

1.0 DRAFT Waste Stream Assessment, August 28, 2008

1.1 Introduction

This section provides an assessment of the Hawai`i County waste stream including background information about population and employment, historical and forecast waste generation, recycling, and disposal, and information about waste composition.

The generation, recycling, and disposal forecasts are referred to as “baseline” in that they are projected assuming no change in the County’s long-term diversion rate. This provides a baseline for the development of new re-use and recycling programs. The final waste stream assessment included in the draft Integrated Solid Waste Management Plan (ISWMP) Update will include the effects of recommended reduction, re-use, and recycling programs.

1.2 Population and Employment

This section provides historical and forecast information about population and employment. These variables, along with other factors such as increases in tourism and construction activity, are factors that contribute to increase waste generation within Hawai`i County.

Historical resident and de facto population for Hawai`i County is shown in Exhibit 1. The de facto population is a measure used by the State of Hawaii to account for the effects of tourism¹. As shown, the population of Hawai`i County was 173,057 in 2007. The County population increased at an average annual rate of 2.7 percent during the 1980s, and has increased at an average annual rate of 2.2 percent since that time. The de facto population has increased somewhat more rapidly than the resident population.

Exhibit 2 provides a forecast of Hawai`i County resident population growth through the year 2030 in each of the County’s 9 council districts, and summaries for West Hawai`i and East Hawai`i. As shown, future population growth is projected to be slower than in the County’s recent past, with more rapid growth expected in West Hawai`i than in East Hawai`i.

¹ De facto population is defined as the number of persons physically present in an area, regardless of military status or usual place of residence. It includes visitors present but excludes residents temporarily absent.

EXHIBIT 1
Historical Population, Hawai'i County

Year	Persons		Average Annual Growth		Ratio De Facto / Resident
	Resident	De Facto	Resident	De Facto	
1980	92,053	98,588			1.07
1990	120,317	133,202	2.7%	3.1%	1.11
2000	148,677	167,063	2.1%	2.3%	1.12
2006	169,419	191,733	2.2%	2.3%	1.13
2007	173,057	not avail.	-	-	-

Source: Hawai'i Department of Business, Economic Development, and Tourism. 2008. Hawai'i County Data Book, Table 1.1 last modified 4/16/08. Accessed at http://www.co.Hawai'i.hi.us/databook_current/section01.htm

EXHIBIT 2
Resident Population Forecast by District, Hawai'i County

District	2000	2005	2010	2015	2020	2025	2030
Population							
Puna	31,458	37,054	42,546	48,361	54,322	57,827	61,452
South Hilo	47,572	47,168	47,427	47,209	46,437	49,432	52,531
North Hilo	1,727	1,675	1,718	1,746	1,752	1,865	1,982
Hamakua	6,132	6,316	6,554	6,733	6,834	7,275	7,731
North Kohala	6,062	6,750	7,909	9,173	10,514	11,192	11,893
South Kohala	13,183	15,962	18,165	20,463	22,780	24,250	25,770
North Kona	28,655	31,056	33,988	36,826	39,427	41,971	44,602
South Kona	8,623	10,451	11,402	12,314	13,143	13,991	14,868
Ka'u	5,850	6,568	7,043	7,475	7,842	8,347	8,871
Total	149,261	163,000	176,750	190,300	203,050	216,150	229,700
West Hawai'i	56,522	64,220	71,463	78,776	85,863	91,403	97,133
East Hawai'i	92,739	98,780	105,287	111,524	117,187	124,747	132,567
Annual Growth Rate							
West Hawai'i		2.6%	2.2%	2.0%	1.7%	1.3%	1.2%
East Hawai'i		1.3%	1.3%	1.2%	1.0%	1.3%	1.2%

The proportion of residents in each District in each year is from the County of Hawai'i General Plan 2005 (Amended December 2006), Table 2-2. Source: Economic Assessment, PFK Hawai'i, January 2000. Those proportions were multiplied by County total forecast total resident population in each year from Hawai'i Department of Business, Economic Development, and Tourism. 2008. Population and Economic Projections for the State of Hawai'i to 2035, DBEDT 2035 Series. Accessed at: http://Hawai'i.gov/dbedt/info/economic/data_reports/2035LongRangeSeries/2035_Long_Range_Series_Report1.pdf

Historical employment in Hawai'i County is shown in Exhibit 3. Employment has grown substantially in recent years, from 40,850 in 1980 to 81,300 in 2006, which corresponds to an average annual growth rate of 2.7 percent over that period.

EXHIBIT 3
Historical Employment, Hawai'i County

Year	Employment	Average Annual Growth
1980	40,850	
1990	55,200	3.1%
2000	65,450	1.7%
2006	81,300	3.7%
1980-2006		2.7%

Civilian employment from County of Hawai'i Data Book Section 11: Labor Force, Employment & Earnings, Table 11.4. Accessed at http://www.Hawai'i-county.com/databook_current/Table%2011/11.4.pdf

Forecast employment for Hawai'i County is shown in Exhibit 4. Employment is forecast to increase at an annual rate of 2.3 percent between 2006 and 2010, at an annual rate of 1.8 percent between 2011 and 2015, and at an annual rate of 1.5 percent thereafter. As noted in the table, the state of Hawai'i's employment forecast is based on information from a source that differs from the historical data reported in Exhibit 3.

EXHIBIT 4
Forecast Employment, Hawai'i County

	2005	2010	2015	2020	2025	2030
Civilian Jobs	92,400	103,400	113,100	122,000	131,700	141,600
Annual Growth Rate		2.3%	1.8%	1.5%	1.5%	1.5%

Note: This forecast is based on data from the Bureau of Economic Analysis, which differs from the historical information provided in Exhibit 3 which is from the Bureau of Labor Statistics (personal communication with Yang-Seon Kim, Economist, DBEDT on August 12, 2008).

Source: Hawai'i Department of Business, Economic Development, and Tourism. 2008. Population and Economic Projections for the State of Hawai'i to 2035, DBEDT 2035 Series. Available at: <http://Hawai'i.gov/dbedt/info/economic/>

1.3 Generation, Disposal, and Recycling

1.3.1 Historical

Historical generation, recycling, disposal for Hawai'i County, and the resulting diversion rates are shown in Exhibits 5 and 6. Generation is the sum of recycling and disposal. As shown, estimated fiscal year² (FY) 2008 generation was 296,473 tons, 29.2 percent of which was recycled (86,443 tons) with the remainder (210,030 tons) going into landfills for disposal.

² The County fiscal year is from July 1 to June 30.

Since FY 2001, both recycling and disposal in the County have increased substantially. Recycling has increased from 26,416 tons in FY 2001 to 86,443 tons in FY 2008, and disposal has increased from 163,825 to 210,030 over the same period. These increases correspond to average annual growth rates of 18.5 percent and 3.6 percent, respectively.

Particularly strong growth was experienced in FY 2004 and FY 2005, which can be attributed, in part, to the effects of storm debris. The County's estimated diversion rate has more than doubled in the past seven years increasing from 13.9 percent in FY 2001 to 29.2 percent in FY 2008³.

EXHIBIT 5

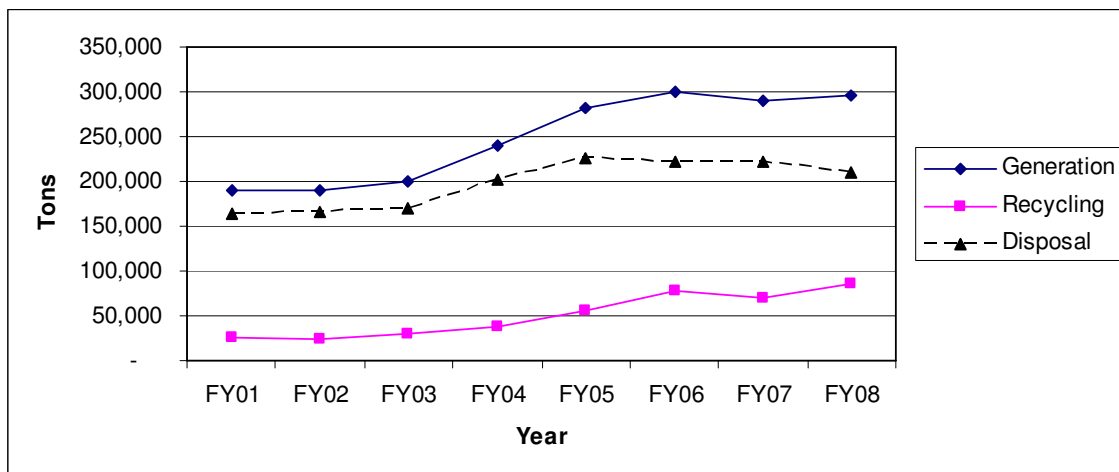
Historical Generation, Recycling, and Disposal and estimated Diversion Rate, Hawai'i County

	Generation	Recycling	Disposal	Diversion Rate
Tons				
FY 2001	190,241	26,416	163,825	13.9%
FY 2002	190,764	24,139	166,625	12.7%
FY 2003	200,300	30,991	169,309	15.5%
FY 2004	239,217	37,375	201,842	15.6%
FY 2005	281,855	56,422	225,433	20.0%
FY 2006	300,121	77,734	222,387	25.9%
FY 2007	290,865	69,117	221,748	23.8%
FY 2008	296,473	86,443	210,030	29.2%
Percent Change FY 2001 – FY 2008				
Total	156%	327%	128%	
Average Annual	6.5%	18.5%	3.6%	

Source: Hawai'i County Department of Environmental Management.

EXHIBIT 6

Historical Generation, Recycling, and Disposal, Hawai'i County



³ Quantifying recycling is challenging because of the number of entities involved and the corresponding lack of a centralized location for data reporting. While the County exerts considerable effort obtaining data from the many recyclers in the County to compile recycled quantity data, it is likely that some materials are recycled that are not included in the data reported in Exhibit 5. Thus, the County's actual recycling rate may be higher than what is shown.

Exhibit 7 reports waste generation on a per-capita basis and compares Hawai'i County's per-capita generation to that of other Hawai'i counties, a reported U.S. average, Seattle, and Vancouver B.C. For Hawai'i counties, the data are shown using both resident and de facto population. As shown, Hawai'i County's per-capita generation is less than that of the other counties in the state, excepting Kauai's when calculated on a defacto basis.

All of the estimates shown in Exhibit 7 are much higher than the 4.6 pound-per-capita-per-day U.S. average reported by the U.S. Environmental Protection Agency (EPA)⁴. This may be the result of the EPA using a different methodology for calculating generation, and because the EPA estimate excludes construction and demolition debris, which is included in the Hawai'i data.

EXHIBIT 7
Per-capita Generation Comparison

Jurisdiction	Pounds/ capita/ day
Resident Population Basis	
Hawai'i County FY 2008 ^a	9.4
Honolulu County, 2004 ^b	9.5
Maui County FY 2006 ^c	14.2
Kaua'i County 2005 ^b	10.0
Seattle, 2006 ^d	9.8
Metro Vancouver, B.C. ^e	8.6
De Facto Population Basis	
Hawai'i County FY 2008 ^a	8.3
Honolulu County, 2004 ^b	8.7
Maui County FY 2006 ^c	10.8
Kaua'i County 2005 ^b	7.4

^aExhibits 1 and 5.

^bDraft ISWMP, Kaua'i County, Section 2 and Hawai'i data book.

^cDraft ISWMP, Maui County, Table 2-4, and Hawai'i data book.

^dCalculated based on information in City of Seattle. 2008. *Recycling Rate 2007 Update*, and population from the Greater Seattle Data sheet. Assumes 10% construction and demolition debris recycling rate.

^eCalculated based on information in Metro Vancouver. 2005. *GVRD Solid Waste Management 2004 Annual Report*. Includes demolition, landclearing, and construction waste.

⁴ United States Environmental Protection Agency, 2008. *Municipal Solid Waste in the United States, 2006. Facts and Figures*. Accessed at <http://www.epa.gov/msw/facts-text.htm>

Exhibit 8 provides a breakdown of total waste discarded at County recycling and transfer stations and total commercial waste delivered directly to landfills between 2001 and 2008 for West and East Hawai'i. As shown, disposal at recycling and transfer stations has grown slightly faster in East Hawai'i than in West Hawai'i during this period. Commercial disposal growth in West Hawai'i has been particularly strong, increasing 53 percent in 7 years for an average annual rate of 6.3 percent. Commercial waste comprises approximately 61 percent, while waste from recycling and transfer stations comprise approximately 39 percent of the total disposed waste countywide. Commercial waste accounts for a larger share of the total in West Hawai'i (68 percent) than in East Hawai'i (51 percent).

EXHIBIT 8

Historical Disposal at Recycling and Transfer Stations and Commercial Customers for West and East Hawai'i

	West Hawai'i		East Hawai'i		Total County	
	Recycling/ Transfer Stations	Comm.	Recycling/ Transfer Stations	Comm.	Recycling/ Transfer Stations	Comm.
Tons						
FY 2001	35,757	56,745	33,302	38,021	69,059	94,766
FY 2002	37,721	58,593	34,278	36,033	71,999	94,626
FY 2003	37,789	63,582	32,765	35,173	70,554	98,755
FY 2004	44,699	81,759	37,756	37,628	82,455	119,387
FY 2005	47,072	95,007	40,456	42,898	87,528	137,905
FY 2006	45,230	93,501	40,400	43,257	85,629	136,758
FY 2007	44,131	94,208	40,586	42,823	84,717	137,031
FY 2008	41,655	86,888	39,575	41,912	81,230	128,800
Percent Change FY 2001 - FY 2008						
Total	16%	53%	19%	10%	18%	36%
Average Annual	2.2%	6.3%	2.5%	1.4%	2.3%	4.5%
Percent of Total	32%	68%	49%	51%	39%	61%

Commercial includes waste delivered directly to landfills by commercial haulers, and some businesses, institutions, and residents.

Source: Hawai'i County Department of Environmental Management.

FY 2008 disposal totals broken down by recycling and transfer station are shown in Exhibit 9. Total disposal during 2008 at recycling and transfer stations ranged from a low of 207 tons at the Miloli'i station, to a high of 14,707 tons at the Hilo station.

EXHIBIT 9
FY 2008 Disposal by Recycling and Transfer Station

West Hawai'i	Tons	Percent of Subtotal	Percent of Total
Kailua	7,860	23.3%	10.7%
Keahou	5,017	14.8%	6.8%
Ke'ei	2,025	6.0%	2.8%
Waiea	2,968	8.8%	4.0%
Miloli'i	207	0.6%	0.3%
Ka'u	3,447	10.2%	4.7%
Waimea	6,376	18.9%	8.7%
Puako	2,681	7.9%	3.7%
Kohala	4,145	12.3%	5.6%
Honoka'a	3,459	10.2%	4.7%
Pa'auilo	1,922	5.7%	2.6%
Laupahoehoe	1,547	4.6%	2.1%
Subtotal	33,795	100.0%	46.1%
East Hawai'i			
Hilo	14,707	37.2%	20.0%
Kea'au	7,443	18.8%	10.1%
Pahoa	5,759	14.6%	7.8%
Kalapana	1,069	2.7%	1.5%
Glenwood	2,940	7.4%	4.0%
Volcano	1,929	4.9%	2.6%
Pahala	1,304	3.3%	1.8%
Papaikou	2,563	6.5%	3.5%
Honomu	1,727	4.4%	2.4%
Other	135	0.3%	0.2%
Subtotal	39,575	100.0%	53.9%
Total Recycling and Transfer Stations	73,370		100.0%

Source: Hawai'i County Department of Environmental Management.

1.3.2 Forecast

Tons per person-employee (persons + employment) is a metric that is useful for projecting future generation because it considers factors that tend to influence both residential and commercial waste. The generation forecast was prepared by examining forecast population and employment, past generation trends, and potential changes to those trends.

Historical generation in tons, pounds per-capita per-day, tons per person-employee, population, and employment are shown in Exhibit 10. As shown, the overall trend over the past seven years has been for strong growth in all of these variables, including more than 4 percent annual growth in per-capita and per person-employee generation.

The forecasts shown in Exhibits 11 to 13 assume 0 percent annual growth in tons per person-employee in FY 2008-10, and 1 percent annual growth thereafter. The reasons for these assumptions include:

EXHIBIT 10
Historical Generation Trends, Hawai'i County

	Tons			Pounds/ capita/ day	Tons per person- employee
	Generation (tons)	Population (tons)	Employment (tons)		
FY 2001	190,241	149,261	214,711	7.0	0.52
FY 2002	190,764	150,860	218,160	6.9	0.52
FY 2003	200,300	153,162	219,312	7.2	0.54
FY 2004	239,217	156,320	230,370	8.4	0.62
FY 2005	281,855	160,129	235,629	9.6	0.71
FY 2006	300,121	164,770	243,420	10.0	0.74
FY 2007	290,865	169,419	250,719	9.4	0.69
FY 2008	296,473	173,057	256,207	9.4	0.69
Avg. Annual Percent Change	6.5%	2.1%	2.6%	4.3%	4.1%

- Waste generation (per person-employee) did not change significantly between FY 2005 and FY 2006 and has declined thereafter: FY 2008 tons per person-employee is about 7 percent lower than what it was in FY 2006.
- The strong growth in FY 2004 and FY 2005 was in part related to booming construction and disposal of large quantities of storm debris.
- The County's record-keeping practices have steadily improved over the period, particularly in recycling. Thus, actual increases in generation in the early years may have been less than shown in Exhibit 10.
- The recent slowdown in the economy has the potential to moderate per-capita waste generation for a period of time.
- Ongoing efforts by the County and local residents, businesses, and institutions to reduce waste may help moderate waste generation in the future.
- Most jurisdictions in the U.S. report little change in per-capita generation in recent years. Nationwide, the U.S. EPA reports long-term per-capita waste generation growth of 1.2 percent per year from 1960 to 2006, with per-capita generation being essentially unchanged since 1990.

A baseline forecast of generation, recycling, and disposal is shown in Exhibits 11 and 12. The baseline forecast assumes no change in the County's diversion rate: the recycling and disposal forecasts will be revised later in this planning process after development of proposed programs to divert additional waste from landfill disposal. As shown, assuming no change in the County's diversion rate, disposal is projected to increase from 210,030 in FY 2008 to 334,155 by FY 2028.

Forecast disposal for recycling and transfer stations and commercial customers in both East and West Hawai'i are presented in Exhibit 13.

EXHIBIT 11

Forecast Baseline Generation, Recycling, and Disposal and Recycling Rate, Hawai'i County

Year	Generation	Recycling	Disposal	Recycling Rate
FY 2008	296,473	86,443	210,030	29.2%
FY 2013	329,683	96,126	233,557	29.2%
FY 2018	373,391	108,870	264,521	29.2%
FY 2023	420,027	122,468	297,559	29.2%
FY 2028	471,684	137,530	334,155	29.2%
Avg. An. Growth Rate				
FY 2008-13	2.1%	2.1%	2.1%	
FY 2013-18	2.5%	2.5%	2.5%	
FY 2018-23	2.4%	2.4%	2.4%	
FY 2023-28	2.3%	2.3%	2.3%	

- Baseline means recycling and disposal forecast does not include the effects of any new recycling programs i.e., assumes current 29.2 percent diversion rate for all years. In the draft plan, the recycling and disposal forecast will change after recommendations are in place for new waste diversion programs.

- Assumes 0% growth in generation per person -employee in FY09-FY11, and 1% growth thereafter.

EXHIBIT 12

Baseline Generation, Recycling, and Disposal Forecast, Hawai'i County

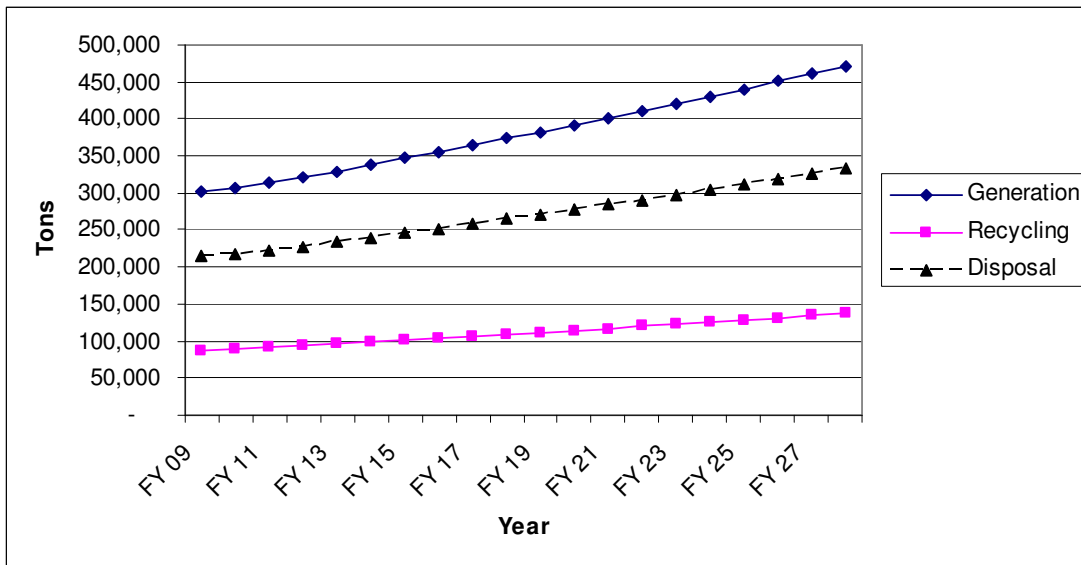


EXHIBIT 13
Baseline Disposal Forecast, Hawai'i County (tons)

Year	West Hawaii		East Hawaii		Total		Total County
	Recycling / Transfer Stations	Commercial	Recycling / Transfer Stations	Commercial	Recycling / Transfer Stations	Commercial	
FY 2008	41,655	86,888	39,575	41,912	81,230	128,800	210,030
FY 2013	47,377	95,547	42,953	47,681	90,329	143,228	233,557
FY 2018	54,961	106,998	47,344	55,218	102,305	162,216	264,521
FY 2023	62,022	118,993	53,060	63,484	115,083	182,476	297,559
FY 2028	69,099	132,090	60,137	72,828	129,236	204,919	334,155

- Baseline means recycling and disposal forecast does not include the effects of any new recycling programs i.e., assumes current 29.2 percent diversion rate for all years. In the draft plan, the recycling and disposal forecast will change after recommendations are in place for new waste diversion programs.

- Assumes 0% growth in generation per person -employee in FY09-FY11, and 1% growth thereafter.

1.4 Waste Composition

A waste composition study was recently conducted for Hawai'i County⁵. That report includes composition estimates, both for the overall waste stream and broken down by recycling/transfer station, commercial, and self-haul wastes⁶ disposed at the landfill. The results are based on samples taken at the West Hawai'i Landfill during May of 2008. A similar study was performed at the South Hilo Landfill in 2001⁷. We have used the results of the 2001 study and current County disposal data to estimate the composition of waste that enters the East Hawai'i landfill. The results are combined to provide waste composition estimates for total County disposal.

Exhibits 14, 15, and 16 show disposed composition estimates for nine waste categories for the entire County, for West Hawai'i, and for East Hawai'i, respectively. When combined, organics and paper comprise more than half of the waste stream. The organics category contains such components as food, green waste, and textiles. Construction and demolition waste accounts for another 22% by weight. The construction and demolition category includes such components as clean lumber and gypsum scrap.

The composition of waste disposed in West Hawai'i is similar to the composition of disposed waste in East Hawai'i. Two differences that merit mention include: there are more organics disposed of in West Hawai'i (35.3%) than in East Hawai'i (29.6%); and there is more special waste disposed of in East Hawai'i (5.2%) than in West Hawai'i (1.9%). The majority of the special wastes disposed of in East Hawai'i consist of industrial sludge, bulky items, and tires.

⁵ CH2M HILL. 2008. *Draft Waste Composition Study, County of Hawai'i*.

⁶ Self-haul refers to waste delivered directly to the landfill (as opposed to a transfer station).

⁷ Cascadia Consulting Group, 2001. *Waste Composition Study, South Hilo Landfill, County of Hawai'i*.

EXHIBIT 14
 Disposed Composition Estimates by Waste Category: Total County

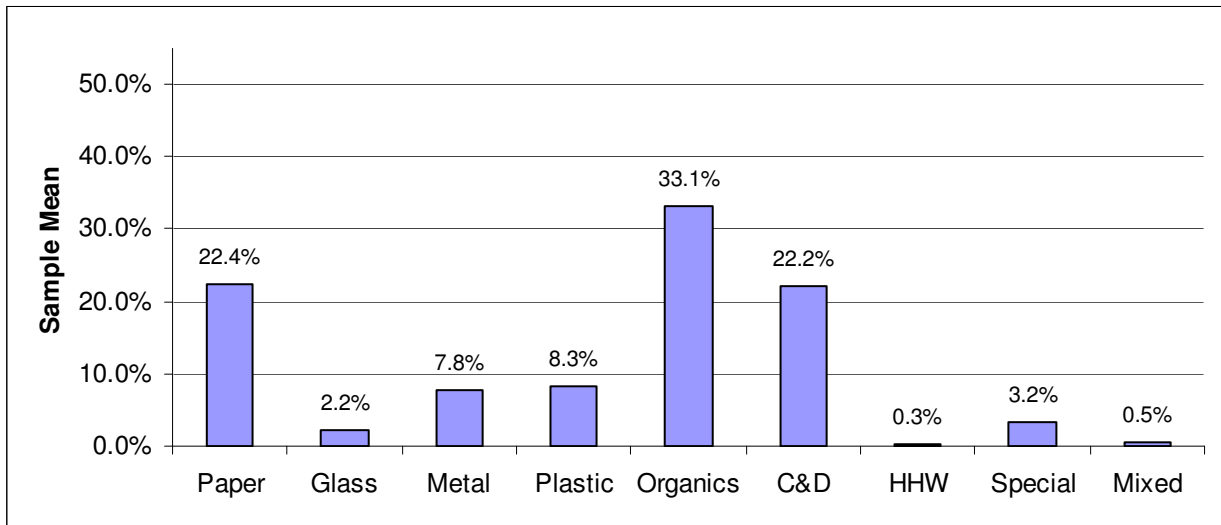


EXHIBIT 15
 Disposed Composition Estimates by Waste Category: West Hawai'i

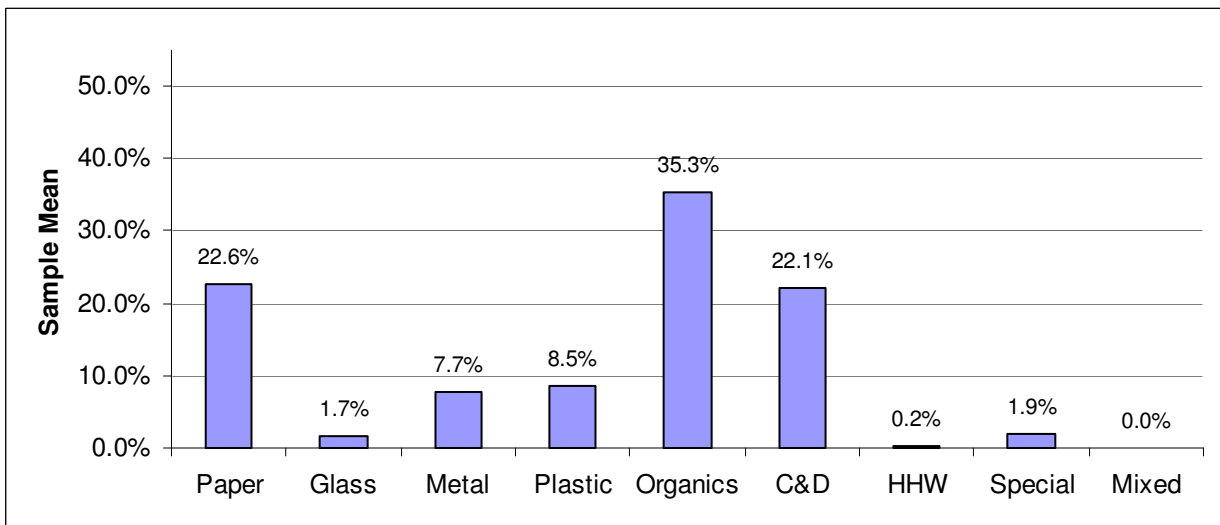
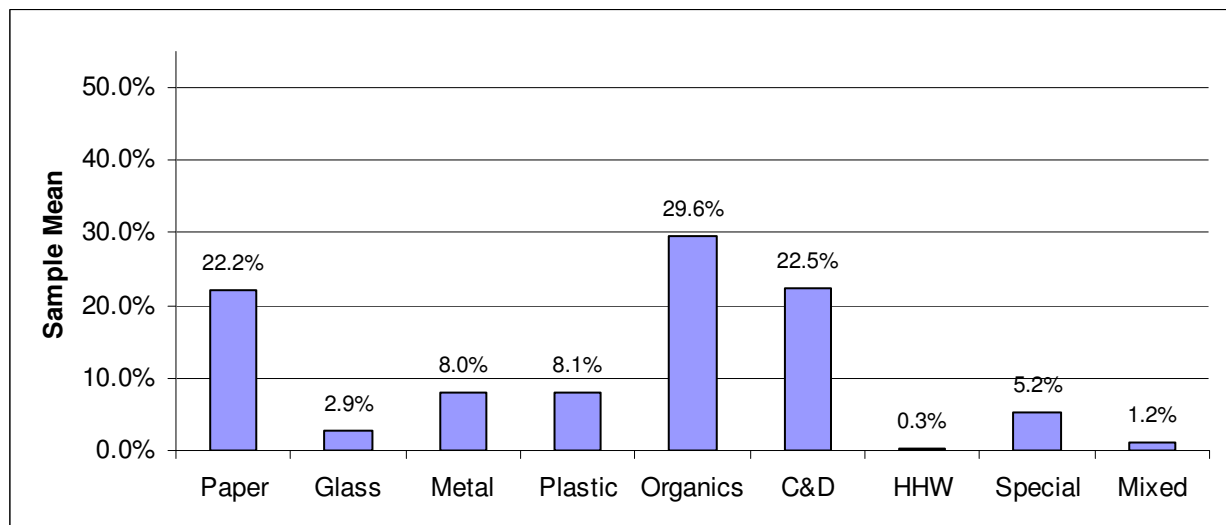


EXHIBIT 16
 Disposed Composition Estimates by Waste Category: East Hawai'i



The waste stream assessment developed data for the amount of waste disposed of for 58 different types of waste. Countywide composition estimates for all 58 waste components evaluated during the study are shown in Exhibit 17.

EXHIBIT 17

Disposed Composition Estimates: Total County

	Tons Disposed	Percent of Total		Tons Disposed	Percent of Total
Paper	47,130	22.4%	Construction and Demolition	46,702	22.2%
Cardboard	16,182	7.7%	Concrete	5,128	2.4%
Bags	723	0.3%	Asphalt Paving	2,212	1.1%
Newspaper	4,193	2.0%	Asphalt Roofing	381	0.2%
White Ledger	1,540	0.7%	Clean and Treated Lumber	22,984	10.9%
Colored Ledger	280	0.1%	Gypsum Board	1,471	0.7%
Computer	92	0.0%	Rocks and Soil	1,707	0.8%
Office	1,510	0.7%	R/C Demo	12,819	6.1%
Magazines	2,424	1.2%	Household Hazardous	527	0.3%
Directories	109	0.1%	Paint	171	0.1%
Miscellaneous	8,634	4.1%	Vehicle Fluids	20	0.0%
R/C Paper	11,443	5.4%	Oil	54	0.0%
Glass	4,592	2.2%	Batteries	117	0.1%
Clear Containers	1,476	0.7%	R/C Hazardous	165	0.1%
Green Containers	1,296	0.6%	Special	6,762	3.2%
Brown Containers	1,024	0.5%	Ash	93	0.0%
Other Containers	307	0.1%	Sewage Sludge	0	0.0%
Flat Glass	160	0.1%	Industrial Sludge	2,826	1.3%
R/C Glass	329	0.2%	Treated Medical	139	0.1%
Metal	16,388	7.8%	Bulky Items	2,177	1.0%
Aluminum Cans	565	0.3%	Tires	1,124	0.5%
Tin Cans	1,525	0.7%	R/C Special	404	0.2%
Ferrous	7,441	3.5%	Mixed	997	0.5%
Nonferrous	504	0.2%	Mixed Residue	997	0.5%
White Goods	742	0.4%			
R/C Metal	5,611	2.7%			
Plastic	17,482	8.3%			
#1 Containers	1,067	0.5%			
#2 Containers	882	0.4%			
Other Containers	818	0.4%			
Film	6,170	2.9%			
Durable	4,002	1.9%			
R/C Plastic	4,543	2.2%			
Organics	69,448	33.1%			
Food	34,230	16.3%			
Textiles	5,485	2.6%			
Leaves and Grass	6,160	2.9%			
Prunings	7,057	3.4%			
Stumps	2,637	1.3%			
Crop Residue	3	0.0%			
Manure	0	0.0%			
R/C Organic	13,875	6.6%			
Total Tons	210,030				
Sample Count	100				

An estimated diversion rate for the nine waste categories is shown in Exhibit 18. The results suggest that more than half of the metal and glass generated in the County is recycled (60% and 58%, respectively). Conversely, only 15 percent of paper is recycled and there is very little construction and demolition debris currently being recycled.

EXHIBIT 18
FY 2008 Diversion Rate by Waste Category

	Tons			Diversion Rate
	Generation	Recycling	Disposal	
Paper	55,296	8,166	47,130	14.8%
Glass	10,872	6,280	4,592	57.8%
Metal	40,784	24,395	16,388	59.8%
Plastic	18,730	1,248	17,482	6.7%
Organics	115,248	45,799	69,448	39.7%
C&D	46,738	35	46,702	0.1%
HHW	698	171	527	24.5%
Special	7,111	349	6,762	4.9%
Mixed	997	0	997	0.0%
Total	296,473	86,443	210,030	29.2%

Recycling composition from Hawai'i County Department of Environmental Management, with some additional allocations by CH2M HILL. Disposal composition from CH2M HILL, 2008. *Draft Waste Composition Study*, County of Hawai'i.