

Chapter 7

HAZARDOUS WASTE GENERATION PROJECTIONS

General economic trends will influence overall patterns of industrial and commercial development. These changes, in combination with source reduction, recycling, and with use of new onsite waste treatment technologies--by existing firms and by new firms-- will determine the volumes and types of hazardous wastes to be generated in Alameda County in 2000.

A. FUTURE ECONOMIC DEVELOPMENT

ABAG, for its Bay Area Regional Hazardous Waste Management Plan, has carried out a series of analyses regarding future economic development. These analyses included such topics as:

- General economic trends
- Industrial growth
- New product
- Local land use

A complete description of the methodology developed by ABAG can be found in the technical appendices of the Bay Area Regional Hazardous Waste Management Plan. Table 7-1 summarizes these growth projections for Alameda County. The highest growth is in services, construction, finance, insurance, real estate, and wholesale trade. Much of this growth, is expected to be in the I-680/I-580 corridor.

Of greatest importance to projections of future hazardous waste generation is the estimate of a 46 percent growth in the manufacturing sector (2.72 percent compounded annually).

B. ALTERNATIVE WASTE STREAM PROJECTIONS

In order to determine Alameda County's future waste management needs, three projections for waste generation were calculated: baseline, moderate and aggressive. Each of these corresponds to a different level of effort to minimize waste at the generating source.

Baseline estimates assume no future increased source reduction effort. They project county development due solely to economic factors.

Moderate estimates include the assumption that modest waste minimization efforts will be in effect. Essentially, this source reduction alternative is driven by market forces (costs of hazardous waste treatment and disposal), as the most important determinant of companies'

**Table 7-1
Business Sector and Population Growth^a
1986-2000
Alameda County**

	Overall Percent Increase	Annually Compounded Growth %
Services	109.12%	5.41%
Construction	77.25%	4.17%
Finance, Insurance, and Real Estate	64.38%	3.61%
Wholesale Trade	60.24%	3.43%
Manufacturing	45.61%	2.72%
Retail Trade	43.91%	2.63%
Transportation, Communication, and Utilities	37.78%	2.32%
Government	18.17%	1.20%
Residences	10.46%	0.71%
Agricultural and Mining	-15.74%	-1.22%
Unclassified	0.00%	0.00%

^aDerived from ABAG projection data--developed by Ray Brady.

decisions, without any special efforts by local governments or the state. These estimates reduce baseline waste generation rates in 2000 according to predictions of what low-level source reduction could achieve.

Aggressive projections estimate hazardous waste generation in 2000 assuming onsite waste minimization will be maximized at both existing and new firms. For these projections, baseline generation estimates were reduced using estimated maximum values for waste minimization potential.

All these projections assume only onsite source reduction and waste minimization; they do not include any further reductions in waste volumes that can be achieved by use of onsite waste treatment technologies or transportable treatment systems.

Although several factors can influence the county waste stream, both moderate and aggressive projections apply reductions to the strictly economically-driven baseline estimates. Other factors, such as regulatory changes, could have significant impact on the projected waste stream. These factors are very difficult to predict and even more difficult to quantify in terms of their effect on waste generation. Therefore, the projections presented here are subject to the effects of regulatory changes, unforeseen overall economic trends, and other potential influences not included in the baseline development data for hazardous waste generation.

It is important to clarify what is meant by "source reduction" here. This term applies to waste minimization techniques which actually reduce the amount of hazardous wastes requiring treatment. These techniques include various "housekeeping" procedures such as reducing spillage; purchasing hazardous materials in bulk containers to eliminate generation of many contaminated, empty packages; and extending the use of solvents. "Source reduction" as used in this chapter does not include onsite treatment.

Another important consideration for this chapter is the effect of industry participation on the projected waste stream. The baseline projection assumes no increased source reduction activity in any industry. Moderate and aggressive projections assume 100 percent industry participation at each level of average effort. With less involvement, these projections would have to be adjusted accordingly. Also, the projections assume that there is potential for increased source reduction in all industries. This is not true in every case. Contact with several small businesses indicates that in order to reduce hazardous materials and disposal costs, source reduction techniques are already being used "as fully as possible." Projections in this chapter do not take this into account.

BASELINE PROJECTIONS

Table 7-2 shows ABAG's calculations of growth in Alameda County hazardous waste generation by industry categories, without any source reduction. Note the large growth in:

- Electrical and electronic equipment: 271%
- Miscellaneous manufacturing: 213%

**Table 7-2
Baseline Waste Growth By Industry^{ab}
1986-2000
Alameda County**

Business Sector	General SIC Code	Industry Group	Percent Waste Growth	Annually Compounded Growth Percent
Agriculture	700	Agriculture Services	-16.13	-1.25
	800	Forestry	-15.61	-1.20
Construction	1500	General Building Contractors	77.25	4.17
	1600	Other Construction	77.09	4.17
	1700	Special Trade Construction	77.27	4.17
Manufacturing	2000	Food and Kindred Production	2.75	0.19
	2500	Furniture and Fixtures	8.45	0.58
	2600	Paper and Allied Products	8.44	0.58
	2700	Printing and Publishing	100.22	5.08
	2800	Chemicals and Allied Products	57.76	3.31
	2900	Petroleum Refining Industries	48.70	2.87
	3000	Rubber and Misc. Plastic Products	29.59	1.87
	3200	Stone, Clay, Glass, and Concrete Products	22.42	1.46
	3300	Primary Metal Industries	27.87	1.77
	3400	Fabricated Metal Products	10.14	0.69
	3500	Nonelectrical Machinery	171.51	7.40
	3600	Electrical & Electronic Equipment	270.55	9.81
	3700	Transportation Equipment	23.45	1.52
3800	Instrumentation and Related Products	211.44	8.45	
3900	Miscellaneous Manufacturing	212.53	8.48	
Transportation ^c	4000		75.9075.90	4.12
	4100	Local and Interurban Transport	43.51	4.12
	4200	Trucking and Warehousing	75.91	2.61
	4400	Water Transportation	75.92	4.12
	4500	Air Transportation	75.87	4.12
	4700	Transportation Services	110.88	4.12
	4800	Communication	24.13	5.47
	4900	Electrical, Gas, and Sanitary Services		1.56
Wholesale Trade	5000	Durable Goods	60.24	3.43
	5100	Nondurable Goods	60.25	3.43
Retail Trade	5200	Building Materials	43.91	2.63
	5300	General Merchandise Stores	44.06	2.64
	5400	Food Stores	43.97	2.64
	5500	Automotive Dealers and Service Stations	43.91	2.63
	5600	Apparel and Accessory Stores	43.94	2.64
	5700	Furniture Stores	43.18	2.60
Finance, Insurance and Real Estate Services	6100	Credit Agencies	69.83	3.86
	6400	Insurance Agents, Brokers, and Services	64.29	3.61
	6500	Real Estate	63.62	3.58
	7200	Personal Services	14.19	0.95
	7300	Business Services	134.99	6.29
	7500	Auto Repair Services	14.19	0.95
	7600	Miscellaneous Repair Services	13.90	0.93
	7900	Amusement and Recreation	47.28	2.80
	8000	Health Services	22.61	1.47
	8200	Educational Services	40.46	2.46
8900	Miscellaneous Services	135.05	6.29	

Continued

Table 7-2 (Cont.)
Baseline Waste Growth By Industry^{a,b}
1986-2000
Alameda County

Public Administration	9100	Executive, Legislative, General Government	7.93	0.55
	9200	Justice, Public Order, and Safety	8.02	0.55
	9400	Human Resources Administration	7.87	0.54
	9500	Environmental and Housing Programs	7.72	0.53
	9600	Economic Programs	7.92	0.55
	9700	National Security and International Affairs	7.92	0.55
Nonclassifiable	9900	Nonclassifiable Establishments	0.00	0.00

^aDerived from ABAG projection data--developed by Ray Brady.

^bDoes not correct for waste minimization or onsite treatment.

^cIncludes communications and utilities.

- Instrumentation and related products: 211%
- Non-electrical machinery: 172%

Table 7-3 summarizes the baseline hazardous waste streams in 2000 in tons per year for each of the 10 basic business sectors; again, without any source reduction. This table applies compound growth rates to the 1986 waste streams from each category. Manufacturing (67,844 tons) and Services (30,577 tons) are dominant in 2000.

Table 7-4 provides detailed projections to 2000 for each of the 18 waste categories defined by DHS in its Technical Reference Manual (TRM). Some 86,500 tons are assumed to be manifested.

Similarly, Table 7-5 presents baseline projections for small quantity generators to 2000, again in each of the 18 waste categories. The total is 50,265 tons. And Table 7-6 pulls all this together, and adds in baseline projections for one-time cleanups and households. The grand total for 2000--without source reduction--is 139,536 tons of hazardous wastes. The seven largest individual components are:

- Waste oil from manufacturing: 29,457
- Waste oil from services: 12,413
- Metal-containing liquids from manufacturing: 8,012
- Non-halogenated solvents from services: 6,492
- Non-metallic inorganic liquids from manufacturing: 6,248
- Non-halogenated solvents from manufacturing: 5,113

MODERATE AND AGGRESSIVE SOURCE REDUCTION

In Table 7-7 are shown the best available estimates for moderate and aggressive source reduction for several key waste streams. These are drawn from the December 1987 Jacobs Engineering study prepared for DHS: "Hazardous Waste Minimization Potential Workbook." The range is from 10 percent to 25 percent reduction for the moderate category, and 25 percent to 55 percent for the aggressive approach. Aggressive estimates were extrapolated from the moderate ones utilizing prior experience with waste reduction programs and hazardous waste generating industries.

Moderate estimates include adoption of one specific waste reduction technique by a typical firm; aggressive estimates include adoption of two or three specific measures by an average firm. The high reduction potential for household wastes may be attributed to the current lack of education about these wastes and about techniques to reduce them. An aggressive education program could yield significant results in this area. Solvents, dye and paint sludges, and resins have high reduction potential because implementing source reduction techniques for these wastes is simple and effective.

Table 7-8 shows three projections for each of the 18 waste categories defined in the TRM. The general Alameda County projected waste stream profile is consistent with estimates for 1986: waste oil, miscellaneous wastes, solvents, metal-containing liquids, and dioxins and PCBs are

**Table 7-3
Baseline Waste Stream-2000
Alameda County**

Business Sector	SIC Codes	TPY, 1986^a	TPY, 2000^{b,c}	Business Sector Growth (%)
Agriculture	700-800	100	119	-1.22
Construction	1500-1700	1,751	3,102	4.17
Manufacturing	2000-2700	46,595	67,844	2.72
Transportation	4000-4900	10,292	14,189	2.32
Wholesale Trade	5000-5100	2,672	4,285	3.43
Retail Trade	5200-5700	7,688	11,058	2.63
Finance, Ins. and Real Estate	6100-7000	111	182	3.61
Services	7100-8900	14,623	30,577	5.41
Public Administration	9100-9700	3,219	3,804	1.2
Nonclassifiable	9900	---	4,376	0.0
		87,051	139,536	

^aPercent growth compounded annually, 1986-2000; TPY = tons per year.

^bDerived from ABAG projection data--developed by Ray Brandy.

^cIncludes manifested, SQG, and household waste projections.

Table 7-4
 Baseline Summary--Manifested Waste Only
 Year 2000
 Alameda County

Business Sector	Total Tons/Year	Waste Category																	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Agriculture & Mining	3	1								1									
Construction	148	10		9	6		52			71									
Manufacturing	57,225	21,529	162	4,932	1,709	0	466	3,230	51	2,605	3,299	7,938	1,382	10	4,541	257			5,114
Transportation, Communication, & Utilities	7,339	782	447	160	108	0	3,966	637	0	439	36	97		38	587				42
Wholesale Trade	3,571	6	194	144	51														
Retail Trade	224	12	1	50	14	9		2,968	14	12	3	0	17	1	13	22			126
Finance, Insurance, & Real Estate	183	39			48			61	1		8					22			61
Services	12,400	660	626	6,030	305	2	523	255		218	63	2,146	764		58				750
Government	3,805	753	29	125	211	0	308	245		66	278	141	1		296	515			837
Unclassified	1,565	483	186	157	4		16	113	1	59	120	141		6	83	10			186
TOTAL	86,463	24,275	1,645	11,608	2,456	11	8,308	4,570	64	3,519	3,796	10,481	2,148	0	54	5,600	808	0	7,120
Growth Percent Compounded Annually	3.95	2.77	3.55	4.02	2.34	2.83	2.37	2.48	4.42	2.51	2.31	2.98	2.42	0.00	2.77	4.67	1.43	0.00	1.81

Waste Categories

- | | |
|---|---|
| 1. Waste Oil | 11. Metal-Containing Liquids |
| 2. Halogenated Solvents | 12. Metal-Containing Sludges |
| 3. Non-Halogenated Solvents | 13. Metal-Containing Liquids (700 series) |
| 4. Organic Liquids | 14. Cyanide & Metal Liquids |
| 5. Pesticides | 15. Non-Metallic Inorganic Liquids |
| 6. Dioxins and PCBs | 16. Non-Metallic Inorganic Sludges |
| 7. Oily Sludges | 17. Soil |
| 8. Halogenated Organic Sludges & Solids | 18. Miscellaneous Wastes |
| 9. Non-Halogenated Organic Sludges & Solids | |
| 10. Dye & Paint Sludges and Resins | |

Table 7-5
Baseline Summary--Small Quantity Generators
Year 2000
Alameda County

Business Sector	Total Tons/Year	Waste Category																		
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	
Agriculture	116					75														41
Construction	2,955	1,448	184	518						103		4			27					487
Manufacturing	10,621	7,928	181	79	9	60		15	15	44	74	137	9	70	1,707					112
Transportation, Communication, & Utilities	6,849	5,208	106	23						18		15			50					1,323
Wholesale Trade	713	472	25	25	12	7			1	11	8	1			23					127
Retail Trade	10,834	8,129	153	30	11					45		25			92					2,196
Services	18,177	11,753	462	552	98			2	460	261	121	142	6	10	335					3,513
TOTAL	50,265	34,938	1,111	1,214	200	60	0	18	476	482	203	324	15	80	2,234	0	0	0	0	7,799
Growth Percent Compounded Annually	3.26	3.13	2.65	3.69	1.61	2.76	3.28	2.35	5.24	3.24	2.53	3.77	4.59	2.20	2.99	0.00	0.00	0.00	0.00	3.80

Waste Categories

1. Waste Oil
2. Halogenated Solvents
3. Non-Halogenated Solvents
4. Organic Liquids
5. Pesticides
6. Dioxins and PCBs
7. Oily Sludges
8. Halogenated Organic Sludges & Solids
9. Non-Halogenated Organic Sludges & Solids
10. Dye & Paint Sludges and Resins
11. Metal-Containing Liquids
12. Metal-Containing Sludges
13. Metal-Containing Liquids (700 Series)
14. Cyanide & Metal Liquids
15. Non-Metallic Inorganic Liquids
16. Non-Metallic Inorganic Sludges
17. Soil
18. Miscellaneous Wastes

Table 7-7
Source Reduction Potential
(Percent)

	Moderate	Aggressive
Solvents	20	50
Metal Solutions	15	40
Dye & Paint Sludges and Resins	25	50
Other Wastes	10	25
Household Hazardous Wastes	25	55

Based on Jacobs Engineering study "Hazardous Waste Minimization Potential Workbook,"
December 1987.

Table 7-8
Waste Generation, 2000, Showing
Baseline, Moderate, and Aggressive Source Reduction Scenarios*
Alameda County

Approach	Overall Reduction	Total Tons/Year	Waste Category																	
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17 ^b	18 ^c
Baseline ^a	0	138,636	59,212	2,757	12,719	3,669	211	8,368	4,571	82	3,996	4,278	10,683	2,470	15	135	7,837	808	0	16,828
Moderate	11.6%	122,549	52,343	2,437	11,243	3,243	186	7,397	4,041	72	3,532	3,782	9,443	2,183	13	119	6,925	714	0	14,876
Aggressive	28.7%	98,843	42,218	1,965	9,069	2,615	150	5,966	3,259	58	2,849	3,050	6,616	1,761	11	96	5,586	576	0	11,948

Waste Categories

- | | |
|---|---|
| 1. Waste Oil | 11. Metal-Containing Liquids |
| 2. Halogenated Solvents | 12. Metal-Containing Sludges |
| 3. Non-Halogenated Solvents | 13. Metal-Containing Liquids (700 series) |
| 4. Organic Liquids | 14. Cyanide & Metal Liquids |
| 5. Pesticides | 15. Non-Metallic Inorganic Liquids |
| 6. Dioxins and PCBs | 16. Non-Metallic Inorganic Sludges |
| 7. Oily Sludges | 17. Soil |
| 8. Halogenated Organic Sludges & Solids | 18. Miscellaneous Wastes |
| 9. Non-Halogenated Organic Sludges & Solids | |
| 10. Dye & Paint Sludges and Resins | |

*Assumes no source reduction; economic growth only.

^aDoes not include contaminated soil.

^bDoes not include household wastes.

the five major waste categories. Together these five categories account for 80 percent of the total waste stream. Contaminated soils (Waste Category 17) are not included because it is not possible to predict accidental spills which would generate these wastes. The baseline projection of 138,636 tons represents a 37 percent increase from 1986. This corresponds to the projected 37 percent increase in county economic development.

The projection assuming moderate source reduction is 22 percent greater than the 1986 estimate: 122,549 tons in 2000. One hundred percent participation in a moderate source reduction effort (an average of one measure per firm) would yield an overall 11.6 percent reduction from baseline generation. Reduction in various waste categories would range from 10 percent in 9 categories to 25 percent in dye and paint sludges and resins. This level of overall source reduction effort would yield 13 to 20 percent reduction of various metal solutions and solvents.

With an aggressive source reduction effort, metal solutions and solvents could each be reduced by 40 to 50 percent. Overall reduction from the baseline generation would be 28.7 percent. The aggressive source reduction effort would yield a countywide total of 98,943 tons of hazardous waste. This is 2 percent less than estimated total hazardous waste generation in 1986. The importance of economic growth to increased waste generation is evident; an aggressive source reduction program based on the Jacobs Engineering study's numbers, when combined with ABAG's projected economic growth; means that Alameda County will not increase in terms of volumes of hazardous waste generation.

This DHS-sponsored approach appears to miss the distinction between source reduction potential at existing facilities (along proportions set out in the Jacobs Engineering Study) and source reduction potential at new facilities, where much lower levels of hazardous waste generation can be demanded by local ordinance. By implementing a strict local ordinance, new growth in manufacturing and services can take place without commensurate increases in hazardous waste generation. These "New Source Performance Standards" can ensure that all new facilities (or significantly expanded facilities) in Alameda County practice a high degree of hazardous waste efficiency in their production processes.

Table 7-9 presents a set of projections for this strict source reduction alternative. This analysis has been completed for key business sectors, not for the 18 waste stream categories shown in Table 7-8. These data were devised using the following assumptions:

- Existing waste generators will, on average, practice aggressive source reduction (as defined by Jacobs): adopting two or three specific waste reduction measures each. Some will adopt more, others less, given an average overall reduction of 28.7 percent from 1986 levels.
- New growth in Alameda County will, on average, be associated with a 50 percent source reduction rate compared to 1986 practices.

**Table 7-9
Hazardous Waste Projections Based on
Strict Source Reduction-2000
Alameda County
(Tons/Year)**

Business Sector	Hazardous Waste Generation-2000 With Strict Source Reduction	Baseline 2000 With No Source Reduction	Percent Decrease From Baseline 2000
Agricultural and Mining	85	119	29
Construction	1,919	3,102	38
Manufacturing	43,708	67,844	36
Transportation, Communications, and Utilities	9,256	14,189	35
Wholesale Trade	2,704	4,285	37
Retail Trade	7,144	11,058	35
Finance, Insurance, and Real Estate	115	182	37
Services	18,359	30,577	40
Public Administration	2,579	3,804	32
Nonclassifiable ^a	979	1,379	29
Residences	1,348	2,097	36
TOTAL	88,196	138,636	36

^aDoes not include contaminated soil.

ABAG's estimates for hazardous waste generation from industrial growth in each business sector were reduced by 50 percent. Overall source reduction potentials for different industries vary from approximately 35 percent to 70 percent; 50 percent is the midpoint. Some of the industrial growth projected by ABAG will come from expansion of existing facilities; the rest will come from the addition of new facilities. The latter can be expected to attain maximum source reduction potential (70 percent or more, on average), whereas the expanded facilities can be expected to attain only the aggressive source reduction potential. Fifty percent seemed a reasonable overall factor to account for various source reduction potentials and different regulatory requirements. These two levels of reduced hazardous waste generation were then added together to produce the strict source reduction estimates shown on Table 7-9.

Table 7-9 shows total countywide hazardous waste generation to be 88,196 tons: 50 percent from the manufacturing sector, and another 21 percent from the services sector. The average amounts to 36 percent less waste than the baseline projection (with no source reduction) and 11 percent below the aggressive source reduction alternative that fails to distinguish between new and existing facilities.

Projections for 2000 thus range from a 37 percent increase in hazardous wastes if no increased source reduction is achieved, to a 2 percent decrease below the present level if a 28.7 percent reduction in baseline (year 2000) generation were achieved through an aggressive source reduction effort and a 36 percent reduction below baseline if strict reduction is pursued. Table 7-10 summarizes these alternatives. Unforeseen factors such as changes in regulatory or economic trends, and limited potential for increased source reduction in some businesses, may influence these projections. They illustrate that utilizing onsite waste minimization techniques will significantly reduce the amount of hazardous waste requiring treatment. In addition, they show that substantial requirements for hazardous waste treatment will still remain in Alameda County, needs to be met either by use of existing offsite facilities; by use of onsite waste treatment techniques; and--finally--by siting of new hazardous waste management facilities within Alameda County.

Table 7-10
Summary of Alternative Projections
Of Hazardous Waste Generation
(Rounded to the nearest 100 tons)

Scenario	Tons/Year	Overall Change
1986 Waste Stream	100,900	---
2000 Baseline (No Source Reduction)	138,600	+37%
2000 Moderate Source Reduction	122,500	+21%
2000 Aggressive Source Reduction	98,943	-2%
2000 Strict Source Reduction	88,200	-13%