
Bond Issuance		5%	percent	2,526,886
Total Capital Cost				53,064,597
Annualized Capital Cost, G.O. Bond		20	Year Term	4,258,041
		5.0%	Interest Rate	

Notes:
1. Costs of siting study are not included.

Exhibit 13-20 - Alternative: Gasification
O&M Cost Analysis

			200 TPD	
Labor Category	**Salary**		**Labor No.**	**Labor Cost**
Supervisor	65,000		1	65,000
Operations Foreman	55,000		2	110,000
Scale Operator	30,000		2	60,000
Mobile Equipment Operators	34,000		3	102,000
Grapple Operators	34,000		2	68,000
Spotters on Tip Floor	22,000		1	22,000
Equipment Operators	34,000		8	272,000
Mechanics	34,000		2	68,000
Clerk	30,000		1	34,000
Laborers	22,000		2	44,000
Subtotal			24	845,000
Fringe Benefits	63%			532,350
Overtime Multiplier			15%	126,750
Subtotal Labor				1,504,100
Fuel (On-site only) @ X gph/Unit	6		$4.00	183,960
Equipment Maintenance	4%			1,181,207
Rolling Stock Maintenance	6%			41,220
Site/Building Maintenance (% of Capital)	2%			997,014
Utilities (electric, water, sewage)	400,000			400,000
Reagents cost base on thruput in tons			$4.00	292,000
Residual Disposal, 25% at a per ton cost of	50.0	tpd	$55	1,003,750
Insurance	1%			498,507
Miscellaneous Supplies/Services (Allowance)				250,000
Security	15,000			15,000
Subtotal Other				4,862,659
Management fee and Profit (15%)	15%			955,014
Contingency, all costs (10 %)	10%			636,676
Total Annual Operating Costs				$7,958,448
Total Tons per Day Handled/Transferred				200
Total Tons Per Year Handled/Transferred	365	days		73,000
Operating/Maintenance Cost, $ per ton				$109.02
Annualized Capital Cost, $ per ton				$58.33
Total Cost, $ per ton				$167.35
Net electrical energy produced for sale at	480	KWHr		35,040,000
Electrical revenue, sold at	$0.150	per KWHr		$5,256,000
Revenue Per Ton				$ 72.00
Net Cost Per ton				$95.35

Exhibit 13-21 – Central Maui MRF and Base Yard Capital Cost Estimates

	Size or Number	Cost Factor	Units	Element Cost
Building Size (sq. ft.)	45,000			
Site Size (Acres)	7			
Capacity (TPD, average, 6 days/week)				309
Land (Cost to be Determined)		$150,000	per Acre	1,050,000
Demolition			per sq. ft..	-
Clearing & Rough Grading		$9,000	per Acre	63,000
Site Work, incl. utilities (new)		$90,000	per Acre	630,000
Building & Foundations		$130	per sq. ft..	5,850,000
Mechanical & Electrical		$45	per sq. ft..	2,025,000
Office Building	6000	$225	per sq. ft..	1,350,000
Scale House	150	$225	per sq. ft..	33,750
Rail Line		$200	per foot	-
A&E Design Engineering & Constr. Mgt		15%	percent	1,492,763
Procurement & Construction Monitoring		5%	percent	497,588
Contingency @ 15%		15%	percent	1,492,763
Subtotal				$14,484,863
Equipment Requirements				
Scale(s), incl. Data Management	2	$90,000	each	180,000
Processing Equipment	1	$6,000,000	each	6,000,000
Front-End Loader(s)	3	$300,000	each	900,000
Grapple(s)	0	$125,000	each	-
Sweeper	1	$115,000	each	115,000
Fork Lift	2	$50,000	each	100,000
Shipping & Misc. Allowance @ 25%		25%	percent	1,823,750
Rolling Stock Units	3.5			
Subtotal				$9,118,750
Other Capital Costs		5%	percent	1,180,181
Total Capital Cost				24,783,793
Annualized Capital Cost, G.O Bond		20	Year Term	1,988,716
		5.0%	Interest Rate	

Notes:
1. Costs of siting study are not included.

Exhibit 13-22 - Central Maui MRF and Base Yard
O&M Cost Analysis

Labor Category	Salary	309 TPD Labor No.	Labor Cost
Supervisor	65,000	1	65,000
Operations Foreman	55,000	2	110,000
Scale Operator	30,000	2	60,000
Equipment Operators	35,000	4	140,000
Grapple Operators	35,000	0	-
Spotters on Tip Floor	31,000	2	62,000
Sorters	22,000	24	528,000
Laborers	22,000	3	66,000
Subtotal		38	1,031,000
Fringe Benefits	63%		649,530
Overtime Multiplier		15%	154,650
Subtotal Labor			1,835,180
Fuel (On-site only) @ X gph/Unit	6	$4.00	183,456
Equipment Maintenance	6%		547,125
Site/Building Maintenance (% of Capital)	2%		289,697
Utilities (electric, water, sewage)	180,000		180,000
Insurance	1%		247,838
Miscellaneous Supplies/Services (Allowance)			100,000
Residue Disposal	15%	$51	736,808
Security	50000		50,000
Subtotal Other			2,334,924
Contingency, all costs (15 %)	0.15		625,516
Total Annual Operating Costs			$4,795,620
Total Tons per Day Handled/Transferred			309
Total Tons Per Year Handled/Transferred	312		96,315
Operating/Maintenance Cost, $ per ton			$49.79
Annualized Capital Cost, $ per ton			$20.65
Total Cost, $ per ton			$70.44

Note: Salaries based on Maui information, 2007

Exhibit 13-23 – Central Maui C&D Processing / Recycling System at Base Yard Capital Cost Estimates

	Size or Number	Cost Factor	Units	Element Cost
Paved Site Area for C&D Equipment	45,000			
Site Size (Acres)	3			
Capacity (TPD, average, 6 days/week)				170
Land (Cost to be Determined)		$150,000	per Acre	450,000
Demolition			per sq. ft..	-
Clearing & Rough Grading		$9,000	per Acre	27,000
Site Work, incl. Electric utilities (new)		$90,000	per Acre	270,000
Foundations/Slabs (No Building)		$60	per sq. ft..	2,700,000
Mechanical & Electrical (In Equipment)		$0	per sq. ft..	
Office Building			per sq. ft..	-
Scale House			per sq. ft..	-
Rail Line			per foot	-
A&E Design Engineering & Constr. Mgt		10%	percent	449,550
Procurement & Construction Monitoring		8%	percent	239,760
Contingency @ 15%		15%	percent	449,550
Subtotal				$4,585,860
Equipment Requirements				
Scale(s), incl. Data Management	0	$90,000	each	-
Processing Plant Equipment, incl. parts	1	$3,000,000	each	3,000,000
Front-End Loader(s)	2	$300,000	each	600,000
Excavator w/Grapple	1	$175,000	each	175,000
Sweeper	0	$40,000	each	-
Yard Truck	0	$90,000	each	-
On-Site Containers for Load-In/Products	10	$6,000	each	60,000
Shipping & Misc. Allowance @ 25%		25%	percent	943,750
	1.5			
Subtotal				$4,778,750
Other Capital Costs		5%	percent	468,231
Total Capital Cost				9,832,841
Annualized Capital Cost, G.O Bond		20	Year Term	789,013
		5.0%	Interest Rate	

Notes:
1. Costs of siting study are not included.

Exhibit 13-24 – Central Maui C&D Processing/Recycling System at Base Yard O&M Cost Analysis

Labor Category		Salary		170 Labor No.	TPD Labor Cost
Supervisor - Included in MRF		65,000		0	-
Operations Foreman		55,000		1	55,000
Scale Operator - Included in MRF		30,000		0	-
FEL Equipment Operators		35,000		2	70,000
Excavator/Grapple Operators		35,000		1	35,000
Spotters on Tip Floor		31,000		1	31,000
Sorters		22,000		11	242,000
Laborers-General Site Cleanup		22,000		2	44,000
	Subtotal			18	477,000
Fringe Benefits		63%			300,510
Overtime Multiplier				15%	71,550
	Subtotal Labor				849,060
Fuel (On-site only) @ X gph/Unit		6		$4.00	78,624
Equipment Maintenance		6%			286,725
Site/Building Maintenance (% of Capital)		2%			91,717
Utilities (electric, water, sewage)		60,000			60,000
Insurance		1%			98,328
Miscellaneous Supplies/Services (Allowance)					100,000
Non-Recycled C&D Haul/Disposal		15,900	tons	$51.00	$810,900
Security Included in MRF		0			-
	Subtotal Other				1,526,295
Contingency, all costs (15 %)		0.15			356,303
Total Annual Operating Costs					$2,731,658
Total Tons per Day Handled/Transferred					170
Total Tons Per Year Handled/Transferred		312			53,000
Operating/Maintenance Cost, $ per ton					$51.54
Annualized Capital Cost, $ per ton					$14.89
Total Cost, $ per ton					$66.43
Recovery Rate		70%			

Note: Salaries based on Maui information, 2007

14. Implementation

14.1 Purpose

The purpose of this chapter is to identify individual tasks and develop implementation timelines for the Plan, as described in Scenario III. This Scenario was recommended by the SWRAC from among five Scenarios created during the course of SWRAC meetings. The SWRAC added the following clarifications to its recommendation of Scenario III: the primary focus of the Plan be the goal of 60% diversion and, secondarily, WasteTEC.[1] The Plan should not specify a single WasteTEC but, rather, determine what is right for the County based on further evaluation. Lastly, the WasteTEC selected must be 'proven technology' that, at the planning and design stage, is not limited to mass burn technology.

The Department of Environmental Management and the Solid Waste Division support the SWRAC recommendations for implementation with the addition of the following elements:

- Evaluate land needed for increased compost operations resulting from improved diversion programs;
- Evaluate standby options for Lanai and Molokai landfills while maintaining and improving recycling collection and processing, including event-based collection of HHW;
- Specify the year 2013 to complete legislation for commercial recycling mandates;
- Add from Scenario V the creation of mandates for the recycling of commercially produced food waste;
- Add from Scenario V the enforcement component for commercial recycling mandates

This plan recommends increasing the diversion rate from its current 30 percent to 60 percent, by the County building MRFs for recycling and C&D materials, a fleet maintenance facility, a household hazardous waste facility, and transfer stations in Hana and Olowalu. The plan also tasks the Division with implementing programs for universal collection of single-stream recyclables, bulky waste, white goods, and yard waste; a household hazardous waste program; and education to support each program. In addition, the plan calls for a WasteTEC facility to convert the residue from recycling and non-recyclable materials to energy. The County will proceed with feasibility and implementation planning, culminating in a procurement that is open to various technologies. The use of the term "waste-to-energy" has deliberately not been used to avoid the potential impression that a particular technology has been

[1]WasteTEC has been used in this ISWMP to describe a waste-to-energy facility that is a key element of the plan but one where the specific technology has not been selected.

selected or has preference. Any technology selected would be required to meet the County's requirements for "proven" results, economy and efficiency.

Scenario III identifies a number of facilities that are needed to support the activities of the Division and help the County reach its diversion goal. In Chapter 13, it is suggested that, for efficient use of land and reduction of transportation and communication links, grouping the facilities should be part of the plan. A solid waste campus, which would be centrally located, was recommended. Because implementation of Scenario III includes siting studies and land purchase, no specific site was recommended.

For each of the component projects in Scenario III, additional implementation planning will be required involving collective bargaining agreements. A team leader for each project will need to be assigned along with a development budget. The individual implementation tasks in each project timeline will need to be described in detail, a methodological approach developed and resources assigned. For each task, the Division may choose to execute the task in-house with Division staff or utilize consultant assistance. Some activities, such as soil borings and groundwater hydraulic analyses, are typically done by firms that specialize in these activities. In all, there are over 125 individual tasks that make up the nine projects and that will constitute the full implementation plan for the selected scenario.

In this chapter, the components of the scenario are outlined in a narrative summary and Gantt chart for each strategic element.

14.2 Resources for Implementation

Implementing the ISWMP will mean bringing a coordinated team of resources to assist in planning the implementation of the programs the Division has decided to pursue. These resources include designating or retaining project managers to oversee the development of each of the facilities to be constructed and programs to be implemented. The County will bring under contract an Architect and Engineer (A&E) firm to assist the Division for site determination and evaluation and to design the projects in the plan where detailed construction specifications and drawings are required by the bid process, including the transfer station and the fleet maintenance facility. A solid waste management consultant will be needed to draft feasibility studies, full service procurement documents and other required reports. Corporation Council will assure and oversee the legal aspects of these specialized contractual arrangements. A specialty law firm may be hired by Corporation Council to assist in the development of these agreements as well as in any collective bargaining agreements that may need to be considered. A law firm experienced in solid waste matters, including requirements of federal and state laws, negotiating energy purchase agreements with electrical end-users and in developing full service contracts between municipalities and operators of WasteTEC firms, would be beneficial to reduce long-term risks for the County. This law firm would also develop full service contracts with future partners, those who win the proposals, in processing Material Recovery Facilities (MRFs) contracts as well as ordinance revision. An education consultant will be retained by the Division to conduct foundational research for education campaigns and graphic development and integration. In addition, collective bargaining agreements will need to be addressed prior to funding and initiating the implementation of projects that involve the relocation of staff.

Any services procured will be in accordance with State and county procurement requirements. Assembling together a team at the outset of this plan can help the County reduce the implementation time and prepare better to implement the activities it has chosen.

14.3 Site Development

The ISWMP calls for the construction of a variety of facilities. Locations for these facilities must be determined before: contracts for construction and services are procured. The locations must be found, reviewed for adequate amount of land, subsoil characteristics to support the structure of the proposed facility, reviewed for ingress and egress traffic, noise pollution, aesthetic impacts, availabilities of utilities, surface and ground water concerns, determination of any archaeological or protected sites, and land use environmental assessments conformance. The Division recognizes, however, that it may not be feasible to have all these facilities at one central location.

The County and/or its contractor will need to obtain: permits for each site (Generally speaking, these permits are in three categories: site development, utility, and zoning); environmental siting approvals from various levels of government, local and state, dealing with flood plains, community land use requirements, and culturally protected sites; and solid waste permits from state and local agencies for siting, design, and operations.

The ISWMP calls for a Central Maui solid waste campus. This campus will include space for administrative offices for the management, support staff, Central Maui drivers, and Division call center. A fleet maintenance facility will be located at the campus to maintain the fleet for both the collection and the landfill. An HHW facility will be located at the site. A MRF to process the recyclables from the single-stream curbside collection will also be a part of the campus. One or more of the mechanics in the Fleet maintenance facility will be trained to maintain the MRF equipment.

Recommended facilities which may be located outside of the Central Maui Solid Waste Campus are the following:

- C&D MRF to process C&D material. A potential site for such a facility may be the existing private C&D landfill. A location must be determined for the facility and, if need be, acquired by the County before the procurement for design, build, and operate.

- WasteTEC Facility needs a location to maximize the efficiencies in routing, residual disposal, and energy transference to a paying end-user.

Finally, transfer stations and convenience centers, which will be located in Hana and Olowalu or on Lanai and Molokai, will need to be designed and operated by the Division. The A&E firm will be required to assist the Division in the detailed design including drawings and specifications for these facilities.

14.4 Centrally Located Solid Waste Campus

The centrally located solid waste campus was recommended to consolidate facilities and shorten communication and transportation links. It would consist of a number of related facilities and administrative space. The implementation of each facility is discussed in the following paragraphs. The Division recognizes that it may not be feasible to have all of these facilities at one central location.

The conceptual timelines at the end of each section represent work after the County Council provides funding. It is expected that Council will have staff perform a significant amount of ground work, which will include property location and preliminary negotiations with permitting agencies, before funding is provided.

14.4.1 Single-Stream Materials Recovery Facility

The Division plans to procure a single-stream recyclables materials processing facility to process the material its curbside collection service collects. The Division may consider a public-private partnership using a design, build, and operate procurement process.. In that way, the Division would interface with one entity that is responsible for the overall development and operations of this facility. The Division would provide the land for the facility and have ownership of the buildings and the equipment, which could be transferred right after the acceptance test or turned over to the County at the end of the contract term.

This partnership must be developed whereby the Division and the contractor work together to assure completion of tasks. The Division will need to develop performance specifications for the facilities that identify parameters, including daily capacity, residue rate, products recovered and marketing requirements. Also, the County will need to provide site data including meets and bounds, soil data and site drawings. Engineering studies to establish soil conditions and infrastructure requirements are best conducted by the Division or its A&E firm prior to procurement. Engineering studies needed for the approval and construction of the MRF would be the responsibility of the contractor. Also, construction of the building and the procurement of equipment would be the responsibility of the contractor but must be equal to or above the standard of quality set by the County.

Designed into the cost and square foot estimates for this facility is office space to house the Division's administration. The Division could move its offices from downtown Wailuku to the centrally located solid waste campus. By doing this, management and operations will be linked closer and have more interface with each other.

This facility would be located in the centrally located solid waste campus. The recommended steps are:

- Select an A&E firm for site studies
- Designate location;
- Submit to the County Council for funding approval;
- After funding approval, develop design, build, and operate procurement documents and release them in a request for proposals format;
- After funding approval, procure needed property;

- Conduct site tests to provide foundation engineering data to be included in the procurement documents.

- After the County has completed the contract with the winning proposer, work together to determine final layout of the site building and process design and apply for permitting approvals;

- As many of the permit approvals are in process, the contractor finalizes construction documents and begins construction; and

- Research on education strategy is performed at one time for all the Division's solid waste programs. Implementation of the education strategy begins before the MRF opens for processing. The MRF is expected to receive material from all sources, private and public.

Total Time: 42 months from initiation of project. Table 14-1 is a timetable showing tasks and subtasks for this project.

Table 14-1 – MRF Conceptual Timetable

	First Year											
Single-Stream MRF	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Select Site				■								
Funding Approval							■					
Performance Requirements					■	■	■					
Procurement Development							■	■	■			
Procurement Process										■	■	■
Contract Negotiations												
Purchase Land							■	■	■	■	■	■
Contractor Finalizes Site Layout												
Permitting - Government Approvals												
Zoning												
Site Plan-Final Design and Approval												
Special Use Permit												
Environmental Assessment												
Erosion Control and Storm Water Permits												
Permit												
Construction												
Shake Down & Acceptance Test												
Commercial Operation												
Education:												
Contract Education Consultant										■		
Brainstorm Session											■	
Decision on Media Strategy												■
Develop Logos/Slogans/Website												
Media Story Development												
Education of Builders/Contractors												

	Second Year											
Single-Stream MRF	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Select Site												
Funding Approval												
Performance Requirements												
Procurement Development												
Procurement Process												
Contract Negotiations	■	■	■									
Purchase Land	■	■	■									
Contractor Finalizes Site Layout			■	■								
Permitting - Government Approvals												
Zoning			■	■	■							
Site Plan-Final Design and Approval						■	■	■	■			
Special Use Permit						■	■	■	■	■	■	
Environmental Assessment						■	■	■	■	■	■	■
Erosion Control and Storm Water Permits												
Permit												
Construction												
Shake Down & Acceptance Test												
Commercial Operation												
Education:												
Contract Education Consultant												
Brainstorm Session												
Decision on Media Strategy												
Develop Logos/Slogans/Website	■											
Media Story Development												
Education of Builders/Contractors												

	Third Year											
Single-Stream MRF	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Select Site												
Funding Approval												
Performance Requirements												
Procurement Development												
Procurement Process												
Contract Negotiations												
Purchase Land												
Contractor Finalizes Site Layout												
Permitting - Government Approvals												
Zoning												
Site Plan-Final Design and Approval												
Special Use Permit												
Environmental Assessment	■	■										
Erosion Control and Storm Water Permits			■	■	■							
Permit						■	■	■				
Construction								■	■	■	■	■
Shake Down & Acceptance Test												
Commercial Operation												
Education:												
Contract Education Consultant												
Brainstorm Session												
Decision on Media Strategy												
Develop Logos/Slogans/Website												
Media Story Development												
Education of Builders/Contractors												

	Fourth Year											
Single-Stream MRF	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Select Site												
Funding Approval												
Performance Requirements												
Procurement Development												
Procurement Process												
Contract Negotiations												
Purchase Land												
Contractor Finalizes Site Layout												
Permitting - Government Approvals												
Zoning												
Site Plan-Final Design and Approval												
Special Use Permit												
Environmental Assessment												
Erosion Control and Storm Water Permits												
Permit												
Construction	■	■	■	■	■	■	■					
Shake Down & Acceptance Test								■	■			
Commercial Operation										■	■	■
Education:												
Contract Education Consultant												
Brainstorm Session												
Decision on Media Strategy												
Develop Logos/Slogans/Website												
Media Story Development				■	■	■	■	■	■			
Education of Builders/Contractors				■	■	■	■	■	■			

14.4.2 Fleet Maintenance

Scenario III calls for a solid waste fleet maintenance center to maintain the expanded fleet needed to support universal collection. This facility would be staffed with Division personnel who maintain both the collection and the landfill equipment. Because of the latter, it is expected that this facility would be located in the centrally located solid waste campus and near enough to the Central Maui Landfill to make repair of its equipment feasible.

Essentially, the County will be responsible to develop the following:

- A conceptual design and estimated capital and operational funding will need to be generated and submitted to Council for funding;

- After funding has been approved, the Division will move to purchase the land needed and develop the bid specifications and drawings necessary to support A&E procurements for the construction and equipment needed for the facility;

- Work with the permitting agencies and finalize building documents and begin construction; and

- Develop job description for mechanics, hire and/or transfer personnel, and train them on proper protocol.

Total time: 33 months from initiation of project. Table 14-2 is a timetable showing tasks and subtasks for this project.

Table 14-2 - Fleet Maintenance Building Conceptual Timetable

Fleet Maintenance Building	First Year												Second Year												Third Year												Fourth Year											
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Funding Approval							X																																									
A&E Conceptual Design					X	X																																										
Purchase Land					X	X	X	X	X	X	X	X	X	X	X																																	
Determination of Final Site Layout															X	X																																
Permitting - Government Approvals:																																																
Zoning															X	X	X																															
Site Plan-Final Design and Approval																		X	X	X	X																											
Special Use Permit																		X	X	X	X	X	X																									
Environmental Assessment																		X	X	X	X	X	X	X																								
Erosion Control and Storm Water Permits																						X	X	X																								
Permit																						X	X	X																								
Prepare Construction/Bid Document																			X	X	X	X	X	X																								
Bid Process																									X	X	X																					
Construction																												X	X	X	X	X	X															
Equipment Put in Place																																	X	X														
Mechanic Crew:																																																
Develop Job Requirements																										X	X																					
Approve Position Hiring/Transfers																																X	X															
Train Personnel																																		X														
Commercial Operation																																			X	X	X	X	X	X	X	X	X	X	X	X	X	X

14.4.3 Household Hazardous Waste

Scenario III implements a household hazardous waste collection program for all three inhabited islands and the Hana region in the County. A permanent facility will be at the centrally located solid waste campus on the Island of Maui; the Division will fund a full-time household hazardous waste manager who will oversee the development of this program.

The HHW program will have event collections on the Islands of Lanai and Molokai, as well as in the Hana Region. The fixed or permanent facility will be open daily for people to use on a regular basis.

The recommended steps are:

- Develop job requirement and work outline for Household Hazardous Waste Manager and provide that and cost projections of the program to Council for funding;

- After funding is approved, the Division should hire a candidate to fill the position, a national search may be required;

- After the position is filled, the manager begins to develop a procurement package for an HHW disposal contractor;

- A site for the location of the permanent HHW facility will have been chosen and acquired, as part of the Solid Waste Campus. The Division will develop the bid specifications and drawings necessary to support A&E procurements for the construction and equipment needed for the facility.

- The Division and its A&E contractor will work with the appropriate permitting agencies to fulfill all permitting requirements;

- Education for a new program will begin with research including, but not limited to, focus groups and a brainstorming session involving HHW manager, HHW contractor and environmental education professionals in the Division. Graphics and media strategy will be created and prepared before the first collection;

- HHW technicians will be hired and/or transferred from other positions to assist the HHW manager in everyday activity and/or event collection. Rules and procedures will be devised by the HHW manager for every aspect of operating the fixed facility and event collections;

- Training of call center operators on HHW so as to better inform citizens who call in; and

- Before the final construction of the permanent facility, three event collections are scheduled where the Division staff progressively takes over more of the hands-on duties from the proposed HHW disposal contractor.

Total time: 24 months from initiation of project. Table 14-3 is a timetable showing tasks and subtasks for this project.

Table 14-3 – Household Hazardous Waste Collection Conceptual Timetable

Household Hazardous Waste	First Year											
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Funding Approval							■					
Develop Job Requirment for HHW Mgr.					■	■						
Approve Position							■					
National Search / Hire								■	■	■	■	■
Procurement Development												
Procurement & Contract for Contractor												
Land Purchase (if necessary)												
Permitting - Government Approvals												
Zoning												
Site Plan-Final Design and Approval												
Special Use Permit												
Environmental Assessment												
Erosion Control and Storm Water Permits												
Permit By Rule												
Final Construction Document Preparation												
Bidding and Award												
Construction												
First Event Collections:												
Lanai												
Molokai												
Hana Region												
Education:												
Contract Education Consultant										■		
Brainstorm Session											■	
Decision on Media Strategy												■
Graphics												
Develop Logos/Slogans/Website												
Education Material												
HHW Technicians												
Develop Job Requirments												
Approve Position Hiring/Transfers												
Train Personnel												
Call Center Operators Trained/In Place												
Operate Permanent Facility												

Household Hazardous Waste	Second Year											
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Funding Approval												
Develop Job Requirment for HHW Mgr.												
Approve Position												
National Search / Hire												
Procurement Development	■	■	■									
Procurement & Contract for Contractor				■	■							
Land Purchase (if necessary)		■	■	■	■	■	■					
Permitting - Government Approvals												
Zoning						■	■	■				
Site Plan-Final Design and Approval						■	■	■	■			
Special Use Permit						■	■	■	■	■		
Environmental Assessment										■	■	
Erosion Control and Storm Water Permits										■	■	
Permit By Rule											■	■
Final Construction Document Preparation						■	■					
Bidding and Award								■	■	■		
Construction												
First Event Collections:												
Lanai				■								
Molokai					■							
Hana Region						■						
Education:												
Contract Education Consultant												
Brainstorm Session												
Decision on Media Strategy												
Graphics			■									
Develop Logos/Slogans/Website			■									
Education Material			■									
HHW Technicians												
Develop Job Requirments												
Approve Position Hiring/Transfers	■	■										
Train Personnel		■	■									
Call Center Operators Trained/In Place			■									
Operate Permanent Facility												

Household Hazardous Waste	Third Year											
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Funding Approval												
Develop Job Requirment for HHW Mgr.												
Approve Position												
National Search / Hire												
Procurement Development												
Procurement & Contract for Contractor												
Land Purchase (if necessary)												
Permitting - Government Approvals												
Zoning												
Site Plan-Final Design and Approval												
Special Use Permit												
Environmental Assessment												
Erosion Control and Storm Water Permits												
Permit By Rule	■											
Final Construction Document Preparation												
Bidding and Award												
Construction		■	■									
First Event Collections:												
Lanai			■									
Molokai				■								
Hana Region					■							
Education:												
Contract Education Consultant												
Brainstorm Session												
Decision on Media Strategy												
Graphics												
Develop Logos/Slogans/Website												
Education Material												
HHW Technicians												
Develop Job Requirments												
Approve Position Hiring/Transfers												
Train Personnel												
Call Center Operators Trained/In Place												
Operate Permanent Facility				■	■	■	■	■	■	■	■	■

Household Hazardous Waste	Fourth Year											
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Funding Approval												
Develop Job Requirment for HHW Mgr.												
Approve Position												
National Search / Hire												
Procurement Development												
Procurement & Contract for Contractor												
Land Purchase (if necessary)												
Permitting - Government Approvals												
Zoning												
Site Plan-Final Design and Approval												
Special Use Permit												
Environmental Assessment												
Erosion Control and Storm Water Permits												
Permit By Rule												
Final Construction Document Preparation												
Bidding and Award												
Construction												
First Event Collections:												
Lanai			■									
Molokai				■								
Hana Region					■							
Education:												
Contract Education Consultant												
Brainstorm Session												
Decision on Media Strategy												
Graphics												
Develop Logos/Slogans/Website												
Education Material												
HHW Technicians												
Develop Job Requirments												
Approve Position Hiring/Transfers												
Train Personnel												
Call Center Operators Trained/In Place												
Operate Permanent Facility	■	■	■	■	■	■	■	■	■	■	■	■

14.5 Additional Solid Waste Facilities

14.5.1 C&D Materials Recovery Facility

The Division plans to procure a contractor to process the C&D materials. SWRAC advised the Division to develop a public-private partnership using a design, build, and operate procurement. In that way, the Division would interface with one entity that is responsible for the overall development and operations of each facility. The Division would, if necessary, provide the land for the facility and have ownership of the buildings and the equipment, which could be transferred right after the acceptance test or turned over to the County at the end of the contract term.

This partnership must be developed whereby the Division and the contractor work together to assure completion of tasks. The Division will need to develop performance specifications for the facilities that identify parameters, including daily capacity, residue rate, products recovered and marketing requirements. Engineering studies needed for the approval and building of the facilities may be shared by both the

Division and the contractor. Construction of the building and the procurement of equipment would be the responsibility of the contractor but must be equal to or above the standard of quality set by the County.

The location of the facility must be in the central Maui area but not necessarily within the Solid Waste Campus. One possible site is at the existing private C&D Landfill and it could potentially be a partnership between the County and the current operator. Alternatively, the C&D facility could be co-located with the MRF. The recommended steps for the development of this project are as follows:

- Designate location;
- Submit to the County Council for funding approval;
- After funding approval, develop design, build, and operate procurement documents and release them in a request for proposals format;
- After funding approval, procure, if necessary, needed property;
- Conduct site tests to provide foundation engineering data to be included in the procurement documents.
- Develop the bid specifications and drawings necessary to support A&E procurements for the construction and equipment needed for the facility. After the County has executed the contract with the winning proposer, work together to determine final layout of the site and receive permitting approvals;
- As many of the permit approvals are in process, the contractor finalizes construction documents and then awards; and
- Research on education strategy is performed at one time for all the Division's solid waste programs. Implementation of the education strategy begins before the MRF opens for processing. The MRF is expected to receive material from all sources, private and public.

Total Time: 42 months from initiation of project. Table 14-4 is a timetable showing tasks and subtasks for this project.

Table 14-4 – C&D Facility Conceptual Timetable

	First Year												Second Year											
C&D Facility	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Select Site				X																				
Funding Approval							X																	
Performance Requirements					X	X	X																	
Procurement Development							X	X	X															
Procurement Process										X	X	X												
Contract Negotiations													X	X	X									
Purchase Land							X	X	X	X	X	X	X	X	X									
Contractor Finalizes Site Layout															X	X								
Permitting - Government Approvals																								
Zoning															X	X	X							
Site Plan-Final Design and Approval																		X	X	X	X			
Special Use Permit																		X	X	X	X	X	X	
Environmental Assessment																		X	X	X	X	X	X	X
Erosion Control and Storm Water Permits																								
Permit																								
Construction																								
Shake Down & Acceptance Test																								
Commercial Operation																								
Education:																								
Contract Education Consultant										X														
Brainstorm Session											X													
Decision on Media Strategy												X												
Develop Logos/Slogans/Website													X											
Media Story Development																								
Education of Builders/Contractors																								

	Third Year												Fourth Year											
C&D Facility	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Select Site																								
Funding Approval																								
Performance Requirements																								
Procurement Development																								
Procurement Process																								
Contract Negotiations																								
Purchase Land																								
Contractor Finalizes Site Layout																								
Permitting - Government Approvals																								
Zoning																								
Site Plan-Final Design and Approval																								
Special Use Permit																								
Environmental Assessment	X	X																						
Erosion Control and Storm Water Permits			X	X	X																			
Permit						X	X	X																
Construction								X	X	X	X	X	X											
Shake Down & Acceptance Test														X	X									
Commercial Operation																X	X	X	X	X	X	X	X	X
Education:																								
Contract Education Consultant																								
Brainstorm Session																								
Decision on Media Strategy																								
Develop Logos/Slogans/Website																								
Media Story Development													X	X	X	X	X							
Education of Builders/Contractors													X	X	X	X	X							

14.5.2 Olowalu Transfer Station

Scenario III calls for the transformation of the existing Olowalu convenience center into a transfer station that would consolidate refuse into transfer trailers, thereby eliminating the need for refuse collection trucks servicing the Lahaina area from traveling to and from CML. The transfer station will be enclosed, and the facility will continue to take recyclables. SWRAC recognized that the location of this facility and the highly trafficked frontage road demanded a traffic study so as to adequately plan for the ingress and egress of the facility. The construction of this facility will be through the Division's A&E contractor.

The recommended steps are:

- The Division must create a conceptual design with cost estimates to provide to Council for funding approval;

- After funding approval, the Division will produce a request for proposals procurement package for the construction of the transfer station; and

- Develop the bid specifications and drawings necessary to support A&E procurements for the construction and equipment needed for the facility. After the County has executed the contract with the winning proposer, work together to determine final layout of the site and receive permitting approvals.

Total time: 32 months from initiation of project. Table 14-5 is a timetable showing tasks and subtasks for this project.

Table 14-5 - Olowalu Transfer Station Conceptual Timetable

Olowalu Transfer Station	First Year												Second Year												Third Year												Fourth Year											
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Funding Approval							■																																									
Conceptual Design					■	■	■																																									
Procurement Development							■	■	■																																							
Procurement Process										■	■	■																																				
Contract Negotiations													■	■	■																																	
Determination of Final Site Layout															■	■																																
Permitting - Government Approvals:																																																
Zoning															■	■	■																															
Site Plan-Final Design and Approval																		■	■	■	■																											
Special Use Permit																		■	■	■	■	■	■																									
Environmental Assessment																		■	■	■	■	■	■	■	■	■																						
Traffic Study																		■	■	■	■	■	■	■	■	■																						
Erosion Control and Storm Water Permits																											■	■	■																			
Permit																														■	■	■																
Final Construction Document Preparation																		■	■																													
Construction																																■	■	■	■	■	■											
Operation																																						■	■	■	■	■	■	■	■	■	■	■

14.5.3 Hana Transfer Station

Scenario III calls for placing the Hana Landfill on Standby with Permit. This transfer station would be designed as a convenience center to collect and haul recyclables and refuse. Roll-off containers would be provided for items that can be recycled. Trash would be placed into a rear-load trash truck and additional containers when trucks are unavailable. Every two days, the rear-load truck will be transported to CML and an empty truck will take its place in the transfer station. The facility will be located on the site of the existing Hana Landfill. The design of this facility will be through the Division's A&E and a bid package used to select a construction contractor.

The recommended steps are:

- The Division creates a conceptual design with cost projections to provide the Council for funding approval;
- Develop the bid specifications and drawings necessary to support A&E procurements for the construction and equipment needed for the facility. After the County has executed the contract with the winning proposer, work together to determine final layout of the site and receive permitting approvals;
- With the contractor, the Division shall finalize site layout;
- Obtain permits, including permit by rule or modification of current permit; erosion control and storm water permits;
- During permit approval, the site layout plans will be finalized; and
- Construction and the placement of equipment will be completed.

Total time: 20 months from initiation of project. Table 14-6 is a timetable showing tasks and subtasks for this project.

Table 14-6 - Hana Transfer Station Conceptual Timetable

Hana Transfer Station	First Year											
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Funding Approval							■					
Conceptual Design					■	■	■					
Procurement Development							■	■	■			
Procurement Process										■	■	■
Contract Negotiations												
Determination of Final Site Layout												
Permitting - Government Approvals:												
Zoning												
Site Plan-Final Design and Approval												
Special Use Permit												
Environmental Assessment												
Erosion Control and Storm Water Permits												
Permit												
Final Construction Document Preparation												
Construction & Equipment												
Operation												

Hana Transfer Station	Second Year											
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Funding Approval												
Conceptual Design												
Procurement Development												
Procurement Process												
Contract Negotiations	■	■	■									
Determination of Final Site Layout			■	■								
Permitting - Government Approvals:												
Zoning			■	■	■							
Site Plan-Final Design and Approval						■	■	■	■			
Special Use Permit						■	■	■	■			
Environmental Assessment						■	■	■	■			
Erosion Control and Storm Water Permits							■	■	■			
Permit							■	■	■			
Final Construction Document Preparation						■	■					
Construction & Equipment											■	
Operation												■

Hana Transfer Station	Third Year											
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Funding Approval												
Conceptual Design												
Procurement Development												
Procurement Process												
Contract Negotiations												
Determination of Final Site Layout												
Permitting - Government Approvals:												
Zoning												
Site Plan-Final Design and Approval												
Special Use Permit												
Environmental Assessment												
Erosion Control and Storm Water Permits												
Permit												
Final Construction Document Preparation												
Construction & Equipment												
Operation	■	■	■	■	■	■	■	■	■	■	■	■

Hana Transfer Station	Fourth Year											
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Funding Approval												
Conceptual Design												
Procurement Development												
Procurement Process												
Contract Negotiations												
Determination of Final Site Layout												
Permitting - Government Approvals:												
Zoning												
Site Plan-Final Design and Approval												
Special Use Permit												
Environmental Assessment												
Erosion Control and Storm Water Permits												
Permit												
Final Construction Document Preparation												
Construction & Equipment												
Operation	■	■	■	■	■	■	■	■	■	■	■	■

14.6 WasteTEC

Scenario III has as its primary goal a high level of recycling, 60 percent of the waste generated in the County, with a WasteTEC facility to handle the 40 percent that is not recycled plus the suitable residue from the recycling facilities. This facility will be located on the Island of Maui and in a central location. Locating the WasteTEC facility near the CML would minimize the hauling of ash, the waste product of a WasteTEC facility, to the landfill. It is expected that this facility would be located in or near the centrally located solid waste campus. The recommended procurement strategy is for the County to hire a single contractor to be responsible for the design, construction, and operation of the facility under a long-term service agreement.

Essentially, the County must take the following steps:

- Make a general assessment based on recent and completed feasibility studies;
- Initiate public education on WasteTEC as part of the overall public education program;
- Prior to the procurement, secure the site for the facility;
- Negotiate letter of intent with Maui Electric for the energy it would produce;
- Update the feasibility study already included in this ISWMP;
- Develop procurement documents with performance and technical specifications, draft the service agreement for design, construction and operations of the facility, and solicit for proposals;
- The procurement will be structured so that a spectrum of technologies can compete if they meet the specifications for performance, reliability, demonstrated experience, financial guarantees, and other key measures.

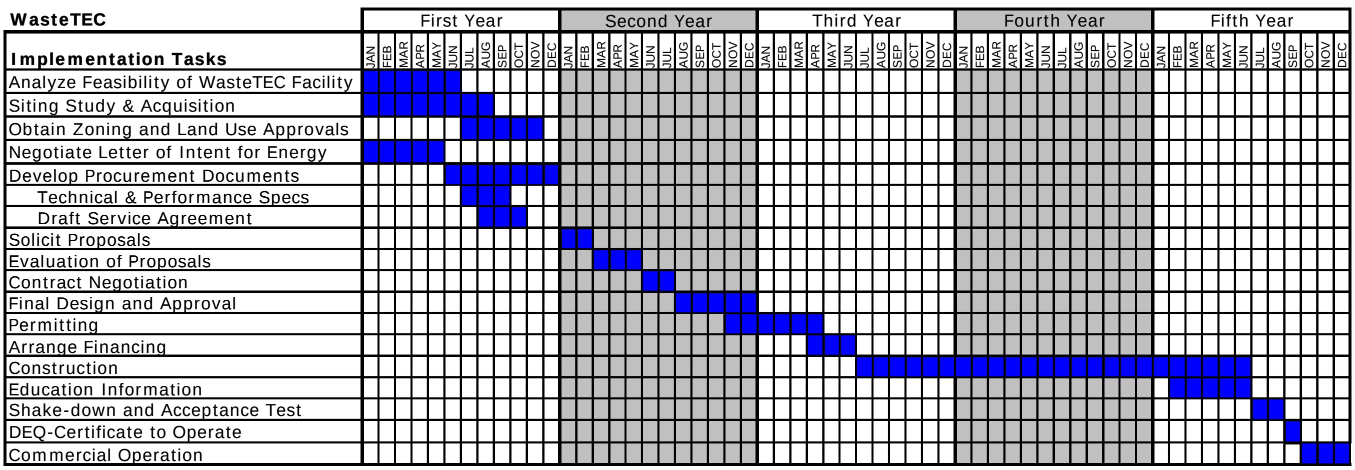
- After the service agreement with the selected proposer is executed, the contractor will provide the final design of the facility to the Division.

- Construction will take approximately 24 months, after which a testing or "shake-down" period will occur before full-scale operation; and

- An education strategy will have to be developed for the WasteTEC facility. A media strategy will be developed so as to adequately inform the press, the public, and customers as to the purpose and energy benefits of the facility, and the environmental impact of the process.

Total time: 57 months from initiation of project. Table 14-7 is a timetable showing tasks and subtasks for this project.

Table 14-7 - WasteTEC Implementation and Construction Conceptual Schedule



14.7 Universal Collection: MSW, Recycling, Bulky Waste, White Goods, and Yard Waste

The SWRAC recommended and the Division supports the recommendation to implement universal curbside collection for all residences served by streets and roads meeting County standards. This would include:

- Refuse collected once per week in a cart;

- Single-stream marketable recyclables collected once every other week in a cart;

- Yard and large green waste collection pilot using carts, paper bags, or bundled, and/or called in by route drivers if within volume and size restrictions and collected every other week;

- Bulky collection on a call-in (appointment) basis within ordinance limits; and

- White goods collection, expanded to include all metals, on a call-in basis.

14.7.1 MSW

The Division supports the implementation of the following:

- Reduce collection of MSW to one time a week; and
- Discontinue manual collection and have only automated and semi-automated collection.

The Division will submit a request for funding to Council for additional automated and semi automated equipment, for the cart lifters that need to be placed on the County's existing rear load collection vehicles, and carts.

Maui Code and administrative rules should be reviewed to determine needed revisions to be done prior to implementation.

They include the following:

- Definition of semi-automated collection;
- Definition of Bulky Waste that limits material to large items inorganic items such as furniture and mattresses;
- Eliminate references to manual collection; and
- Eliminate all references to garbage collection of more than once a week. There will be no bags allowed to be set out but there can be two wheeled carts set out for weekly collection.

14.7.2 Recycling

Scenario III calls for the Division to provide curbside collection of single-stream recyclables as part of residential universal collection. The collection of such materials on the Island of Maui will have to be implemented after a MRF is operating in order to process the newly collected material. The Islands of Molokai and Lanai, however, may collect and ship to a processor on Oahu after such a contract has been procured by the Division.

As the curbside recycling is implemented, an ordinance to limit trash collection to once a week and to a limited number of carts would go into effect. Balance between once-a-week trash collection and every-other-week recyclables collection would be in effect. This will allow the Collection Section of the Division to utilize its employees and equipment so as to minimize costs and maximize work.

To implement curbside recycling collection, equipment must be procured and delivered, trucks must be routed, personnel trained, and an education program must be devised and implemented.

The recommended steps to implement this program are:

- County Council approves funding;
- Procure and contract for recycling equipment such as trucks and carts;
- Finalize house counts, secure addresses, produce route maps;
- Prepare personnel for recycling collection with job description, training on equipment, services, and routes;
- Coordinate schedule with the MRF construction schedule;
- Develop education campaign for new recycling program. The Division will have coordinated research for all programs with an education consultant and have prepared a media education strategy in conjunction with all other proposed programs. This strategy will include pre-implementation media exposure of the program, education material about the program delivered to each household with a cart, a new section on the Division's website for the new program; and
- Call center employees contract work trained to handle influx of calls about the new program. Hours of call center and number of customer service representatives should be increased for a period of six weeks after the implementation of the new collection service.

Total Time: 14 months from initiation of project. Table 14-8 is a timetable showing tasks and subtasks for this project.

Table 14-8 - Recycling Collection Conceptual Timetable

	First Year												Second Year												Third Year												Fourth Year											
Universal Collection: Recycling	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Funding Approval																															X																	
Ordinance Change																															X																	
Ordinance Takes Effect																																												X				
Procure & Contract Recycling Equipment																																X	X	X	X													
Delivery of Equipment																																										X						
Delivery of Carts to Customers																																											X	X	X			
Routing:																																																
Finalize Housecounts																																					X											
Secure Address Database																																						X										
Geocode Address to GIS																																							X									
Draw Polygons of Proposed Routes																																								X								
Draft Collection Path Routes																																									X							
Finalize Path Routes																																										X						
Collection Crews:																																																
Develop Job Requirements																																						X										
Approve Position Hiring/Transfers																																										X	X					
Train Personnel																																												X	X			
Drivers Operate Shadow Routes																																													X			
Education:																																																
Contract Education Consultant										X																																						
Brainstorm Session											X																																					
Decision on Media Strategy												X																																				
Develop Logos/Slogans/Website													X																																			
Cart Education Material																																							X									
Call Center Operator Recycling Training																																												X	X			
Operation																																														X	X	X

14.7.3 Bulky Waste and White Goods

White Goods and Bulky Items collection is not dependent upon the construction of a MRF. The implementation of the collection of these materials can begin in many parts of the County as soon as the necessary ordinances are passed.

Scenario III calls for the curbside collection of white goods on all three islands and the region of Hana by appointment. Citizens call into the customer service center, are given a date to set their material out at the curb, and a collection truck will come by to collect the material. The Division will have to purchase trucks for this kind of collection to augment its fleet of one flatbed truck with a liftgate. It has been recommended that a combination of flatbeds and knuckle-boom collection vehicles be purchased so as to be utilized for many different collection tasks, such as delivering carts and storm debris collection.

White goods will be delivered to a processor to be recycled. The bulk items will be disposed of through the Division's WasteTEC or landfill. Any white goods and bulk items that can be reused will be diverted to the private sector for reuse.

Bulky waste (e.g., furniture) collection will mainly be collected by a rear-load truck in the Hana Region and on Molokai. On Lanai, a flatbed or knuckle-boom would be used for its collection. The region of Hana and the Island of Molokai will collect bulky waste on the same day as the collection of garbage. Citizens simply set the material out with their household trash and the Division will coordinate the collection. Central Maui and Lanai will collect Bulky items by appointment.

The recommended steps are:

- Funding approval from Council for the purchase of additional equipment;
- Division shall procure for the approved additional equipment and oversee its contract and delivery;
- Point-to-point routing software shall be purchased and implemented for the collection on the Island of Maui;
- Education strategy will be developed using results of focus groups and brainstorming session. Material for media will be created as will a new section on the Division's website, and training of call center operators so as to respond in an informative manner to customers who seek information on these kind of collections; and
- Collection crews will be educated (1) as to what items to collect, (2) to note if they see such material sitting out at the curb, and (3) about the purpose of implementing the program.

Total time: 13 months from initiation of project. Table 14-9 is a timetable showing tasks and subtasks for this project.

Table 14-9 – Bulky Waste and White Goods Conceptual Timetable

Universal Collection: Bulky Waste and White Goods	First Year											
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Funding Approval							■					
Procure & Contract Equipment								■	■	■	■	
Delivery of Equipment												
Routing:												
Point to Point Routing Software												
Routing Software Training												
Education:												
Contract Education Consultant										■		
Brainstorm Session											■	
Decision on Media Strategy												■
Develop Logos/Slogans/Website												
Call Center Operator Training												
Collection Crews:												
Develop Job Requirements												
Approve Position Hiring/Transfers												
Train Personnel												
Operate												

Universal Collection: Bulky Waste and White Goods	Second Year											
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Funding Approval												
Procure & Contract Equipment												
Delivery of Equipment					■	■						
Routing:												
Point to Point Routing Software			■	■	■							
Routing Software Training					■							
Education:												
Contract Education Consultant												
Brainstorm Session												
Decision on Media Strategy												
Develop Logos/Slogans/Website					■							
Call Center Operator Training							■					
Collection Crews:												
Develop Job Requirements							■					
Approve Position Hiring/Transfers							■					
Train Personnel							■					
Operate							■	■	■	■	■	■

Universal Collection: Bulky Waste and White Goods	Third Year											
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Funding Approval												
Procure & Contract Equipment												
Delivery of Equipment												
Routing:												
Point to Point Routing Software												
Routing Software Training												
Education:												
Contract Education Consultant												
Brainstorm Session												
Decision on Media Strategy												
Develop Logos/Slogans/Website												
Call Center Operator Training												
Collection Crews:												
Develop Job Requirements												
Approve Position Hiring/Transfers												
Train Personnel												
Operate	■	■	■	■	■	■	■	■	■	■	■	■

Universal Collection: Bulky Waste and White Goods	Fourth Year											
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Funding Approval												
Procure & Contract Equipment												
Delivery of Equipment												
Routing:												
Point to Point Routing Software												
Routing Software Training												
Education:												
Contract Education Consultant												
Brainstorm Session												
Decision on Media Strategy												
Develop Logos/Slogans/Website												
Call Center Operator Training												
Collection Crews:												
Develop Job Requirements												
Approve Position Hiring/Transfers												
Train Personnel												
Operate	■	■	■	■	■	■	■	■	■	■	■	■

14.7.4 Yard Waste

Although the SWRAC recommended a goal of universal collection of every other week, the Division will have to move toward that goal in conjunction with the ability of local processors to handle the material. The Division's current contractor for the processing of green waste is at capacity. It is estimated that the contractor would need an approximate twenty (20) acres to process more yard waste in Central Maui. Such land will have to be procured by the County and provided for the processing of yard waste before curbside collection of yard waste can occur on the Island of Maui.

The Division is currently pursuing discussions with potential processors of yard waste on the Island of Lanai. A processor will need to be contracted before collection of yard waste is implemented on Lanai. The same is true for the Island of Molokai.

When processors are contracted for yard waste, the Division will implement pilot collection programs using an assortment of collection methods: yard waste in carts and collected by automatic side loaders and/or rear loading collection vehicles.

Once the Division has determined what its collection program will be, it acquires the needed containers and education material and begins implementing the program.

14.8 Call Center

Scenario III calls for a consolidation of citizens' calls and inquiries to the Division through a customer call center where all requests will be tracked, work orders created, and services tracked. The call center does not need to be located in the solid waste campus but may, if all the administrative functions are located there. Its functional requirements are sufficient telecommunications and server capacity. The work order system will integrate with the Division's routing software to better track activities and customer service. The Division will be able to run reports tracking level of calls related to each service activity performed by the Division, close work orders, track time it took to complete the work order, and many other valuable measurements for management.

Essentially, the County must implement the following:

- Determine number of personnel to staff the call center, the location, and the corresponding capital and operational funding required, and submit these to Council for funding approval;
- After funding approval, develop a procurement package, if needed, for the equipment, construction and work-order software;
- Continually throughout this process, the Division will have to work closely with the County's Information Services to integrate phone and computer software;
- Develop job descriptions for a supervisor of the call center and the technicians and hire them; and
- Develop an educational strategy that educates the citizens on calling one, as opposed to seven, published Division number. This may involve a slogan on its brochures that reminds people of the number to call for information and to request services. The technicians should also be educated on all facets of Division operations.

Total time: 15 months from initiation of project. Table 14-10 is a timetable showing tasks and subtasks for this project.

Table 14-10 – Call Center System Conceptual Timetable