FILE

Lorraine R. Inouye
Mayor

Norman K. Hayashi
Director

Tad Nagasako
Deputy Director

Planning Department

25 Aupuni Street, Room 109 • Hilo, Hawaii 96720 • (808) 961-8288

October 31, 1991

Mr. Brian J. J. Choy, Director
Office of Environmental Quality Control
220 South King Street, 4th Floor
Honolulu, HI 96813

Dear Mr. Choy:

Final EIS-West Hawaii Sanitary Landfill
Determination of Acceptability

We have reviewed the Final EIS for the proposed West Hawaii Sanitary Landfill. The requirements of Chapter 343, Hawaii Revised Statutes, were triggered by the project's use of County funds and State-owned lands.

In accordance with Section 11-200-23 of the Department of Health's Environmental Impact Statement Rules and pursuant to our discussion with your office, which authorized the County Planning Department as the state's representative, we have determined the Final EIS to be acceptable as we find that said document has satisfied the following criteria:

1. Procedures for assessment, consultation, review and revisions required for the EIS have been complied with;

2. Content requirements for a Final EIS have been satisfied; and

3. Comments submitted during the review process have been responded to adequately and revisions have been incorporated or appended to the final document.

The Final EIS will serve as a useful tool in weighing the impacts of the proposal against the criteria established by law during future decision-making processes.

Mr. Brian J. J. Choy, Director
October 31, 1991
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Should you have any questions, please feel free to contact our office.

Sincerely,

NORMAN K. HAYASHI
Planning Director

CRK:smo
3507D
cc: Mayor Lorraine Inouye
Bruce McClure, Chief Engineer
R. M. Towill

(FINAL)
ENVIRONMENTAL IMPACT STATEMENT for the

WEST HAWAII SANITARY LANDFILL

Puuanahulu, North Kona, Hawaii

OCTOBER 1991

PREPARED FOR:

County of Hawaii
Department of Public Works

RMTC
R. M. Towill Corporation

420 Waiakamilo Rd., Suite 411
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FINAL

ENVIRONMENTAL IMPACT STATEMENT

FOR

WEST HAWAII SANITARY LANDFILL
PUUANAHULU, NORTH KONA, HAWAII

This document is prepared pursuant to
Chapter 343, Hawaii Revised Statutes

PROPOSING AGENCY:

COUNTY OF HAWAII
DEPARTMENT OF PUBLIC WORKS
25 Aupuni Street
Hilo, Hawaii 96720

Bruce C. McClure

BRUCE C. McCLURE, P.E.
Chief Engineer

October 14, 1991
Date

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SECTION 1

SUMMARY

1.1 INTRODUCTION

1.1.1 Development Summary

APPLICANT:	County of Hawaii Department of Public Works
PROPERTY OWNER:	State of Hawaii
PROPERTY LOCATION:	North Kona District, County of Hawaii, Ahupuaa of Puuanahulu, 6600 feet inland from Pueo and Keawaiki Bays, between Queen Kaahumanu and Mamalahoa Belt Highways
TAX MAP KEY:	Division 3, Zone 7, Section 1, Plat 03, Parcel 1
SIZE:	300 acres
EXISTING LAND USE REGULATIONS:	*State Land Use District:* Agriculture County General Plan: Extensive Agriculture County Zoning: Extensive Agriculture
EXISTING LAND USES:	Vacant and unimproved.
EIS ACCEPTING AUTHORITIES:	Governor of the State of Hawaii Mayor of the County of Hawaii

1.2 OVERVIEW AND DETERMINATION

The sanitary landfill located in Kealakehe, Kailua-Kona, and operated by the County of Hawaii to service West Hawaii (North and South Kona, South Kohala and Kamuela), is near its capacity. With the projected growth of the West Hawaii region, particularly in North Kona, South Kohala, and Kamuela, the County has determined that to meet the increasing need to provide services for solid waste reuse and disposal, a new sanitary landfill is required as part of an integrated solid waste management system (Figures 1-1 and 1-2).

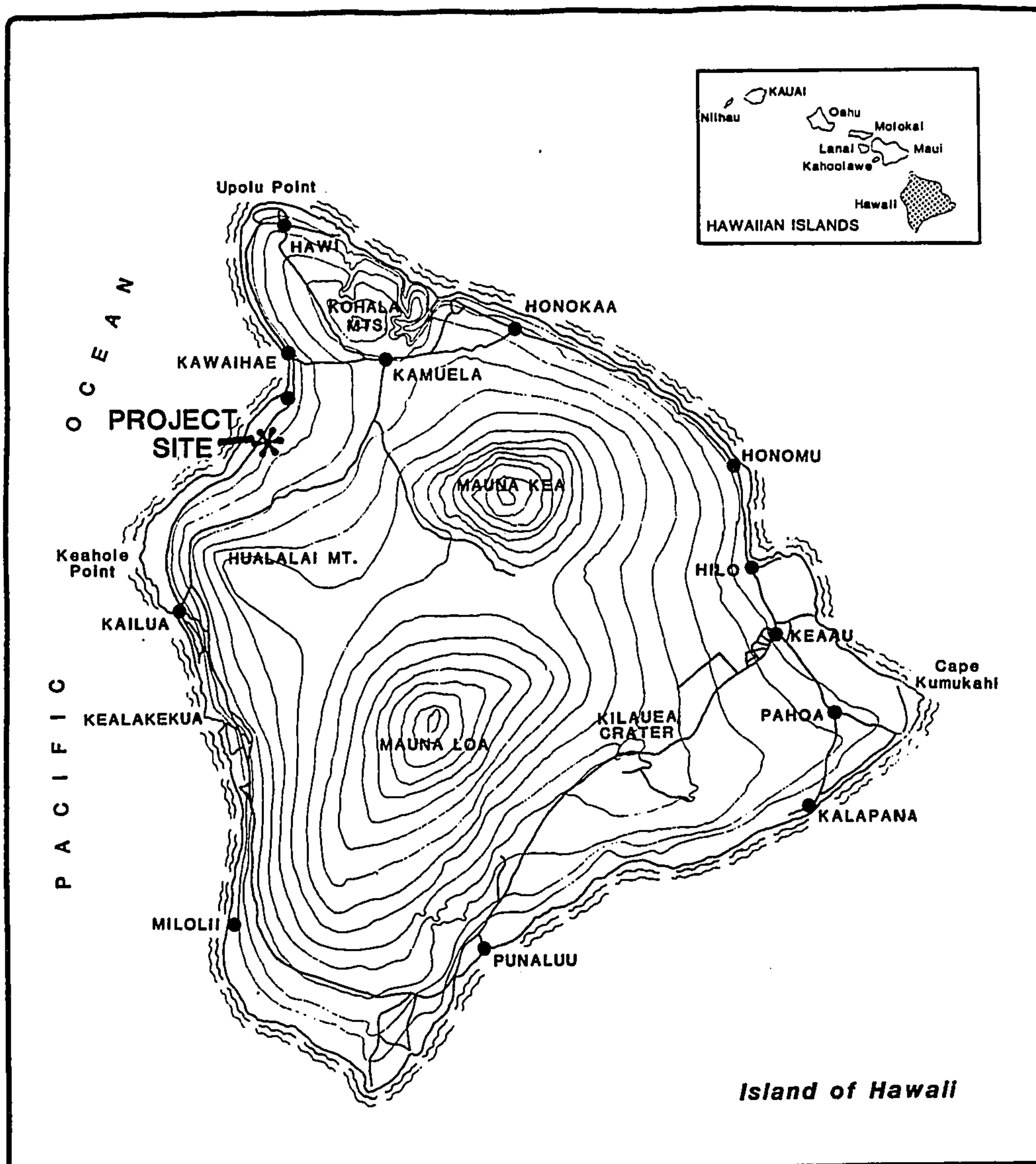
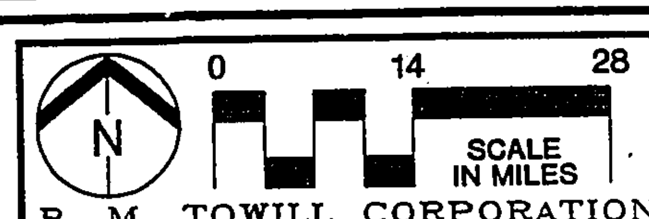


FIGURE 1-1
PROJECT LOCATION MAP
WEST HAWAII SANITARY LANDFILL
County of Hawaii



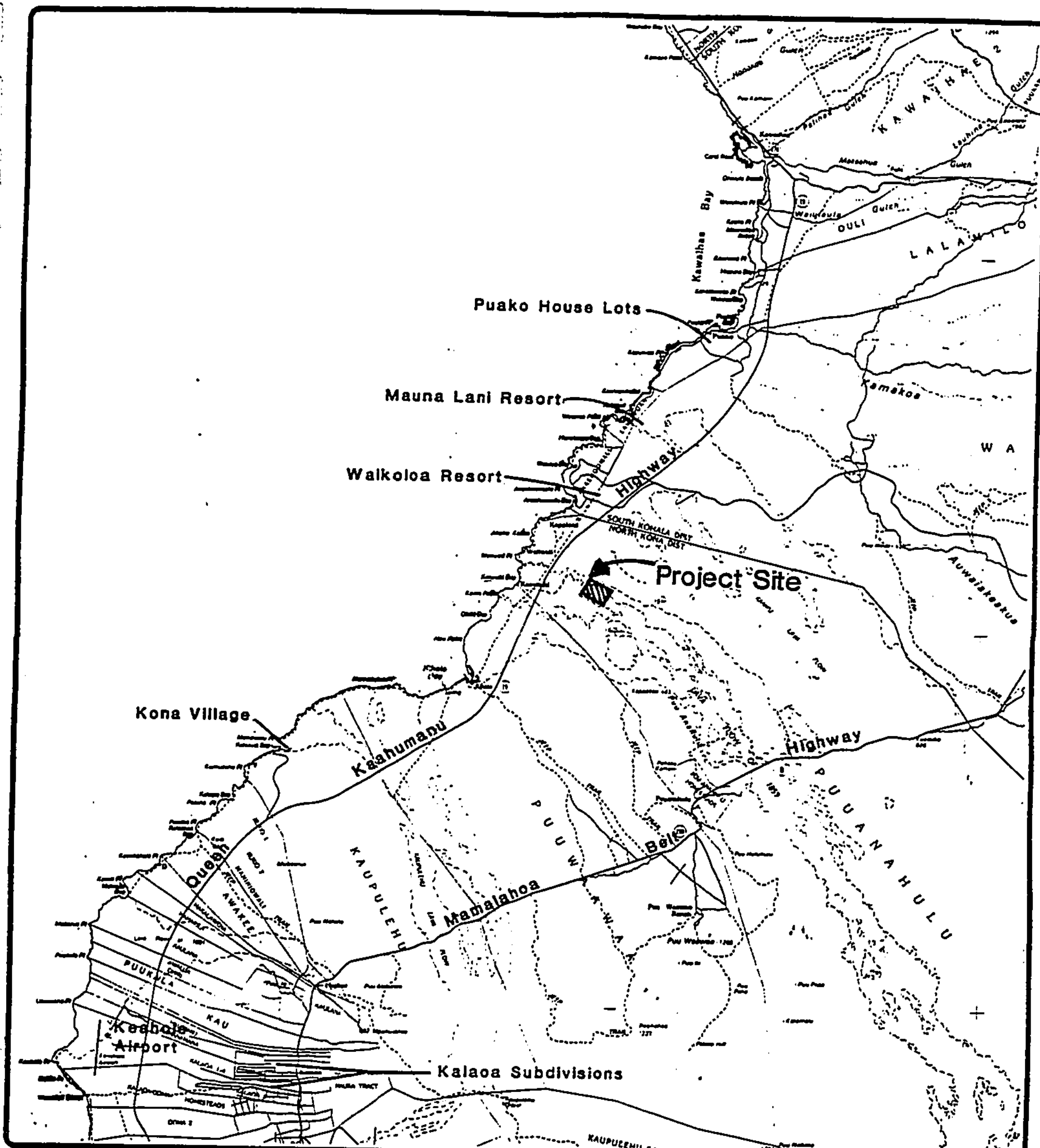


FIGURE 1-2
VICINITY MAP

WEST HAWAII SANITARY LANDFILL
County of Hawaii

N
0 15,000 30,000
SCALE IN FEET
R. M. TOWILL CORPORATION

The existing 13-acre sanitary landfill is projected to reach its capacity by end of 1992, and the County has determined that expansion at Kealakehe would not be feasible due to is proximity to proposed public facility and residential land uses. Area needed to accommodate solid waste separation modules for resource recovery including recycling and composting, and the lack of on-site generated cover material were also considered significant factors in the decision to locate the new sanitary landfill elsewhere.

Given the potentially significant environmental impacts of the project, the Hawaii County Public Works Department determined that a full environmental impact statement (EIS) was required. An EIS Preparation Notice (EISPN) was subsequently published in the December 23, 1990 issue of the Office of Environmental Quality Control Bulletin.

This EIS is being prepared pursuant to Chapter 343, HRS, and the EIS regulations promulgated by Chapter 200 of Title 11, Department of Health. The purposes of this EIS are to provide information to public officials and members of the community about the nature of the subject action; to assess the existing environmental conditions of the property and surrounding areas; to evaluate potential impacts of the proposed landfill development, to present mitigating actions for those impacts and to consider alternatives to the subject action.

In addition, the Final EIS will be used as a supporting document during the Special Permit (SP) process.

1.3 DESCRIPTION OF AND RATIONALE FOR PROPOSED ACTION

The overall objective of the proposed project is to develop a new sanitary landfill site that will include recycling and resource recovery modules to service the solid waste disposal needs of the rapidly developing North and South Kona, South Kohala and Kamuela districts, yet minimize adverse impacts on existing and future municipal and residential land uses.

As the County began to determine the location of the new West Hawaii Sanitary Landfill, Statewide interest and awareness in the need to better utilize our resources by reusing and recovering much of the material that currently is going into our disposal facilities led to the development of a Statewide integrated solid waste management plan (Integrated Solid Waste Management Plan for the State of Hawaii, State Department of Health, March 1991). This plan establishes the foundation for the County's integrated solid waste management program that includes the proposed West Hawaii Landfill.

The situation has been further exacerbated by recent changes to the Federal regulations on solid waste disposal facilities. Motivated by the need to protect groundwater resources and minimize the risks to the environment posed by landfills, the Federal government has adopted more stringent regulations for solid waste disposal facilities. Thus, the West Hawaii Sanitary Landfill facility is being designed as a solid waste disposal landfill in line with Federal (Subtitle D) regulations on solid waste disposal facilities. The proposed sanitary landfill will also accommodate a green waste composting facility with the capacity to include other solid waste recycling and reuse facilities on site, as appropriate.

Although there are a number of different methods to treat and dispose of solid waste, the sanitary landfill remains an indispensable part of the solution. It is by far the most common method of waste disposal. Incineration, recycling and resource recovery are utilized to a lesser extent. Reliance on sanitary landfills could be reduced by increased use of these three alternative methods. Each method produces by-products requiring a sanitary landfill for final disposal; i.e., non-recyclable materials, and non-processibles and ash from recycling and incineration methods respectively, and solid waste from transfer stations.

Thus, the County of Hawaii's proposed new 300-acre sanitary landfill site is planned to include separate sections on site for the sorting and storage of recyclable goods, material to be composted, and for final waste disposal. This site is being designated as part of the County's integrated solid waste management system the goal of which is to reduce the County's overall waste stream. The proposed system focuses on accommodating various practical and feasible long term methods of solid waste recycling and disposal that cumulatively help reduce the total volume of garbage that ends up in the landfill.

Based on the State's and the County of Hawaii Planning Department's population projections and further extrapolations to the year 2015, West Hawaii's population is expected to grow from 40,000 in 1989 to 122,000 by 2015. Hence, the proposed landfill will be developed to begin operation in 1992 and maintained to meet the growing area's solid waste disposal needs for the next 25 years.

It is the intent of the new landfill to serve as West Hawaii's primary landfill facility and to accommodate initial solid waste volumes of 70,300 tons per year and more as the population increases. Based on the population projections above, this new landfill facility will receive a total of 134,000 tons of refuse per year by the year 2015.

Access to the landfill will be from the Queen Kaahumanu Highway as shown in Figure 1-3. The landfill access road will be a paved two-lane road with a 50-foot right-of-way. Entry will be controlled by a gate at Queen Kaahumanu Highway. Approximate distance from the highway to the proposed new site will be approximately 3,200 lineal feet.

1.4 SUMMARY OF IMPACTS AND MITIGATING MEASURES

The large land area of the proposed project (300 acres) indicates that it could have significant environmental impacts. The following subsections outline the potential impacts on the existing environment.

1.4.1 Potential for Groundwater Contamination

The closest potable groundwater source is located 5 miles north of the project site. This is at the 2,380-foot elevation. Nearshore waters are located 1.25 miles makai of the site. A double liner system will be utilized to line the bottom of the landfill to prevent the leakage of leachate into groundwater resources. Monitoring wells will be placed mauka of the landfill site to establish baseline data prior to project construction. Monitoring wells will also

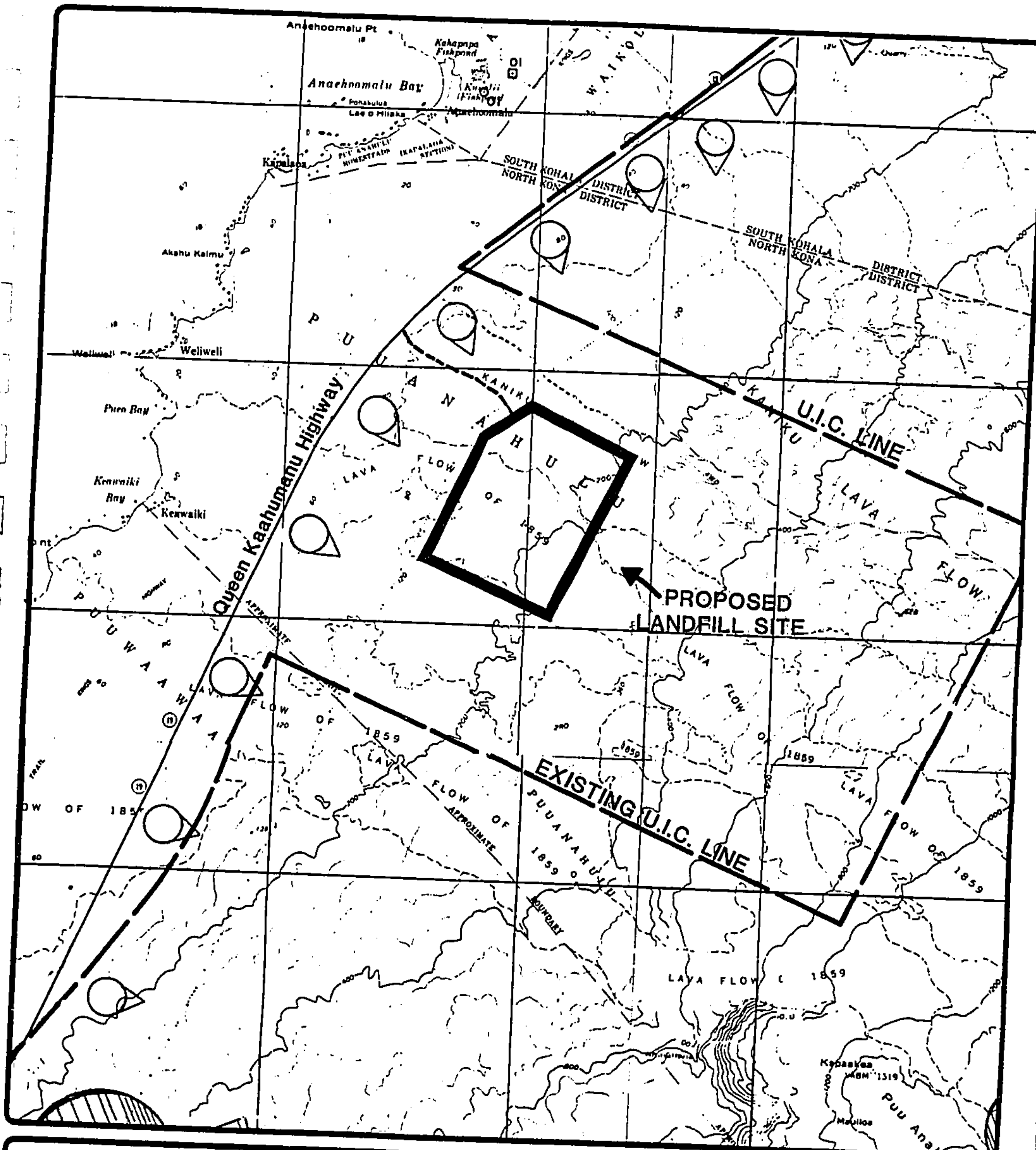


FIGURE 1-3

SITE LOCATION

WEST HAWAII SANITARY LANDFILL

County of Hawaii

N

0 3000 6000

SCALE IN FEET

R. M. TOWILL CORPORATION

be built makai of the project site for future testing for possible leachate contamination. The project site is down gradient and far removed from any existing groundwater well currently used for public water supply.

> Leachate: Leachate is the liquid formed as water passes through refuse dissolving any chemicals. Signs of leachate production usually appear years after the landfill has been in operation and continue after the landfill has been completed. A leachate collection system will be installed within the landfill and pumped out regularly for treatment and disposal at a municipal wastewater treatment facility.

1.4.2 Views/Visual Resources

Existing mauka views in the project vicinity from coastal areas are of vast barren lava flows. The closest coastal resort is Waikoloa located between two and three miles north of the project site. Introduction of a sanitary landfill in Puuanahulu will result in potential view impacts as the project expands in a mauka direction because elevation gradually increases in this direction.

Design solutions to mitigate potential view impacts will include a "land form alteration" approach so that the finished landfill grades will be contoured into the landscape so as to not become an intrusion to existing views. Further, excavated soils and lava will be used to create berms for perimeter screening on the makai border of the landfill site.

1.4.3 Archaeological Resources

Two archaeological sites are located outside of the proposed project site. The first one (15,409: CSH1) located east of the mauka border is a lava tube site. The other (15,414: CSH6) is a temporary shelter. Both are requiring data recovery, and site 15,409 (CSH1) will be preserved "as is." Both sites are situated on older pahoehoe lava. The mauka border of the project site will be situated at least 200 feet makai of the Site CSH1. Both sites will be preserved with fencing around the perimeters to avoid anticipated secondary impacts (i.e., trucks driving onto the site) from the proposed landfill development and long-term operation. Consultation with the State Historic Preservation Division of the Department of Land and Natural Resources will be conducted prior to formulation of a data recovery and preservation plan.

1.4.4 Leachate

A double liner system that will include a high density polyethylene liner with bentonite bonded to the upperside of the liner and another high density polyethylene bottom liner will be used to prevent leachate migration into the groundwater table over the lifecycle of the landfill.

A leachate collection and treatment system will be installed to handle any leachate that is generated on site. The collection system will consist of a network of perforated pipes installed at the bottom of the landfill. Perforated pipes will be connected to manholes which will serve as sampling/storage wells. Leachate will be intercepted by the perforated pipes and will flow into the manholes in batch operations. The leachate will be collected regularly, treated and taken to a municipal wastewater treatment plant.

To minimize leachate production, the final landfill grading will divert rainfall runoff from the site. Off-site runoff will be diverted around the landfill site. Capping with a low permeability cover will be provided in addition to the grading.

1.4.5 Odor Control

Prevailing wind conditions during the day are from the northeast. The winds reverse direction at nightfall and flow from the southwest. Odor problems arise in strong wind conditions.

Odor problems will be minimized by proper landfill management and cover. Potential odor problems that the closest populated areas are facing will be minimized by the practice of daily soil cover.

1.4.6 Vector Problems

At most open dumps vector problems include the proliferation of rats, flies and birds. The proper operation of a sanitary landfill would minimize much of the vector problems. Daily soil coverage should deter rats, flies and birds, and other vermin from breeding in the landfill. The County will monitor the population of these animals within the project area to minimize the chances of the spread of diseases or other problems associated with these pests.

1.4.7 Erosion

Runoff originating in off-site areas will be diverted around the landfill site by earth swales.

Prior to the construction of the landfill facility, an erosion control plan will be developed and approved by the County Department of Public Works. Besides the proper operational and management techniques, the most effective methods of erosion control within the landfill site are temporary ditches, grading and/or silting basins. After the landfill is completed, the site should be graded to prevent erosion from runoff and to minimize infiltration.

1.4.8 Litter

The remote location of the project site minimizes the potential problem of litter scattering onto adjacent properties. At present, existing landfill users travel on both Queen Kaahumanu Highway and Mamalahoa Highway to dispose of their refuse at the Kealakehe Sanitary Landfill. The litter on the Queen Kaahumanu Highway is not anticipated to be worse than what is presently occurring. An 8+ foot high chain link fence will be installed along the access road, and around the landfill site to prevent litter from entering adjacent areas.

1.4.9 Gases

Carbon dioxide and methane are produced by the decomposing solid wastes. In the initial breakdown, the biological decomposition is accomplished by aerobic microbes which utilize the oxygen available in the refuse to produce primarily carbon dioxide. As oxygen is depleted, the aerobes die and anaerobe microbes, which flourish in the absence of oxygen, digest the organic material forming not only carbon dioxide, but also methane and hydrogen sulfide gases. High concentrations of these gases may cause explosions in the leachate manhole.

The proposed methods of gas control at the West Hawaii landfill site are through collection in the leachate collection system and natural ventilation. Since the gases will collect in the leachate collection system, the methane concentration can be monitored at the leachate manhole. To prevent explosions when the methane concentration exceeds four percent, the manhole cover should be removed to allow the gases to escape into the atmosphere.

Natural ventilation takes place when gases rise and diffuse through the final cover to the atmosphere. Natural ventilation is an economical and effective method of dispersing gas in a landfill. The combination of releasing gas from the leachate manhole and natural ventilation will minimize the environmental effects of gas production by the landfill. Gas monitoring will be conducted periodically to prevent potential methane gas accumulation.

1.4.10 UIC Line

The State Department of Health (DOH) established the Underground Injection Control (UIC) program in 1984. The purpose of this program is to protect the State's potable groundwater resources from pollution by subsurface wastewater disposal. The program regulations are accompanied by UIC maps which demarcate a boundary line known as the "UIC Line." Lands that are makai of this line are not restricted from subsurface wastewater disposal by underground injection. Location of the proposed landfill makai of the UIC line is in conformance with the UIC program.

1.4.11 Botanical Resources

Siting of the proposed landfill on the 1859 lava flow will not have a significant impact on the botanical resources as the flow is largely barren. The majority of the plants that occur on the flow are introduced or alien species. The few natives found on the flow tend to be the more hardy, weedy types; these also occur elsewhere throughout the islands.

1.4.12 Traffic

A traffic study was conducted to evaluate the impacts that the proposed landfill will have on Queen Kaahumanu Highway existing traffic. Vehicular trips generated by the project are expected to increase from 1989 to 2016 as West Hawaii grows.

The traffic study found that the level of landfill related traffic by 2016 will have little impact on traffic conditions at the proposed intersection, where the new access road will meet Queen Kaahumanu Highway. To accommodate the widest range of user groups, access to the landfill will be open 6 days a week. The County is considering keeping the new landfill open 7 days a week.

1.4.13 Public Services and Facilities

The primary beneficial impacts will occur in the area of public services and facilities: this landfill site is expected to come on line in 1992, and will accommodate West Hawaii's solid waste disposal needs through the year 2015. From a public health perspective, the project will also provide a solution to an imminent problem at the Kealakehe landfill, which is already near its planned capacity. Permitting the closure of the existing landfill is a major benefit that will result from this project.

1.5 RELATIONSHIP TO LAND USE PLANS AND POLICIES

The proposed project is basically consistent with State and County land use plans and policies. The project site is located on lands designated Agriculture by the State Land Use Commission (SLUC). However, according to the Land Study Bureau, the soils are poorly suited for any agricultural uses. The County of Hawaii will initially petition for a special permit from the County Planning Commission to develop the West Hawaii Sanitary Landfill. The Planning Commission will forward its recommendation to the State Land Use Commission regarding the Special Permit.

1.6 ALTERNATIVES CONSIDERED

Alternatives considered to the proposed action were the no-project alternative, alternative waste reduction and reuse methods, and consideration of three other sites. The no-project alternative is typically considered when contemplating any new action. The second alternative, consideration of other waste reduction and reuse methods are described and discussed relative to the County's development of an integrated Solid Waste Management Plan that is underway.

An advisory committee consisting of County of Hawaii staff, West Hawaii residents, business representatives, State officials and consulting planners and engineers, conducted a preliminary site assessment. The committee recommended consideration of three alternative sites. The site that was selected addressed the site selection criteria as set forth in landfill site selection standards and rules.

1.7 NECESSARY PERMITS AND APPROVALS

The establishment of the West Hawaii Sanitary Landfill will require a number of State and County government permits. All of the necessary permits will be obtained at the appropriate time. The necessary permits include the following:

1.7.1 State of Hawaii

Department of Health:	Solid Waste Management Permit
State Land Use Commission:	Special Permit

1.7.2 County of Hawaii

County Planning Commission:	Special Permit
Dept. of Public Works:	Grading and Grubbing Permit
Planning Department:	Plan Approval

SECTION 2
Project Description

SECTION 2
PROJECT DESCRIPTION

2.1 PROJECT LOCATION

The proposed project is 300 acres in size and is in a lava field on State-owned land (Figure 1-1). It lies in the Ahupuaa of Puuanahulu and north of the boundary of Puuwaawaa in North Kona, Tax Map Key 7-1-03:01. An overhead utility line that runs parallel to Queen Kaahumanu Highway, is approximately 400 feet makai of the proposed landfill site. The project site is located between Queen Kaahumanu Highway and Mamalahoa Belt Highway, approximately 6,600 feet inland from Pueo Bay and Keawaiki Bay.

The proposed landfill site is located on a barren 1859 lava flow more than 1-1/2 miles from any populated areas. The area and its vicinity are a barren zone where no indication of former human use was observed. Several private homes adjacent to Keawaiki Bay are the closest populated area located about one and one-half miles northwest of the project site. Of the available sites in the West Hawaii area, this location is a suitable site from an operational as well as an environmental perspective. The preliminary site location is shown in Figure 1-3. This figure also shows the proposed access road.

The originally proposed location of the landfill is south of the proposed new site. The decision to relocate the original site was based on discussions and evaluations by a West Hawaii Solid Waste Management Advisory Committee which was comprised of representatives from the governmental and private sectors in the County (see Appendix E for list of members). The primary basis for the selection of the new proposed landfill site was its close proximity to the highway.

Abundant land area and low rainfall are two factors that made this area a candidate for a new landfill site. The area adjacent to the Queen Kaahumanu Highway from Kealakehe to

Puako is similar; however, the proposed site is better suited for a landfill because it is more centrally located to the West Hawaii region areas of projected growth, which are expected to stretch as far north as North Kohala and south to South Kona.

2.2 REFUSE GENERATION DATA

Refuse generation projections are important in any solid waste management plan. The projections determine the landfill life and have an impact on landfill operations and the economics of the project.

The projections in this study are theoretical projections based on population growth and refuse generation rates.

2.2.1 Projections Based on Population

The refuse generation projections calculated for West Hawaii are based on de facto population and a refuse production rate of 6.0 lbs/capita/day (Tables 2-1 and 2-2). The population projection information was obtained from the "Hawaii State Data Book, 1990." The populations for North and South Kona, and North and South Kohala were used to estimate West Hawaii's population. The "Kona Regional Plan," 1982, estimated between 70-85 percent of Hawaii County's transient population will be in West Hawaii. The defacto population of West Hawaii has been estimated by using 85 percent of the de facto population of Hawaii County (see Figure 2-1). To determine the population projections up to the year 2015, the resident and defacto populations for West Hawaii were plotted in graph form (see Figure 2-1). A straight line population projection, based on the population growth from the year 2000 to 2010, was used to determine the population growth to the year 2015.

The production rate of 6.0 lbs/capita/day was based on information from the Refuse Division, City and County of Honolulu due to the lack of accurate data for Hawaii County. The "Oahu Solid Waste Management Plan," May 1983, estimated the refuse production rate to be 5.7 lbs/capita/day from the year 1985 to 2000. The 6.0 lbs/capita/day is adjusted for

TABLE 2-1

RESIDENT POPULATION PROJECTION[1]
WEST HAWAII

	POPULATION IN THOUSANDS							
	1970	1980	1985	1990	1995	2000	2005	2010
KONA	8.8	19.6	26.2	32.9	39.9	46.3	51.8	--
KOHALA	5.6	7.8	10.4	15.3	22.2	28.2	33.7	--
TOTAL	14.4	27.4	36.6	48.2	62.1	74.5	85.5	--

TRANSIENT POPULATION HAWAII COUNTY[2]
(DEFACTO - RESIDENT)

		POPULATION IN THOUSANDS							
		1970	1980	1985	1990	1995	2000	2005	2010
DEFACTO	65.7	99.5	116.0	134.4	158.6	183.0	211.0	243.0	
RESIDENT		63.5	93.0	109.3	124.6	142.5	160.4	180.8	206.1
TRANSIENT		2.2	6.5	6.7	9.8	16.1	22.6	30.2	36.9
85% TRANSIENT		1.9	5.5	5.7	8.3	13.7	19.2	25.7	31.4

DEFACTO POPULATION PROJECTION WEST HAWAII
(WEST HAWAII TOTAL + 85% TRANSIENT)

	POPULATION IN THOUSANDS							
	1970	1980	1985	1990	1995	2000	2005	2010
DEFACTO POPULATION WEST HAWAII	16.3	32.9	42.3	56.5	75.8	93.7	111.2	--

[1]From Table IX-19, Kona Regional Plan, 1982.
[2]From Tables 5, 7 and 18, State of Hawaii Data Book, 1990.

TABLE 2-2

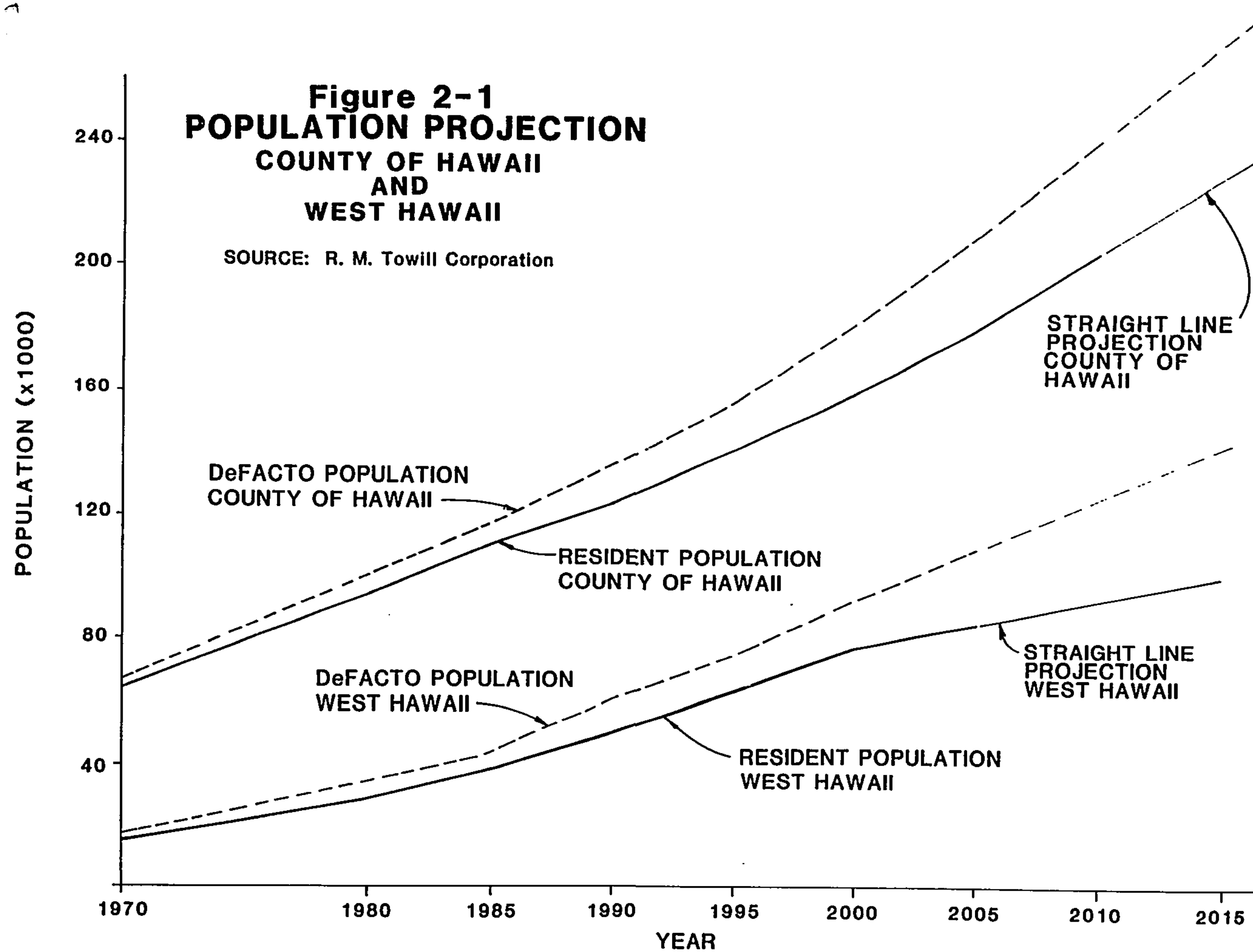
WEST HAWAII SOLID WASTE GENERATION
POPULATION BASIS
LOOSE REFUSE

Year	Population (x1000)	Production Rate lbs/cap/day	Annual Production x1000 ton/yr	Cumulative Production x1000 ton	x1000 cy
1990	56.5	----	----	----	----
1991	60.4	----	----	----	----
1992	64.2	6.0	70.3	70.3	703
1993	68.1	6.0	74.5	144.8	1,448
1994	71.9	6.0	78.8	223.6	2,236
1995	**75.8**	**6.0**	**83.0**	**306.6**	**3,066**
1996	79.4	6.0	86.9	393.5	3,935
1997	83.0	6.0	90.8	484.3	4,843
1998	86.5	6.0	94.8	579.1	5,791
1999	90.1	6.0	98.7	677.8	6,778
2000	**93.7**	**6.0**	**102.6**	**780.4**	**7,804**
2001	97.2	6.0	106.4	886.8	8,868
2002	100.7	6.0	110.3	997.1	9,971
2003	104.2	6.0	114.1	1,111.2	11,112
2004	107.7	6.0	117.9	1,229.1	12,291
2005	**111.2**	**6.0**	**121.8**	**1,350.9**	**13,509**
2006	114.7	6.0	125.6	1,476.5	14,765
2007	118.2	6.0	129.4	1,605.9	16,059
2008	121.7	6.0	133.3	1,739.2	17,392
2009	125.2	6.0	137.1	1,876.3	18,763
2010	128.7	6.0	140.9	2,017.2	20,172
2011	132.2	6.0	144.8	2,162.0	21,620
2012	135.7	6.0	148.6	2,310.6	23,106
2013	139.2	6.0	152.4	2,463.0	24,630
2014	142.7	6.0	156.3	2,619.3	26,193
2015	146.2	6.0	160.1	2,779.4	27,794

Notes:
1. Populations 1990, 1995, 2000 and 2005 obtained from Defacto Population Projection West Hawaii, Table 2-1.
2. Populations for individual years and beyond 2005 were obtained by straight-line interpolation, Figure 2-1.
3. Solid waste production based on landfill operation to start in 1992.
4. Loose refuse density based on 200 lbs/cy.

Figure 2-1
POPULATION PROJECTION
COUNTY OF HAWAII
AND
WEST HAWAII

SOURCE: R. M. Towill Corporation



West Hawaii because resorts and rural areas generally produce more refuse per capita than urban areas.

The annual solid waste production for the period 1990-2015 is shown on Table 2-2. The cumulative production is based on starting the landfill operation at the end of 1989 or the beginning of 1990. The total volume is based on a density of loose refuse of 200 lbs/cy.

Table 2-3 provides both the annual and cumulative loose and compacted in-place refuse volumes from the year 1989 to 2015. An in-place compacted density of 1,000 lbs/cy was used to determine the life of the landfill.

2.3 LANDFILL DEVELOPMENT PLAN

The most common method of refuse disposal is by sanitary landfill. By definition, a sanitary landfill is an engineered method of disposing of solid wastes on land in a manner that protects the environment by spreading the wastes in thin layers, compacting it to the smallest practical volume, and covering it with soil by the end of each working day.

The definition identifies three components necessary to satisfy the requirements of a sanitary landfill: spreading wastes in thin layers; compaction to the smallest practical volume; and daily cover. These three steps are vital in a sanitary landfill to reduce settling problems, fires, flies and rat breeding, and to conserve space.

Landfills create potential problems such as gas generation and migration, leachate generation and pollution. Proper design and operation of a landfill will minimize and control potentially adverse impacts. Proper litter control and landscaping practices will be emphasized to enhance the aesthetic and environmental characteristics of the landfill.

A sanitary landfill is an effective method of disposing of solid wastes as well as providing land for reclamation when the landfill closes.

2.3.1 Method of Operation

The three types of landfill configurations are the trench method, the area method, and the ramp method.

The "trench method" involves excavating a trench into which the wastes are compacted and covered. The excavated earth can be used for cover or stockpiled for future use.

The "area method" utilizes the existing ground surface. Wastes are spread on the ground surface, compacted and covered with earth from another source.

The "ramp method," a combination of the trench and area methods, is the recommended method. In this method, also known as the "progressive slope" method, the refuse is spread and compacted by standard landfilling equipment, then covered with either stockpiled or imported soil. This process is repeated creating a succession of slopes across the landfill. When one layer or lift covers the landfill floor, the second lift is begun.

The maximum working slope for each refuse cell will be 3 to 1 and the lifts will be 15 feet high (Figures 2-2 and 2-3). The refuse is to be compacted to a density between 800 to 1,200 lbs/cy. The final slope should not exceed 4 to 1 for this proposed project.

Construction of the landfill site will take place prior to the opening of the landfill. The finished landfill will be a prepared excavated area complete with stockpiled cover material, and leachate and gas control devices ready for operation using the ramp method.

A single-story weigh station of 396 square feet, a butler type 6,000 square foot office/storage and equipment building and a single-story 1,056 square foot administration building will be included on the project site. These facilities will be serviced with potable water and wastewater collection systems. In the short term, potable water will be made available through a temporary storage system.

TABLE 2-3

IN-PLACE VOLUME PROJECTIONS

Year	LOOSE REFUSE x1000 CY Annual	Cumulative	COMPACTED REFUSE x1000 CY Annual	Cumulative
1990	----	----	----	----
1991	----	----	----	----
1992	703	703	141	141
1993	745	1,448	149	290
1994	788	2,236	158	447
1995	**830**	**3,066**	**166**	**613**
1996	869	3,935	174	787
1997	908	4,843	182	969
1998	948	5,791	190	1,158
1999	987	6,778	197	1,356
2000	**1,026**	**7,804**	**205**	**1,561**
2001	1,064	8,868	213	1,774
2002	1,103	9,971	221	1,994
2003	1,141	11,112	228	2,222
2004	1,179	12,291	236	2,458
2005	**1,218**	**13,509**	**244**	**2,702**
2006	1,256	14,765	251	2,953
2007	1,294	16,059	259	3,212
2008	1,333	17,392	267	3,478
2009	1,371	18,763	274	3,753
2010	1,409	20,172	282	4,034
2011	1,448	21,620	290	4,324
2012	1,486	23,106	297	4,621
2013	1,524	24,630	305	4,926
2014	1,563	26,193	313	5,239
2015	1,601	27,794	320	5,559

Notes:
1. Loose refuse based on 200 lbs/cy.
2. Compacted refuse based on 1,000 lbs/cy.
3. Cumulative based on starting landfill operations in 1992.

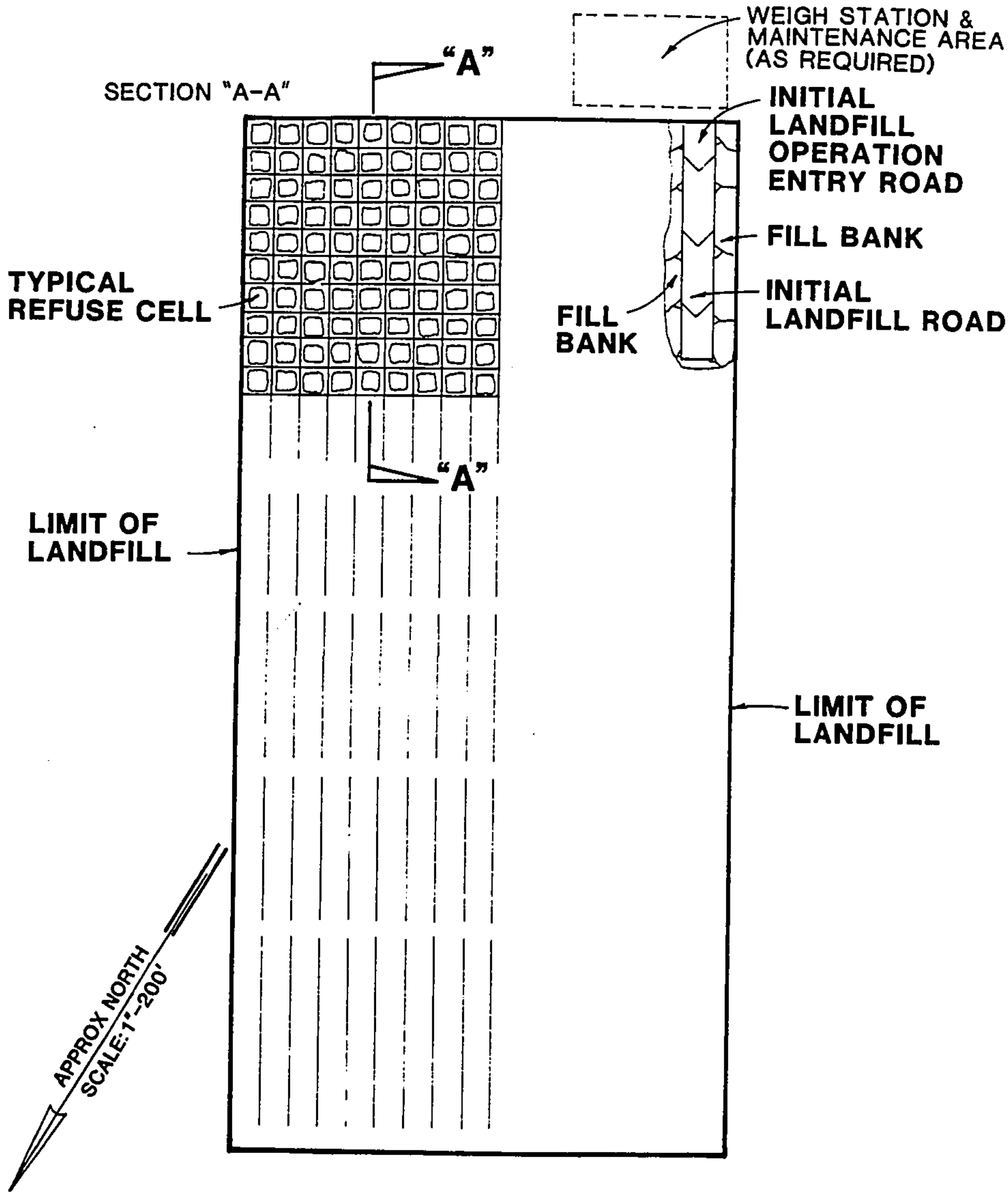


Figure 2-2
LANDFILL DEVELOPMENT PLAN
INCREMENT 1

CORRECTION

THE PRECEDING DOCUMENT(S) HAS
BEEN REPHOTOGRAPHED TO ASSURE
LEGIBILITY
SEE FRAME(S)
IMMEDIATELY FOLLOWING

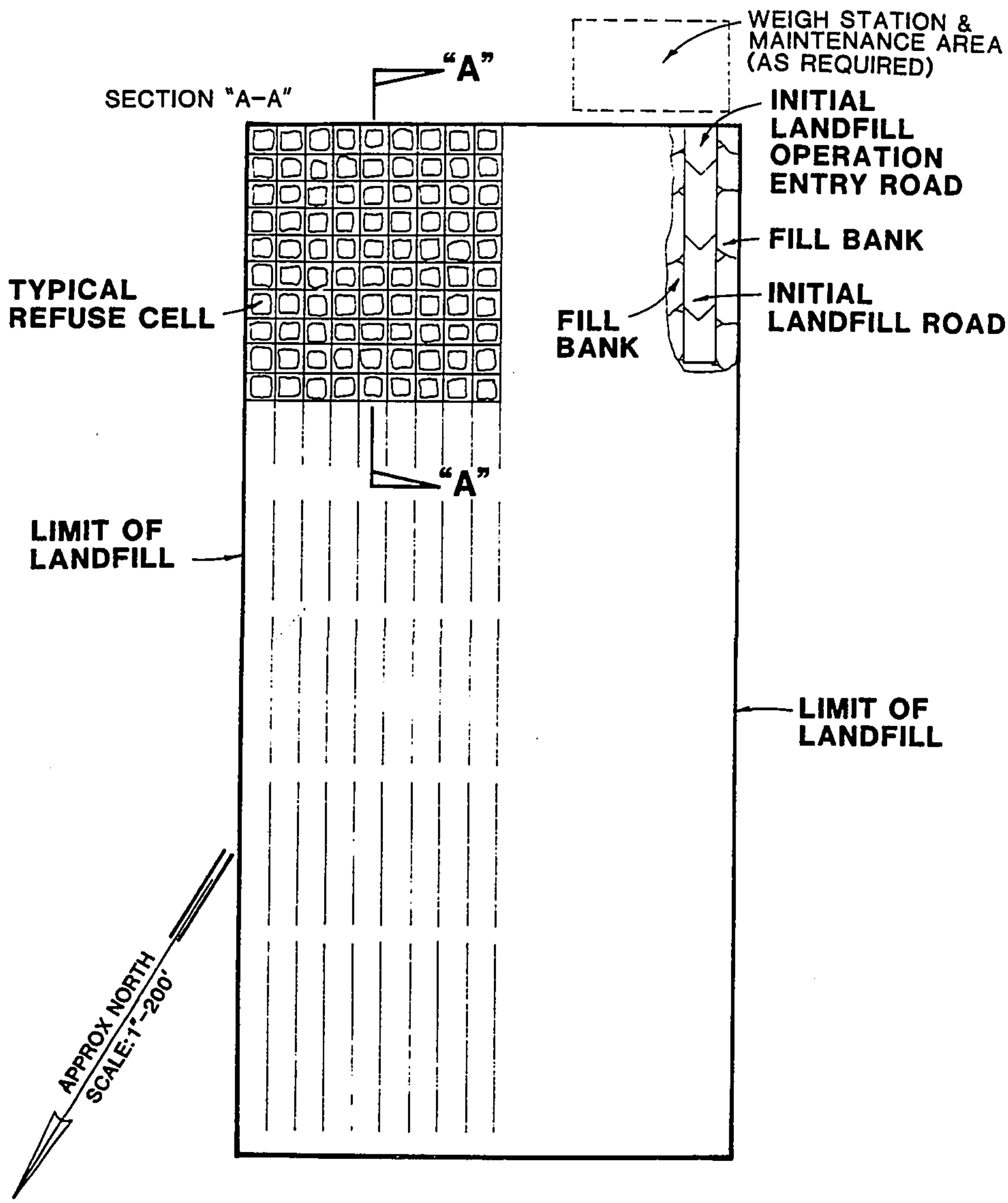


Figure 2-2
LANDFILL DEVELOPMENT PLAN
INCREMENT 1

Figure 2-3

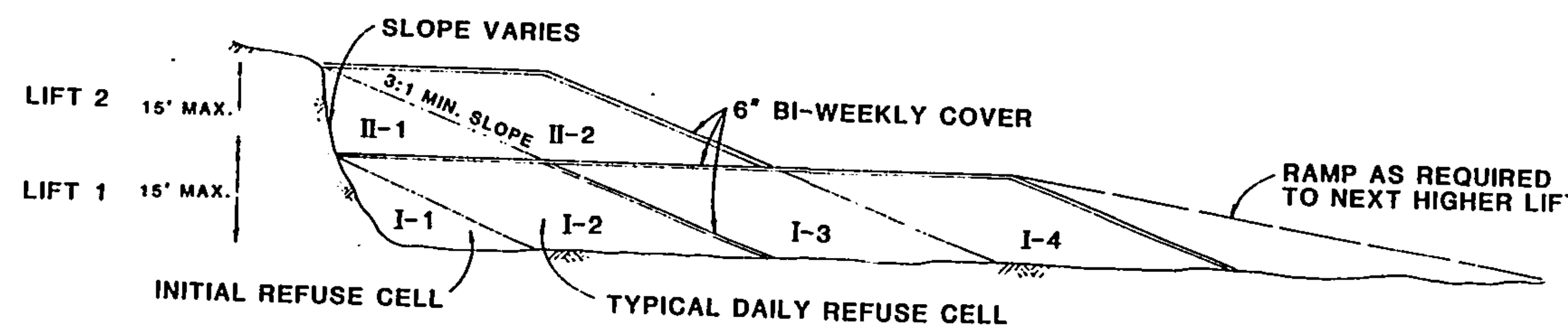
SECTION "A-A"
TYPICAL LIFT DEVELOPMENT

SCALE: HORIZ. 1"=20'
VERT. 1"=20'

1"-20' 20 0 20 40

PROCEDURE: (For Increment 1)

1. EXCAVATE AND PREPARE EXISTING GROUND.
2. LAY LEACHATE COLLECTION PIPES.
3. DEVELOP LIFT 1. BEGIN AT THE SOUTHWEST CORNER AND PROCEED IN A NORTHERLY AND WESTERLY DIRECTION.
4. BUILD RAMP AT NORTH END OF LIFT 1 TO PROVIDE ACCESS TO LIFT 2.
5. DEVELOP LIFT 2 IN SIMILAR MANNER AS LIFT 1 (STEP 3)



2.3.2 Grading

Earthwork operations are a continuing process in a landfill. The landfill operations include excavating the landfill, spreading and compacting refuse, and transporting material for cover from the stockpiled excavated earth. Grading also includes development of drainage swales to divert surface runoff around and from the landfill area. The final grades will tie into natural contours.

2.3.3 Excavation

The proposed landfill site must be excavated before the landfill is opened. The larger rocks from excavated earth will be removed to obtain material satisfactory for cover soil. The cover soil will be stockpiled for future use. The excavation shall also shape, compact and prepare the bottom of the landfill to insure proper functioning of the leachate collection system.

2.3.4 Cover Material Generation

The quality of soil is important in any sanitary landfill operation. Desirable characteristics include easy workability, moderate cohesion and strength. The most suitable cover soil is a mixture of sand, silt and clay. Sandy loam is generally a very desirable cover soil. On the other hand clear sands are unsuitable since they are readily permeable and would allow large quantities of water access to the deposited refuse. Clay and silt make poor cover soils due to their shrink-swell properties. The shrink-swell properties cause deep cracks in the soil providing access to the refuse by rodents, insects and water as well as allowing gases to escape.

In general, the cover soil should be a well graded mixture of fine and coarse components. As a "rule of thumb" there should be sufficient cover material to insure 1 part of cover soil to 4 parts compacted refuse (based on daily cover).

2.3.5 Stockpiling

The location of the stockpile is important to allow efficient maneuvering of equipment. The proposed stockpile locations are to be shown in the design of the landfill.

2.3.6 Drainage

Proper drainage is important in any landfill operation to limit the amount of infiltration into the refuse cell. Infiltration may result in excessive leachate and gas production.

The design of a landfill should incorporate a surface drainage system to prevent water from contacting deposited refuse. Just as important as the surface drainage is the design and operation of the landfill to ensure that groundwater does not contact the deposited refuse. The uncontrolled production and migration of leachate can lead to serious environmental problems.

The terrain ranges from extreme slopes to relatively level ground. This area generally receives between 10 to 20 inches of rainfall per year. Prior to enactment of "Subtitle D," this low amount of rainfall generally would not require a leachate collection system, however, such a system will be provided for additional environmental protection. A schematic of such a leachate system is shown on Figure 2-4. The actual system will be based on slopes of landfill and other topographic and geotechnical considerations.

Due to its relatively young age and porous nature, the site has no distinct drainage courses. Runoff generated offsite should be directed around and away from the site. The final grading should also divert runoff around the site to prevent accumulation of water.

2.3.7 Landfill Life and Size

The life of a landfill is determined by the population and refuse projections. The landfill should be in operation approximately 25 years. Thus, the defacto population of West Hawaii has been projected to the year 2015. This landfill will be developed in five (5) increments. (Each increment is determined from the projected in-place cumulative refuse volume in Table 2-4.) Each increment will accommodate approximately five (5) years of refuse generation, except for Increment 1 which will accommodate six years of refuse generation.

It is important to point out that the life is dependent on the population projection and may vary if the projections are not as anticipated.

The total area needed for the proposed landfill is determined by using the cumulative volume of in-place compacted refuse for the year 2015. The total area needed is based on a 4 to 1 refuse to cover ratio, 25 percent buffer area, and a landfill depth of 30 feet. The cumulative refuse volume plus the cover requirements determines the area needed to properly dispose of the refuse. The refuse disposal area is increased by the 25 percent buffer area to allow for the safe operation of vehicles and equipment. Thus, the refuse area increased by the 25 percent buffer zone is the total area required for the landfill.

The area for each increment is determined using the same process as used for the total landfill area. The compacted refuse volume used will be a total projected refuse volume for the five-year increment period (see Table 2-4).

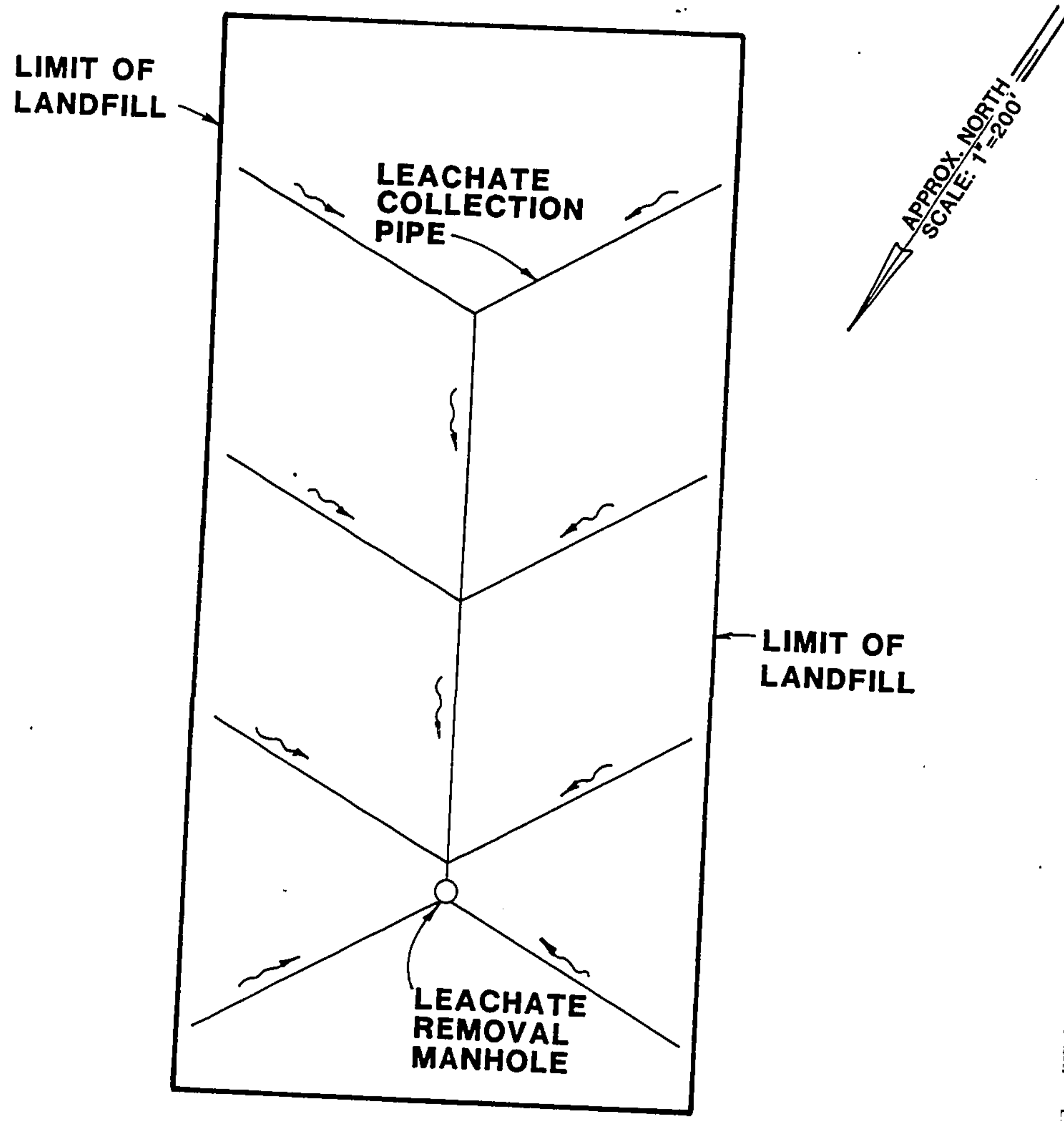


Figure 2-4
LEACHATE COLLECTION SYSTEM INCREMENT 1

LEGEND

———	LEACHATE COLLECTION PIPE
○	LEACHATE REMOVAL MANHOLE
~→	DIRECTION OF LEACHATE FLOW

TABLE 2-4

LANDFILL AREA

Year	Annual Production (x1000 TONS)	Annual In-place Volume (x1000 CY)	Cumulative In-place Volume (x1000 CY)	Annual Area (Acres)	Increment Area (Acres)	Cumulative Area (Acres)
1990	----	----	----	----		
1991	----	----	----	----		
1992	70.3	141	141	4.8		
1993	74.5	149	290	5.1		
1994	78.8	158	447	5.4		
1995	**83.0**	**166**	**613**	**5.7**	**21**	**21**
1996	86.9	174	787	6.0		
1997	90.8	182	969	6.2		
1998	94.8	190	1,158	6.5		
1999	98.7	197	1,356	6.8		
2000	**102.6**	**205**	**1,561**	**7.1**	**33**	**54**
2001	106.4	213	1,774	7.3		
2002	110.3	221	1,994	7.6		
2003	114.1	228	2,222	7.8		
2004	117.9	236	2,458	8.1		
2005	**121.8**	**244**	**2,702**	**8.4**	**39**	**93**
2006	125.6	251	2,953	8.6		
2007	129.4	259	3,212	8.9		
2008	133.3	267	3,478	9.2		
2009	137.1	274	3,753	9.4		
2010	**140.9**	**282**	**4,034**	**9.7**	**46**	**139**
2011	144.8	290	4,324	10.0		
2012	148.6	297	4,621	10.2		
2013	152.4	305	4,926	10.5		
2014	156.3	313	5,239	10.7		
2015	**160.1**	**320**	**5,559**	**11.0**	**52**	**191**

Areas Based On:

1. 2 - 15 ft. Cells.
2. 4 (H) to 1 (V) ratio for refuse cover.
3. 25% Buffer area for operations and vehicle access.
4. No volume reduction or resource recovery facility incorporated.
5. Approximately 29,100 cy/acre (based on above criteria).

SECTION 3
The Physical Environment & Related Impacts

SECTION 3
THE PHYSICAL ENVIRONMENT AND RELATED IMPACTS

3.1 GENERAL

The Island of Hawaii is the most recently formed of the Hawaiian Islands. The County of Hawaii encompasses the entire island. Commonly referred to as the Big Island, it has nearly twice the land area of all the other islands in the State combined. Formed by five volcanoes, its area is still being expanded by volcanic eruptions. Mauna Kea, the highest of the five, rises 13,796 feet from the northerly part of the island; the Mauna Kea Observatory is located at its summit.

The other volcanoes are Mauna Loa (13,677 feet above sea level), Hualalai (8,271 feet above sea level), Kohala (5,480 feet), and Kilauea (4,093 feet). Kilauea and Mauna Loa are active volcanoes; Mauna Kea and Kohala Mountain have not erupted for several hundred years. But Hualalai, to which the project site is located closest, last erupted in about 1800.

3.2 GEOGRAPHY AND CLIMATE

The project area lies on the undissected uplands of Hualalai at an elevation between 120 feet and 200 feet, near the leeward or Kona coast of the island. The Kona coast is characterized as an area that is generally dry as it is shielded by the mountains from the rain of the prevailing tradewinds. This region consists of an arid plain of lava flows. Elevation at the Queen Kaahumanu Highway is approximately 120 feet above mean sea level. The proposed access road would begin at Queen Kaahumanu Highway between Akahu Kaimu and Weliweli Point, on the Kaniku lava flow, which it crosses and then ascends a pre-1859 a'a flow for about one mile from approximately the 80-foot contour up to about the 120-foot elevation. The site is situated just west of the foot of Puuanahulu. Existing slopes average 2 to 5 percent through the area leading up to the site.

Rainfall recorded at the Puuwaawaa rain gauge station indicates that this region receives an annual average of 10 to 20 inches, one of the driest areas on the island (Figure 3-1). This

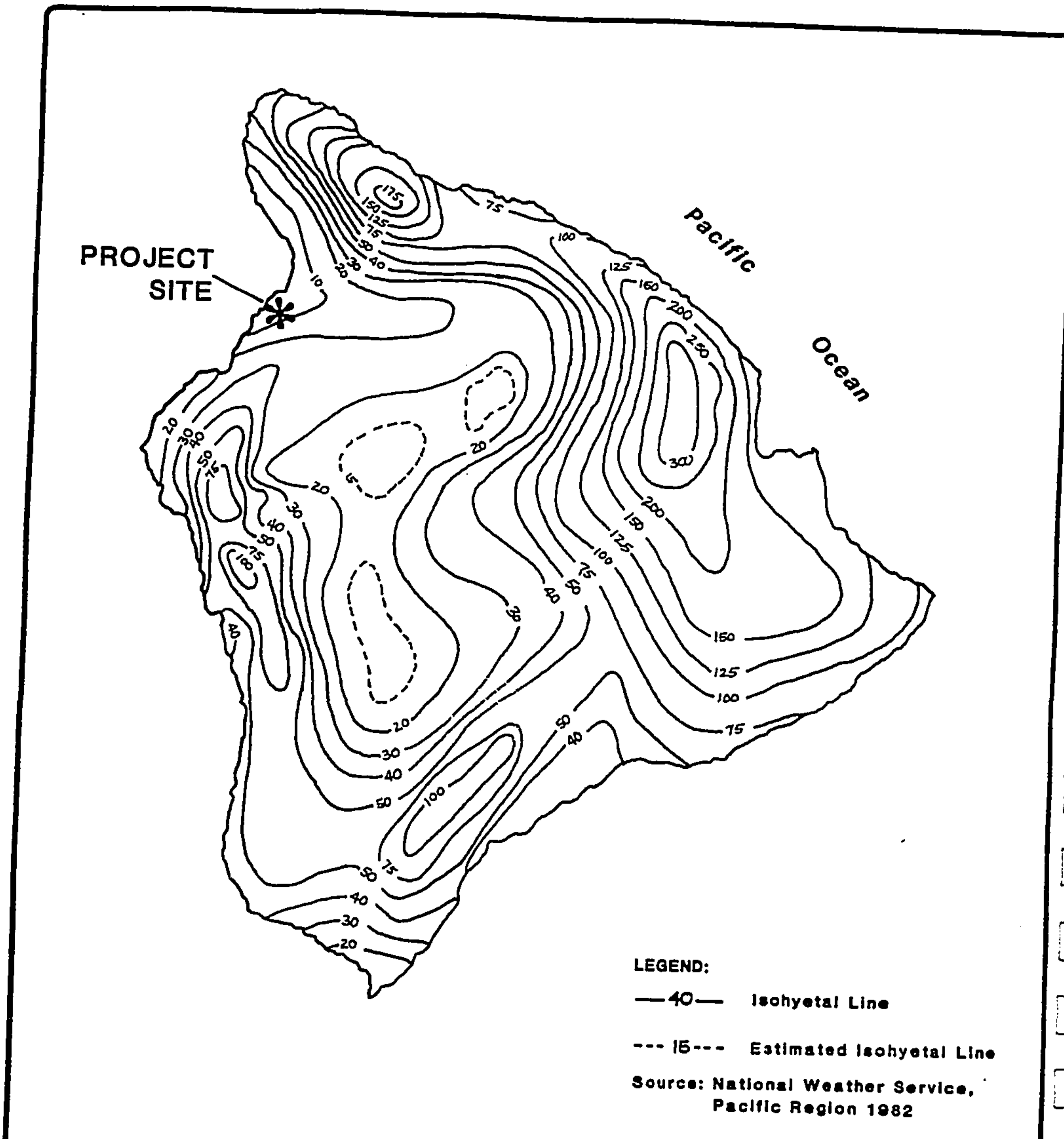
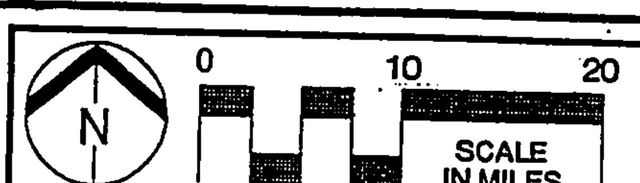


FIGURE 3-1
MEAN ANNUAL RAINFALL
WEST HAWAII SANITARY LANDFILL
County of Hawaii



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area tends to experience rainfall maximums in late afternoon and evening, from showers that form within sea breezes which move onshore and upslope during the day. The months of May to October are usually wetter than for the rest of the State. Average annual temperature is 75°F., with an extreme high of 98°F and an extreme low of 52°F. Humidity is generally low, averaging under 40 percent during the late morning and afternoon hours.

The land masses of Mauna Loa, Mauna Kea and Hualalai block the prevailing northwest trades, and a land/sea breeze system predominates the area. The prevailing wind pattern is diurnal--onshore winds in the morning and early afternoon, returning to offshore breezes in the late afternoon and evening (Figure 3-2). The area is known to experience windy conditions, particularly during summer months (N. Ahi, Mauna Lani Resort, 10/1/91). Wind velocities average up to 40-50 miles per hour from Waimea.

A. Impacts and Mitigation Measures

No significant changes to the regional climate are anticipated as a result of this project.

The distance between Keawaiki Bay and Pueo Bay and the project site is 1.2 miles. When the prevailing winds shift later in the day, odors and noise may be carried in the direction of Waikoloa which is more than two miles away. However, whatever noise and odors traveling in this direction would dissipate also before reaching Waikoloa. Homes near Keawaiki may be adversely impacted by odors from the landfill during the day. Daily soil cover will be placed to minimize these odor problems.

3.3 LAND USES AND OWNERSHIP

3.3.1 Ownership

Establishment of the West Hawaii Sanitary Landfill will be contained within the Ahupuaa of Puuanahulu which is owned by the State of Hawaii, and under the control of the Department of Land and Natural Resources.

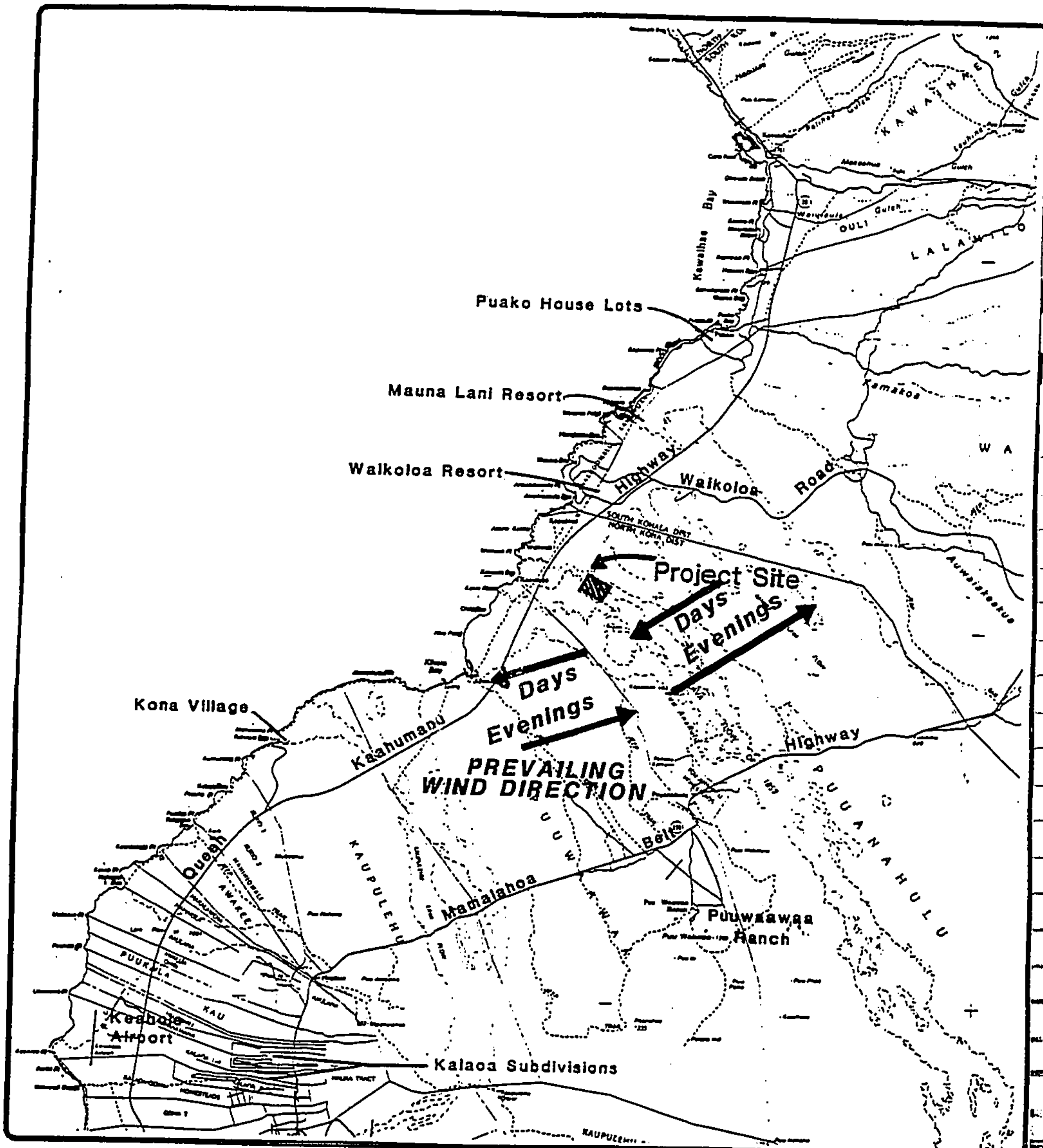


FIGURE 3-2

PREVAILING WIND DIRECTIONS

WEST HAWAII SANITARY LANDFILL

County of Hawaii

Portions of the lands in the vicinity are being leased to F. Newell Bohnett under General Lease No. S-3589 for ranching. The 300-acre site proposed for development as a landfill is not being utilized for ranching purposes. It is, in fact, vacant and undeveloped.

3.3.2 Existing Land Uses

Most of the land areas are open and receive very little recreational or residential use. There are private residences at Weliweli Point and at Keawaiki Bay. Several houses are clustered south of the brackish water pools near the middle of Keawaiki Bay. Access to Keawaiki Bay is via a private dirt road leading from Queen Kaahumanu Highway. Keawaiki Bay, Pueo Bay and Weliweli Point may also be reached by trail from 'Anaeho'omalu and Kiholo Bays.

3.3.3 State Land Use

The State Land Use classification for the project site and areas surrounding the site are shown in Figure 3-3. The site is classified as Agriculture. A special permit will be sought for use of these lands.

3.3.4 General Plan and County Zoning

The County General Plan designates the project site as Extensive Agriculture. County zoning is Extensive Agriculture. A Special Permit will be sought to utilize lands designated as Agriculture by the State Land Use Commission.

A. Impacts

The proposed sanitary landfill will not affect the existing land uses significantly. The undeveloped status of the immediate site and its adjacent land uses are compatible with the project.

3.4 GEOLOGY AND SOILS

The undersea mountain range that makes up the Hawaiian Islands was almost wholly built up by volcanic activity. Hawaii is the most recently formed of the Hawaiian Islands. Geologically, the proposed project site is young, formed by prehistoric and historic lava flows from Hualalai and Mauna Loa.

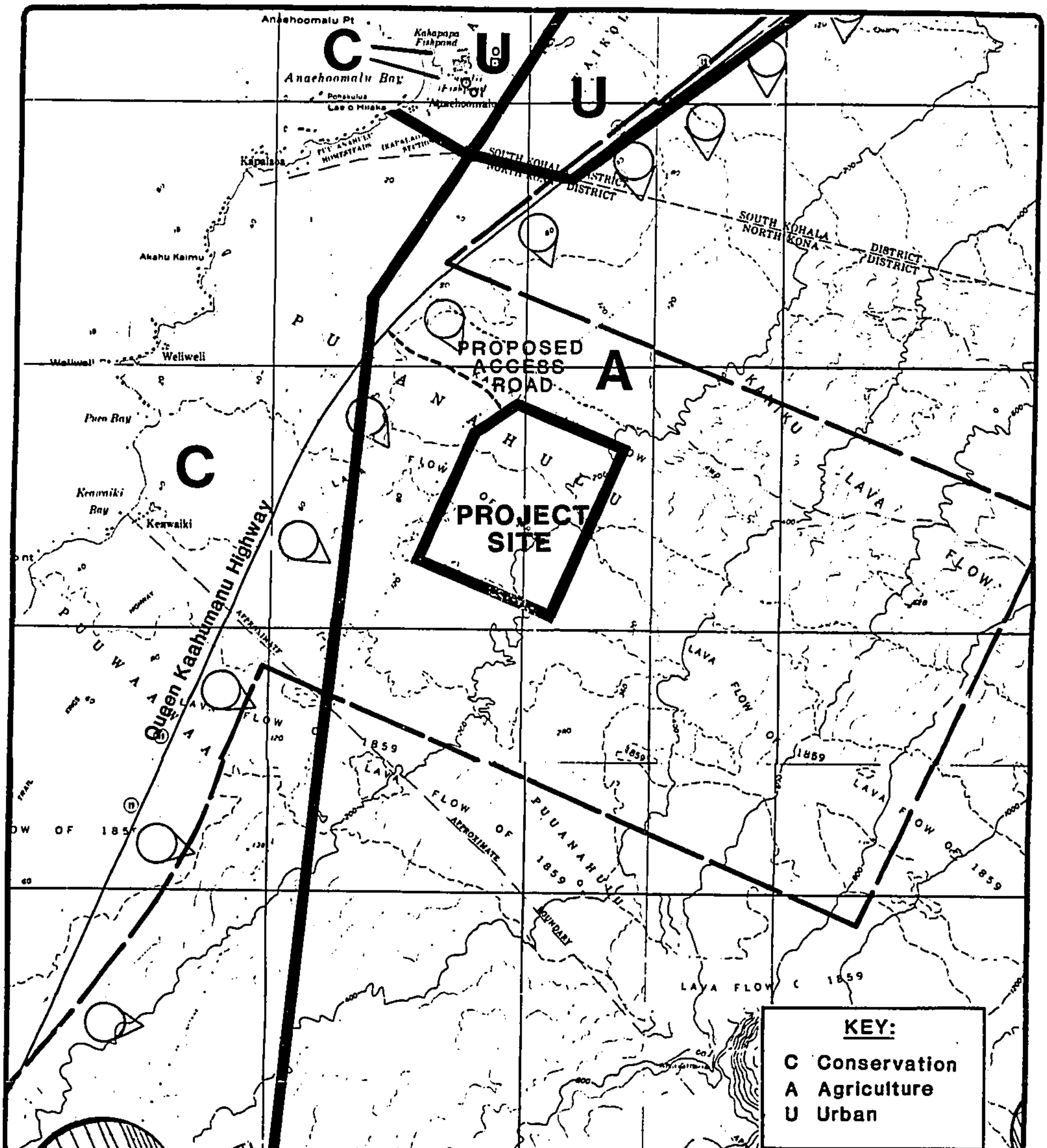


FIGURE 3-3
STATE LAND USE DISTRICTS
WEST HAWAII SANITARY LANDFILL
County of Hawaii

R. M. TOWILL CORPORATION

According to the U.S. Department of Agriculture Soils Conservation Service the site is generally characterized by two soil types. The a'a (rLV) and pahoehoe (rLW) lava flows are characterized as sparsely vegetated and with little or no soil covering. The project site substrate is covered with crumbled a'a and small ridges of pahoehoe lavas.

The a'a flow which occurs on the project site is largely barren with a few plants found in small, isolated pockets of soil and rubble or spreading in from the edge of the flow where it interfaces with the kiawe forest or fountain grass grassland. Moist pockets of soil on the pahoehoe outcroppings support mosses and scattered lichens.

The Land Study Bureau's Detailed Land Classification Report of the Island of Hawaii has designated the lands at the project site as Class E, which are lands that are very poor and least suited for agriculture.

The ideal soil cover is a clay material with low permeability. The next best alternative will be to use the soil with the most similar characteristics and that is economically available. Other landfills have been using sand as well as base coarse material, such as crushed rock. The intent of the County is to seek a better material than these, especially if it exists in the vicinity of the site. A soils test will be performed in the area to determine the type and quantity of soil material available for use as cover material. If it is found that the import of cover material is required, the necessary cover material will then be imported.

A. <u>Impacts</u>

There is a possibility of encountering lava tubes within these soil types. Existence of lava tubes poses a threat to life and property in the event that they collapse during excavation and construction.

The geological condition of the proposed access road is one of a'a lava covering pahoehoe lava. Therefore, chances of lava tubes being opened by grading for the road are minimal to "nil" because a'a does not have lava tubes, and actually functions as a mantle over them.

B. Mitigation

Average excavation depth of 20-30 feet is planned for this project. Extreme caution should be taken during grading operations in the event that lava tubes are discovered. If lava tubes are encountered during grading, they will be filled and compacted with soil.

3.5 TOPOGRAPHY AND SLOPES

The project site is located in Puuanahulu on a barren a'a lava flow, approximately 1.36 miles east of Kiholo Bay. The terrain in the vicinity of the proposed landfill is varied, ranging from level to sloping. The makai portion of the site has an average slope of 2 percent, while the mauka portion has an average slope of six percent. The overall average slope of the site is 3 percent. The site is situated between about the 120 to 200-foot elevation. Onsite topographic conditions consist of a terrain vegetated primarily with introduced fountain grass and kiawe trees.

A. Impacts and Mitigation

Construction of the weigh station, equipment and repair, and administration buildings will require minimal grading. This will not adversely impact existing topographic conditions.

The site's relatively flat topography poses a landscape design challenge as the area of the landfill expands in a mauka direction. Because the site increases in elevation in this direction, the landfill may increase in visibility from shoreline areas. Thus, potentially adverse view impacts will be mitigated by careful and sensitive attention to implementing a landform alteration with curvilinear coverage of each cell with excavated lava rocks and soil. By doing so, the development will blend in with the natural landscape with minimum impact on views.

3.6 FLORA AND FAUNA

3.6.1 Flora

A. Existing Conditions

Field studies to assess the botanical resources found on the project site were conducted on April 21, 1991. The primary objectives of the survey were to: 1) describe the major vegetation types; 2) inventory the flora; and 3) search for threatened and endangered species protected by Federal and State laws.

Prior to undertaking the field studies, a search was made of the pertinent literature to familiarize the principal investigator with other botanical studies conducted in the general area. Topographic maps and recent, black and white aerial photographs were examined to determine vegetation cover patterns, terrain characteristics, access, boundaries, and reference points. Access was by foot from the Queen Kaahumanu Highway and then following along the service road under the HELCO utility line.

A walk-through survey method was used. The species recorded are indicative of the season ("rainy" vs. "dry") and the environmental conditions at the time of the survey. A survey taken at a different season and under varying environmental conditions would yield slight variations in the species list especially of the weedy, annual taxa.

The mauka-makai alignment of the proposed sanitary landfill impacts the largely barren 1859 Lava Flow, which is composed of 'a'a lava. This is roughly 85 to 90 percent of the project site. Somewhat densely vegetated areas, supporting fountain grass grassland, are found on the geologically older pahoehoe flows located on the northeastern corner and along portions of the south boundary line.

Fountain Grass Grassland

This vegetation type occurs on geologically older lava flows, principally pahoehoe lava. The grassland can be easily picked up on the black and white aerial photos as the lighter-colored areas; the 1859 lava flow appears as the darker black areas. The older flows support a rather dense cover of fountain grass with scattered kiawe trees (Prosopis pallida). Kiawe trees tend to become somewhat denser along the edges of the 1859 flow. Common shrubs and subshrubs associated with this vegetation type are 'uhaloa, pluchea, 'ilima (Sida fallax), and indigo (Indigofera suffruticosa).

The grassland areas may harbor plants of the pololei fern (Ophioglossum consinnum), a candidate endangered species. The plants are very ephemeral, coming up for only a few weeks during the rainy season. None of this species was observed during the botanical survey conducted in April 1991; it may have been too dry by then. The fern is associated with hummocky pahoehoe flows where soil has accumulated in pockets. The fern has been recorded from the Mauna Lani resort area, from the Pu'u Anahulu site at about the 640 foot elevation, and recently along the coast at Kua Bay, Maniniowali. A more intensive search for the fern in the grassland areas needs to be conducted during the rainy season (December to February). The plants tend to occur in localized colonies of limited distribution.

This grassland is used by feral goats; goat droppings are occasional and some browsing damage to the vegetation can be seen in places.

Vegetation on 1859 Lava Flow

The tumbled heaps of clinkery, sharp and scoriaceous 'a'a lava are largely devoid of vegetation. Plant cover is 1 to 3 percent and tends to occur in small, scattered patches, usually in depressions. Fountain grass (Pennisetum setaceum) and pluchea (Pluchea symphyteifolia) are the most frequently found species. Occasionally a few plants of hairy spurge (Chamaesyce hirta), 'uhaloa (Waltheria indica), and Portulaca pilosa can be found associated with the fountain grass/pluchea patches.

B. Impacts and Mitigation

The 1859 Lava Flow covers roughly 85 to 90 percent of the 300-acre project site. Siting of the proposed landfill on this lava flow will not have a significant adverse impact on the botanical resources as the flow is largely barren. The majority of the species that occur on the flow are introduced or alien species. The few natives found on the flow tend to be more hardy, "weedy" types; these also occur elsewhere throughout the islands. The grassland areas cover only 10 to 15 percent of the site and are also dominated by introduced species as fountain grass and kiawe. Of a total of 28 species inventoried on the site, 23 (82 percent) are introduced; 4 (14 percent) ar indigenous, i.e., native to the Hawaiian Islands and elsewhere; and 1 (4 percent) is endemic, i.e., native only to the islands. None of the native species are officially listed as threatened or endangered species (U. S. Fish and Wildlife Service 1989); nor are any candidate or proposed for such status (U. S. Fish and Wildlife Service 1990).

There is a small possibility that the grassland area may harbor a few plants of the pololei fern (Ohioglossum concinnum), a candidate endangered species. The plants are very ephemeral, appearing for only a few weeks during the rainy season. None of these plants were seen during the April 1991 survey, due perhaps to the dry season. The fern is associated with hummocky pahoehoe flows where soil has accumulated in pockets of depressions. The fern has been recorded from the Puuanahulu area at about the 640 foot elevation (Char 1989a), from the Mauna Lani Resort area (1989b), and recently along the coast at Kua Bay, Maniniowali (Char 1991). If the grassland areas are to be actively used for the landfill site, then a more intensive search for the fern during the rainy season should be conducted. If the grassland areas are to be used as a buffer zone and not directly impacted, then a survey for the fern is not needed.

The proposed landfill project site is situated primarily on the 1859 Lava Flow which supports very sparse vegetation. Impacts to the botanical resources on this area are expected to be minimal. The grassland may harbor a candidate endangered species, the pololei fern. A survey of the grasslands will be conducted if these areas will be directly impacted by the proposed landfill. Also, a reconnaissance of the access road corridor will be conducted when the final alignment is selected.

Fires of human origin are a major concern. Fires in this region can spread quickly and jump from area to area in brisk wind conditions due to the highly flammable cover of fountain grass. A fire plan will be developed by the County of Hawaii, and reviewed and approved by the State Division of Forestry and Wildlife of the Department of Land and Natural Resources as well as the appropriate County agencies.

3.6.2 Fauna

A survey of the bird and mammal species was conducted for the proposed project by Phillip L. Bruner, and the survey results are summarized below. The report in its entirety can be found in Appendix D.

Field observations were conducted in early June 1991 over a two-day period at the proposed landfill site. The objectives of the study were to:

(1) Document what bird and mammal species occur on the property or may likely occur given the type of habitats available;

(2) Provide some baseline data on the relative (estimated) abundance of each species;

(3) Determine the presence or likely occurrence of any native fauna particularly any that are considered "endangered" or "threatened". If such occur or may likely be found on or near the property, identify what features of the habitat may be essential for these species;

(4) Identify any special or unique habitats for wildlife that may occur on the site and note what importance these areas may have for the fauna in this region of the island.

Field observations were made with binoculars and by listening for vocalizations. Observations were concentrated during the peak bird activity periods of early morning and late afternoon. Observations of feral mammals were limited to visual sightings and evidence in the form of scats and tracks. Two evenings were devoted to searching for the presence of owls and the Hawaiian Hoary Bat (Lasiurus cinereus semotus).

A. Findings

Resident Endemic (Native) Birds: No Short-eared Owl or Pueo (Asio flammeus sandwichensis) were observed but this bird could potentially occur on occasion at this location. Pueo are relatively common on the island of Hawaii particularly at higher elevations.

Because no wetlands exist on the property, native waterbirds are not expected. The disturbed nature of the habitat and its location make it highly unlikely that any other endemic birds, aside from the two mentioned, would utilize this property.

Migratory Indigenous (Native) Birds: Migratory shorebirds spend their winters in Hawaii between August and May. Some juveniles will stay through the summer months as well (Johnson and Johnson 1983). Of all the shorebird species that migrate to Hawaii in the winter the Pacific Golden Plover (Pluvialis fulva) are the most abundant. Plover prefer open areas such as exposed intertidal reef, rocky shorelines, mud flats, lawns, pastures, plowed fields and sparse grasslands. No plover were recorded during the survey.

Resident Indigenous (Native) Birds: No indigenous species were recorded. The only species in this category is the Black-crowned Night Heron (Nycticorax nycticorax). The absence of wetland habitat precludes the occurrence of this species.

Resident Indigenous (Native) Seabirds: No seabirds were observed on the property. The presence of predators make this site unsuitable for nesting or roosting seabirds.

Exotic (Introduced) Birds: A total of 13 species of exotic birds were recorded during the field survey. The most abundant species were Yellow-fronted Canary (Serinus mozambicus), Warbling Silverbill (Lonchura malabarica) and Japanese White-eye (Zosterop japonicus).

Feral Mammals: Small Indian Mongoose (Herpestes auropunctatus) were seen and scats of cats and dogs were also found during the survey. Feral Goats (Capra hircus) were common. A total of 47 goats were recorded. No trapping was conducted in order to assess the relative abundance of mammals.

Records of the endemic and endangered Hawaiian Hoary Bat are sketchy but the species has been reported from the district of North Kona (Tomich 1986; Kepler and Scott 1990). None were observed during this field survey despite evening searches of the area. This species roosts primarily in trees. Much remains to be known about the natural history of this bat and its ecological requirements in Hawaii.

All in all, no special or unique environmental resources were discovered. Disturbed habitats found on this site are common in this region of the island. For the most part native floral and faunal communities have been replaced by introduced plants and animals.

B. Impacts and Mitigating Measures

The proposed development will decrease the attractiveness of the area for certain introduced species of birds such as Yellow-fronted Canary and Warbling Silverbill while at the same time increase the suitability of the property for other species. Species that will be expected to continue to use the site following development, and perhaps even increase in abundance include: common myna, zebra dove and spotted dove. Some species such as the house sparrow might invade this new habitat. This species is limited to areas of human activity and often forages in feed lots and refuse dumps.

Landfills are also attractive to feral cats and dogs as well as rodents. Populations of mongoose, mice and rats will very likely increase following the development of the sanitary landfill. The proliferation of scavenging animals will be mitigated by implementing proper landfilling procedures that will include covering the landfill with soil on a daily basis.

Further, the predator population will be monitored by the County in cooperation with the Department of Land and Natural Resources to control the proliferation of such animals. Should the situation arise such that the predator population indicates a potential threat to public health, a trapping and eradication program will be instituted.

3.7 HYDROLOGY AND DRAINAGE

3.7.1 Offsite

The proposed landfill site is located in a part of the North Kona watershed that includes the summit of Hualalai and the area north of Keahole Point. This area generally has very low rainfall and runoff. The average annual rainfall for this area is 10 to 20 inches. The soils in the area are extremely permeable. Due to the low rainfall and the permeable soil, there are no distinct drainage courses.

The proposed site is not considered to be a flood plain area, according to the National Flood Insurance Program. Thus, flood proofing requirements and specific use restrictions are not applicable to the proposed project.

3.7.2 Onsite

Storm water generated on site presently infiltrates into the ground or runs off the site into the more permeable lava fields.

A. Impacts and Mitigating Measures

The terrain ranges from extreme slopes to relatively level ground. Due to its relative young age and porous nature, the site has no distinct drainage courses. Flow generated offsite should be directed around and away from the site. The final grading should also divert all flows around the site to prevent accumulation of water.

B. Erosion

Despite the low rainfall characteristics of this area, unusual storm events could cause erosional problems at this landfilling project where earthwork is occurring continuously. Storm runoff over the developing landfill could carry soil cover or washed-out refuse out of the landfill and into adjacent areas. This type of occurrence could result in the loss of cover material for the landfill as well as sediment and/or refuse accumulation problems in surrounding areas.

This type of problem will be avoided by implementing proper landfilling operations which include measures for erosion control. Refuse washout will be minimized by following the proper landfilling methods of compacting the refuse adequately and performing the required periodic soil covering.

Sedimentation runoff will also be controlled at this project by planned grading of the developing landfill and by constructing silting basins at the low point of each incremental landfill. Any surface runoff generated on the landfill site will flow into the silting basin. Sediments that are carried in the runoff will be allowed to settle out in the basin. The clarified runoff will be discharged out of the operations area. Certain sections of the leachate collection pipes will be interconnected with the silting basins such that any storm runoff that flows over the landfill floor surface and is intercepted by the pipes will be discharged without having to be handled as leachate. An erosion control plan is required by the County of Hawaii and will be developed for this project.

After landfill closure, erosion of the final soil cover will be minimized by stabilizing the soil with native on-site vegetation. Closure of the landfill will occur incrementally to prevent erosion of non-active areas. After all of the incremental landfills are completed, the entire area may be recycled and converted to other uses such as a recreational or passive park.

With the development of the landfill, offsite surface runoff, storm runoff, and rainfall will be routed around the site by swales and back to its natural drainage course.

3.8 GROUNDWATER RESOURCES

The project site is located at a low enough elevation (between 120 to 200 feet) in the Puuanahulu area such that it is down gradient and far removed from any existing groundwater wells that would be tapped for potable water. The wells that are located closest to the proposed landfill site are privately owned and water is usable for irrigation purposes only since the chloride levels are too high (i.e., higher than 300 mg/l) (Figure 3-4). These are eight wells owned by Waikoloa Water Company, and are located approximately two miles north of the proposed landfill site. The nearest known potable water source is located about 5 miles mauka of the landfill site, at the 2,380 foot elevation, above the Mamalahoa Belt Highway.

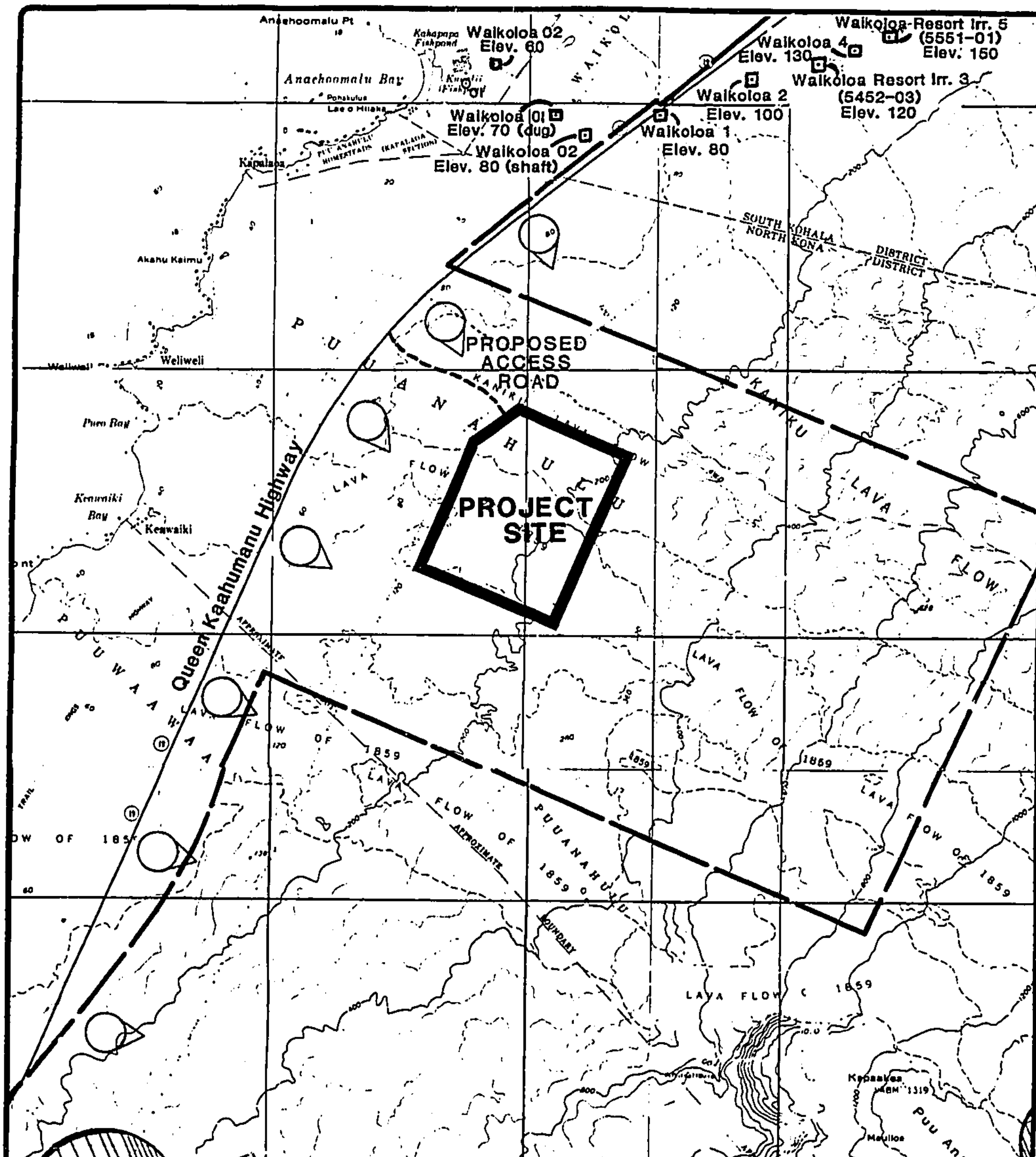
The following is a list of existing wells as identified in Figure 3-4:

Well Number	Location	Use
Waikoloa 02	Elevation 60	Irrigation
Waikoloa 01	Elevation 70 (dug)	Unknown
Waikoloa 02	Elevation 80 (shaft)	Irrigation
Waikoloa 1	Elevation 80	Irrigation
Waikoloa 2	Elevation 100	Irrigation
Waikoloa Resort Irrigation 3(5452-03)	Elevation 120	Irrigation
Waikoloa 4	Elevation 130	Irrigation
Waikoloa Resort Irrigation 5(5551-01)	Elevation 150	Irrigation

A. Impacts and Mitigation

Groundwater resources are located at a substantial distance mauka of the project site so as to not be endangered by potential leachate contamination from the proposed landfill.

The solid waste that will be disposed of at the proposed landfill is expected to be typical of the domestic waste on Hawaii. Hazardous waste will not be accepted by the landfill. Yet leachate is expected to be produced during periodic rains, and this, despite all preventive measures taken, could



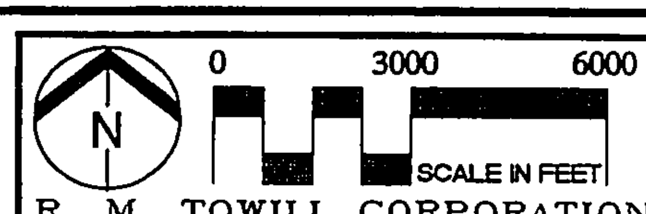


FIGURE 3-4
WATER WELL LOCATION MAP
WEST HAWAII SANITARY LANDFILL
County of Hawaii

potentially contaminate the downgradient groundwater. Therefore, the groundwater could be contaminate by the following chemicals:

Volatile organic compounds (vinyl chloride, carbon tetrachloride, chloroform, benzene, toluene, ethylbenzene, and xylene); semi-volatile organic compounds (phenol, aldrin, dieldrin, and chlordane); halogenated volatile organic compounds (dibromochloropropane); metals (lead, chromium, arsenic, cadmium, and mercury); inorganic compounds (carbon dioxide, sulfur dioxide, hydrogen sulfide, and carbon disulfide); and hydrocarbons (methane). The above list of chemicals is presented as only a guide to the potential contaminants in the leachate which might impact the groundwater and is not a comprehensive list. There is also a high degree of organics (Biological Oxygen Demand and Chemical Oxygen Demand) in the leachate as well as primary nutrients such as ammonia, nitrates and phosphorus. In order to determine a more thorough and comprehensive list of potential groundwater contaminants, leachate monitoring will be required.

B. <u>Preventive Measures - Drainage System</u>

In order to mitigate the potential problem of leachate migration into adjacent lands and groundwater zones, three preventive measures will be included in the design of the sanitary landfill:

(1) A surface drainage system which directs offsite runoff around the landfill and proper slope and grading on the landfill surface will be employed to minimize the infiltration of water into the landfill and subsequent leachate generation; and

(2) A double liner system consisting of a high density polyethylene liner with bonded bentonite and another high density polyethylene liner will be placed on the bottom and side slopes of the landfill. This liner

system will then be protected by a layer of soil or crushed gravel placed over it. This would make the bottom of the landfill impermeable and prevent any percolation of leachate into the ground.

(3) A leachate collection system will be installed at the bottom of the landfill to capture any leachate that has percolated through the refuse above, in order to prevent its further migration into the lower soil strata.

These systems will address drainage conditions both during the development of the landfill and after completion and closure of the landfill. The surface drainage system will consist of swales and a concrete ditch supplemented by planned surface grading. Surface runoff flows generated from higher elevations will be directed around the landfill by a concrete ditch along the southern boundary and a swale along the eastern boundary. These diversions will prevent additional water from flowing onto the site.

Surface grading within the landfill site during development and after closure will be designed to prevent ponding on the surface, in order to minimize water infiltration into the refuse and subsequent leachate generation. The grading work will also be designed for soil erosion control. A leachate collection and treatment system will be installed to handle any leachate that is generated on-site. The collection system will consist of a network of perforated pipes installed at the bottom of the landfill. The perforated pipes will be connected to manholes which will serve as sampling/storage wells. Leachate will be intercepted by the perforated pipes and will flow into the manholes. The accumulated leachate will be pumped from these manholes in batch operations periodically and taken to a municipal wastewater treatment plant.

The disposal method appears to be the most cost-effective and logical, as the quantity of generated leachate is expected to be minimal due to the low rainfall characteristics of this vicinity and the mitigation measures employed. The vicinity of the project site typically receives as little as 10 inches of rain annually, which would normally eliminate the need for leachate control. A leachate collection system will be provided nonetheless.

Leachate will generally move downward where it will be intercepted by the perforated pipes, and leachate migration through the bottom will be virtually zero.

C. Leachate Monitoring Wells

1. Monitoring Well Placement and Rationale

A fourth measure will be active monitoring of the existing groundwater to determine whether leachate migration has occurred and impacted the groundwater. There will be at least one upgradient well which will be able to take representative (background) groundwater samples. In addition, there will be at least three downgradient wells which will be able to immediately detect any migration of a statistically significant amount of a hazardous waste or a hazardous waste constituent. In order to best accomplish and detect groundwater contaminant migration, the three wells will be placed in a triangular pattern in accordance with "Optimal Sampling Geometry for Hazardous Waste Sites," D. Parkhurst, 1984.

The owner or operator will develop and follow a sampling and analysis plan. This plan will include (1) sample collection; (2) sample preservation and shipment; (3) analytical procedures and methods; and (4) chain of custody control.

* Compliance Monitoring

  The goal of the compliance monitoring program is to insure that leakage of hazardous constituents into the groundwater does not exceed environmentally acceptable levels. While in compliance monitoring, the owner/operator must determine if groundwater protection standards have been exceeded. The groundwater protection standard contains four elements (1) a list of hazardous constituents present in the groundwater that would result from leachate seepage at the landfill; (2) specific concentration limit values (i.e., MCL's, ACL's, and background values); (3) the location at which the groundwater protection standard applies, this is the point where monitoring must occur; and (4) the period during which the groundwater protection standard applies.

  If the facility's groundwater protection standards are exceeded, the owner/operator will proceed to corrective action. The goal of the corrective action program is to bring the facility back into compliance with its groundwater protection standards. The facility develops a program to return hazardous constituents to their respective concentration limits by either removing the constituents or treating them in place.

2. Remedial (Treatment) Processes

   There are many different types of treatment processes which remove contaminants from groundwater such as: oxidation; reduction; adsorption/absorption; extraction; biochemical detoxification; separation; ion-exchange; chemical detoxification; air stripping, steam stripping; filtration; and UV/Ozonolyses. It is beyond the scope of this analysis to discuss each of the above processes. Instead three remedial processes will be discussed below in order to illustrate the different techniques which can be utilized in the treatment of groundwater contamination. In all remedial processes periodic post-testing is recommended in order to evaluate the effectiveness of the treatment method.

* <u>Carbon Adsorption</u>

  This technique involves the installation of an extraction well and an injection well whereby the groundwater to be treated is removed and passed through a carbon bed and then reinjected into the aquifer. Carbon adsorption is used to remove volatile organic chemicals such as benzene or carbon tetrachloride from groundwater. The main disadvantage of carbon adsorption treatment is the generation of contaminated carbon which must be disposed of as a hazardous waste.

* <u>UV/Ozonolyses</u>

  This technique also involves the installation of an extraction and an injection well, but unlike carbon adsorption, it is a total destructive process that does not generate a hazardous waste. UV/Ozonolyses involves pumping the groundwater to be treated through a reaction chamber where it is irradiated with UV light and concurrently infused with ozone gas. The UV radiation breaks the chemical bonds of contaminants and has been utilized to effectively treat both organic and non-volatile pesticide groundwater contamination.

  This technique has been utilized at numerous Superfund sites and has been very effective at removing such contaminants as 1,2-Dichloropropane and Chloroform from groundwater. Since it is a total destructive process, the effluent can thereby be discharged directly to a wastewater treatment plant

* Bioremediation

  A treatment process in which nutrients such as nitrogen and/or phosphorous are added to the contaminated groundwater to enhance the degradation of organic compounds by indigenous or applied microorganisms (bacteria and/or fungi) under aerobic or anaerobic conditions. Treatment of groundwater by in-situ bioremediation has proven very effective in removing hydrocarbons from contaminated aquifers. This process involves the addition of nutrients and/or oxygen (usually as hydrogenperoxide or liquid oxygen) to an aquifer in order to enhance the degradation of the hydrocarbons by indigenous soil microbes. The nutrients and oxygen are added above ground to groundwater from recovery wells, and then the water is reinjected or drained into infiltration galleys. The recovery wells and reinfection wells, or infiltration galleries are designed so that the water containing oxygen and nutrients is recirculated through the zone of contamination. There are *two general configurations for this* bioremediation process. In one, nutrients and oxygen are mixed above ground, then reinjected. In another, the recovered groundwater is first treated in an aboveground bioreactor, and then the treated water containing microbes, nutrients, and oxygen is reinjected into the contaminated aquifer.

A double synthetic liner system will be used to line the bottom of the landfill to help prevent leachate migration into the groundwater table over the life cycle of the landfill. The bottom and sides of the landfill will be lined with a high density polyethylene liner. Bonded to the top of the liner is a bentonite layer. This bentonite layer will then be covered with another high density polyethylene liner.

Upon the closure of the landfill, a final soil cover of 3 to 4.5 feet will be spread and compacted over the refuse. The soil cover will serve as an semi-impervious layer, minimizing the infiltration of rain water into the layers of decomposing solid waste. The finished surface of the landfill will be graded with a crown along the middle to provide for sheetflow runoff across the surface to off-site drainage areas, thereby further minimizing water percolation through the landfill mass. Each increment of the landfill will be closed as completed.

3.9 AIR QUALITY AND NOISE LEVELS

Noise, fugitive dust, fuel emissions and odors are expected to be generated from the short-term construction activities of the weigh station, equipment and repair, administration building, landfill site, and long-term landfilling operations. These nuisance-type problems are inherent to the required activities and unavoidable. However, these impacts will not be significant and will cease when the landfill is closed.

A. Impacts and Mitigating Measures

Short-Term

Dust and noise generated as a result of construction activities on the weigh station, repair and equipment, and administration buildings will be minimized as these activities will be carried out in accordance with State and County regulations.

Long-Term

Adverse impacts will be minimized to the greatest extent possible by proper maintenance of the construction and landfilling equipment, good housekeeping procedures, and proper landfilling operations. Odor problems will also be minimized by proper solid waste handling and soil covering. Noise impacts will be minimized by not allowing operations in the evenings.

The decomposition of solid wastes in a landfill produces a number of gases, most commonly carbon dioxide, methane and hydrogen sulfide. The latter two gases are responsible for odors that may occur at improperly operated landfills. These gases can also be toxic or explosive in high concentrations.

For larger landfills, systems are provided for the collection and burning of the gases which are produced. This landfill gas conversion system provides two beneficial results. The collected gas has a high caloric value and can be burned to produce energy. Additionally, collection of the landfill gas prevents its release into the atmosphere, thereby reducing odor problems and minimizing the release of noxious gases and the risk of explosions. The installation of a gas conversion system is being considered at this time.

If a landfill gas conversion system is not installed as a part of the project, the methane gas concentration will be monitored at the leachate removal manhole to prevent possible explosions. When the methane concentration exceeds 4 percent, the manhole cover will be removed to facilitate gas escape.

The impacts of air pollution on adjacent properties will be minimal. The prevailing winds will carry any air-borne elements toward the north and northeast where there are hills, higher elevation lava fields, and no major urban areas.

The closest urban areas relative to the project site are Waikoloa (approximately 2 to 3 miles north) and homes located alongside Keawaiki Bay (1.2 to 1.5 miles west). Of the 2 developments, Waikoloa would be in the receiving path of prevailing winds from the landfill. However, because of its distance from the project site, any odors and noise would dissipate before reaching Waikoloa.

It should be noted again that the proposed project will minimize odor problems by covering the landfill with soil daily.

3.10 VIEWS/VISUAL RESOURCES

A. Existing Conditions

Existing mauka views toward the project site from coastal areas and Queen Kaahumanu Highway are of vast expanses of barren lava flows. Views toward the ocean from upland areas are uninterrupted within this vicinity with the closest residential development being homes adjacent to Keawaiki Bay approximately one and three quarters miles northwest of the project site. The closest coastal resort, Waikoloa, is located just over two miles to the north of the project site.

B. Impacts and Mitigating Measures

Introduction of a sanitary landfill will minimally alter the existing view planes by disrupting the natural landscape of expansive lava flows from certain points along the northern sections of Queen Kaahumanu Highway looking southeast onto the project site (Figure 3-5, Section A-A). There will be no visual intrusion from Queen Kaahumanu Highway looking northeast onto the project site (Figure 3-5, B-B).

In order to minimize the visibility of the landfill from Queen Kaahumanu Highway and coastal areas, development of the site will include excavation by up to 25 feet. This will, in effect, create a "depression" at the makai end of the project site, thus minimizing any disruption to the existing views onto the site. Further, the height of the landfill will be limited from 25 to 30 feet above existing grades.

Future expansion of the landfill will be in the mauka direction. Because the site increases in elevation design solutions including the following will be implemented to minimize view impacts:

1) The final grading plan will take a "land form alteration" approach so that the final product will look like a natural land form that will follow the existing contours rather than stand out as an intrusion on the landscape.

2) The landscape plan will be to maintain a continuity of surface treatments with adjacent areas; that is, rocks and/or natural grasses, etc., to limit the visual breakup.

3) Excavated soil and lava will be used to create berms for perimeter screening on the makai border of the landfill site.

Stray dust from trucks and tractors at the landfill site will be visible from Queen Kaahumanu Highway. Camouflaging by the use of berms will help minimize these adverse view impacts.

3.11 <u>OFFSHORE ENVIRONMENT</u>

The following are excerpts from a study entitled "West Hawaii Coral Reef Inventory," prepared by Nolan and Cheney for the U. S. Army Corps of Engineers, March 1981.

A. <u>Existing Conditions</u>

<u>Shoreline and Immediate Uplands</u>. The coastline is highly irregular with a number of small, exposed beaches, low basalt cliffs, and wave washed benches. The shoreline is derived from prehistoric Mauna Loa lava flows of the Ka'u series and from an 1859 Mauna Loa eruption. Three open embayments (Pueo Bay, Keawaiki Bay, and 'Ohiki Bay) occur in this region. A 100-300 foot wide, black sand beach, approximately 2,500 feet in length, covers most of the shoreline in Keawaiki Bay. Black sand beaches are generally known to

attract green turtles (Hawksbill turtles are the endangered species) for foraging purposes. However, there is no documented evidence of existing green turtle habitat (G. Nitta, National Marine Fisheries Service, July 1991).

There is a smaller, mixed coral and black sand beach in Pueo Bay. The shoreline north of Pueo Bay and south of Keawaiki Bay to Kaiwi Point consists of a wave-washed bench. Basalt cliffs up to 10 feet in height are found from Kaiwi Point to 'Ohiki Bay. Other than a very gradual rise in elevation (amounting to about 200 feet in 2 miles-- the mauka extent of the proposed project site), there are no distinguishing physical features in the immediate uplands.

Embayments and Ponds. Both Pueo and Keawaiki Bays are exposed and unprotected embayments, although the southern portion of Keawaiki Bay receives protection from southeasterly swells from a shallow reef which extends part way across the bay. The inner portion of the bay slopes gently from a basalt-covered basalt platform to a white sand bottom at -60 feet. The outer reef has a 2 to 6 foot mantle of limestone over a basalt base. The northern section of Keawaiki Bay lacks protection and has bottom characteristics like that of Pueo Bay.

The floor of inner Pueo Bay is a limestone covered basalt pavement with large, scattered boulders. At -40 to -60 feet the bottom is smooth with coral rubble over basalt pavement separated by large sand channels.

Eight fresh or brackish water ponds occur between Weliweli Point and 'Ohiki Bay. The Keawaiki Bay ponds have sand bottoms, and the others have rock or hard bottoms.

Water Quality Features. Water visibility in Keawaiki and Pueo Bays is excellent and there is no evidence of pollution. The salinity of the brackish water ponds is reported to range from 2 to 4 ppt. The waters in this region are Class AA.

Biological Features. The predominant feature of this region is the rich coral growth in Keawaiki Bay and in Pueo Bay. Certain species of subtidal algae have also been surveyed in these areas. The fish life is abundant and diverse; at least 24 species of reef fish inhabit the area.

B. Impacts and Mitigation Measures

There is no documented evidence of endangered species of green turtle habitat downstream in the offshore areas of this region. Thus, the proposed project is not expected to have adverse impacts on the existing biological environment of offshore communities of Keawaiki and Pueo Bays. Further, because the landfill will be developed in accordance with the proposed new stringent EPA rules regulating the design, development and operation of sanitary landfills (Subtitle D, see Appendix F), potential contamination problems caused by leachate or surface runoff will be minimized.

3.12 OTHER

3.12.1 Litter

The remote location of the site as well as the site being set below the surrounding grade will minimize the nuisance problem of litter scattering into adjacent properties. An 8+ foot high chainlink fence will be installed along the access road, and around the landfill site to prevent litter from entering adjacent areas. To further contain the litter, temporary fences will also be installed as required along the landfill floor during incremental landfilling.

The project area experiences high northeast trade conditions from Waimea during the summer months. Winds are known to blow at a maximum rate of 40 to 50 miles per hour (mph) in the coastal direction during these gusty wind periods. Under highly unusual conditions, winds have been reported to gust up to 100 mph. However, these episodes usually occur once every several years.

Impacts and Mitigation Measures

There is a higher probability of increased amounts of windblown litter scattering in and around the landfill site as a result of this project. The predominant expected users of the landfill will be commercial haulers and compactors. State health regulations require that loads going into landfills be covered to prevent scattering litter enroute. This regulation will be strictly enforced. A series of fences with a minimum height of 8 feet will be placed around the perimeter of each cell of the project site. Further portable fencing will be placed downwind of the working face to capture windblown litter. Then as landfill management practice, litter will be picked upon on a daily basis to prevent either litter from roaming off the site and into surrounding areas such as the Queen Kaahumanu Highway.

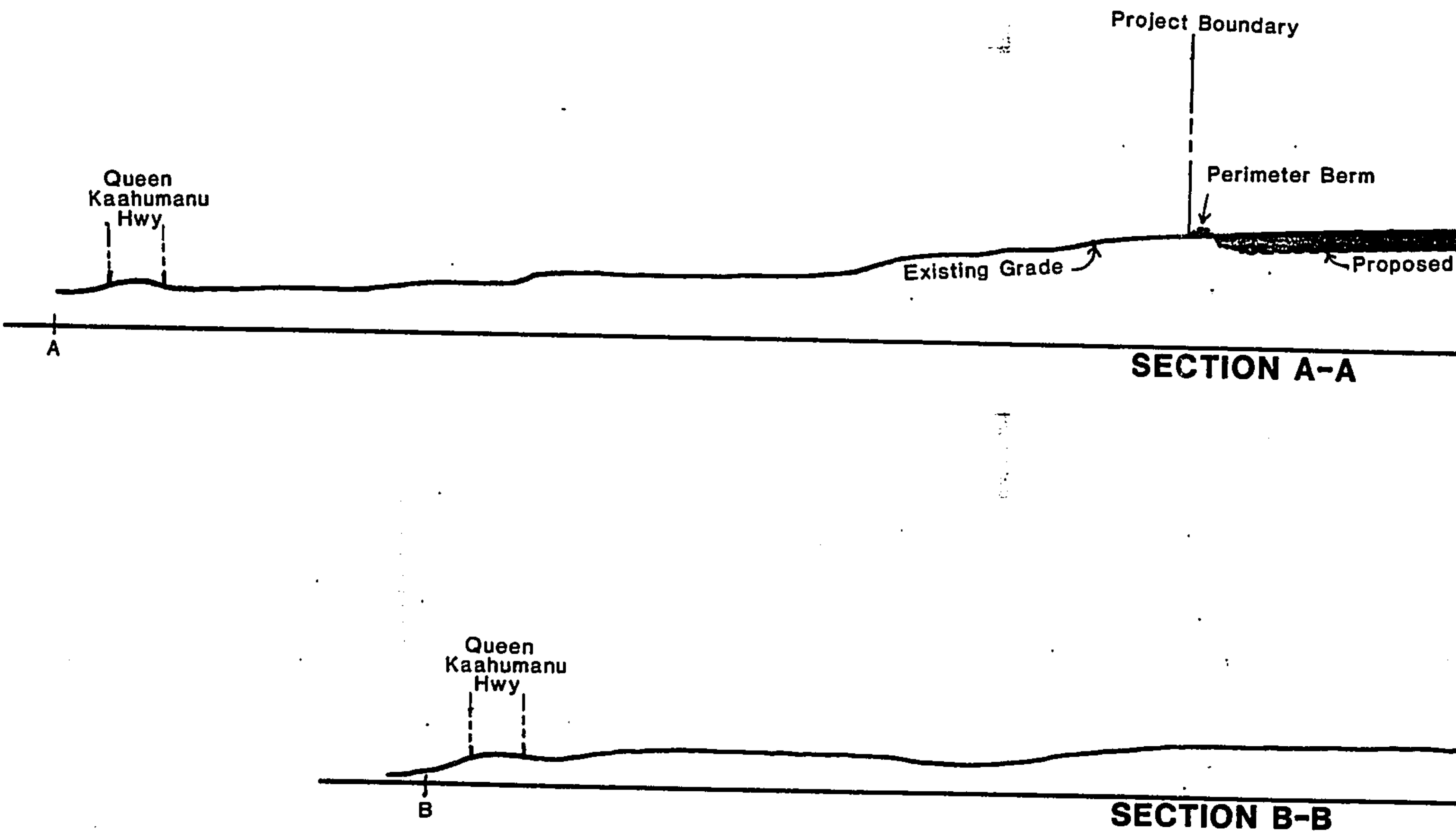


FIGURE 3
SITE SEC

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HORIZON

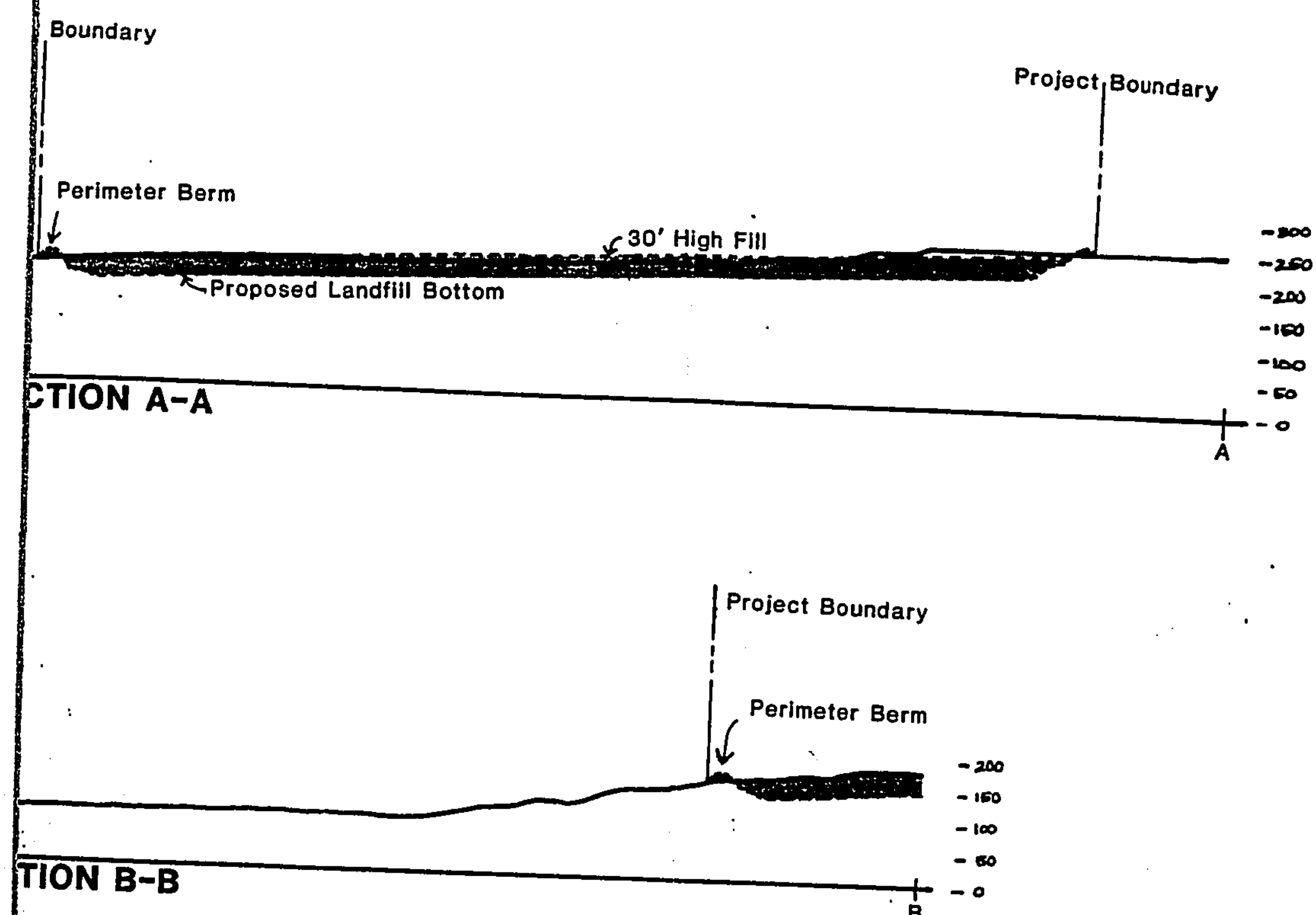
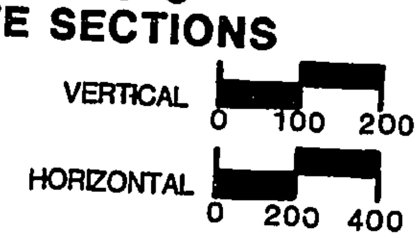
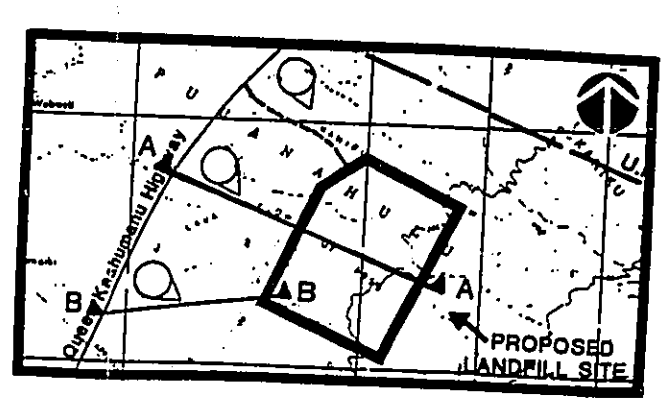


FIGURE 3-5
SITE SECTIONS





SECTION 4
The Socio-Economic Environment and Related Impacts

SECTION 4

THE SOCIO-ECONOMIC ENVIRONMENT AND RELATED IMPACTS

4.1 HUMAN ENVIRONMENT

4.1.1 Population and Economy

A. State in General

In the past three decades the entire State of Hawaii has seen a near doubling of its population. Of the four counties, Maui has experienced the most dramatic change in population, followed by the Island of Hawaii. Oahu still has the largest number of people, however, the percentage change in population has been greater on the neighbor islands.

B. Hawaii County in General

In 1989, the Big Island's population was 138,000; 42 percent of the island's people reside in the county seat of Hilo. The fastest growing districts of the island from 1970 to 1989 were North Kona (376 percent increase), Puna (207 percent increase and South Kohala (290 percent increase) (DBED, Data Book, 1990). North Kona and South Kohala are located in West Hawaii, the area experiencing the highest tourism growth.

4.1.1.1 West Hawaii

The current total resident population of West Hawaii (North and South Kona, and South Kohala) is some 39,900 persons, which is 64 percent above the 1980 figure of 24,269 residents (DBED Data Book, 1990).

While Hilo, Puna, and West Hawaii will serve as the County's primary population districts, substantially rapid growth is projected to occur in West Hawaii due to several resort development projects proposed or under construction. Based on the State's and the County of Hawaii's population projections, West Hawaii is expected to grow from nearly 40,000 in 1989 to 122,000 by the year 2015.

4.1.1.2 Economy and Employment

Business and employment trends in West Hawaii can be characterized as having moved from a principally agricultural based employment center to one where the visitor industry is the largest employer. In 1950, 52 percent of the employed persons listed their primary employment as being in agriculturally related fields. By 1970 the employment characteristics of the area had changed dramatically. Service related employment, primarily the visitor industry, had increased from 8.2 percent of the work force to 17 percent. The agricultural industry declined from 52 percent to 8.6 percent of employed persons. The County is making strides to diversify its economy by initiating new industries such as high tech, aquaculture, space-related industries, and alternative energy development.

4.1.1.3 Research and Development

Hawaii County has participated in the research and development industry through the Mauna Kea and Mauna Loa Observatories, the University of Hawaii Cloud Physics Laboratory, Hawaii Volcano Observatory, and various agricultural research centers. The University of Hawaii at Hilo has become a 4-year institution, and will play an increasingly important role in the community.

The Natural Energy Laboratory of Hawaii (NELH) at Keahole is currently involved in research and development in energy and aquaculture projects. Hawaii Ocean Science and Technology (HOST) Park located adjacent to NELH is being developed for similar projects on a commercial scale. NELH will soon be involved in geothermal-related research at the Hawaii Geothermal Project site in Puna.

Further, interest has rapidly evolved over the past few years in developing a space-launching facility, and the Big Island has been selected as the location for such a facility. Despite all of this anticipated diversification of the economy, however, the phenomenal population growth predicted for West Hawaii over the coming 10 to 20 years will predominantly be a result of tourism and its related businesses.

4.1.1.4 Visitor Industry

This industry has become the County's major economic activity in the past 15 years. The number of westbound visitors to the Island of Hawaii in 1970 was 446,400. By 1984, the count showed 760,900 visitors. The hotel and condominium inventory during the same period grew from 3,200 to 6,944 units. The 1987 inventory showed 7,328 units. Condominium units accounted for 28.7 percent of all Big Island units, with 2,102 units among 51 condominium properties (Visitor Plant Inventory, Hawaii Visitors Bureau Market Research Dept., Feb., 1987) (Table 4-1).

Employment in hotels, services, and trade also experienced similar increases. In 1970, there were 1,800 hotel jobs throughout the County; and by 1986, the number increased to more than 4,100. All in all, employment opportunities spurred by the growth of this industry have been the catalyst for the County's economic growth.

Table 4-1 shows the projected growth in hotel and condominium units to the year 2005, and increase in hotel industry jobs correlated with the increase in hotel rooms in each of the four island counties. These projections are based on DBED's Revised Long-Range Economic and Population Projections (Series M-K), January 1988.

It is probably unrealistic to expect that all of these planned projects will, in fact, be implemented. Nevertheless, the expected increase in visitor plant inventory along with planned residential developments will result in major increased demands for many services and facilities, including the West Hawaii Sanitary Landfill.

A. Impacts

Based on economic (particularly in the visitor industry) growth projections and associated population growth extrapolated to the year 2016, the proposed sanitary landfill will be able to service the solid waste disposal needs of the West Hawaii region over the next 25 years.

TABLE 4-1

HOTEL/CONDO UNIT AND JOB PROJECTIONS BY COUNTY

SUBJECT	1985	1990	1995	2000	2005
HAWAII					
Hotel/Condo Units	7,500	10,100	13,700	16,800	20,100
Hotel Jobs	4,100	5,200	6,100	7,000	7,800
OAHU					
Hotel/Condo Units	38,600	41,800	45,700	49,400	53,300
Hotel Jobs	16,900	18,400	19,000	19,300	19,600
KAUAI					
Hotel/Condo Units	5,700	7,700	10,000	12,600	15,400
Hotel Jobs	2,500	3,100	3,800	4,500	5,200
MAUI					
Hotel/Condo Units	14,200	17,800	21,900	26,300	29,600
Hotel Jobs	6,900	8,000	9,100	10,300	10,900

From 1985 to 2005, it is projected that Oahu's share of hotel rooms will decline from just under 59 percent to 45 percent. Likewise, the neighbor island share of visitor units is projected to increase from just under 42 percent to 55 percent in 2005. Hawaii County's share of Statewide visitor rooms for 2005 is projected at 18 percent. For Kauai, the share is 12 percent, while for Maui, the share is 25 percent. Maui continues to experience tourism growth faster than the State average.

4.2 RECREATION

The surrounding area of the project site, to within at least a 2-mile radius, is open lava fields sparsely vegetated predominantly with fountain grass and kiawe trees. Goats roam the area freely and feed on the vegetation. The closest landside public recreational facility is Kiholo Bay lookout, 5.5 miles south along the coast makai of the Queen Kaahumanu Highway.

A public hunting preserve is planned south of the project site in the ahuapuaa of Puuwaawaa. Ocean recreational uses are fishing activities that include lay netting and throw netting on the southern margin of Keawaiki Bay and trolling in the offshore waters. Excellent diving can be found in the reef areas in Keawaiki Bay and in Pueo Bay. During calm seas, the protected waters of Keawaiki Bay are especially suited for the casual or beginning SCUBA diver or snorkeler. This area is only marginally suitable for limu picking. It is fair for nori in the winter and/or limu halahala, but poor for the collection of other forms of limu.

According to the 1985 State Recreational Functional Plan, there are no public recreational facilities planned within the vicinity of the project site.

A. Impacts

The establishment of the landfill will not adversely impact existing landside recreational facilities in West Hawaii because of its relative location in Puuanahulu. Stringent new EPA regulations that will guide the design, development and operation of the project will minimize the potential impacts on ocean recreational uses.

4.3. HISTORIC AND ARCHAEOLOGICAL RESOURCES

An archaeological reconnaissance survey was conducted by Cultural Surveys Hawaii, the results of which are summarized below. The report in its entirety can be found in Appendix B.

An archaeological study was conducted for the purposes of (1) locating, describing, and evaluating archaeological sites in the project area, (2) determining the project boundaries, and (3) assessing the impact, if any, of the proposed development of the landfill on the archaeological resources. Attention was given to locating trails and lava tube sites on the proposed project site. Aerial reconnaissance was conducted in June 1991. The ground survey was conducted in June and September 1991, with walk-through inspections of located sites and exploration of three major tube ssytems (Sites 50-10-10-15,409; 15-409; and 15,412). A reconnaissance of the proposed access road was conducted in September 1991.

A. Findings

A total of six sites were observed during the survey. All six were situated on pahoehoe lava. Figure 4-1 shows the location of the identified sites. Table 4-2 provides a summary of site types, probable functions, probable ages, an significant assessment. Site types include lava tubes (3), a cave shelter (1), a C-shaped shelter (1), and a quarrying site (1):

TABLE 4-2
SUMMARY OF SITES

State Site # 50-10-10-	Temporary Site #	Type	Function	Age	Significance	Comment
15,409	CSH1	lava tube	habitation	prehis	C,D	Midden and artifacts observed
15,410	CSH2	lava tube	shelters	prehis	D	Midden and artifacts observed
15,411	CSH3	modif. ridge	quarry	prehis	D	
15,412	CSH4	lava tube	shelter	prehis	D	
15,413	CSH5	C-shaped	shelter	prehis	NLS	
15,414	CSH6	caves	shelters	prehis	D	Midden and artifacts observed

The proposed landfill site at Puuanahulu in North Kona encompasses 300 acres, the bulk of which is situated on a'a lava of the 1859 Mauna Loa flow. The project site is situated within the traditional ahupuaa of Puuanahulu ("Ten-day hill", Pukui, Elbert, Mookini 1974:195). Puuanahulu is a very large ahupuaa, extending from the Kona Coast to the Central plateau or Saddle region (i.e., Pohakuloa Training area).

The ahupuaa of Puuanahulu was listed as government lands at the time of the Mahele (division of Land, ca. 1848) and thus was under the control of the Interior Department. Leases for Puuanahulu were awarded as early as the 1850s. The early leases ca. 1850s - 1870s were for goat pasturage. Leases after the 1870s were generally for cattle grazing. Leases between 1870 and the early 1900s were to Francis Spencer and/or his daughter Frances Tasmania Spencer.

Recent (ca.1970 until present) archaeological research along this portion of the Kona Coast has defined three general zones, the coastal habitation zone, barren zone, and the upland agricultural zone. The project area is within the so-called barren zone. Barren zone utilization is generally confined to temporary shelters for people traveling between the coast and uplands, extended or recurrent-use residences at natural cave features, and use of caves for burials. No evidence of burials were observed in any of the caves explored. However, the other sites observed indicate the type of temporary, or in the case of Site CSH1 (15,409), recurrent use as would be expected. Also, as would generally be expected, sites seem to be disturbed only on pahoehoe lava and the a'a contains few or no sites (Figure 4-1).

However, on the older pahoehoe lava, both to the north and south of the a'a flow, archaeological sites (CSH1, CSH5, and CSH6) were observed. Located

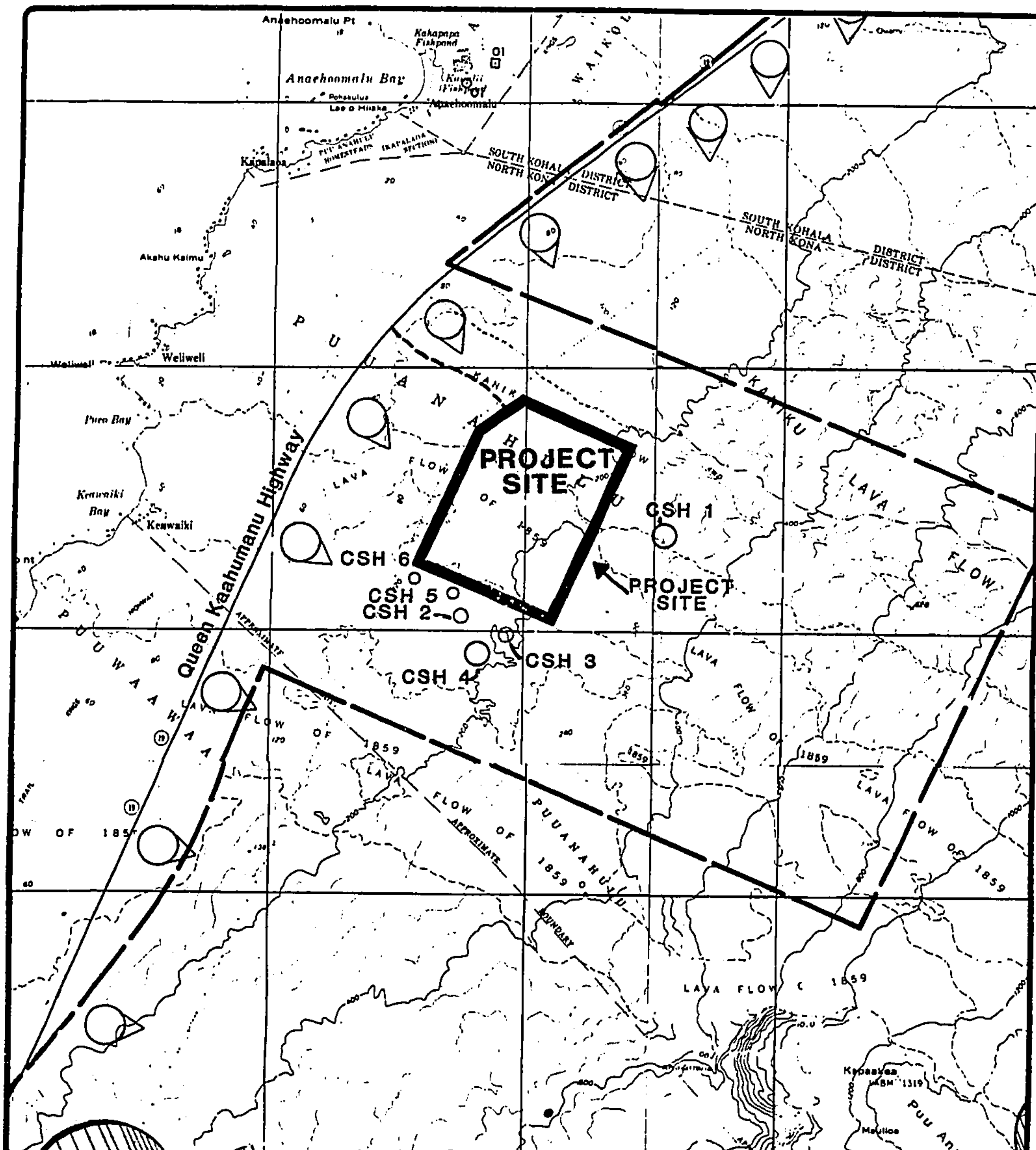


FIGURE 4-1
ARCHAEOLOGICAL SITES
WEST HAWAII SANITARY LANDFILL
County of Hawaii

N

0 3000 6000
SCALE IN FEET

R. M. TOWILL CORPORATION

outside of the northeast corner of the project area is a large lava tube (CSH1) within which are two archaeological features. The two features are a well-built platform and a paved area delineated by a boulder alignment. Two artifacts (cowry shell lures) and a sample of organic remains were recovered from the features within the tube. The tubes was explored approximately 1,500 feet beyond the light zone without any additional cultural material (features, artifacts or midden) being observed. The tube goes underneath the 1859 a'a flow which would have sealed off any additional entrances within the project area. No additional entrances were in fact observed within the explored regions of the tube.

Site CSH5 near the southwestern corner of the project area is on older pahoehoe lava. This site is a small C-shape alignment of boulders built directly on exposed pahoehoe bedrock. No midden, artifacts, or cultural deposits were observed. Since the site has been accurately located on the project map, and photographic records, a plan view drawing, and a verbal description have been made, no further archaeological work is recommended at this particular site.

Site CSH6 is a cluster of lava bubble shelters situated on older pahoehoe lava near the extreme southwestern corner of the project area. The cluster includes five shelters and one ahu, all associated with a single pahoehoe tumulus that is within 20 feet of the 1859 a'a lava flow. Midden, consisting mainly of marine shells, was observed within the rocky soil interior of each of the five shelters.

B. Impacts and Mitigation Measures

General significance assessment for the six archaeological sites are presented in Table 4-2. The assessments are based on National Register criteria. Sites 15,410, 15412, 15413, and 15,414 are deemed significant solely for their informational content, criterion D (site may be likely to yield information important in prehistory or history). Site 15,409 is assessed as significant according to Criteria D and C (site is an excellent example of a site type). Site 15,409 may not be an exceptional example when compared to other major cave sites (e.g., cave 900) but within this specific project area it does represent the best example of a style type. Site 15,413, a small C-shape with no cultural deposit (since it is constructed directly on exposed bedrock) is characterized as No Longer Significant (NLS). This is based on its having been documented by photographs, notes on construction style, measurements, and accurate locational information during the present survey.

The present proposed landfill site was configured to avoid archaeological sites that were located during this survey. Sites 15,410 through 15,413 are well outside of the newly proposed landfill site. These sites will be preserved "as is" by placing perimeter fencing around each of them during construction and maintained during the life of the landfill.

Sites 15,409 and 15,414 will be subjected to further data recovery work. These sites although outside of the new project area, are close enough to be affected by secondary impacts such as unauthorized dumping, inadvertent destruction and, possibly, looting. Site 15,409 will be preserved "as is" after data recovery. The site will be identified by a sign and fenced during and after construction.

Finally, a Data Recovery and Preservation Plan will be prepared in consultation with the State Historic Preservation Division of the Department of Land and Natural Resources to address the tentative recommendations detailed above. The plan will include details on data recovery, interim protection, and long-term protection (i.e., preservation) for Site 15,409.

4.4 INFRASTRUCTURE AND PUBLIC SERVICES

4.4.1 Transportation Facilities

A traffic impact analysis was conducted by Pacific Planning and Engineering, Inc., and the results are summarized below. The report in its entirety can be found in Appendix C.

A. Existing Conditions

The main roadways servicing the North Kona region are Queen Kaahumanu Highway and Mamalahoa Highway. Queen Kaahumanu and Mamalahoa Highways are parallel facilities.

Queen Kaahumanu Highway is the main highway in the North Kona region running in a north-south direction along the coastline between Kailua-Kona and Kawaihae. It is a two-lane undivided highway with 24 foot-wide pavement and a speed limit varying from 35 to 55 mph. Queen Kaahumanu Highway is maintained by the State Department of Transportation (DOT). The major intersections along Queen Kaahumanu Highway are channelized with left-turn storage lanes, deceleration and acceleration lanes.

Mamalahoa Highway is a two-lane roadway running in a north-south direction parallel to Queen Kaahumanu Highway. Mamalahoa Highway services the higher elevated areas between Waimea and North Kona.

Traffic counts along Queen Kaahumanu Highway taken over a 24-hour period were obtained from the DOT. The DOT counts indicated that the weekday morning and afternoon peak hours occur from 6:30 to 7:30 am and 3:15 to 4:15 pm respectively.

Traffic volumes at the study intersection were taken from manual traffic counts taken at the intersection of Queen Kaahumanu Highway and the Kona Village entrance on January 30, 1991 during the afternoon peak period. The manual traffic count data are summarized in Appendix C.

B. Future Conditions

Traffic generated by the proposed developments, listed in Table 4-2 below, within the immediate area will impact the study intersections by the year 1992.

Table 4-3

Future Developments

Development	Land Uses
Waikoloa Resort	
Condominiums	
Bay Club	172 units
Vista Waikoloa	122 units
Commercial Center	
King's Shop	56,000 sq.ft.
Waikoloa Village	
Condominiums	
Fairways	51 units
Knolls	17 units
Single Family Dwellings	
Kopona Hills	62 units
Sunset Ridge	161 units
Individual Vacant Lots	70 units
Waikoloa Knolls	
Single Family Dwellings	
Phase I	177 units
Phase II	60 units
Kona Village	
Hotel	120 rooms

Future Roadway Facilities

DOT has plans to widen Queen Kaahumanu Highway to a four-lane divided highway from Palani Road to Kawaihae. However, the plans are not definite at this time.

Queen Kaahumanu Highway is planned to be a limited access highway with frontage roads and interchanges at selected locations.

Trip Generation for Year 2016

The number of trips generated by the sanitary landfill was estimated using data derived from manual vehicular counts taken at the Kailua Landfill facility by the County of Hawaii in March 1988. Abcut 95% of the vehicles entering the Kailua Landfill were trucks including semi-trailer, dump trucks, container trucks, half and quarter ton trucks, and pickup trucks. The remaining five percent were passenger vehicles.

Trips generated by the proposed landfill are expected to increase from the year 1992 to the year 2016 (year in which the proposed landfill is expected to reach capacity) as West Hawaii grows. By the year 2016, it is estimated that the landfill will receive a total of 134,000 tons of refuse per year compared to an initial solid waste volume of 46,300 tons per year in 1992. The increase in solid waste is almost three-fold and there would be a corresponding increase in landfill traffic.

The level of landfill traffic by year 2016, however, would have little impact on traffic conditions at the study intersection. The controlling factors would be the growth in traffic on Queen Kaahumanu Highway and the physical conditions of Queen Kaahumanu Highway, such as number of lanes, by the year 2016.

C. Impacts and Mitigating Measures

The study intersection was analyzed using methods for unsignalized intersections from the Highway Capacity Manual (HCM) Special Report 209, 1985. This analysis method is based on the estimated number of vehicle turning movements which could proceed through a conflicting traffic stream. The LOS is determined by the amount of vehicle reserve capacity available for a particular turning movement. A lower amount of reserve capacity available indicates a poorer level of service.

The LOS for two-lane rural highways and unsignalized intersection analysis are classified into six categories ranging from A to F, where LOS A is the best condition and LOS F is the worst.

The proposed West Hawaii Sanitary Landfill is not expected to have a significant impact on traffic flow at the proposed intersection of Queen Kaahumanu Highway and the project access road, when the project begins operations in 1992, with the following intersection recommendations.

It is recommended that the proposed intersection of the landfill access road to Queen Kaahumanu Highway be channelized with left-turn storage lanes for safety and to maximize roadway capacity. Deceleration and acceleration lanes are also recommended, due to the high speed traffic on this stretch of highway.

Presently, Queen Kaahumanu Highway is operating at stable traffic flow conditions, LOS C. Even without the project, the LOS will drop to LOS D, which is still stable flow. With the project, it will remain at LOS D.

The analysis results indicate that traffic along Queen Kaahumanu Highway will not be delayed beyond normal driving conditions at the project access road intersection. The left turn movement from Queen Kaahumanu Highway into the landfill access road will operate at excellent level-of-service. The right turn movements from the landfill access road will also operate at very good level-of-service. Vehicles attempting left turns out of the landfill access road, however, will experience long delays, LOS E.

All in all, the West Hawaii Sanitary Landfill traffic is expected to grow by year 2016, however, it would have little impact on traffic conditions at the study intersection. The controlling factors would be the growth in traffic on Queen Kaahumanu Highway and the physical condition of Queen Kaahumanu Highway, such as number of lanes, by the year 2016.

The State Department of Transportation maintains a policy of uninterrupted flow along Queen Kaahumanu Highway. Therefore, only grade-separated interchanges (no signalization) will be permitted. In the event that Queen Kaahumanu is widened with frontage roads, consideration should be given to connecting to the frontage road system.

4.4.2 Water Supply and Sewer Systems

There is no potable water supply available at the project site. Neither is the site served by a public wastewater collection and disposal system. An irrigation system is being considered at this time. In the long term, as part of a fire containment plan to prevent the spread of fire at the landfill site, a well will be dug to make available a constant supply of potable water. In the short term, potable water will be made available through a temporary storage system.

4.4.3 Electrical and Communication Systems

Electric power and telephone service are not currently available at the project site. The weigh station and administration building proposed to be developed as part of the sanitary landfill project will tie into existing electrical and telephone lines along Queen Kaahumanu Highway as required.

SECTION 5
Relationship of the Proposed Project to Existing Public Plans, Policies and Controls

SECTION 5
RELATIONSHIP OF THE PROPOSED PROJECT TO EXISTING PUBLIC PLANS, POLICIES AND CONTROLS

This section discusses the relationships of the proposed sanitary landfill to the various plans and policies guiding State and County actions. Other plans and regulations pertaining to the proposed project are also discussed.

5.1 POLICY PLANS

Both the State of Hawaii and the County of Hawaii have adopted general plans to guide the physical, social and economic development of the islands in general and specifically for Hawaii. These general plans give in broad outline the objectives and policies that encourage the controlled development of Hawaii's resources (energy, water, economics, etc.). Although general in nature, these policies provide the framework for the proposed sanitary landfill project.

5.2 HAWAII STATE PLAN

The Hawaii State Plan was signed into law on May 22, 1978, and officially revised in 1986. It is a long-range guide that "establishes for Hawaii an overall theme, goals, objectives, policies, priority directions and a system for plan formulation and program coordination to provide for the integration of all major State and County activities." It provides a basis for determining priorities and allocating limited resources such as public funds, services, manpower, land, energy and water. It also seeks to assure the coordination of State and County plans, policies, programs, projects and regulatory activities.

The Hawaii State Plan objectives and policies that pertain most directly to the proposed West Hawaii Sanitary Landfill are contained in Section 14 of the Plan:

"Section 14: Objective and Policies for Facility Systems - In General

(a) Planning for the State's facility systems in general shall be directed towards achievement of the objective of water, transportation, waste disposal, and energy and telecommunication systems that support Statewide social, economic, and physical objectives.

(b) To achieve the general facility systems' objective, it shall be the policy of the State to:

(1) Accommodate the needs of Hawaii's people through improvement priorities established through the planning process.

(2) Encourage flexible service delivery systems that can adapt to changing pubiic demands and priorities.

(3) Ensure that required facility systems can be supported within resource capacities and at reasonable cost to the user."

The proposed project clearly responds to this general objective and its related policies: the objective of the proposed West Hawaii Sanitary Landfill is to provide for a needed, new solid waste disposal facility located at a geographically central, environmentally suitable site.

The operational plan and proposed leachate control system for the landfill also respond to:

"Section 15: Objectives and Policies for Facility Systems - Solid and Liquid Wastes

(Objective (a) (1)) "Maintenance of basic public health and sanitation standards relating to treatment and disposal of solid and liquid wastes."

More specifically, the West Hawaii Sanitary Landfill site promotes the policy which helps the State and the County achieve this objective. The policy states that it shall be the State's role to:

> (Section 15 (b)(2) and (3)
> (2) "Promote re-use and recycling to reduce solid and liquid wastes and employ a conservation ethic."
> (3) "Promote research to develop more efficient and economical treatment and disposals of solid and liquid wastes."

5.3 STATE'S WEST HAWAII REGIONAL PLAN

The State's West Hawaii Regional Plan was developed in 1989 in response to the anticipated increased job opportunities and corresponding rise in population with the expanded economic growth in this geographic area of the Island of Hawaii. The West Hawaii regional planning effort is coordinated by the Office of State Planning. The plan addresses issues which require State attention in order to most effectively meet the region's present and emerging needs.

The State's interest in formulating and implementing a plan for the West Hawaii region are fourfold:

- to coordinate State activities in the region in order to respond more effectively to emerging needs and critical problems;
- to address areas of State concern;
- to coordinate the Capital Improvements Program within a regional planning framework; and
- to provide guidance in State land use decision-making processes.

The West Hawaii Regional Plan is intended to complement the County of Hawaii's General Plan and Community Development Plans.

Among the numerous goals that provide the focus and direction of this planning effort is to encourage and support the County in its efforts to investigate and implement cost effective methods of (waste) volume reduction. Actions include supporting the County's plan to site and develop a new sanitary landfill in the West Hawaii region prior to the closing of the Kealakehe Landfill.

5.4 HAWAII COUNTY GENERAL PLAN

The County General Plan, adopted by Ordinance No. 439 on December 15, 1971, and revised and adopted by the County Council in November 1989, establishes a long range, comprehensive planning program for the County of Hawaii. The Plan contains goals, policies, and standards concerning 13 elements, as well as a series of land use maps referred to as General Plan Land Use Pattern Allocation Guide (LUPAG) Maps. The LUPAG maps delineate 13 different land use categories throughout the County. It is important to note that the LUPAG map boundaries are not intended to be site specific, thus they are not to be interpreted as zoning maps, for example.

The LUPAG map designates the project area as Extensive Agriculture. The Extensive Agriculture designation is the current zoning for the area.

Public Facilities is one of the 13 elements contained in the draft revised County General Plan. The goal to which the proposed sanitary landfill project is most applicable states, "Encourage the provision of public facilities that effectively service community needs and seek ways of improving public service through better and more functional facilities which are in keeping with the environmental and aesthetic concerns of the community."

The standards found also in the General Plan by which the new sanitary landfill is to be developed, call for its "establishment in accordance with the needs of communities," and for it to be landscaped. The anticipated relocation of the present Kealakehe, Kailua-Kona site to Puuanahulu is recognized in the Public Facilities element narrative as well (Page IX-26, April 1987 draft). The West Hawaii Landfill responds to the standards set forth by the draft

General Plan for the new site and expansion proposed will serve the rapidly growing population in the South Kohala-North Kona region. Landscaping of the site will be considered in the design stages of the landfill.

5.5 HAWAII COUNTY ZONING

The subject property is currently zoned Extensive Agriculture by the County of Hawaii Zoning Ordinance. The Extensive Agriculture district applies to areas intended for use as pasturage and range lands.

5.6 OTHER PROGRAMS AND CONTROLS

5.6.1 State Environmental Policy

The State recognizes the need for information on the environmental consequences of a proposed action in making decisions. Thus, an Environmental Impact State (EIS) is required for any project that: significantly impacts the environment; is not specifically exempted; uses either State or County funds or lands; is in a Conservation District, shoreline setback area, or in certain parts of Waikiki; is a listed historic site; and/or requires a County General Plan amendment. The proposed West Hawaii Sanitary Landfill will be County-funded, and the large scale of the project indicates that it could have significant environmental impacts. Hence, this DEIS has been prepared to comply with the State's environmental policy and to insure that environmental concerns are given appropriate consideration along with economic and technical considerations.

5.6.2 National Flood Insurance Program

In 1990, the Federal Emergency Management Agency (FEMA) published the "Flood Insurance Study" for Hawaii County. This study investigates the existence and severity of flood hazards in Hawaii. The flood boundaries for streams, and the flood insurance zones and base flood elevation lines are delineated in the Flood Boundary and Floodway Map (FBFM), and the Flood Insurance Rate Map (FIRM) respectively. These maps are the principal result of the "Flood Insurance Study," and have been incorporated into Hawaii County's Flood Plain Management Program.

The State participates in drainage and flood control through the Department of Land and Natural Resources' Division of Water and Land Development. This agency is responsible for the implementation of a Statewide flood control program, and for providing technical and financial assistance to the Counties and the Soil and Water Conservation Districts.

The Flood Insurance Study, which identifies critical flood plain areas, coupled with the appropriate rules and regulations of the Federal Emergency Management Agency, has been incorporated into what is now Chapter 27 of the Hawaii County Code entitled, "Flood Control."

The North Kona district has been divided into two watershed areas. The project area is located in the northern half of the district, above Keahole Point, and receives less than 30 inches of rainfall annually. The soils of the area are extremely permeable and there is no record of hazardous flooding in this area. The proposed project site is located 3.5 miles inland from the western shoreline of the Big Island. According to this study, the site is in an area of minimal flooding. Under the National Flood Insurance program, these areas are not considered to be flood plain areas, thus, flood proofing requirements and specific use restrictions are not applicable to the proposed project.

5.6.3 State Underground Injection Control Program

The State Department of Health established the Underground Injection Control (UIC) program by the adoption of Administrative Rules, Title 11, Chapter 23: "Underground Injection Control," in 1984. The purpose of this program is to protect the State's potable groundwater resources from pollution by subsurface wastewater disposal. These regulations are accompanied by UIC maps which are marked with a boundary line known as the "UIC Line." Lands that are makai of the UIC Line are not restricted from subsurface wastewater disposal by underground injection.

A. Impacts and Mitigation Measures

The UIC Line in the vicinity of the project site is shown in Figure 3-4. The proposed site is located makai of the existing UIC Line. The location of project site is in conformance with the standards and criteria of the State UIC program.

5.6.4 Agricultural Lands of Importance to the State of Hawaii

The State Department of Agriculture has established a system of classifying agricultural lands within the State of Hawaii. The system is entitled, "Agricultural Lands of Importance to the State of Hawaii" (ALISH) and includes the following three categories of agricultural lands:

A. Prime Agricultural Land - Land which has the soil quality, growing season, and moisture supply needed to produce sustained high yields of crops economically when treated and managed according to modern farming methods.

B. Unique Agricultural Land - Land that has the special combination of soil quality, location, growing season, moisture supply and is used to produce sustained high quality and/or high yields of specific crop when treated and managed according to modern farming methods.

C. Other Important Agricultural Land - Land other than Prime or Unique Agricultural Land that is also of Statewide or local importance for agricultural use.

According to the ALISH maps for the lands in the immediate study area and the vicinity of the proposed project site, none are classified in any of the categories defined above. Therefore, the lands in the project site and its vicinity are of no significance for agricultural uses.

However, because a non-agricultural use is proposed for the site, a Special Permit will be sought for the sanitary landfill.

5.6.5 Hawaii Coastal Zone Management Program and Special Management Area

The Hawaii Coastal Zone Management Program (HCZMP) was established to guide the use, protection and development of the land and ocean resources within Hawaii's coastal zone. Its objectives and policies, as stated in Chapter 205A of the Hawaii Revised Statutes, place an emphasis on the following areas: scenic and open spaces, historical resources, recreational resources, development, coastal ecosystem, economic uses, and coastal hazards. Any significant development activity within the coastal zone must conform to the HCZMP objectives and policies mandated by law.

The HCZMP is augmented on the County level by the establishment of Special Management Areas (SMA) which control development along the shoreline. Construction activities within the SMA usually require an SMA permit from the appropriate County agency. For the vicinity of the project site, the SMA boundary line runs approximately parallel to the coastline and 1500 feet inland. The SMA line runs parallel to the Queen Kaahumanu Highway in this vicinity. Since the project is mauka of this line, it is not within the SMA. Hence, the HCZMP is inapplicable.

5.7 NECESSARY PERMITS AND APPROVALS

A. State of Hawaii

	Type
Department of Health	Solid Waste Management Permit
State Land Use Commission	Special Permit
Department of Transportation	Plan Approval

B. County of Hawaii

County Planning Commission	Special Permit
Department of Public Work	Grading and Grubbing Permit
Planning Department	Plan Approval

SECTION 6
Alternatives to the Proposed Action

SECTION 6

ALTERNATIVES TO THE PROPOSED ACTION

Alternatives considered to the proposed action were the "no-project" approach, alternative solid waste disposal and/or re-use methods, and alternative landfill sites. The "no-project" alternative is typically considered when contemplating any new action.

The second alternative, other methods of processing and disposing of solid waste, has begun to be actively pursued as viable options to the traditional landfilling method as communities are facing shortages in landfill capacity. While the Hawaii State Legislature in 1991 adopted a long-range plan (Act 324 of 1991) that directs the island counties to develop and implement integrated solid waste management plans with the objective of achieving an overall waste reduction of 50 percent by the year 2000, the County of Hawaii earlier began seeking ways to reduce its waste production through viable methods including recycling and green waste processing. Preliminary results of the County's efforts will be discussed in this section with the purpose of providing an update to the new directions in which the County is moving to achieve its goal of waste reduction.

The third set of alternatives provides a review of the consideration given to alternative sites in the region by the West Hawaii Solid Waste Management Advisory Committee.

6.1 NO-PROJECT ALTERNATIVE

The no-project alternative implies that no new solid waste disposal site will be developed. If the proposed project is not undertaken, the Kailua-Kona landfill will soon reach its capacity, after which time there will be no other suitable site (as defined according to pending Subtitle D EPA landfill design and development regulations) to accept West Hawaii's solid waste. Lack of a location for, or means of disposing of the region's refuse will promote unsanitary conditions thereby endangering the health and safety of the community. Thus, the need to develop a new sanitary landfill site supercedes the no-project option.

6.2 ALTERNATIVE SOLID WASTE DISPOSAL METHODS

6.2.1 Overview

There are four other alternative disposal or processing methods which have been used for solid waste disposal. These methods include shredding, baling, resource recovery, and incineration. Resource recovery methods are processes by which energy and/or materials are recovered from refuse, and include composting, pyrolysis, and recycling. A description of each process is provided below, and their advantages, disadvantages, and status are outlined in Table 6-1.

These alternative methods are volume reduction measures that produce residues that must be disposed of. Although these alternatives can extend the lifespan of a landfill by substantially reducing the volume of refuse to be handled, a landfill is still needed. Hence, even if these alternative methods were implemented, the need for a new landfill will not be eliminated.

A combined system of resource recovery and landfilling could be a cost-effective alternative when considering long-term economics. The County is in the process of developing an integrated solid waste management system that will include short- and long-term practical, feasible strategies that will ultimately achieve solid waste stream volume reduction. Preliminary program features will be discussed following a presentation of the range of the different methods available.

6.2.2 Shredding

A major advantage of the shredding process is that it reduces the volume of solid waste and converts it into a relatively homogeneous material which in many cases does not need daily cover (only final or cell covers). The machinery required for this process is commercially available in various types. The most commonly used is the hammermill. An important consideration in choosing the equipment is the size of the particles produced. This size consideration is important with regard to the process following shredding; i.e., energy

TABLE 6-1

ADVANTAGES AND DISADVANTAGES OF ALTERNATE DISPOSAL OR PROCESSING METHODS

METHOD	ADVANTAGES	DISADVANTAGES	STATUS
Shredding	Significantly reduces solid waste volume. A large portion of solid waste can be shredded. Reduced volume provides an advantage in hauling, handling and landfilling.	Some waste cannot be introduced in a shredder system due to size, density, high moisture content, hazardous qualities or any other qualities requiring specialized handling in any system.	Shredding is being considered as a viable method to be utilized in the preparation of green waste products for the final composting function. As part of the range of preparation methods being evaluated at present, chipping is also a potential process that would be compatible. While shredding would be a suitable process for plantings and vegetation, chipping would be appropriate for wood and other similar waste.
	Shredded waste is easily compacted and can extend the life of the landfill. When compacted, a landfill has fewer voids than unprocessed waste density and is 25 to 60 percent greater depending if daily coverages is required.	Municipal solid waste is known to have a high percentage of flammable materials which have started fires in the shredder.	
	Does not attract vectors, support combustion, have an objectionable odor or lead to littering.	There is a potential for explosions within the shredder due to explosive materials which may enter the facility.	
	Produces a more uniform fuel for incineration. The problem of agitating the fuel to prevent uneven fire beds is minimized.	Shredders are noisy and are dust producers so the entire operation must be enclosed with dust collectors installed.	
	Produces a uniform material so it is a common prerequisite for composting.	Uneven feeding or jamming of the shredder can significantly reduce the output of the mill.	
	Public acceptance to shredding facilities have been relatively good in comparison to acceptance of more conventional solid waste processing or disposal facilities.		
	Compared to other reduction processes, the initial investment and operation cost is relatively low.		

TABLE 6-1 (Continued)

ADVANTAGES AND DISADVANTAGES OF ALTERNATE DISPOSAL OR PROCESSING METHODS

METHOD	ADVANTAGES	DISADVANTAGES	STATUS
Incineration	Solid waste is reduced in both weight and volume. Reduces refuse quickly and efficiently. Reduced volume is advantageous in terms of hauling, handling and landfilling. Can extend landfill life significantly. It is adaptable to energy recovery processes such as steam generation and recovery of minerals from the residue.	Requires large capital expenditures and has high operating costs. Skilled labor is required for the operation and maintenance of the facility. Improper operations can result in air, water and land pollution. Residents may object to having an incinerator in their neighborhood.	This is not being considered at the present time. However, a long-range alternative under consideration for the past 2 years is to eventually ship some of the County's solid waste to Oahu for incineration at the H-Power facility.
Baling	Can almost double the lifespan of a landfill. Can handle most types of solid wastes. Bales are easier to transport and to handle. Cost is comparable to cost of other forms of solid wastes. Allows more immediate use of the disposal site since only a minimal amount of settling is anticipated.	A greater initial investment is required than with a conventional transfer station handling the same amount of solid waste. A resource recovery system cannot be used in conjunction with this process once a bale has been formed. Presently, data on the economics and effects of baling on decomposition, gas the leachate formation and settling are incomplete.	Baling is not being considered at the present time.
Composting	Reduces the volume and weight of refuse. Extends the lifespan of a landfill. The end product can be used as a soil conditioner to improve soil characteristics.	Municipal refuse does not contain the necessary amount of nitrogen to ensure proper digestion. This means a supplemental source of nitrogen must be introduced.	

TABLE 6-1 (Continued)

ADVANTAGES AND DISADVANTAGES OF ALTERNATE DISPOSAL OR PROCESSING METHODS

METHOD	ADVANTAGES	DISADVANTAGES	STATUS
		The organic matter undergoing decomposition is an attractant to vectors and generates odor. The total amount of solid waste is not accounted for in the process because of the required separation of organic refuse from inorganic. It becomes uneconomical when applied on a large scale due to the high cost of application to land. Sale of the end product is dependent on the market.	Preliminary program planning indicates that greenwaste composting is the most viable resource recovery method that should be included at the new landfill site. Preliminarily, the area that will be required for such a processing facility will be approximately 20 to 30 acres. Area devoted to composting will be about 5 acres with the remainder being used for chipping, shredding, storage and a buffer area. The composting area may be on an asphalt or concrete slab. The area needed for solid waste processing and materials recovery will be about 100 feet x 300 feet exclusive of roads and parking area. Office, scale house and maintenance facility will be about 10,000 sq. ft. An area near the project (landfill) site entrance may be desirable for the composting operation.
Pyrolysis	It reduces the weight and volume of solid wastes which facilitates its handling. Landfill life is extended. The process is not influenced by weather conditions. A liquid or gas fuel can be produced by this process from solid waste.	The system requires skilled operators. If an efficient production of fuel is required, shredding and separating is required prior to pyrolysis. Impacts which may occur during operation of the facility include noise, dust, thermal atmospheric discharge and contaminated wastewater. The cost for this process is high.	Not being considered at this time.

TABLE 6-2 (Continued)

ADVANTAGES AND DISADVANTAGES OF ALTERNATE DISPOSAL OR PROCESSING METHODS

METHOD	ADVANTAGES	DISADVANTAGES	STATUS
Recycling	Conserves irreplaceable resources. Reduces the quantity of refuse to be disposed thereby increasing the landfill life. Recovered material can lower disposal costs. Siting of a resource recovery facility would possibly generate less opposition than a landfill due to public concern with conservation.	Aside from aluminum, Hawaii has little demand for secondary materials since the islands are not a major manufacturing center. The degree of risk varies with the complexity of the system. The economies of any system are based on projected maintenance costs, separation systems, an assumed value for the product and a market for the secondary materials.	To be included as part of the County's integrated solid waste management system.

recovery, disposal, or a combination of both.

6.2.3 Baling

Baling is a technique used to convert loose refuse into heavy blocks by compaction and is another means of reducing the volume of solid waste that must be landfilled. When transfers and long hauls are necessary to dispose of solid waste, it can save on costs. It not only can extend the life of the landfill, but the handling and transport of wastes becomes easier.

6.2.4 Resource Recovery Methods

A. Composting

Composting (a bioconversion technology) is the biological decompostion of organic materials. Municipal solid waste components, such as food waste, yard waste, paper, and other miscellaneous organics, are decomposed by microorganisms under controlled conditions. Composting technology, which can be environmentally sound and relatively simple, creates a product that can be used as a soil amendment, mulch, and as landfill cover material.

The growing demand for landfill alternatives in this country is leading more communities to implement leaf and yard waste composting projects. By 1989, there were an estimated 800 to 1,000 yard waste composting facilities in the nation. As more states ban the disposal of leaves and/or other yard wastes in landfills (e.g., Minnesota, New Jersey, Wisconsin, Illinois and Pennsylvania have passed such laws), yard waste composting is expected to increase rapidly.

In 1988, yard waste ranked as the second highest contributor of household trash (17.6 percent) next to paper (40 percent) at the neighborhood landfill ("Popular Science" magazine, October, 1990). "Other" waste made up 11.6 percent, metals 8.5 percent, plastics 8 percent, food waste 7.4 percent, and glass 7 percent, according to the same article.

Yard waste consists of leaves, brush, tree and shrubbery trimmings, grass, and garden wastes generated by nurseries, landscapers, municipal programs, and individual citizens.

Yard waste composting is becoming more widespread in the United States as public agencies recognize the large amounts of biodegradable materials that are currently being placed in landfills, and as the general public becomes aware of the value of the stabilized end product. Although volume reduction estimates are highly site specific, the composting process can reduce the initial volume of leaves by 60 to 80 percent, depending on the initial and final physical characteristics fo the leaves and finished compost product.

There are a variety of existing users of compost, including: nurseries, landscape contractors, recreational facilities (e.g., a golf course), and reclamation projects, etc. Another use is for cover material in the final closure of landfills. Although compost is a valuable resource for certain applications, it may be necessary in some areas to sell it at lower prices or give it away. Some programs have offered a free exchange of compost for an equal volume of yard waste.

A composting operation on the Kona (West Hawaii) side of the island will require a municipal water main or other high-capacity source of fresh water. Single-phase power and telephone service will be required for the scale facility.

B. Pyrolysis

Pyrolysis involves the thermal decomposition of refuse in an anaerobic or near anaerobic condition. The high temperatures generated and the lack of oxygen breaks the materials down into three parts. The first is a gas which is primarily hydrogen, methane and carbon monoxide. The second product is a liquid fuel that includes organic chemicals (acetic acid, acetone and methanol). Lastly, a char is produced that is composed of almost pure carbon and includes any glass, metal or rocks that may have been included in the initial material. The end result is the conversion of solid wastes into a storable, transportable liquid or gas fuel.

C. Recycling

Recycling involves the recovery of materials from municipal refuse that can be marketed for reuse. There are basically two methods of recovery that are available. The first is recovery before refuse is placed within a collection vehicle, as is often done in Hawaii with aluminum cans. The second method is recovery from the mixed municipal refuse after its collection.

Types of materials that are recoverable include paper, glass and metal containers. These are generally separated at the source of generation and directly transported to a dealer of recycled materials or to a manufacturer. In Hawaii, the largest market is for aluminum cans which has been steadily increasing. Landscape trimmings for composting, and recycled steel and paper are not viable markets here.

6.2.5 Solid Waste Disposal by Incineration

The possibility of energy generation by refuse incineration has been studied by other counties in the attempt to reduce dependence on petroleum oil importation. The process of incineration involves a controlled combustion that reduces solid, liquid or gaseous solid wastes into carbon dioxide, other gases and a relatively noncombustible residue. It can reduce the volume of solid wastes introduced into the system by as much as 80 to 90 percent, thereby considerably extending the life of a landfill.

This system is, however, one of the most costly alternatives due to the higher construction costs necessitated by the increasingly strict air pollution control requirements set forth by the

Federal government. The advantages and disadvantages of incineration are listed in Table 6-1.

6.2.6 Other

Other alternative measures being considered for incorporation into the integrated solid waste management system are materials recovery facilities for household hazardous waste collection, and processing for tires.

6.3 ALTERNATIVE SITES

During the fall of 1990, a total of four sites in the West Hawaii region were considered for selection of the new sanitary landfill site by the West Hawaii Advisory Committee for Solid Waste Disposal. Three of the sites were located in the general vicinity of Puuwaawaa and Puuanahulu while the fourth was located further north in Kawaihae near the Kawaihae Harbor.

A set of site evaluation criteria was applied to assess the suitability of each of the sites for use as a sanitary landfill. The factors that were considered included the following:

a) Environmental Concerns
   - Location relative to floodplains
   - Location relative to drinking water sources
   - Location relative to down gradient groundwater sources
   - Location relative to endangered or threatened natural habitat
   - Current and future on site and surrounding land uses
   - Existence of historic/archaeological resources
   - Aesthetic factors including site visibility, distance from nearest residential development.

b) Technical Concerns
   - Projected life of the site
   - Surface water control

- Groundwater drainage requirements
- Availability of leachate treatment facilities
- Site slopes
- Suitability of soils
- Precipitation-- worst case 24 hour period
- Climatic extremes
- Level of traffic congestion on access roads
- Compatibility with Resource Recovery
- Proximity to transport facility

c) Economic Concerns

- Distance from sources of solid waste
- Distance from sources of cover material
- Amount of road construction required for access to site
- Initial capital cost of site preparation

The Kawaihae site was deleted due to the fact that it was located within an area designated for future urban expansion. Provided that urban expansion proceeded as planned, the sanitary landfill would have been found as an incompatible land use with its neighboring residential and commercial developments. Further, its location would not be considered equidistant from the South Kona sources of solid waste generation as it is to North Kohala and Waimea.

The three sites (see Figure 6-1) that were located within close proximity of each other were initially considered due to their central geographic location within the service area for the West Hawaii region. All in all, the physical, environmental, and technical criteria applied to each of the three sites resulted in a fairly close set of numerical ratings of all three candidate sites. Thus, specific considerations were used to distinguish the differences among them to help determine the most appropriate for use as a landfill.

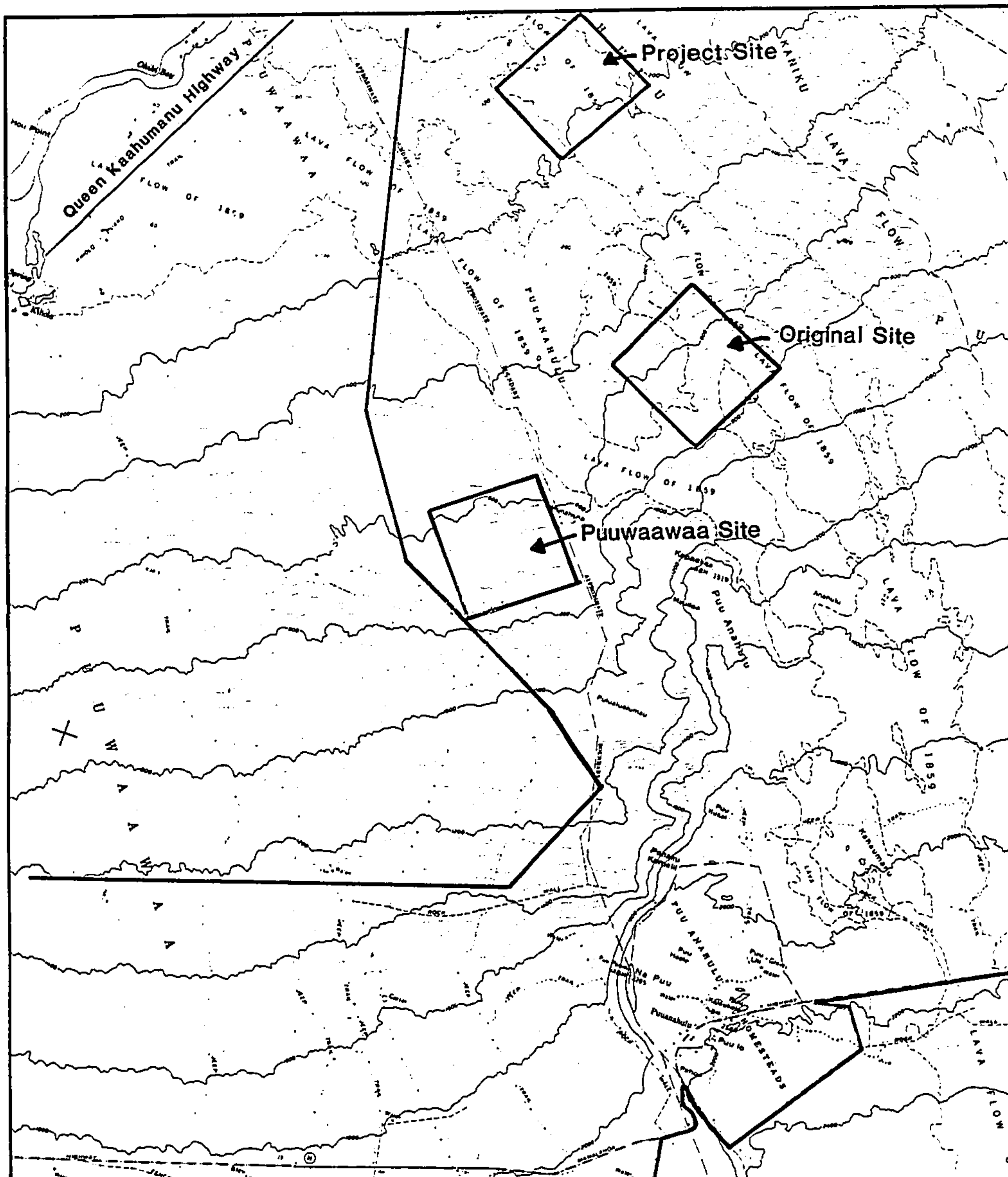


FIGURE 6-1
ALTERNATIVE SITES
WEST HAWAII SANITARY LANDFILL
County of Hawaii

R. M. TOWILL CORPORATION
Honolulu, Hawaii

The "original" site located at the 700-foot elevation was deleted due to its proximity to future public recreational (hunting grounds) facilities.

The Puuwaawaa site, located at the 600- to 700-foot elevation, was deleted due to its proximity to the future Puuwaawaa public hunting grounds. The potential danger of fires spreading in an already arid region posed a threat to the future recreational uses in the area.

The selected Puuanahulu site (shown as "Project Site" in Figure 6-1), located at the 120- to 200-foot elevation, was found to be the most suitable due to its close proximity to the existing access road- Queen Kaahumanu Highway, thereby indicating the least capital cost for construction of a new access road.

SECTION 7

Irreversible and Irretrievable Commitments of Resources and the Relationship Between Local Short-Term Uses of Man's Environment and the Maintenance & Enhancement of Long-Term Productivity

SECTION 7

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES AND THE RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

7.1 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

The proposed West Hawaii Sanitary Landfill will require the irreversible and irretrievable commitment of a number of resources. These resources include the materials, capital, manpower and energy needed to plan, construct, operate and maintain the landfill facility.

The commitment of 300 acres of land to establish the site will be irreversible and irretrievable. The use of the site as a landfill will eliminate it from other uses through at least the year 2015, when the landfill is anticipated to reach its capacity. However, the existing site in its present state is not suitable for other uses, permitted or otherwise.

If the site is not established as a landfill, it would probably be returned to recreational/open space use when the mineral resources of the area are depleted. In this case, the minimum effort required to make the area useable would be to cover the floor with the topsoil stockpiled on-site, and landscape it.

The use of the site as a landfill will result in the use of the stockpiled topsoil as refuse cover material, which will be an irretrievable loss of the topsoil resource. However, the top of the completed landfill is being planned for recreational or open space use. Because of this intent, the landfill design will include the reservation of sufficient topsoil to provide a final soil cover over the refuse to permit revegetation. Therefore, whether or not the site is used as a landfill, it will probably be eventually planned for open space use.

Implementation of the proposed project will not result in the significant loss of natural or cultural resources. The site is not a significant wildlife habitat, nor are there any endangered species known to inhabit the area. While there are three known archaeological or historic sites within the outer reaches of the project boundaries, proposed mitigation measures will help prevent adverse impacts on these sites.

Site preparation and development will utilize financial, manpower and material resources which are irretrievable for planning, engineering, construction, and operation and maintenance. The capital expenditure required for the establishment of the new landfill, including access road and drainage improvements, leachate control system and fencing installations, landfilling equipment purchases for the first increment will amount to approximately $9 to $12 million. Following increments may cost from $0.6 to $1.0 million, not including equipment replacement.

The cost of importation of cover soil for landfill operations may range from $381,000 to $500,000, depending on the amount needed following the soils test to determine the amount and type already available in the vicinity of the site.

Upon the closure of the landfill, the site will be limited in the number of feasible uses. The uneven, long-term settlement of the landfill and the generation of potentially hazardous landfill gas (methane) will preclude the future development of the site for residential or urban uses.

7.2 THE RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

Solid waste will be continually and increasingly produced in the foreseeable future. A safe and efficient means of disposal must be available to the people of West Hawaii. A sanitary landfill, strategically located and properly operated, is safe, and can be free of vector problems with minimal litter and dust generated and no odor impacts on populated areas. The landfill is presently the most efficient and economical means for the disposal of solid waste on the Big Island. Even with the implementation of a resource/energy recovery system, a landfill must still be available for the disposal of residual solid wastes.

Potential contamination by leachate migration is the primary adverse impact of the proposed project. This impact is a long-term concern since leachate migration can occur during landfill development as well as long after the landfill is closed. Fortunately, the project site is located over a groundwater region that is not suitable for drinking water use, hence, the threat of potable water contamination is remote.

There is a possibility that the underlying brackish water may be withdrawn in the future and desalinated to produce a potable water supply. However, if and when desalinization is implemented, there are other locations on the island where brackish water can be withdrawn. Despite the fact that there are no definite future plans to withdraw the underlying groundwater for desalination and potable water use, the landfill is being designed with all practical precautions to minimize leachate contamination of the groundwater.

The proposed project will not result in a significant loss of environmental resources. Although the implementation of the project will preclude the use of the land for other purposes for at least the next 25 years, the existing site conditions and land use regulations governing the site already restrict its feasible uses. The most feasible use for the site in its present state other than for a sanitary landfill is to reuse it as open space. The intent of this project after landfill closure is to ultimately recycle the land to recreational/open space use or create a recreational park.

Although the landfill project will require the irretrievable use of the land for the next 25 years, and will thereafter permanently limit the feasible use of the land, the project will aid in the maintenance and enhancement of long-term productivity for the Island of Hawaii. The project is essential for the desired social and economic growth of the island's population. There does not appear to be any acceptable alternative to this proposed action.

SECTION 8

UNRESOLVED ISSUES

As part of a fire control plan, a well will be dug to provide a potable water source for the purpose of providing water to the administration, repair and equipment buidings, and for putting out fires on the project site and in its vicinity to prevent the potential spread of wildfires. Tapping into a potable water source for this type of use is possible and the development, operation, and maintenance of such a facility will cost a minimum of approximately $150,000. The alternate means of providing a water supply for fire control would be to provide a catchment basin. However, this alternate means would not be as effective due to the probability that this basin would remain relatively void of water most of time since this part of West Hawaii receives on the average 10 to 20 inches of rain annually.

Until a permanent water source is constructed, potable water will be made available at the site through a temporary storage system.

SECTION 9

CONSULTED PARTIES AND PARTICIPANTS IN THE EIS PROCESS

9.1 FEDERAL

National Weather Service, Department of the Army
National Marine Fisheries Service, Department of the Interior

9.2 STATE OF HAWAII

Office of State Planning, Office of Environmental Quality Control
Dept. of Health, Environmental Permits Branch
Dept. of Agriculture, Planning Branch, Environmental Center
Dept. of Land and Natural Resources
Dept. of Business and Economic Development, Housing and Finance Development Corporation
Land Use Commission
Dept. of Transportation
University of Hawaii Meteorology Department

9.3 COUNTY OF HAWAII

Dept. of Public Works, Waste Management Div.
Planning Department
Dept. of Water Supply
Fire Department
Dept. of Housing and Community Development

9.4 OTHERS

Kona Kohala Chamber of Commerce
West Hawaii Advisory Committee on Solid Waste Disposal
Professor Peter M. Vitousek
Sierra Club, Moku Loa Group
Barrett Consulting Group
Hawaii Leeward Planning Group
Waikoloa Highlands Office
Kohala Coast Resort Association
Hawaiian Electric Light Company

SECTION 10

LIST OF PREPARERS

10.1 LIST OF EIS PREPARERS

R. M. TOWILL CORPORATION	Steven Kellogg, Principal-in-Charge Colette Sakoda, Senior Planner Roy Tsutsui, Project Engineer Gregg Hiyakumoto, Senior Engineer Sean Seltzer, Hazardous Waste Proj. Mgr.
CHAR & ASSOCIATES (Flora)	Winona Char, Principal
CULTURAL SURVEYS HAWAII (Archaeology)	Hallett H. Hammatt, Ph.D. Douglas Borthwick
PACIFIC PLANNING & ENGINEERING, INC. (Traffic)	Jonathan Shimada, Ph.D. Conrad Higashionna Benson Chow
PHILLIP L. BRUNER (Fauna)	Phillip L. Bruner, Assistant Professor of Biology BYU-H

SECTION 11

COMMENTS AND RESPONSES TO THE PREPARATION NOTICE

JOHN WAIHEE
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF BUSINESS, ECONOMIC DEVELOPMENT & TOURISM
LAND USE COMMISSION
Room 104, Old Federal Building
335 Merchant Street
Honolulu, Hawaii 96813
Telephone: 548-4611

ESTHER UEDA
EXECUTIVE OFFICER

January 16, 1991

Ms. Colette Sakoda
R. M. Towill Corporation
420 Waiakamilo Road, #411
Honolulu, Hawaii 96817

Dear Ms. Sakoda:

Subject: EIS Preparation Notice - West Hawaii Sanitary Landfill

We have reviewed the subject EIS Preparation Notice and find that the vicinity map (p.4) is inadequate to make a determination as to whether the proposed landfill falls within the Agricultural District.

We suggest that you include in the EIS a map that clearly reflects the landfill boundaries in relationship to the State Land Use district boundaries.

We appreciate the opportunity to review this matter. If you have any questions, please call me or my staff at 548-4611.

Sincerely,

ESTHER UEDA
Executive Officer

EU:to

cc: DPW
Hawaii County Planning Dept.

Department of Public Works
25 Aupuni Street, Room 202 • Hilo, Hawaii 96720 • (808) 961-8321 • Fax (808) 969-7138

Lorraine R. Inouye
Mayor
Bruce C. McClure
Chief Engineer
Laurence E. Capellas
Deputy Chief Engineer

March 15, 1991

MS ESTHER UEDA EXECUTIVE DIRECTOR
STATE DEPARTMENT OF BUSINESS
ECONOMIC DEVELOPMENT & TOURISM
LAND USE COMMISSION
ROOM 104 OLD FEDERAL BUILDING
335 MERCHANT STREET
HONOLULU HI 96813

SUBJECT: EIS PREPARATION NOTICE FOR THE WEST HAWAII SANITARY LANDFILL

We have received your letter of January 14, 1991, regarding the Environmental Impact Statement Preparation Notice for the West Hawaii Sanitary Landfill.

The Draft Environmental Impact Statement will contain a map that will clearly indicate the proposed project boundaries in relationship to the State Land Use district boundaries.

We appreciate your participation in the planning process of this important project.

Bruce C. McClure

BRUCE C. McCLURE, P.E.
Chief Engineer

cc: OEQC, B. Anderson
R. M. Towill Corp., C. Sakoda
Hawaii County Planning Department, N. Hayashi

CADES SCHUTTE FLEMING & WRIGHT
ATTORNEYS AT LAW

January 21, 1991

521-9339

Mr. Bruce McClure
Chief Engineer
County of Hawaii
Department of Public Works
27 Aupuni Street
Hilo, Hawaii 96720

Re: EIS Preparation Notice for the New West Hawaii Sanitary Landfill (the "Project")

Dear Mr. McClure:

Enclosed you will find a copy of a letter to Mr. Gianini, Deputy Corporation Counsel for the County of Hawaii, regarding the above-referenced matter. We have not heard from Mr. Gianini or your office since the date of the letter. Please deliver to me any information you have on the Project to date (as such information relates to the new site recently selected). We also wish to inform you of our desire to participate in the EIS preparation process and request an opportunity to comment on the draft and final EIS upon publication.

Thank you in advance for your cooperation.

Very truly yours,

Glenn H. Kobayashi
for
CADES SCHUTTE FLEMING & WRIGHT

ghk/05600/0001/corres/mcclure

KAILUA-KONA, HAWAII OFFICE

Department of Public Works
25 Aupuni Street, Room 202 • Hilo, Hawaii 96720 • (808) 961-8321 • Fax (808) 969-7138

Lorraine R. Inouye
Mayor
Bruce C. McClure
Chief Engineer
Laurence E. Capellas
Deputy Chief Engineer

REC'D MAR 1 8 1991

March 15, 1991

MR GLENN H KOBAYASHI
CADES SCHUTTE FLEMING & WRIGHT
1000 BISHOP STREET
HONOLULU HI 96813

SUBJECT: EIS PREPARATION NOTICE FOR THE WEST HAWAII SANITARY LANDFILL

We have received your letter of January 21, 1991, regarding the subject project. Your request to participate in the EIS preparation process by way of providing comment on the draft and final EIS upon publication of the documents has been noted. You will be included on the list of consulted parties.

BRUCE C. McCLURE, P.E.
Chief Engineer

cc: OEQC, B. Anderson
R. M. Towill Corp., C. Sakoda
Hawaii County Planning Department, N. Hayashi

CADES SCHUTTE FLEMING & WRIGHT
ATTORNEYS AT LAW

March 18, 1991

Mr. Bruce McClure
Department of Public Works
County of Hawaii
25 Aupuni Street
Hilo, Hawaii 96720

Re: Puuanahulu Landfill

Dear Mr. McClure:

This office represents Doris and Earl Bakken who are homeowners in Kiholo Bay, Hawaii. It has come to their attention that the County of Hawaii is in the process of developing a Draft Environmental Impact Statement relative to the proposed Puuanahulu landfill.

Mr. and Mrs. Bakken request the opportunity to review and comment upon the Draft EIS. You may contact them through this office. The address is as follows:

Doris and Earl Bakken
c/o Cades Schutte Fleming & Wright
B-303 Hualalai Center
75-170 Hualalai Road
Kailua-Kona, Hawaii 96740
Telephone: 329-5811

Thank you for your attention to this matter. I remain,

Very truly yours,

Roy A. Vitousek III
for
CADES SCHUTTE FLEMING & WRIGHT

cc: Colette Sakoda
R. M. Towill

Galen Koba
Department of Public Works
County of Hawaii

Lorraine R. Inouye
Mayor
Bruce C. McClure
Chief Engineer
Laurence E. Capellas
Deputy Chief Engineer

Department of Public Works
25 Aupuni Street, Room 202 • Hilo, Hawaii 96720 • (808) 961-8321 • Fax (808) 969-7138

April 5, 1991

RECD APR 1991

DORIS AND EARL BAKKEN
C/O CADES SCHUTTE FLEMING & WRIGHT
B-303 HUALALAI CENTER
75-170 HUALALAI ROAD
KAILUA-KONA HI 96740

SUBJECT: ENVIRONMENTAL IMPACT STATEMENT PREPARATION NOTICE - WEST HAWAII SANITARY LANDFILL

We have received your request to review and comment on the Draft Environmental Impact Statement for the subject project through a letter dated March 18, 1991, from Roy Vitousek, III of Cades Schutte Fleming & Wright.

When the Draft EIS is published, we will be sending you a copy of the document.

BRUCE C. McCLURE, P.E.
Chief Engineer

cc: Hawaii County Planning Department, N. Hayashi
OEQC, B. Anderson
R. M. Towill Corp., C. [illegible]nda
Cades, Schutte Fleming & Wright, R. Vitousek, III

December 24, 1990

Mr. Bruce C. McClure, P.E.
Chief Engineer
Department of Public Works
25 Aupuni Street, Room 202
Hilo, Hawaii 96720

Dear Mr. McClure:

Please forgive the delay in answering your December 5 letter. I have been on an extended mainland trip.

We were pleased to hear that you have selected a more desirable site for your West Hawaii landfill.

As you are aware, we were very seriously concerned over the forest fire hazard at your proposed upper site. The new location appears to be buffered by lava flows.

We were also pleased to learn that the contingencies included some type of recycling and utilization of the waste material as well as the employment of a private experienced company to manage the facility.

It appears that you will endeavor to install a low impact "good neighbor" facility.

In my opinion the only potential unsightly problem that should be addressed at your new landfill is the creation of dust that will blow toward the highway and hotels. This problem can very easily be controlled by drilling a relatively inexpensive well at the site and keeping the areas well sprinkled. [illegible] will [illegible] minimize the potential fire danger.

RECD JAN 22 1991

Mailing Address: Post Office Box 1536, Kailua-Kona, Hawaii 96745, Telephone: 808 325-7433

I sincerely hope that you will be successful in your desire to install a new state of the art waste management facility that will not present the problems that you have had with the existing Kailua-Kona dump.

Good luck.

Yours truly,

F. Newell Bohnett

Colette: For clarity, the ¶ above reads –
I sincerely hope that you will be successful in your desire to install a new state of the art waste management facility that will not present the problems that you have had with existing Kailua-Kona dump.

NO RESPONSE LETTER NEEDED

WAIKOLOA

April 16, 1991

Mr. Bruce C. McClure
Chief Engineer
Department of Public Works
County of Hawaii
25 Aupuni Street
Hilo, Hawaii 96720

RE: West Hawaii Sanitary Landfill
Environmental Impact Statement

Dear Mr. McClure:

I would like to request a copy of the EIS Preparation Notice for the proposed new West Hawaii Sanitary Landfill. Also, as an adjacent landowner, Waikoloa Development Co. would like to be a consulted party in the preparation of the Draft and Final Environmental Impact Statements.

I look forward to receiving a copy of the EIS Preparation Notice and the Draft EIS, when it is available.

Sincerely,

Ken Melrose
Director of Planning

ac

HIGHLANDS OFFICE
Post Office Box 3028 Waikoloa, Hawaii 96743 Phone (808) 883 [illegible] Fax (808) [illegible]

Department of Public Works

25 Aupuni Street, Room 202 • Hilo, Hawaii 96720 • (808) 961-8321 • Fax (808) 969-7138

Lorraine R. Inouye
Mayor
Bruce C. McClure
Chief Engineer
Laurence E. Capellas
Deputy Chief Engineer

May 8, 1991

RMT		WES	
DK		KTS	
RYK		SRK	
REC'D MAY 10 1991 RMTC			
RDE			
GSY			
DKM			

MR KEN MELROSE
DIRECTOR OF PLANNING
WAIKOLOA HIGHLANDS OFFICE
PO BOX 3028
WAIKOLOA HI 96743

SUBJECT: Environmental Impact Statement Preparation Notice for the West Hawaii Sanitary Landfill

We have received your letter of April 16, 1991, in which you requested a copy of the EIS Preparation Notice and to be a consulted party in the preparation of the Draft and Final Environmental Impact Statements.

Our consultant has been directed to transmit a copy of the Preparation Notice to you as well as to include you as a consulted party in the Draft EIS preparation process. We appreciate your continued participation in the planning of this important County project.

Bruce C. McClure

BRUCE C. McCLURE, P.E.
Chief Engineer

cc: Hawaii County Planning Department, Planning Director
OEQC, Acting Director
R. H. Towill Corp., C. Sakoda

Kohala Coast Resort Association

P.O. Box 5000, Kohala Coast, Island of Hawaii 96743-5000 • Telephone (808) 885-4915, Facsimile (808) 885-1044

Wednesday

Mr. Bruce C. McClure
Director
County of Hawaii
DEPARTMENT OF PUBLIC WORKS
25 Aupuni Street
Hilo, HI 96720

November 28, 1990

Re: New West Hawaii Landfill
Site Selection

Mr. McClure:

The Kohala Coast Resort Association members viewed "DLNR's proposed site," for a future West Hawaii Landfill at Puuanahulu. We believe this site can be acceptable given the following conditions:

1. This landfill shall be only one element in an integrated waste management strategy for Hawaii County, which must include recycling and recovery and, which must be initiated prior to or concurrent with the commencement of operating a new landfill.

2. It shall be professionally managed by a company successful in operating landfills in which recycling, recovery, vector, litter, odor, and noise controls are vital parts of their operation. They shall manage the new landfill from the start and in compliance with the Environmental Protection Agency, Department of Health, and other applicable County, State and Federal regulations.

3. The location shall be south (Kona side) of the lava ridge which is in the North Kona District, about one and one-half to two miles south of the South Kohala/North Kona District boundary, with land filling activity beginning approximately 1,000 feet mauka of the power lines and situated such that it does not become visually significant to north bound motorists on the Queen Kaahumanu Highway.

4. Maximum height of the landfill shall not exceed thirty (30) feet above existing grades.

5. As cells of the landfill are completed, they shall be shaped and capped so that they are visually consistent with the natural character of the surrounding lava formations and the Puuanahulu cliffs. Re-vegetation shall be consistent with the surrounding flora.

6. Access off of Queen Kaahumanu Highway will be fully channelized and unsignalized, consistent with the Department of Transportation policy for Queen Kaahumanu Highway to remain a high speed, unrestricted arterial.

I appreciate the opportunity to participate in the site selection process. I respectfully request that Kohala Coast Resort Association be a consulted party during the preparation of the Environmental Impact Statement for the new landfill site.

Best regards,

KOHALA COAST RESORT ASSOCIATION

Thos Rohr, President

ckk

Department of Public Works
25 Aupuni Street, Room 202 • Hilo, Hawaii 96720 • (808) 961-8321 • Fax (808) 969-7138

Lorraine R. Inouye
Mayor
Bruce C. McClure
Chief Engineer
Laurence E. Capellas
Deputy Chief Engineer

May 28, 1991

HMI		W...	
DK		KTS	
RYK		SRC	
REC'D MAY 31 1991 RMTC			
RDE			
GSY			
DKM			

MR THOMAS ROHR PRESIDENT
KOHALA COAST RESORT ASSOCIATION
ATTENTION MS NOELANI WHITTINGTON
PO BOX 5000
KOHALA COAST HI 96743-5000

SUBJECT: WEST HAWAII SANITARY LANDFILL

I am in receipt of your letter of November 28, 1990, in which the Resort Association set forth some criteria for the siting and management of the new sanitary landfill in the Ahupuaa of Puuanahulu. The following responses were prepared for your information.

1. The County has taken the initiative to develop an effective integrated solid waste management system in which the landfill in West Hawaii will be but one component along with alternatives including recycling and resource recovery. We proactively helped to develop and implement a County plan early this year to carry out the State policy of having each County formalize its integrated solid waste management plans. The County has contracted with the Barrett Consulting Group to develop and operationalize our solid waste management plan that is intended to focus on waste reduction.

2. Whether the new sanitary landfill will be managed by a private company will remain a policy question that will have to be discussed with the labor unions and the County Council.

3. With the reorientation of the landfill, the 1,000-foot setback will be on the lower 15% of the 300-acre site. The further back (mauka) we start, the higher the elevation and visibility of the landfill will be.

4. We agree that the maximum height of the landfill will not exceed thirty (30) feet above the existing grades.

5. Capping material must have low permeability (compacted soil) to prevent seepage of leachate from the landfill into the ground. Because of this, lava may not be permissible. No vegetation is allowed on cell capping--it is allowed only on the final closure cap.

6. Access and new access road design will be reviewed by and subject to approval by the State Department of Transportation. We need to have the agency's approval for a right-of-entry for construction work.

In response to your request, the Resort Association will be a consulted party during the preparation of the Environmental Impact Statement.

Thank you for participating in the planning process of this important County project.

Bruce C. McClure

BRUCE C. McCLURE, P.E.
Chief Engineer

CS:BCM:ctc

cc: R. M. Towill Corp., C. Sakoda

SECTION 12

COMMENTS AND RESPONSES TO THE DRAFT EIS

DEPARTMENT OF THE ARMY
U. S. ARMY ENGINEER DISTRICT, HONOLULU
BUILDING 230
FT SHAFTER, HAWAII 96858-5440

REPLY TO ATTENTION OF:

August 12, 1991

Planning Division

RMT			
DK		KTS	
RYK		SRK	
REC'D AUG 1 3 1991			RMTC
RDE			
GSY			
DKM			

AUG 13 1991

Mr. Norman K. Hayashi
Planning Director
Hawaii Planning Department
25 Aupuni Street, Room 109
Hilo, Hawaii 96720

Dear Mr. Hayashi:

Thank you for the opportunity to review and comment on the Draft Environmental Impact Statement (DEIS) for the proposed West Hawaii Sanitary Landfill, Puuanahulu, North Kona, Hawaii (TMK 7-1-03: 1). The following comments are provided pursuant to Corps of Engineers authorities to disseminate flood hazard information under the Flood Control Act of 1960 and to issue Department of the Army (DA) permits under the Clean Water Act; the Rivers and Harbors Act of 1899; and the Marine Protection, Research and Sanctuaries Act.

a. A DA permit is not required for this project.

b. According to the Federal Emergency Management Agency's Flood Insurance Rate Map (Map Index dated July 16, 1990), the project site is in Zone X - unshaded (areas determined to be outside of the 500-year flood plain).

Sincerely,

ORIGINAL SIGNED

Kisuk Cheung
Director of Engineering

Copies Furnished:

Department of Public Works
County of Hawaii
Attention: Mr. Bruce McClure
25 Aupuni Street
Hilo, Hawaii 96720

✓R.M. Towill Corp.
Attn: Ms. Colette Sakoda
420 Waiakamilo Road, Room 411
Honolulu, Hawaii 96817

Department of Public Works

Lorraine R. Inouye
Mayor

Bruce C. McClure
Chief Engineer

Laurence E. Capellas
Deputy Chief Engineer

County of Hawaii • 25 Aupuni Street, Room 202 • Hilo, Hawaii 96720 • (808) 961-8321 • Fax (808) 969-7138

October 8, 1991

Mr. Kisuk Cheung
Director of Engineering
Department of the Army
U.S. Army Engineer District, Honolulu
Building 230
Ft. Shafter, Hawaii 96858-5440

Attn: Planning Division

Dear Mr. Cheung:

West Hawaii Sanitary Landfill
<u>Draft Environmental Impact Statement</u>

We are in receipt of your letter of August 12, 1991 regarding the subject project. The information you have provided with regard to the fact that no Department of the Army permit will be required, and that the FIRM rating is Zone X (areas determined to be outside of the 500-year flood plain) has been noted.

Thank you for your participation in the planning process of this important project.

Sincerely,

Bruce C. McClure

Bruce McClure
Chief Engineer

cc: Office of Environmental Quality Control
County of Hawaii Planning Dept.
R. M. Towill Corp.

WAIKOLOA

REC'D SEP 5 1991

August 29, 1991

Mr. Bruce McClure
Chief Engineer
Department of Public Works
County of Hawaii
25 Aupuni Street
Hilo, Hawaii 96720

RE: WEST HAWAII SANITARY LANDFILL
DRAFT ENVIRONMENTAL IMPACT STATEMENT (DEIS)

Dear Mr. McClure:

Following review of the DEIS, we offer these comments for your consideration in preparing the Final EIS.

1. The volumes of the solid waste when the new landfill is opened needs to be consistently represented in Table 2-2 and in Section 1.3 on page 1-4. Do these volumes assume any reduction as a result of recycling efforts?

2. Correction is necessary in Section 1.4.1 on page 1-4. All Waikoloa wells at the 60 through 70 foot elevations are brackish irrigation wells, not potable.

3. Will the general public have access to the new landfill? Will a transfer station be located on the site of the new landfill to accommodate residential users within your standard ten mile radius service area?

4. When Queen Kaahumanu Highway becomes a divided four or six lane freeway, will the County construct its own "diamond" interchange for access to the landfill or will a frontage road be constructed connecting to the proposed Waikoloa Interchange? If so, we assume that the County will construct the frontage road at its expense and contribute on a prorata basis to the cost of the interchange.

HIGHLANDS OFFICE
Post Office Box 3028 Waikoloa, Hawaii 96743 Phone (808) 883-1000 Fax (808) 883-1414

As the major resort in closest proximity to the proposed landfill, we request to be a consulted party in the site design and visual mitigation improvements. It is not in the best interests of either party to adversely affect property values at Waikoloa.

Thank you for your consideration of our comments.

Sincerely,

Ken Melrose
Vice President/Planning

wh

cc: Mr. Thos Rohr

Lorraine R. Inouye
Mayor
Bruce C. McClure
Chief Engineer
Laurence E. Capellas
Deputy Chief Engineer

Department of Public Works

County of Hawaii • 25 Aupuni Street, Room 202 • Hilo, Hawaii 96720 • (808) 961-8321 • Fax (808) 969-7138

October 8, 1991

Mr. Ken Melrose
Vice President/Planning
Waikoloa Highlands Office
P. O. Box 3028
Waikoloa, Hawaii 96743

Dear Mr. Melrose:

West Hawaii Sanitary Landfill
Draft Environmental Impact Statement

We are in receipt of your letter of August 29, 1991 regarding the subject project. The following has been prepared in response to your comments.

1. Item nos. 1 & 2, Solid Waste Data and Waikoloa Wells
The text of the EIS will be revised to reflect your recommended changes.

2. Transfer Station
The predominant types of vehicles expected at the new landfill will be commercially-owned compactors, trailers, and the like. The County will not be including a transfer station at the Puuanahulu site.

3. Future Access from Queen Kaahumanu Highway
Preliminary indications from the State Department of Transportation is that access to the landfill site will be off a frontage road when Queen Kaahumanu Highway becomes a divided four or six lane freeway. Discussions regarding other improvements relative to the widening of Queen Kaahumanu Highway as they affect the landfill have yet to occur.

Last but not least, we would be happy to meet with you to discuss the current site design and visual mitigation details.

Thank you for your participation in the planning process of this important project.

Sincerely,

Bruce C. McClure

Bruce McClure
Chief Engineer

cc: OEQC
Hawaii County Planning Dept.
R. M. Towill Corp.

Doris and Earl Bakken
c/o Roy A. Vitousek III
Cades Schutte Fleming & Wright
B-303 Hualalai Center
75-170 Hualalai Road
Kailua-Kona, Hawaii 96740
September 4, 1991

Mr. Norman Hayashi
Director of County of Hawaii
Planning Department
25 Aupuni Street
Hilo, Hawaii 96720

Re: West Hawaii Sanitary Landfill DEIS
Puuanahulu, North Kona, Hawaii
TMK: 7-1-03:1 (por)

Dear Mr. Hayashi:

We live at Kiholo Bay, North Kona. Because of the proximity of the proposed West Hawaii Sanitary Landfill to our home, we requested an opportunity to comment on the draft Environmental Impact Statement. We are very concerned about the quality of the environment of North Kona and South Kohala, and we appreciate this opportunity to comment on the draft Environmental Impact Statement.

First, we certainly agree that West Hawaii requires a new sanitary landfill. We also feel it is very important that the County continue to evaluate and implement alternative methods of waste disposal, including recycling and resource recovery. While the sanitary landfill may be a necessary part of a solid waste disposal system, we hope that the County will place greater emphasis on alternative solid waste reduction and disposal methods.

Secondly, we certainly believe that the location of the proposed landfill site, as evaluated in the draft Environmental Impact Statement, is far superior to the previous site. We think the present site substantially reduces the adverse visual impacts and potential fire impacts, and indeed substantially reduces a number of other potential environmental impacts, because of the location of a majority of the new proposed site on the 1859 lava flow. We would urge that the entire landfill site be restricted to the 1859 lava flow and that no work be done on the nearby older pahoehoe flows.

We are concerned about potential groundwater contamination as we utilize on-site sources for all of our potable water needs. We utilize a reverse osmosis desalinization system but we are still very concerned about groundwater quality and the potential for groundwater contamination. In reviewing the Environmental Impact Statement we are somewhat confused as to the methods you intend to use to reduce the potential for groundwater contamination. In Section 1.4.1, you mentioned utilizing "a liner with a 10^{-7} impermeability is being considered to line the bottom of the landfill to prevent leakage of leachate onto the ground . . . . In a later portion of the draft Environmental Impact Statement, you mention "a soil compacted membrane of up to 24 inches in thickness will be used to line the bottom of the landfill to help prevent leachate migration into the groundwater table over the life cycle of the landfill."

We were unclear as to whether the "soil compacted membrane" and the "liner of 10^{-7} impermeability" referred to the same thing or whether there was an inconsistency in the draft Environmental Impact Statement.

Further, even if we accepted that the system as designed would prevent leakage of leachate into the ground, what would happen if the membrane and/or liner were damaged? How would you know whether there was damage to the membrane or failure of the membrane to actually prevent migration of leachate into the groundwater? Are there monitoring wells planned and, if so, how many and where will they be located? Is there a means of locating the area of rupture or damage? In other words, if leachate migration into the groundwater is detected, how would the situation be corrected?

We are concerned as to the potential impact of leachate not only on our drinking water but on the near shore environment as well. As you may know, Kiholo Bay serves as a refuge for large numbers of green sea turtles. There has been an ongoing turtle tagging project sponsored by the National Marine Fisheries Service and Hawaii Preparatory Academy which has, over the years, tagged literally hundreds of green sea, and recently Hawksbill, turtles in Kiholo Bay. Interestingly, <u>none</u> of the turtles captured during this project has suffered from the tumors which seem to have become so common in green sea turtles in other Hawaiian waters. Certainly, special care must be taken to protect the quality of the near-shore water quality in this area.

The draft Environmental Impact Statement contains a basic discussion of leachate collection and treatment system. Again, while the system may be adequate in design, it is clear that a considerable amount of ongoing maintenance and monitoring will be required to keep the system working. This is true of many other aspects of the landfill management plan. We are concerned that adequate provision be made for professional management of the landfill. We are concerned about the danger of explosion from methane gases and odor from hydrogen sulfide. Our particular concern with respect to methane explosions is not only for safety of people at the landfill, but for the potential fire. Our concern with respect to the hydrogen sulfide is odor.

Kiholo Bay is located southwest of the proposed site. As stated in the odor control portion of the draft Environmental Impact Statement, "prevailing wind conditions during the day are from the northeast." This means that our home may be exposed to odor problems. We recognize that "odor problems will be minimized by proper landfill operation and cover," and that "potential odor problems that the closest populated areas are facing will be minimized by the practice of daily soil cover." Again, we are concerned that the ongoing management of the landfill be conducted in a professional manner. The existing Kealakehe Landfill has a substantial odor, vector, and air quality problems. Presumably these problems also could have been minimized by the practice of daily soil cover and by proper landfill operation. They were not, and we have little assurance that simply moving to a new location would improve the quality of landfill management. Because so many aspects of the potential environmental impacts of the project are dependent upon, and would be minimized by proper landfill management, we think the Environmental Impact Statement should deal specifically with the County's plans for upgrading and professionalizing their landfill management. In the alternative, experienced professional managers should be hired by the County and/or bids be given for the contract to operate the landfill.

We are also concerned as to where the County intends to obtain fill material. This is not made clear in the Environmental Impact Statement. It seems unlikely that adequate fill material is available on site. If fill material has to come from somewhere else, where will it come from? If it requires developing new soil quarries, isn't this an environmental impact generated by the proposed landfill project which should be considered in the draft Environmental Impact Statement? We would be particularly concerned if any effort is made to quarry fill material from the Puuanahulu ridge or cinder cones. This area represents a unique and beautiful geologic feature on the West Hawaii coast which should not be disrupted by cinder, soil, or cover material mining.

We are vitally concerned about fire. We are concerned for the safety of ourselves and our home, and we are also

concerned about potential impact on unique dryland forest environments, the Puuanahulu and Pu'uwa'awa'a region. We would hope that the proposed landfill would be situated entirely on the 1859 lava flow so as to reduce the potential for fire. We also hope that appropriate fire protection services, such as an adequate water supply and adequate pumping capacity, would be in place at the landfill site.

We are also quite concerned about litter. It is our hope that adequate steps will be taken to enforce the County's ordinances relative to littering, both "intentional" and "accidental" by not adequately covering loads on the way to the landfill. We would hope that a fence would be installed around the landfill site and along the access road to prevent windblown litter from getting off site. We would also hope that the landfill management and staff would pick up litter along the fence and in the landfill area on a regular basis. We consider the days of operation of the landfill should be seven days a week rather than six days a week. We are concerned that closing the landfill may lead to unscrupulous individuals just dumping their solid waste along the sides of Kaahumanu Highway or on turnoff areas from the highway.

Finally, it our hope that the County of Hawaii will work closely with the State Department of Health, the Federal Environmental Protection Agency, and other concerned agencies in staying current with respect to landfill management and technology. We have to realize that if this proposed landfill is built, it will be with us forever. We must do all we can to prevent loss or degradation of our beautiful, unique marine and terrestrial environments in West Hawaii.

Again, thank you for the opportunity to comment with respect to the draft Environmental Impact Statement.

Very truly yours,

Randy Urbanrue

Doris and Earl Bakken

cc: County of Hawaii, Dept. of Public Works
c/o Director, Bruce McClure
RM Towell Corporation
Attn: Collette Sakota

Lorraine R. Inouye
Mayor

Bruce C. McClure
Chief Engineer

Laurence E. Capellas
Deputy Chief Engineer

Department of Public Works

County of Hawaii • 25 Aupuni Street, Room 202 • Hilo, Hawaii 96720 • (808) 961-8321 • Fax (808) 969-7138

October 8, 1991

Doris and Earl Bakken
c/o Roy A. Vitousek III
Cades Schutte Fleming & Wright
B-303 Hualalai Center
75-170 Hualalai Road
Kailua-Kona, Hawaii 96740

Dear Doris & Earl Bakken:

West Hawaii Sanitary Landfill
Draft Environmental Impact Statement

We are in receipt of your letter of September 4, 1991 regarding the subject project. The following has been prepared in response to your comments and questions.

1. Groundwater Protection Against Leachate Contamination
We have recently arrived at a decision on the choice of a liner system for the proposed West Hawaii landfill. It will be a double liner whereby the bottom will be lined with a high density polyethylene material and the upper layer consisting of a soil bentonite composition. This bentonite layer will then be covered with yet another thick polyethylene material. This liner system is an even more conservative method of leachate protection that has been proposed in the new Federal Subtitle D Environmental Protection Agency (EPA) regulations. Within the site, a leachate collection system of pipes will be constructed. Periodic emptying of the pipes will occur and the collected leachate will be taken to a nearby wastewater treatment plant.

   As another precautionary measure, monitoring wells will be placed above the landfill site to first of all, establish a baseline for existing groundwater conditions, and below the site to allow for testing while the landfill is in operation. Should there be a detection of leachate in the monitoring well, the County is considering several alternatives including, 1) pumping the water up from the well and treating it, or 2) bio-remediation.

2. Landfill Management
The West Hawaii landfill, as all new landfills, will be managed in strictest accordance with the newly approved Federal Subtitle D EPA regulations. The new regulations are the result of the need to protect groundwater resources and to minimize the risks to the environment posed by landfills. These regulations sets guidelines for the design, construction and management of sanitary landfills. The County is studying the possibility of contracting an experienced, private landfill management company to operate the new West Hawaii landfill.

3. Cover Material
The lava rocks that will be excavated to a depth of 30 feet below grade to begin construction of the landfill will be used as cover material. The amount of cover soil required is approximately 4 to 1; that is, for every 4 parts of refuse, 1 part cover material is needed. This crushed lava, which will be sufficient in supply, will be applied daily.

4. Fire Prevention
The County is still investigating the feasibility of constructing its own brackish water well for the purpose of preventing the spread of fires on the project site. A decision will be made before the start of construction. However, our discussions with Oahu landfill operators (Waste Management, a private professional landfill operator who operates landfills across the nation) indicate that the best method of preventing the spread of fires on site is smothering with dirt.

5. Litter Control
The perimeter of the landfill will be surrounded by a 8+ foot tall fence that will trap windblown litter. The private operator of the Waimanalo Gulch landfill on Oahu said that windblown litter is picked up daily to prevent trash from blowing off the project site. This policy will also be applied at the West Hawaii landfill.

   State regulations require covering of loads being taken to landfills. Further, we are expecting that the predominant types of vehicles utilizing this landfill will be commercially-operated compactors, trailers and the like, rather than open pickups driven by private citizens. Transfer stations, which are open 24 hours daily, will continue to be available in key areas for trash drop offs by private citizens.

Last but not least, you can be assured that the County will be working closely with the Federal EPA, State Department of Health, and all concerned and affected agencies in staying current with regard to landfill management and technology.

Thank you for participation in the planning process of this important project.

Sincerely,

Bruce C. McClure

Bruce McClure
Chief Engineer

cc: OEQC
County Planning Dept.
R. M. Towill Corp.

JOHN WAIHEE
Governor

STATE OF HAWAII
OFFICE OF ENVIRONMENTAL QUALITY CONTROL
220 SOUTH KING STREET
FOURTH FLOOR
HONOLULU HAWAII 96813

BRIAN J. J. CHOY
Director

RECEIVED SEP 5 1991

September 4, 1991

Ms. Colette Sakoda
R. M. Towill Corporation
420 Waiakamilo Road, #411
Honolulu, Hawaii 96817

Dear Ms. Sakoda:

This is written in reference to the draft environmental impact statement (EIS) for the West Hawaii Sanitary Landfill.

The Office of Environmental Quality Control offers the following comments for your consideration. Citations indicating applicable authority from the Hawaii Administrative Rules (HAR) follow each comment in brackets and is provided for your information.

1. Please include in Section 1 (Summary) a brief discussion of unresolved issues described in Section 8. [HAR §11-200-17(b)]

2. In Section 5, please provide a listing of necessary approvals (in tabular format) which include; a description of the approval; approving agency; and the current status of the approval. [HAR §11-200-17(h)]

3. Since the proposed action constitutes a direct/indirect source of pollution as prescribed by a government agency, please include any necessary data (e.g. physico-chemical analyses) which characterize such pollution. [HAR §11-200-17(i)]

4. Please indicate in the draft EIS where the administrative requirements of HAR §11-200-17(j) (RELATIONSHIP BETWEEN LOCAL SHORT TERM USES OF HUMANITY'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG TERM PRODUCTIVITY) is met.

Thank you for the opportunity to comment. If you have any questions, please call Leslie Segundo at 586-4185.

Very truly yours,

Brian J. J. Choy

BRIAN J. J. CHOY
Director

cc: Norman Hayashi, County of Hawaii
Bruce McClure, P.E., County of Hawaii, Dept. of Public Works

Department of Public Works

Lorraine R. Inouye
Mayor

Bruce C. McClure
Chief Engineer

Laurence E. Capellas
Deputy Chief Engineer

County of Hawaii • 25 Aupuni Street, Room 202 • Hilo, Hawaii 96720 • (808) 961-8321 • Fax (808) 969-7138

October 8, 1991

Mr. Brian J. J. Choy
Director
State Office of Environmental Quality Control
220 So. King Street, Fourth Floor
Honolulu, Hawaii 96813

Dear Mr. Choy:

West Hawaii Sanitary Landfill
Draft Environmental Impact Statement

We are in receipt of your letter of September 4, 1991 regarding the subject project. The following has been prepared in response to your comments:

1. A discussion of unresolved issues will be included in Section 1 (Summary) as described in Section 8.

2. A listing of necessary approvals will be provided in Section 5.

3. The Department of Health (DOH) would normally be the reviewing agency requiring any data as part of the Solid Waste Management Permit application. However, DOH understands that a double liner system will be used to line the bottom and sides of the new sanitary landfill to prevent leakage of leachate that would otherwise have threatened potential groundwater sources, etc. Thus, DOH does not require any data (telecon with J. Ikeda on 9/17/91) per se that might characterize any potential direct/indirect source of pollution.

   However, the Final EIS will contain a discussion on the composition of leachate that have generally either been found or could possibly be found from landfills, and the methods of monitoring and mitigation measures for any possible contamination.

4. In accordance with HAR Section 11-200-17(j), the discussion that addresses "Relationship Between Local Short-Term Uses of Man's Environment and the Maintenance and Enhancement of Long-Term Productivity," is already included as Section 7.2 in the Draft EIS.

Thank you for your participation in the planning process of this important project.

Sincerely,

Bruce C. McClure
Bruce McClure
Chief Engineer

cc: R. M. Towill Corp.
Hawaii County Planning Dept.

Kohala Coast

September 5, 1991

Mr. Bruce McClure
Chief Engineer
Department of Public Works
County of Hawaii 25 Aupuni Street
Hilo, Hawaii 96720

RE: WEST HAWAII SANITARY LANDFILL--
DRAFT ENVIRONMENTAL IMPACT STATEMENT (EIS)

Dear Mr. McClure;

The Kohala Coast Resort Association members have reviewed the draft environmental impact statement and offer the following comments for your consideration in preparing the final EIS.

1. The new landfill should accommodate the integrated solid waste management concept within the first phase of site development including recycling, green waste compost, other reuse facilities and a transfer station for the remainder of the waste stream sorted onsite. Provisions to accommodate sludge from municipal and private sewage treatment plants into the compost operation might be beneficial.

2. As stated in our November 28, 1990 letter, we feel the landfill should be professionally managed by a company successful in operating landfills in which recycling, recovery, vector, litter, odor and noise controls are vital parts of their operations. They should manage the new landfill from the start and in compliance with the Environmental Protection Agency, Department of Health and other applicable County, State and Federal regulations.

3. The revised location shall be contained south of the lava ridge, which is in the North Kona district, about one-and-a-half miles south of the South Kohala/North Kona district boundary. If land filling is to occur within 1,000 feet mauka of the power line corridor then an undulating berm, covered with natural (non crushed or track rolled) lava should be constructed along the entire makai boundary to serve as a visual barrier to the landfilling activity.

..more..

"365 Days of Sunshine"

4. The maximum landfill height of thirty (30) feet above existing grade is verified in the EIS.

5. Representations concerning visual mitigation and re-vegetation need to be consistent throughout the EIS. Reuse as a recreational park, as stated in Section 3.7.2--paragraph B, (page 3-14) is inconsistent. Re-vegetation should be consistent with the surrounding flora.

6. If Queen Kaahumanu highway is widened to a four or six lane divided freeway, as presently proposed by the Department of Transportation, how will access to the landfill be provided?

Kohala Coast Resort Association members represent a substantial contribution to the economy of Hawaii County. Adverse affects on this resort industry will not be beneficial to either the County, State, or our members. These comments are consistent with those provided in November 1990. Your consideration of these remarks in the final EIS is appreciated.

Kohala Coast Resort Association requested to be a consulted party in the site design of the first increment of the landfill.

Thank you for your time.

Sincerely,

THOS ROHR
PRESIDENT
Kohala Coast Resort Association

cc: Bill Mielcke, Mauna Kea Properties
Adi Kohler, Mauna Kea Beach Hotel
Max Yuki, Mauna Lani Resort
Charles Park,Mauna Lani Bay Hotel and Bungalows
Herve Humler, Ritz-Carlton, Mauna Lani
Pat Cowell, Hyatt Regency Waikoloa
Paul Pastoor, The Royal Waikoloan
Colette Sakoda, R.M. Towill

Lorraine R. Inouye
Mayor
Bruce C. McClure
Chief Engineer
Laurence E. Capellas
Deputy Chief Engineer

Department of Public Works

County of Hawaii • 25 Aupuni Street, Room 202 • Hilo, Hawaii 96720 • (808) 961-8321 • Fax (808) 969-7138

October 8, 1991

Mr. Thos Rohr
President
Kohala Coast Resort Association
HC02 Box 5300
Kohala Coast, Hawaii 96743

Dear Mr. Rohr:

West Hawaii Sanitary Landfill
Draft Environmental Impact Statement

We have received your letter of September 5, 1991 regarding the subject project. The following has been prepared in response to your comments.

1. Integrated Solid Waste Management System
Your recommendation that the recycling, composting and other waste reuse facilities be accommodated within the first phase of site development is also desirable by the County. The engineering design that is currently underway includes the siting of these facilities within the project site. The possible accommodation of sludge from municipal and private sewage treatment plants into the compost operation will be taken under advisement.

2. Private Management of the Landfill
The Department of Public Works is studying the alternative of private management at this time. However, the management of the new landfill will be in strict compliance with the Environmental Protection Agency, Department of Health, and other applicable County, State and Federal regulations, no matter who is responsible for the overall and day-to-day management.

3. Locational and Aesthetic Considerations
As was described in earlier correspondence (May 28, 1991), with the reorientation of the landfill, the 1,000-foot setback will be located on the lower 15% of the 300-acre site. The further back (mauka) we begin, the higher the elevation and visibility of the landfill will be. As was described in the Draft EIS, the engineering grading and design are incorporating a landform alteration approach. This means that unique design features such as an undulating perimeter berm that will be covered with lava rocks to serve as a visual barrier.

4. Re-Use of Site Upon Landfill Closure
Reuse of the landfill site following its closure in 25 years may be a recreational park. Other sites elsewhere have been developed into golf courses. No vegetation is allowed on cell (phase) capping-- it is, however, allowed only on the final closure cap.

5. Future Access off Queen Kaahumanu
The final access road design will have to be approved by the Department of Transportation. Preliminary indications from the DOT are that the landfill access road will be connected in the future to a frontage road system when Queen Kaahumanu Highway is upgraded to a high-speed, divided freeway facility.

We would be happy to meet with you to provide you an update on the site design and first increment of the landfill at your convenience. Thank you for your participation in the planning process of this important project.

Sincerely,

Bruce C. McClure

Bruce McClure
Chief Engineer

cc: OEQC
County Planning Dept.
R. M. Towill Corp.

Hawaii Electric Light Company, Inc. • PO Box ... • Hilo, HI 96721-1027

GENPP
H-H/G

September 5, 1991

Planning Department
County of Hawaii
25 Aupuni Street
Hilo, Hawaii 96720

Attention: Mr. Norman Hayashi

Gentlemen:

Subject: West Hawaii Sanitary Landfill
Draft Environmental Impact Statement
Puu Anahulu, North Kohala

BACKGROUND

In mid-1988, Hawaii Electric Light Company (HELCO) hired the environmental engineering consulting firm CH2M Hill to evaluate alternative sites for an electric generation power plant to be located in West Hawaii. The study responded to the need to identify potential power plant sites capable of accommodating 200MW of generating equipment. CH2M Hill concluded that two sites at Kawaihae appeared most suitable for a power plant facility and that the vicinity of the County of Hawaii's proposed Puu Anahulu landfill warranted further study.

Early in 1990, HELCO hired CH2M Hill to conduct further analysis of the Puu Anahulu area. As a result of the 1990 work, CH2M Hill identified two alternative sites at Puu Anahulu as possible power plant sites.

Subsequently, during the fall of 1990, the County of Hawaii reconsidered the location of the proposed Puu Anahulu landfill and re-sited the facility at the site that is the subject of the above captioned draft environmental impact statement (EIS). The site presently being considered for the landfill is in very close proximity to one of the two sites that CH2M Hill recommended as a possible power plant site.

COMMENTS

The landfill site now being considered and HELCO's possible siting of a power plant at Puu Anahulu are viewed by HELCO as being compatible uses that could potentially complement each other.

If both facilities were to be developed in close proximity to each other, on either adjacent sites or a shared site, it would be possible to share certain costs for the development of infrastructure. These include items such as an access road and water system improvements. The close proximity of the landfill site and HELCO's power plant could also be mutually beneficial should a garbage-to-energy plant be installed in the future.

HELCO would like to state its interest in acquiring approximately 10 acres of land on the mauka portion of the area currently planned for multi-use development within the proposed landfill site. The 10-acre property would be utilized for the installation of initial generating units and required support facilities with the possibility of expanding mauka on State land for future power generation requirements.

We look forward to coordinating HELCO's power plant siting with the County on the basis that it does not detract from either the planning done for the landfill or the County's schedule for the development of the project.

Sincerely,

Clyde H. Nagata

Clyde H. Nagata, Manager
Engineering Department

CHN:DK:ts

cc: County of Hawaii, Department of Public Works
R. M. Towill Corp.
CH2M Hill

Department of Public Works

County of Hawaii • 25 Aupuni Street, Room 202 • Hilo, Hawaii 96720 • (808) 961-8321 • Fax (808) 969-7138

Lorraine R. Inouye
Mayor

Bruce C. McClure
Chief Engineer

Laurence E. Capellas
Deputy Chief Engineer

October 8, 1991

Mr. Clyde H. Nagata, Manager
Engineering Department
Hawaiian Electric Light Company, Inc.
P. O. Box 1027
Hilo, Hawaii 96721-1027

Dear Mr. Nagata:

West Hawaii Sanitary Landfill
Draft Environmental Impact Statement

We are in receipt of your letter of September 5, 1991 regarding the subject project. Your comments relative to the economic advantages to co-location of your proposed electric generation plant with the County's sanitary landfill are important considerations. The County will also be taking other issues, including impacts on view planes, into consideration as well.

Thank you for your comments and recommendations.

Sincerely,

Bruce C. McClure
Bruce McClure
Chief Engineer

cc: OEQC
R. M. Towill Corp.

Alan Lowrey Brown
P.O. Box 2047 Kamuela Hawaii 96743

Mr. Norman Hayashi
County Planning Dept.
25 Aupuni St.
Hilo, HI
96720

September 6, 1991

Dear Mr. Hayashi:

I am writing in response to the DEIS for the West Hawaii Sanitary Landfill as I am a part owner along with my two brothers and sister of the 15 acre parcel of land that fronts Keawaiki Bay. The land, fish ponds and home have been placed on the national, state and county historic register and have been designated a Historic Residence. I believe it is the only home with such a designation in the county. While we agree that a new facility is needed we are perplexed to learn that the landfill site has been relocated so close to our home and that there may be adverse affects for us.

Our first concern is that leachate may penetrate the 24" compacted soil membrane and as "*the soils of the area are extremely permeable*" will migrate to and pollute our fish pond and then the waters of Keawaiki Bay which is classified as Class AA. The ponds at Wainana'alii, inland of Pueo Bay, and Weli Weli will also be affected. Both the Bishop Museum and the Nature Conservancy have studied the Keawaiki pond as it is a primary example of the brackish ponds found on the Kohala Coast. We have recently entered into an agreement with the Maui Economic Opportunity Office to help us restore the mullet and awa breeding in the pond. As the report states "*Potential contamination by leachate migration is the primary adverse impact of the proposed project. This impact is a long term concern since leachate migration can occur during land fill development as well as long after the land fill is closed.*" Since it appears that the landfill will contain all types of petroleum products, pesticides, herbicides, batteries and all other toxic materials that our society uses and discards, a contaminated

leachate that reaches our pond and then the ocean would be tragic. And while the report says " *A 100-300 foot wide, black sand beach approximately 2,500 feet in length, covers most of the shoreline in Keawaiki Bay. Black sand beaches are generally known to attract green turtles (Hawksbill turtles are the endangered species) for foraging purposes. However, there is no documented evidence of existing green turtle habitat.*" That statement is false as there is an area on the north portion of the bay where turtles have historically fed and I saw a turtle there the weekend of 8-27-91 while kyaking. The report further says " *A soil compacted membrane of up to 24" in thickness will be used to line the bottom of the landfill to help prevent leachate migration into the groundwater table over the life of the landfill.*" The proposed monitoring wells makai of the site will only identify the pollution problem not stop it. Nor will they identify where the leaks are occurring so no action can be taken to stop the leaking. All that will be known is that pollution is present. Thus, even if EPA requirements are met, there is no assurance that this highly contaminated leachate can not enter the groundwater 200 feet below then reach our pond and continue into the Class AA ocean water which is only 6,600 feet from the site.

The next concern is "*Homes near Keawaiki may be adversely impacted by odors from the landfill during the day. Daily soil cover will be placed to minimize these odors.*" The best soil for that daily covering is a "*mixture of sand, silt and clay*" but that type of soil is not available any where near the site or maybe anywhere on the island so a course mixture of crushed lava from the site will be used because of cost factors. Since that is not optimum, we will certainly suffer the consequences as will the people travelling on the Queen Ka'ahumanu Hwy. This is an adverse impression the visitors will receive before entering the Waikoloa, Mauna Lani and Mauna Kea resort areas.

We are also disturbed by the real danger of a major fire. No water is available to the site and the comment that "*Tapping into a brackish, non potable water source for this type of use is possible, however, the development, operation, and maintenance of such a facility will*

(3)

cost a minimum of approximately $150,000." indicates that solution will not be used because of the cost. The Kona dump has burned so often why are we to assume that this one wont burn? Because our property is at risk, a non solution is not acceptable.

"*Noise, furtive dust, fuel emissions and odor: These nuisance -type problems are inherent to the required activities and unavoidable. However, these impacts will not be significant and will cease when the land fill is closed.*" These problems may not be considered significant but to our home and the quiet life style we enjoy it will be devastating. Waiting 25 years for the dump to close is not a comforting thought.

A vital subject not given <u>any</u> consideration in the report is the wind. At any time of the year significantly, strong trade winds do blow through the area. The refuse will not be covered fast enough to prevent scattering as it first must be "*spread in thin layers; compaction to the smallest practical volume; and daily covering.*" There will be a great deal of litter down wind even reaching the highway and the proposed 8' fence will hardly be a sufficient barrier. Because there is not the manpower to retrieve the rubbish, will it all just remain strewn about the landscape?

The endemic and endangered Hawaiian Hoary Bat while not seen at the site are much in evidence at our home. Some evenings there are as many as 6 catching insects over the pond. Also, the Black Crowned Night Heron is a frequent resident of our fish pond with up to 4 birds present during certain times of the year.

"*SMA boundry line runs approximately parallel to the coastline and 15,000 feet inland. The proposed project site is not situated within this SMA.*" Since the site is within 6,600 feet of the ocean there is a mistake in that statement.

It is disturbing to read that two viable sites were "*deleted to its proximity to future public recreational (hunting grounds) facilities.*" Why should hunting goats in a future public hunting grounds be a reason to move the site into close proximity to a residence?

(4)

We are disappointed that since "*Several private homes adjacent to Keawaiki Bar* (sic) *are the closest populated area located about one and one-half miles northwest of the project site.*" no contributor to this report asked for our in put to a project of such magnitude and so close to our home.

We feel that lack of any consideration given to the strong winds in the area and the affect it will have on the landfill make this report inadequate. In conclusion we ask that at the very least the site be moved to the upper U.I.C. line and that we be included in all further action concerning the landfill.

Sincerely,

Alan Lowrey Brown

Alan Lowrey Brown
and for:
Zadoc W. Brown Jr.
Cynthia B. Quisenberry
David T. Brown

Department of Public Works
County of Hawaii • 25 Aupuni Street, Room 202 • Hilo, Hawaii 96720 • (808) 961-8321 • Fax (808) 969-7138

Lorraine R. Inouye
Mayor

Bruce C. McClure
Chief Engineer

Laurence E. Capellas
Deputy Chief Engineer

October 8, 1991

Mr. Alan L. Brown
P. O. Box 2047
Kamuela, Hawaii 96743

Dear Mr. Brown:

West Hawaii Sanitary Landfill
Draft Environmental Impact Statement

We have received your letter of September 6, 1991 regarding the subject project. The following has been prepared in response to your comments. These written responses were initially discussed at our meeting in my office on September 25, 1991.

1. Potential leachate contamination
The bottom and sides of the new sanitary landfill in Puuanahulu will be lined with a double liner system to prevent any possible leachate from seeping into groundwater sources or travelling into underground areas to affect the ocean and its resources 6,600 feet away from the site. The bottom liner will be an extremely dense polyethylene liner. Attached to the upper side of this liner will be a bentonite soil membrane that will expand when moistened and become water tight. Another polyethylene liner will be placed above this soil layer.

The use of this double liner system is an indication of the extreme caution the County is exercising in the development and management of any new landfill to prevent any possible threat to the residents' health and safety. Stringent standards are being set by the federal government (EPA's Subtitle D regulations) in the construction and maintenance of new landfills. However, the method described herein is even more conservative that any of the proposed standards indicated in the Subtitle D rules which were recently approved.

2. Odors from the Landfill
Daily soil cover is the best prescribed method for the prevention of adverse odor impacts on surrounding areas. This has been confirmed by private and public landfill operators on Oahu.

3. Fires
The prescribed method of fire control by landfill operators (Waste Management, a national private corporation who professionally manages landfills across the nation) on Oahu is to use dirt to smother fires as well as to design a firebreak road around the perimeter of the landfill site.

We are still pursuing the possibility of constructing our own source of potable water in the project area. This may be used as an alternate fire control method.

4. Noise, Dust, Fuel Emissions
Noise, dust and fuel emissions are unavoidable impacts associated with a sanitary landfill. However, the cells within the project site will be surrounded by a series of berms and the cells will be excavated down approximately 25 feet below existing grades. Operations will be conducted during daytime hours thereby restricting any noise, dust and fuel emissions impacts within a one-mile radius during the day. Further, noises and dust dissipate as they move away from the project site.

5. Strong Winds
The northeast tradewinds flowing from Waimea average 40-50 miles per hour in velocity mainly during the summer months. Paper and other light-weight trash will be contained within the landfill site by the construction of hog wire fencing of 8+ foot heights surrounding the perimeter of each cell. Further, the landfill operator, as a daily maintenance program, make sure that windblown trash will be picked up.

6. Endangered Avifauna
Your reference to the spotting of the Hawaiian Hoary Bat and the Black Crowned Night Heron are on your property and removed from the proposed landfill site. These species are known to frequent coastal areas and forests. Since the project site is in an open lava field, none of these species were expected to be seen, and the field survey conducted by our consulting biologist confirmed this.

7. <u>SMA Boundary</u>
The text of the EIS will be revised to reflect the fact that the Special Management Area (SMA) boundary line runs parallel with Queen Kaahumanu Highway. Thus, as stated in the Draft EIS, the project site <u>is</u> not situated within the SMA.

8. <u>Other Sites Considered</u>
Alternative sites on State-owned land that were considered by the advisory committee on solid waste management were determined to be too close in proximity to other public recreational grounds that would have contained conflicting uses with the landfill in terms of safety to public facilities users and increasing the chances of fires with recreational users (such as hunters and hikers) in the vicinity.

9. <u>Consultation</u>
While the project site was chosen following a lengthy site consideration process that involved County and State public officials, West Hawaii resort and other business representatives, and area residents, the planning process is still ongoing.

We welcome your comments during the next phases of the planning process. You will be receiving a copy of the Final EIS upon publication and you will be included in the Special Permit proceedings at the County Planning Commission.

Thank you for your recommendations and your participation in the planning process of this important project.

Sincerely,

Bruce C. McClure
Bruce McClure
Chief Engineer

cc: OEQC
County Planning Dept.
R. M. Towill Corp.

University of Hawaii at Manoa

Environmental Center
A Unit of Water Resources Research Center
Crawford 317 • 2550 Campus Road • Honolulu, Hawaii 96822
Telephone: (808) [illegible]

September 6, 1991
RE:0588

Mayor, County of Hawaii
c/o Department of Public Works
Attn: Bruce McClure, P.E.
27 Aupuni Street
Hilo, Hawaii 96720

Dear Mayor Inouye:

Draft Environmental Impact Statement (DEIS)
West Hawaii Sanitary Landfill
North Kona, Hawaii

The above referenced project proposes construction of a 300 acre sanitary landfill in Puuanahulu, North Kona, to meet increasing solid waste disposal needs of the West Hawaii Region on the Island of Hawaii. This project is intended to be an integral part of a long-range integrated solid waste management system which may include recycling and composting.

Our comments on the West Hawaii Sanitary Landfill DEIS were prepared with the assistance of Yu-Si Fok and Ed Murabayashi of the Water Resources Research Center; Frank Peterson, Geophysics; Harlan Hashimoto, School of Public Health; Reginald Young, College of Engineering; and Alex Buttaro of the Environmental Center.

Paper Conservation

Significantly less paper would have been needed if the text of this document had been printed on both sides of each page and was single rather than double spaced. Incorporating this suggested format in the EIS would make the document thinner and smaller, thereby requiring less filing space, reducing draft and final EIS production costs, and presenting a more reader-friendly document.

Language and Style

Section 1.4.1 (page 1-4) states, "Because a liner with 10 (to the minus seventh) impermeability is being considered to line the bottom of the

landfill to prevent the leakage of leachate into the ground, nearshore water resources are not expected to be endangered." What substantive mitigation of potential impacts to nearshore waters is offered by the mere consideration of an impermeable liner? This statement should either be omitted or restructured in the FEIS so the conclusion necessarily follows from the premise. Poorly structured statements such as these may be interpreted as reflecting project advocacy and should be omitted from EIS documents. Aside from the logical flaw noted, the correct term is "permeability," not "impermeability." Furthermore, as used, the quantity is meaningless, since no units are specified.

Water Supply

Section 4.2.2 (page 4-12) states that "As part of a fire containment plan to prevent the spread of fire at the landfill site, a well may be dug to make availabe [sic] a constant supply of brackish water." What criteria will be applied to determine whether or not the well will be dug? Our reviewers strongly recommend that a source of water be made available as part of a fire containment plan, and to mitigate fugitive dust impacts.

Also, this document mistakenly states that Waikoloa Wells 01 and 02 at elevations 60 and 70 feet are potable water sources; this is certainly not the case, as they are sources of brackish water used for irrigation (see p. 3-15 of this document).

Leachate Production and Water Quality

Our reviewers note the section describing Leachate Production and Water Quality (section 3.8.B, page 3-16) inadequately addressed the confinement and collection of leachate and the impacts it will have a brackish irrigation water and brackish waters which have potential for de-salinized uses in the future. We suggest that the County consider using impermeable synthetic lining materials which are able to seal the bottom of the landfill so that there is virtually no leachate percolation out of the landfill. The "liner method" is much more effective than using soil as a sealant, because soil is permeable, whereas the synthetic liners are impermeable.

Source of Soil Fill Cover

Substantial quantities of soil fill will be required to meet regulatory requirements for a sanitary landfill operation. Consequently, intended sources for such fill must be specified, and potential environmental consequences of soil procurement and transport should be disclosed. We note that the proposed solid waste site has virtually no soil material within its boundaries and therefore assume that it will have to be transported in from adjacent areas. Our reviewers note that it would be an unfortunate loss if the unusual geologic structures of the cones of Puu Anahulu were excavated for the land fill soil cover.

Archaeological Resources

Although the archaeological consultant recommended preservation of site -15,409 (CSH1), this document does not state what the department actually intends to do with the site. On what basis and to what extent will the recommendations of the archaeological consultant be either ignored or incorporated?

Recycling and Composting

This document should include a more thorough discussion of the size and design of anticipated recycling and composting operations and the various environmental impacts these operations will entail.

General Summary

Our reviewers expressed serious concern over the DEIS's sparse and apparently insufficient discussion of the effects of leachate on the quality of existing groundwater resources. Additionally, a more thorough discussion should be provided describing the source and transport of soil fill. This information should be provided in the Final EIS pursuant to Section 11-200-17 of Title 11 EIS Rules, which requires that all relevant and feasible consequences and implications of an action be disclosed and evaluated.

Thank you for the opportunity to review this document and we hope you will find our comments helpful.

Sincerely,

John T. Harrison, Ph.D.
Environmental Coordinator

cc: OEQC
Norman Hayashi, County Planning Department
~~Bruce McClure, County of Hawaii Department of Public Works~~
Collette Sakoda, R.M. Towill Corp. ✓
Roger Fujioka
Y.S. Fok
Ed Murabayashi
Harlan Hashimoto
Frank Peterson
Reginald Young
Alex Buttaro

Lorraine R. Inouye, Mayor
Bruce C. McClure, Chief Engineer
Laurence E. Capellas, Deputy Chief Engineer

Department of Public Works

County of Hawaii • 25 Aupuni Street, Room 202 • Hilo, Hawaii 96720 • (808) 961-8321 • Fax (808) 969-7138

October 8, 1991

John T. Harrison, Ph.D.
Environmental Coordinator
University of Hawaii at Manoa
Environmental Center
2550 Campus Road, Crawford 317
Honolulu, Hawaii 96822

Dear Dr. Harrison:

West Hawaii Sanitary Landfill
Draft Environmental Impact Statement

We are in receipt of your letter of September 6, 1991 regarding the subject project. The following has been prepared in response to your comments.

1. Paper Conservation
Your comments and recommendations regarding ways of conserving material have been taken under advisement.

2. Language and Style
Your editorial comments have been noted and appropriate revisions will be incorporated in the text.

3. Water Supply
Per Waste Management, a professional private corporation which operates landfills across the nation and who operates the City and County of Honolulu Waimanalo Landfill, the most effective method of fire containment used in a landfill site is smothering with dirt. The appropriate type of water for fire containment will be potable water. The engineering design will include water lines for potable water in the short term. However, the actual provision of potable water will follow the geotechnical study that is currently underway.

   The definition of the type of water available at Waikoloa Wells 01 and 02 (elevations 60 and 70) will be revised to reflect that they are sources of brackish water.

4. Leachate Production and Water Quality
Our landfill design engineers have concluded during this last month, that a double liner system will be used for the new sanitary landfill in Puuanahulu. The bottom and sides of the landfill will be lined with an extremely dense polyethylene liner. Attached to the upper side of this liner will be a bentonite soil membrane that will expand when moistened and become watertight. This soil membrane will then be covered with yet another thick polyethylene liner.

The double liner system described above is an extremely conservative leachate leakage prevention method-- more conservative than that recommended in the proposed EPA Subtitle D rules.

5. <u>Source of Soil Fill Cover</u>
The source of the cover soil material will be the lava rocks that will be excavated for the project and in the vicinity. The rocks will be crushed and applied on a daily basis. Excavated lava for each increment of the project will be used as this supply will be plentiful.

6. <u>Archaeological Resources</u>
The archaeologist's recommendation of site preservation for -15,409 (CSH1) will be carried out by the County of Hawaii. As a follow up to the consultant's recommendation, the site will be minimally tested to determine the extent of overall significance through analysis of recovered materials.

7. <u>Recycling and Composting</u>
As of this date, the County's integrated solid waste management system is not developed to a level that will enable detailed discussion of the size and design of anticipated recycling and composting operations and the various environmental impacts these operations will entail. However, a general discussion of what the expected impacts and appropriate mitigation measures are (based on similar operations elsewhere), will be included in the Final EIS.

8. <u>General Summary</u>
Discussion of the effects of leachate on the quality of existing groundwater resources will be included in the Final EIS. As earlier explained, the site's lava rocks that will be excavated to construct the various increments of the landfill will be crushed and used as soil cover. Impacts will be minimal because local material will be utilized thereby allowing the visible portion of the landfill to blend in with its surrounding in a cost effective manner.

Thank you for your participation in the planning process of this project.

Sincerely,

Bruce C. McClure

Bruce McClure
Chief Engineer

cc: OEQC
County Planning Department
R. M. Towill Corp.

Planning Department
25 Aupuni Street, Room 109 • Hilo, Hawaii 96720 • (808) 961-8288

Lorraine R. Inouye
Mayor
Norman K. Hayashi
Director
Tad Nagasako
Deputy Director

September 6, 1991

Ms. Colette Sakoda
R. M. Towill Corp.
420 Waiakamilo Rd., Room 411
Honolulu, HI 96817

Dear Ms. Sakoda:

Draft Environmental Impact Statement
West Hawaii Sanitary Landfill

Thank you for the opportunity to review and comment on the Draft EIS for the proposed West Hawaii Sanitary Landfill. We provide you with the following comments:

1. Page 1-1:

   The applicant should be noted as County of Hawaii, Department of Public Works.

2. Page 1-2:

   The EIS states that the document has been prepared to fulfill the requirements for a State Land Use Commission Special Permit for use of agriculture-designated lands. It would be a more appropriate statement to state that the Final EIS will be used as a supporting document during the Special Permit process.

3. Pages 1-5, 3-19 and 3-20:

   The EIS should include firmer analysis of viewplanes and visual impacts. More discussion and illustrations from various location points (Mamalahoa Highway, Queen Kaahumanu Highway, Waikoloa, coastal areas, etc.) need to be included in the EIS. In addition, the visual impact of the proposed access road, fencing along the access road and entry way need to be discussed.

4. Page 1-9:

   The County of Hawaii will initially petition for a Special Permit from the County Planning Commission.

5. Page 1-10:

   Plan Approval from the Planning Department will be required, and as such, this should be added to the list of necessary approvals.

6. Page 2-1:

   A map showing the location of the originally proposed landfill site in relation to the new site should be included in the EIS.

7. Page 3-2:

   The landfill site will be situated within the ahupuaa of Puuanahulu rather than Puuwaawaa as stated.

8. Page 3-3:

   Adjacent landownership should be discussed and illustrated, including Bohnett's lease lands and other State leases on the property or in the vicinity.

9. Page 3-4:

   Reference is made on possibility of importation of cover material. The EIS needs further detail discussion on this as to where such cover material will be obtained from and how much will be needed.

10. Page 3-5:

    The project site is located in Puuanahulu rather than Pueo as stated.

11. Page 4-4:

    The planned public hunting reserve should be identified on a map and the distance from the project site should be noted.

12. Page 5-3:

    The State's policy Section 15(b) (1) refers primarily to sewerage facilities. It would be more appropriate to cite Section 15(b) (2) and (3) of the State's policies with regards to solid waste.

13. Page 5-3:

Discussion on the State West Hawaii Regional Plan should be included in the EIS.

14. Page 5-3:

The updated County of Hawaii General Plan has been adopted since November 1989. Hence, reference to a draft General Plan should be revised accordingly. The LUPAG Map designates the project area as Extensive Agriculture rather than Unplanned as stated. In addition, paragraph 2 of said section should be discussed under County Zoning (Page 5-3).

15. Page 6-6 and 6-7:

The EIS should include a map(s) showing the locations of the alternative sites.

16. The project description should also discuss any accessory uses or structures such as maintenance buildings, etc.

17. Please be informed that the County is in the process of formulating a Northwest Hawaii Development and Open Space Plan.

18. Figures 1-3, 3-3, 3-4 and 4-1 should illustrate a common proposed access road alignment. In addition, the location of the alignment should be included in the Unresolved Issues section as a topography study, archaeological survey and botanical survey have not been conducted for the alignment area.

19. Reference to Special Use Permit throughout the document should be changed to Special Permit.

20. Typographical errors on Pages 1-3, 2-1, 4-4, 4-11, 4-12, 5-7, and 6-4.

Should you have any questions, please feel free to contact Alice Kawaha of this office.

Sincerely,

NORMAN K. HAYASHI
Planning Director

AK:smo
2986D
cc: Bruce McClure, Chief Engineer
Brian J. Choy, OEQC

Department of Public Works
County of Hawaii • 25 Aupuni Street, Room 202 • Hilo, Hawaii 96720 • (808) 961-8321 • Fax (808) 969-7138

Lorraine R. Inouye
Mayor
Bruce C. McClure
Chief Engineer
Laurence E. Capellas
Deputy Chief Engineer

October 8, 1991

Mr. Norman Hayashi
Director
County of Hawaii Planning Department
25 Aupuni Street, Room 109
Hilo, Hawaii 96720

Dear Mr. Hayashi:

West Hawaii Sanitary Landfill
Draft Environmental Impact Statement

We are in receipt of your letter of September 6, 1991 regarding the subject project. The following has been prepared in response to your comments and recommendations.

1. Item nos. 1, 2, 4, 5, 7, 10, 14, 18, 19, and 20
These recommended changes to the text of the EIS have been noted, and will be reflected in the Final EIS.

2. Item no. 3, Viewplanes and Visual Impacts
Firmer analysis of viewplanes and visual impacts will be included in the Final EIS.

3. Item nos. 6, 8, 11, and 15
Additional discussions and illustrations regarding locations of previously considered sites, adjacent landownership and lease lands, planned hunting reserve relative to the project site, as appropriate, will be included in the Final EIS.

4. Item no. 9, Cover Material
The discussion on the type and required amount of cover material will be updated in the Final EIS.

5. Item nos. 12 and 13, Public Plans and Policies
The discussion regarding the project's consistency with the State's policies on solid waste will be added.

The project's consistency with the State West Hawaii Regional Plan will be discussed in the Final EIS.

6. Item no. 16, Structures
The project description will include discussion of any accessory uses or structures such as maintenance buildings.

The County's ongoing development of a Northwest Hawaii Development and Open Space Plan has been noted.

Your comments and recommendations during the planning phase of this important project are appreciated.

Sincerely,

Bruce C. McClure
Bruce McClure
Chief Engineer

cc: OEQC
R. M. Towill Corp.

REC'D SEP 9 1991

P.O. Box 1405
Kamuela, Hawaii
96743
September 6, 1991

Norman Hayashi
County Planning Department
25 Aupuni Street
Hilo, Hawaii 96720

Dear Sir,

Having just returned to the islands, and having been made aware of the Puuanahulu landfill EIS and its deadline for comments today, on the deadline date itself, I have had time for only one reading of the draft report.

However, I feel that my comments will be of value.

My immediate reaction to the whole project is that we the people are heading toward sacrificing another piece of clean land to landfill because we have not woken up to the reality that our land and resources are finite.

The choking, noxious reality of the Kealakehe landfill will be repeated on this new site if the plan is accepted as laid down.

We have tried to keep that disgusting pile at Kealakehe under control for years, with no success, and a history of waste and pollution, industrial accident and illness. We will repeat that mistake if we accept this plan.

I say this because we are looking at the

problem in the wrong way.

If we the people were presented with a stringent governmental policy for recycling, we would comply. We would, because we'd be fined otherwise.

It is my opinion that recycling ought not to be an alternative but an imperative.

I believe this because we are paying anyway, by accepting less than the best for our health, our wealth, our land and our sea.

We can turn the problem around. Instead of beginning with a great huge new landfill, we can consider where the "trash" comes from.

We can buy selectively, avoiding those materials that cannot be used more than once - styrofoam, disposible diapers, plastic wrap - once again, I am so newly returned that I do not know in full what can be returned here.

We can wash out and sort all the returnable containers and materials we use. Clean trash becomes useful materials - easy for us to take to the recycling depot. We could have the stores from which we take single use materials be responsible for recycling them.

We can agitate for government monies to be applied to recycling.

We can compost all that high percentage of organic waste, which we will have faithfully kept seperate from all the other materials, long

3

it, and sell it. Compost is like nice clean dirt when properly done. It beats smelling groundup garbage. And we now import garden compost from the mainland at a high cost. Consider the shipping.

We can be imaginative. We can separate and stockpile materials. We can think long term. If we say "these things are not valuable now", we will be missing the lesson that history has taught us when we considered hiring someone at a cost of millions to mine the landfill at Kealakehe to reclaim materials.

The point is, separated materials, excluding toxics, do not pollute, they do not smell, create gasses, or threaten our health.

Let us begin right, and right now, not at that point when we do so out of desperation, in a sick and empty world.

Yours sincerely

Pat Godfrey

P.S. In addition, I do not believe that two days and two evenings are enough to do the animal and shore occupants of the area justice.

Lorraine R. Inouye
Mayor

Bruce C. McClure
Chief Engineer

Laurence E. Capellas
Deputy Chief Engineer

Department of Public Works

County of Hawaii • 25 Aupuni Street, Room 202 • Hilo, Hawaii 96720 • (808) 961-8321 • Fax (808) 969-7138

October 8, 1991

Pat Godfrey
P. O. Box 1405
Kamuela, Hawaii 96743

Dear Ms. Godfrey:

West Hawaii Sanitary Landfill
Draft Environmental Impact Statement

We have received your letter of September 6, 1991 regarding the subject project. The following has been prepared to provide you with an update on the County's efforts in developing and implementing an integrated solid waste management system.

The County has taken the initiative to develop an effective integrated solid waste management system in which the landfill in West Hawaii will be but one component along with alternatives including recycling and resource recovery. We proactively helped to develop and implement a County plan early this year to carry out the State policy of having each County (Hawaii, Maui, Kauai, and Honolulu) formalize its integrated solid waste management plans. The County has contracted with the Barrett Consulting Group to develop and operationalize our solid waste management plan that is intended to focus on waste reduction. Barrett was also contracted to develop a green waste reduction system for the County.

While the Hawaii State Legislature in 1991 adopted a long-range plan (Act 324 of 1991) that directs the island counties to develop and implement integrated solid waste management plans with the objective of achieving an overall waste reduction by 50 percent by the year 2000, the County of Hawaii earlier began seeking ways to reduce its waste production through viable methods including recycling and green waste processing. The proposed West Hawaii landfill site will, as a result, include an area for reuse and recycling facilities for operations such as green waste composting in the near future.

Although there are a number of different methods to treat and dispose of solid waste, the sanitary landfill remains an indispensable part of the solution. It is by far the most common method of waste disposal. Incineration, recycling and resource recovery are utilized to a lesser extent. Reliance on sanitary landfills could be reduced by increased use of these alternative methods. Each method produces by-products requiring a landfill for final disposal; i.e., non-recyclable materials, and non-processibles and ash from recycling and incineration methods respectively, and solid waste from transfer stations.

Last but not least, the West Hawaii landfill, like all other landfills in the planning and development stages, will be designed, constructed, managed and maintained under newly adopted Federal (Environmental Protection Agency) Subtitle D regulations. The Motivated by the need to protect groundwater resources and to minimize the risks to the environment posed by landfills, the Federal government has adopted more stringent regulations for solid waste disposal facilities. One of the major requirements under these new regulations will be that the bottom liner of the landfill be impermeable so that leachate will not be allowed the chance of seeping through the bottom and into groundwater resources.

We appreciate your recommendations regarding the management of solid waste disposal. We share in your concerns and comments about the need to actively move forward in the reduction of waste volume, and hope that this update on the County's actions toward that same goal is helpful.

Sincerely,

Bruce C. McClure

Bruce McClure
Chief Engineer

cc: OEQC
Hawaii County Planning Dept.
R. M. Towill Corp.

JOHN WAIHEE
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
P. O. BOX 621
HONOLULU, HAWAII 96809

WILLIAM W. PATY, CHAIRPERSON
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AQUACULTURE DEVELOPMENT PROGRAM
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CONVEYANCES
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION PROGRAM
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

REF:OCEA:SKK

SEP 10 1991

FILE NO.: 92-070
DOC. NO.: 1569E

RECD SEP 11 1991

The Honorable Norman K. Hayashi
Director
Planning Department
County of Hawaii
25 Aupuni Street
Hilo, Hawaii 96720

Dear Mr. Hayashi:

SUBJECT: West Hawaii Sanitary Landfill Draft
Environmental Impact Statement
Location: Puuanahulu, North Kona, Hawaii
TMK: 7-1-3: 01

Thank you for giving our Department the opportunity to comment on this matter. We have reviewed the materials you submitted and have the following comments.

Brief Description:

A 300-acre sanitary landfill is being proposed for the Ahupuaa of Puuanahulu, about 6,600 feet inland from Pueo and Keawaiki Bays. Precautions proposed for this landfill site include:

1. a system of perforated pipes to be laid first for leachate collection;

2. a soil layer (maximum depth = 24") to serve as a liner for the landfill;

3. soil filling of any lava tube discovered during the course of the landfill development (to reduce the likelihood of runoff reaching the sea); and

4. developing the site so that rainfall and runoff are to be directed away from the land (to reduce leachate production).

AQUATIC RESOURCES COMMENTS:

All practical precautions appear to be considered for this proposed landfill. The low rainfall of this area (20-30"/year) also reduces the likelihood of leachate production and runoff. We have no suggestion for further precautions or mitigative measures at this time.

WATER RESOURCE MANAGEMENT COMMENTS:

The groundwater down gradient of the project site is currently unused and quite brackish. Nevertheless, DWRM supports the proposed measures to prevent leachates from entering the groundwater.

STATE PARKS COMMENTS:

To minimize visual intrusion, screen ~~paintings~~ plantings at strategic locations should be considered to mask litter control fencing and/or soften berms.

Thank you for your cooperation in this matter. Please feel free to call me or Sam Lemmo at our Office of Conservation and Environmental Affairs, at 548-7837, should you have any questions.

Very truly yours,

WILLIAM W. PATY

cc: County of Hawaii
Dept. of Public Works
R. M. Towill Corp.

Lorraine R. Inouye
Mayor

Bruce C. McClure
Chief Engineer

Laurence E. Capellas
Deputy Chief Engineer

Department of Public Works

County of Hawaii • 25 Aupuni Street, Room 202 • Hilo, Hawaii 96720 • (808) 961-8321 • Fax (808) 969-7138

October 8, 1991

Honorable William W. Paty
Chairperson
Board of Land and Natural Resources
P. O. Box 621
Honolulu, Hawaii 96809

Dear Mr. Paty:

West Hawaii Sanitary Landfill
Draft Environmental Impact Statement

We are in receipt of your letter dated September 10, 1991 (File No.: 92-070, Doc. No.: 1569E). In response to the recommendation from State Parks regarding the use of screen plantings to minimize visual intrusion, we will take the comment under advisement.

Thank you for your participation in the planning process of this important project.

Sincerely,

Bruce C. McClure

Bruce McClure
Chief Engineer

cc: OEQC
Hawaii County Planning Dept.
R. M. Towill Corp.

JOHN WAIHEE
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813-5097

EDWARD Y. HIRATA
DIRECTOR

DEPUTY DIRECTORS
AL PANG
JOYCE T. OMINE
JEANNE K. SCHULTZ
CALVIN M. TSUDA

IN REPLY REFER TO:
HWY-PS
2.8633

REC'D SEP 13 1991

September 12, 1991

Mr. Norman K. Hayashi
Director
Planning Department
County of Hawaii
25 Aupuni Street, Room 109
Hilo, Hawaii 96720

Dear Mr. Hayashi:

Draft Environmental Impact Statement,
West Hawaii Sanitary Landfill,
Puuanahulu, North Kona, Hawaii
TMK: 7-1-03: por. 1

We are providing the following comments on the subject document.

1. The channelization of the intersection of the landfill access road and Queen Kaahumanu Highway and any required improvements should be implemented by the developer at no cost to the State. Street lighting should be provided at this intersection.

2. Construction plans for work within the State highway right-of-way should be submitted for our review and approval.

3. The landfill access road will be connected in the future to a frontage road system when Queen Kaahumanu Highway is upgraded to a high-speed, limited access, divided freeway facility.

4. Visual and aesthetic considerations should be incorporated during planning/design phases of the landfill. Lava rock berms should be considered to visually screen the landfill site from the highway and coastal areas.

5. The Traffic Impact Analysis Report should discuss impacts based on traffic volumes and safety. It should mention and evaluate other feasible accesses to the site.

Very truly yours,

Edward Y. Hirata
Director of Transportation

bc: R.M. Towill Corp. (Colette Sakoda)

Department of Public Works

County of Hawaii • 25 Aupuni Street, Room 202 • Hilo, Hawaii 96720 • (808) 961-8321 • Fax (808) 969-7138

Lorraine R. Inouye
Mayor

Bruce C. McClure
Chief Engineer

Laurence E. Capellas
Deputy Chief Engineer

October 8, 1991

Mr. Edward Hirata
Director
State Department of Transportation
869 Punchbowl Street
Honolulu, Hawaii 96813-5097

Dear Mr. Hirata:

West Hawaii Sanitary Landfill
Draft Environmental Impact Statement

We are in receipt of your letter dated September 12, 1991 regarding the subject project. The following has been prepared in response to your comments and recommendations:

1. Necessary intersection improvements including channelization will be implemented as a County-funded project. If required, street lighting will be provided.

2. Construction plans for work within the State highway right-of-way will be submitted for DOT's review and approval.

3. The landfill access road is being designed with the anticipated future connection to a frontage road system when Queen Kaahumanu Highway is upgraded to a high-speed, limited access, divided freeway facility.

4. Visual and aesthetic screening to minimize any potential adverse impacts to views from public roadways and the coastal areas is being incorporated into the design process at present. Landform alteration mitigation measures include varying and undulating the shape of the berm around the perimeter of the entire site, for example.

5. The Traffic Impact Analysis Report discusses the project impacts based on traffic volumes and safety. The conclusion drawn by the traffic consultant is that the increase in traffic as a result of the project will have very little impact on existing traffic volumes in the project vicinity.

Thank you for your participation in the planning process of this important project.

Sincerely,

Bruce C. McClure

Bruce McClure
Chief Engineer

cc: OEQC
County Planning Dept.
R. M. Towill Corp.

JOHN WAIHEE
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
P. O. BOX 621
HONOLULU, HAWAII 96809

WILLIAM W. PATY, CHAIRPERSON
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LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

REF:OCEA:SKK

SEP 23 1991

FILE NO.: 92-070
DOC. NO.: 1686E

The Honorable Norman K. Hayashi
Director
Planning Department
County of Hawaii
25 Aupuni Street
Hilo, Hawaii 96720

Dear Mr. Hayashi:

Subject: Additional Comments
Draft EIS -- West Hawaii Sanitary Landfill
Location: Puuanahulu, North Kona, Hawaii
TMK: 7-1-03: 1 (por.)

HISTORIC PRESERVATION DIVISION CONCERNS:

At this time, we must conclude that the project has not yet undergone acceptable archaeological inventory survey. After the initial archaeological inventory survey (Appendix B -- Archaeological Survey of the Proposed West Hawaii Landfill Site, Puuanahulu, North Kona, Hawaii, Borthwick, Folk, Hammatt and Stride, July 1991), the boundaries of the project area were apparently shifted to avoid some of the historic sites found. This left two areas unsurveyed; approximately 40 acres immediately north of the survey area and the proposed access road to the landfill. These areas need to undergo archaeological inventory survey, and until an acceptable inventory of significant historic sites is available, we are unable to evaluate the effects of this project on such sites.

We, can however, comment on the initial inventory survey report and the incorporation of its findings and recommendations in the Draft EIS. We concur that the survey adequately identifies all historic sites within the initially defined project area. Although the survey did not include 100% surface coverage of this area, we feel that, when combined, the described survey sweeps and the extensive aerial coverage are sufficient. Ground visibility is excellent in the area and the probability of historic sites is low on the 1859 lava flow which dominates the project area. A total of six sites were found including four lava tubes used for shelter or habitation, a C-shaped wall probably used for shelter and a small quarry area.

Sufficient information is presented on these sites and on the archaeology and history of the region to evaluate the significance of these sites. We concur that the five sites identified (# 15410, 15411, 15412, 15413 and 15414) are significant for the information they contain (Criterion "d") and that one (# 15,409) is also significant as a good example of site type (Criteria "c" and "d"). We also concur with the general mitigation measures proposed for those site which will probably be directly or indirectly effected by construction or use of the landfill. Sites 15409 and 15414 should undergo additional data recovery and 15409 should also be preserved in place.

Sections of the Draft EIS which deal with historic preservation should more adequately reflect the status of historic preservation compliance and the results and recommendations of the completed inventory survey. Some of these inconsistencies or omissions are discussed below:

1. Again, the survey does not cover the entire project area. This needs to be clearly pointed out, along with the fact that survey of the area is needed.

2. The Draft EIS (p. 1-5; 4-6) lists three sites (CSH-1, CSH-5 and CSH-6) as being in the outer reaches of the project area or within it. In Figure 4-1, only two of these sites are shown as being within the project boundaries. The archaeological report in Appendix B only discusses two sites, both outside the immediate project area, which could be affected by use of the landfill. The final EIS should present one map showing the locations of all identified sites which will or could be damaged by construction and use of the landfill and should, now that they are available, use their official State Site Inventory numbers. The significance of each site should also be discussed in a manner consistent with the archaeological inventory report.

3. Proposed mitigation measures for each potentially effected site should be specified EIS or a strong commitment made to prepare and implement a specific mitigation plan which must be reviewed and approved by our office. We agree that a 200 foot buffer is adequate to protect CSH-1 and that some data recovery work is warranted, but we also need to know that measures will be taken to protect the site during construction and, later, during use of the landfill. This mitigation plan should include such measures as temporary and permanent fencing around a designated buffer zone. In the case of CSH-1, we also feel that the full, downslope extent of the lava tube should be explored as part of the data recovery work. This precaution could be important given the probability of burials in lava tubes in this general area.

If you have any questions about this review, please call me or Holly McEldowney at 587-0008, or our Office of Conservation and Environmental Affairs, at 548-7837.

Very truly yours,

WILLIAM W. PATY

cc: OEQC

Department of Public Works

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Lorraine R. Inouye
Mayor

Bruce C. McClure
Chief Engineer

Laurence E. Capellas
Deputy Chief Engineer

October 8, 1991

Honorable William Paty
Chairperson
Department of Land and Natural Resources
P. O. Box 621
Honolulu, Hawaii 96809

Dear Mr. Paty:

West Hawaii Sanitary Landfill
<u>Draft Environmental Impact Statement</u>

We have received a copy of an interoffice memo dated September 11, 1991 from Don Hibbard of the State Historic Preservation Office to Roger Evans of the Office of Conservation and Environmental Affairs. The following has been prepared in response to your staff's comments and concerns.

1. <u>Additional Survey Work and Report of Findings</u>
   The consulting archaeologists have completed their field survey of the additional acreage including the proposed access road alignment and the northern portion that is planned to contain the recycling and waste re-use processing facility. The archaeological report will be summarized in the final EIS, and the report in its entirety will be included in the appendix of the document.

2. <u>Inventoried Sites</u>
   The text discussion and Figure illustration locating the three sites (CSH-1, CSH-5 and CSH-6) will be revised to reflect a consistent discussion of the archaeological inventory report.

3. <u>Mitigation Measures</u>
   The site identified as CSH-1 will be protected with appropriate fencing during construction, and then with permanent fencing after construction. This commitment to implementing these mitigation measures will be reflected in the Final EIS.

Thank you for your participation in the planning process of this important project.

Sincerely,

Bruce C. McClure

Bruce McClure
Chief Engineer

cc: OEQC
Hawaii County Planning Dept.
R. M. Towill Corp.

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1. County of Maui, Final Environmental Impact Statement - Central Maui Sanitary Landfill, prepared for the Department of Public Works, prepared by R. M. Towill Corporation, 1985.

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APPENDIX A

BOTANICAL SURVEY

BOTANICAL SURVEY

WEST HAWAI'I SANITARY LANDFILL

NORTH KONA DISTRICT, ISLAND OF HAWAI'I

by

Winona P. Char

CHAR & ASSOCIATES
Botanical/Environmental Consultants
Honolulu, Hawai'i

Prepared for: R.M. Towill Corporation

July 1991

BOTANICAL SURVEY
WEST HAWAI'I SANITARY LANDFILL
NORTH KONA DISTRICT, ISLAND OF HAWAI'I

INTRODUCTION

The County of Hawai'i proposes to develop a new ±300-acre sanitary land fill to service West Hawai'i (North and South Kona and North and South Kohala). The Kealakehe landfill site is nearing capacity and with the rapid growth of parts of West Hawai'i, a new landfill site is needed to meet future refuse disposal needs. The project site is located largely on the sparsely vegetated Lava Flow of 1859 within the Ahupua'a of Pu'u-anahulu in North Kona. The site is located east (mauka) of a HELCO utility line which runs parallel to and mauka of the Queen Ka'ahumanu Highway.

Field studies to assess the botanical resources found on the project site were conducted on 21 April 1991. The primary objectives of the survey were to: 1) describe the major vegetation types; 2) inventory the flora; and 3) search for threatened and endangered species protected by Federal and State laws.

SURVEY METHODS

Prior to undertaking the field studies, a search was made of the pertinent literature to familiarize the principal investigator with other botanical studies conducted in the general area. Topographic maps and recent, black and white aerial photographs were examined to determine vegetation cover patterns, terrain characteristics, access, boundaries, and reference points. Access was by foot from the Queen Ka'ahumanu Highway and then following along the service road under the utility line.

A walk-through survey method was used. Notes were made on plant distributions and associations, substrate types, topography, exposure, drainage, etc. Plants were indentified in the field; plants which could not be positively identified were collected for later determination in the herbarium and for comparison with the recent taxonomic literature.

The species recorded are indicative of the season ("rainy" vs. "dry") and the environmental conditions at the time of the survey. A survey taken at a different season and under varying environmental conditions would no doubt yield slight variations in the species list especially of the weedy, annual taxa.

DESCRIPTION OF THE VEGETATION

The mauka-makai alignment of the proposed sanitary landfill impacts the largely barren 1859 Lava Flow, which is composed of 'a'a lava. This is roughly about 85 to 90% of the project site. Somewhat densely vegetated areas, supporting fountain grass grassland, are found on the geologically older pahoehoe flows located on the northeastern corner and along portions of the south boundary line.

A more detailed description of the vegetation follows. A check-list of all those vascular plants encountered during the field studies is presented at the end of this report.

Fountain Grass Grassland

This vegetation type occurs on geologically older pahoehoe lava flows for the most part, and, occupies only a small percentage of the total project site, roughly 10 to 15% of the site. The fountain grass grassland can easily be picked up on the black and white aerial photographs as the lighter-colored areas; the 1859 Lava Flow appears as the darker black areas.

These weathered pahoehoe flows support a rather dense cover of the introduced fountain grass (Pennisetum setaceum) with scattered trees of kiawe (Prosopis pallida). The trees become somewhat more dense along the southwest portion of the boundary. Fountain grass cover varies from 60 to as much as 80%. Common shrubs and smaller shrubs or subshrubs associated with this vegetation type are indigo (Indigofera suffruticosa), 'uhaloa (Waltheria indica), 'ilima (Sida fallax), and pluchea (Pluchea symphytifolia). Locally common are small patches of pili grass (Heteropogon contortus).

This grassland is used by feral goats; goat droppings are occasional and some browsing damage to the vegetation can be seen in places.

'A'a Lava with Sparse Vegetation

A less well defined rift zone, which fans out on the northern slope of Mauna Loa, gave vent to the extensive Lava Flow of 1859 (Macdonald and Abbott 1970). This 'a'a lava flow covers almost the entire project site. The tumbled heaps of clinkery, sharp, and scoriaceous 'a'a lava are largely devoid of vegetation. Plant cover is very sparse, from 1 to 3% and tends to occur in small, scattered patches, usually in depressions. Fountain grass and pluchea are the most frequently seen plants on the flow. Occasionally, a few plants of hairy spurge (Chamaesyce hirta), 'uhaloa, kiawe, coat buttons (Tridax procumbens), and Portulaca pilosa can be found; these are usually associated with the fountain grass/pluchea patches in low-lying areas.

DISCUSSION AND RECOMMENDATIONS

The 1859 Lava Flow covers roughly 85 to 90% of the ±300-acre project site. Siting of the proposed landfill on this lava flow will not have a significant negative impact on the botanical resources as the flow is largely barren. The majority of the species that occur on the flow are introduced or alien species. The few natives found on the flow tend to be the more hardy, "weedy" types; these also occur elsewhere throughout the islands. The grassland areas cover only 10 to 15% of the site and are also dominated by introduced species as fountain grass and kiawe. Of a total of 28 species inventoried on the site, 23 (82%) are introduced; 4 (14%) are indigenous, i.e. native to the Hawaiian Islands and elsewhere; and 1 (4%) is endemic, i.e., native only to the islands. None of the native species are officially listed as threatened or endangered species (U. S. Fish and Wildlife Service 1989); nor are any candidate or proposed for such status (U. S. Fish and Wildlife Service 1990).

There is a small possibility that the grassland area may harbor a few plants of the pololei fern (Ophioglossum concinnum), a candidate endangered species. The plants are very ephemeral, appearing for only a few weeks during the rainy season. We did not see any plants during our survey in April 1991; it may have been too dry by then. The fern is associated with hummocky pahoehoe flows where soil has accumulated in pockets in depressions. The fern has been recorded from the Pu'uanahulu area at about the 640 ft. elevation (Char 1989a), from the Mauna Lani Resort area (1989b), and recently along the coast at Kua Bay, Maniniowali (Char 1991). If the grassland areas are to be actively used for the land fill site, then a more intensive search for the fern during the rainy season should be conducted. If the grassland areas are to be used as a buffer zone and not directly impacted, then a survey for the fern is not needed.

In summary, the proposed landfill project site is situated primarily on the 1859 Lava Flow which supports very sparse vegetion. Impacts to the botanical resources on this area are expected to be minimal. The grassland may harbor a candidate endangered

species, the pololei fern. A survey of the grasslands is recommended if these areas will be directly impacted by the proposed landfill. Also a reconnaissance of the access road corridor will need to be conducted when the final alignment has been selected.

As in the earlier site selection reports for a West Hawai'i landfill (Char 1989a), fires of human origin are a major concern. Fires in this region can spread quickly and jump from area to area in brisk wind conditions due to the highly flammable cover of fountain grass. The fire plan should be reviewed and approved by the State Division of Forestry and Wildlife as well as the appropriate County agencies.

LITERATURE CITED

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PLANT SPECIES LIST -- West Hawai'i Sanitary Landfill

A checklist of all those vascular plants inventoried during the survey is presented below. The plants are divided into three groups: Ferns, Monocots, and Dicots. The taxonomy and nomenclature of the Ferns follow Lamoureux (1984); the flowering plants, Monocots and Dicots, are in accordance with the most recent treatment of the flora by Wagner et al. (1990). Common English and/or Hawaiian names, for the most part, follow St. John (1973) or Porter (1972).

The following information is provided:

1. Scientific name with author citation.
2. Common English and/or Hawaiian name, when known.
3. Biogeographic status. The following symbols are used:
   E = endemic = native only to the Hawaiian Islands
   I = indigenous = native to the islands and also elsewhere throughout the Pacific
   X = introduced or alien = all those plant species brought to the islands intentionally or accidentally after Western contact (1778); not native.
4. Presence (+) or absence (-) of a particular species within each of two vegetation types recognized on the project site (see text for description):
   fgg = Fountain Grass Grassland
   lava = 'A'a Lava with Sparse Vegetation

Scientific name	Common name	Status	Vegetation type fgg	lava
FERNS				
NEPHROLEPIDACEAE (Sword Fern Family)				
Nephrolepis multiflora (Roxb.) Jarrett ex Morton	hairy sword fern	X	-	+
SINOPTERIDACEAE (Cliffbrake Fern Family)				
Doryopteris decipiens (Hook.) J. Sm.	'iwa'iwa, kumu-niu	E	-	+
FLOWERING PLANTS				
MONOCOTS				
POACEAE (Grass Family)				
Eragrostis tenella (L.) P. Beauv. ex Roem. & Schult.	lovegrass	X	+	+
Heteropogon contortus (L.) P. Beauv. ex Roem. & Schult.	pili, pili grass	I	+	-
Pennisetum setaceum (Forssk.) Chiov.	fountain grass	X	+	+
Rhynchelytrum repens (Willd.) Hubb.	Natal redtop	X	+	+
DICOTS				
ASTERACEAE (Daisy Family)				
Ageratum conyzoides L.	maile-hohono	X	+	+
Emilia fosbergii Nicol.	red-pualele	X	+	-
Gnaphalium purpureum L.	purple cudweed	X	+	-
Pluchea symphytifolia (Mill.) Gillis	pluchea	X	+	+
Sonchus oleraceus L.	milkweed, pua-lele	X	+	-
Tridax procumbens L.	coat buttons	X	+	+
CHENOPODIACEAE (Goosefoot Family)				
Chenopodium carinatum R. Br.	keeled goosefoot	X	+	-

Scientific name	Common name	Status	Vegetation type fgg	lava
CONVOLVULACEAE (Morning-glory Family)				
Ipomoea indica (J. Burm.) Merr.	koali-'awania	I	-	+
CUCURBITACEAE (Squash Family)				
Momordica charantia L.	wild bittermelon	X	+	+
EUPHORBIACEAE (Spurge Family)				
Chamaesyce hirta (L.) Millsp.	hairy spurge	X	+	+
FABACEAE (Pea Family)				
Chamaecrista nictitans (L.) Moench	partridge pea, lauki	X	+	+
Desmodium tortuosum (Sw.) DC.	Florida beggarweed	X	+	-
Indigofera suffruticosa Mill.	indigo, 'iniko	X	+	-
Prosopis pallida (Humb. & Bonpl. ex Willd.) Kunth	kiawe	X	+	+
GENTIANACEAE (Gentian Family)				
Centaurium erythraea Raf.	bitter herb	X	+	-
LAMIACEAE (Mint Family)				
Hyptis pectinata (L.) Poit.	comb hyptis	X	+	+
MALVACEAE (Mallow Family)				
Sida fallax Walp.	'ilima	I	+	-
MOLLUGINACEAE (Carpetweed Family)				
Mollugo cerviana (L.) Ser.	threadstem carpetweed	X	+	+
PORTULACACEAE (Purslane Family)				
Portulaca oleracea L.	common purslane, pigweed	X	+	-
Portulaca pilosa L.	'ihi	X	+	+

Scientific name	Common name	Status	Vegetation type fgg	lava
STERCULIACEAE (Cocoa Family)				
Waltheria indica L.	'uhaloa, hi'aloa, kanakaloa	I?	+	+
VERBENACEAE (Verbena Family)				
Lantana camara L.	lantana, lakana	X	+	-

APPENDIX B

ARCHAEOLOGICAL RECONNAISSANCE

Archaeological Survey for the Proposed West Hawai'i Landfill Pu'uanahulu, North Kona, Hawai'i

(TMK 3-7-1-1)

by

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prepared for

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by

Cultural Surveys Hawai'i
October 1991

Abstract

Cultural Surveys Hawaii conducted, at the request of R.M. Towill Corp., an archaeological assessment – including archaeological survey and a review of pertinent literature – for the proposed West Hawaii Landfill in Pu'uanahulu, North Kona. The survey of a roughly 550-acre parcel located six (6) archaeological sites - all on pahoehoe lava. The sites include a habitation cave, shelters and a quarry site. Based on these findings the landfill project area was adjusted to avoid the sites. The present configuration of the landfill (ca. 300 acres) is on 'a'ā lava of the 1859 Mauna Loa flow and the Kaniku flow upon which no sites were observed during Cultural Surveys Hawai'i's survey.

The review of pertinent literature indicated the landfill site is situated within what has been termed a "barren zone" (Rosendahl, 1973). The barren zone is generally characterized as an area with only temporary type habitation sites. The present survey findings tend to support this characterization.

Recommendations for further work include data recovery work at Sites 50-10-10-15,409 (a lava tube site) and -15,414 (a temporary shelter), followed by preservation "as is" of Site -15,409. Consultation with the State Historic Preservation Division of the Department of Land and Natural Resources should take place prior to formulation of a data recovery and preservation plan.

Acknowledgements

The authors wish to thank Ms. Colette Sakoda of R.M. Towill Corp. for her help in coordinating this project and Russ Figureroia of R.M. Towill's Kona Office for project support.

Word processing was performed by Dr. Vicki Creed of Windword Processing.

Fieldwork was conducted by William H. Folk, Douglas F. Borthwick and Richard Ballasteros.

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I. Introduction

A. Introduction

At the request of R.M. Towill Corp. Cultural Surveys Hawaii conducted an archaeological assessment of the proposed West Hawaii Landfill, Pu'uanahulu, North Kona, Hawaii Island. The assessment included a survey of an access road and a 550-acre parcel of land located *mauka* (east) of Queen Ka'ahumanu Hwy. with a review of the archaeological and historical literature pertinent to the project area. Following the survey the decision was made to realign the proposed West Hawaii Landfill project area, so as to exclude any archaeological sites. Presently, the proposed 300-acre landfill is situated on two adjoining 'a'ā lava flows on which no sites were observed. However, on older pahoehoe lave to the south and east of the proposed landfill six sites were observed, two of which are recommended for further research. This report will detail work done for the original survey area with background research applicable to Pu'uanahulu in general.

B. Scope of Work and Methods

Based on preliminary review of aerial photographs and historic and archaeological literature, a survey strategy utilizing aerial reconnaissance (helicopter) followed by surface survey of specific locations was agreed upon.

Aerial reconnaissance was conducted over a four-hour period on June 5, 1991. The reconnaissance consisted of low-level sweeps (north/south) over the project area with landings at four locations (designated sites). The landings allowed for inspection of individual sites when notes and photographs were also taken.

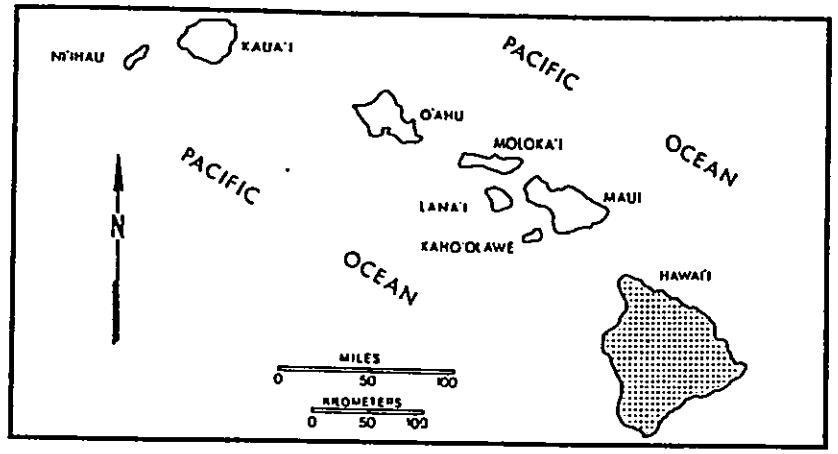

FIGURE 1
State of Hawai'i

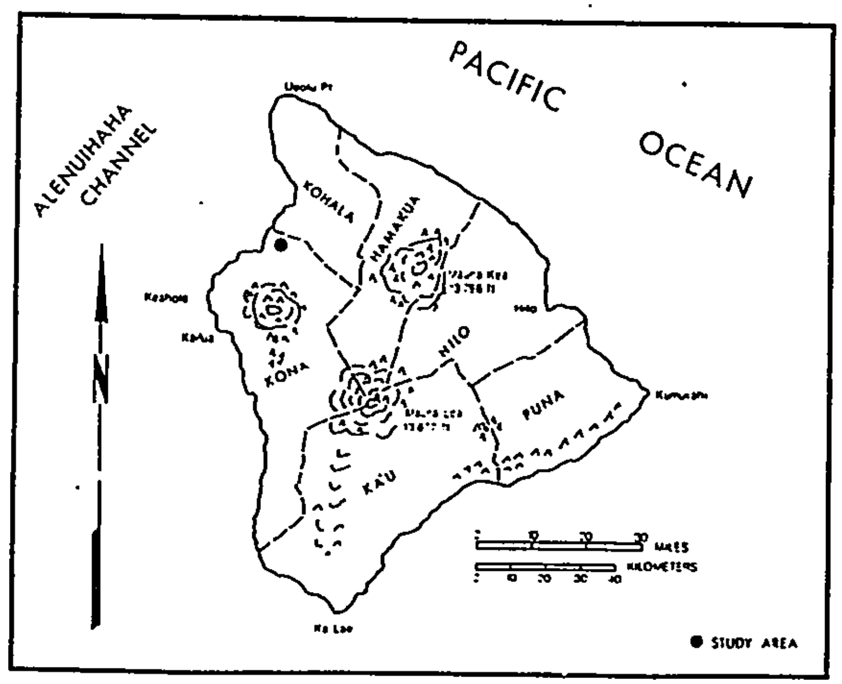

FIGURE 2
General Location Map, Hawai'i Island

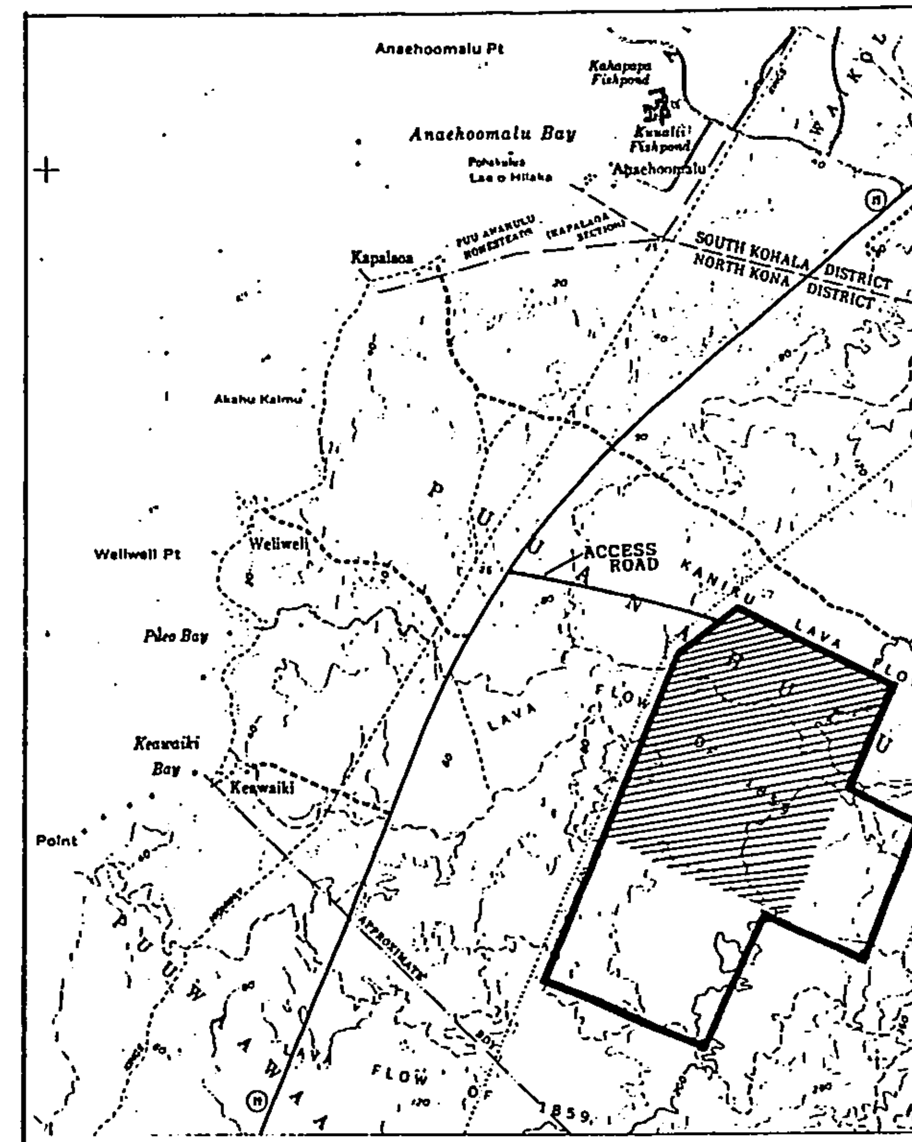

Fig. 3 USGS 'Anaeho'omalu Quad Map Showing Surveyed Area (outlined) and Proposed West Hawaii Landfill Site (hatched)

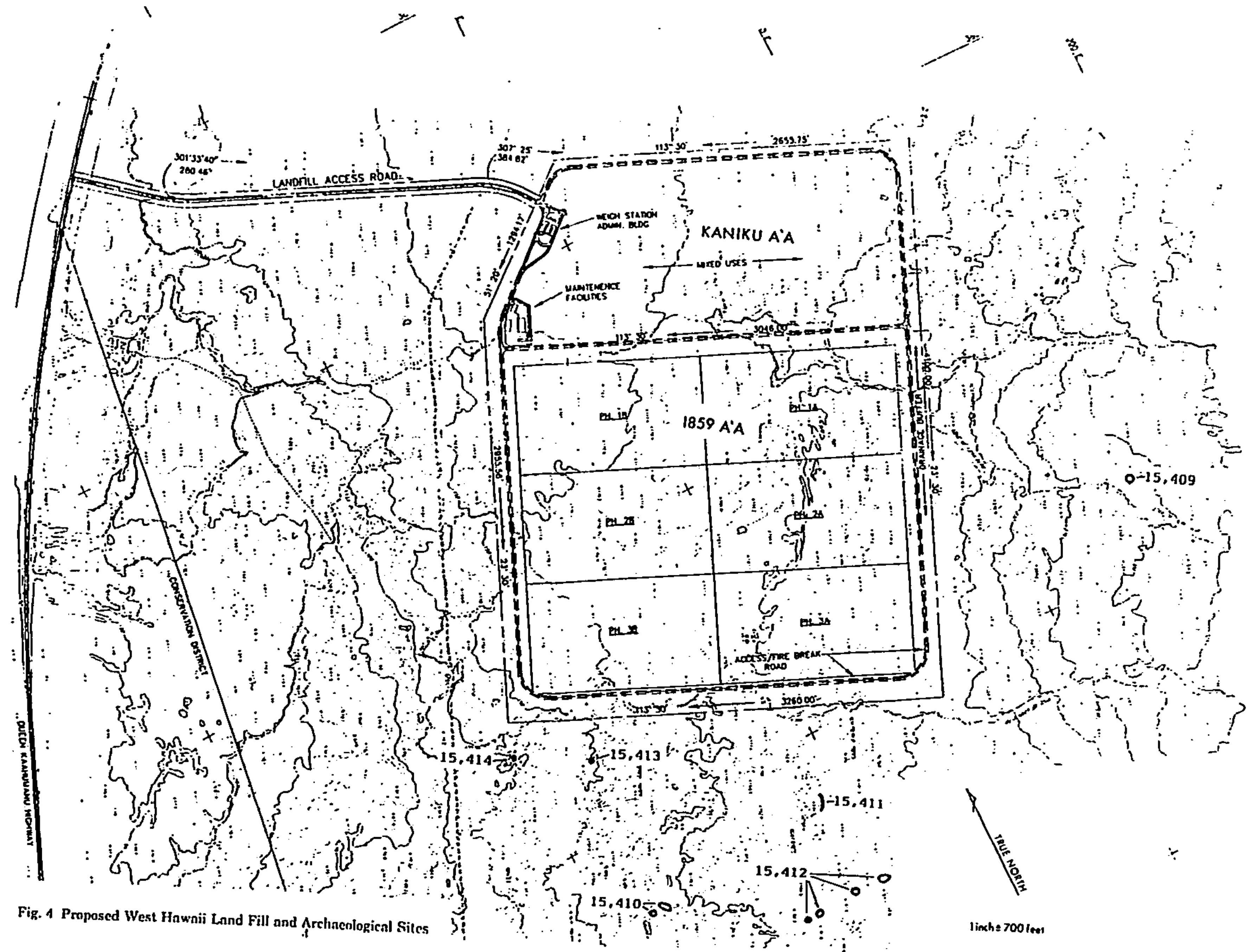

Fig. 4 Proposed West Hawaii Land Fill and Archaeological Sites

1inch=700 feet

In general the coverage of the aerial reconnaissance was excellent due to the open terrain (exposed lavas) within the project area.

Ground survey coverage was conducted on four separate days; June 6th, June 30th, September 25th, and September 26th and consisted of four *mauka/makai* (east/west) oriented transects in older pahoehoe lava, two cross-slope (north/south) transects on the 1859 'a'ā flow, one cross slope and two *mauka/makai* oriented transects following the staked access road alignment.

During the ground survey, further inspection procedures of located sites included notes, photographs, drawings and a collection of a few samples (i.e., artifacts, fiber, and wood). The ground survey also included exploration of three major tube systems (Sites 50-10-10-15,409, -15,410, and -15,412).

Plotting of sites was done on aerial photographs (supplied by R.M. Towill) and USGS 'Anaeho'omalu Quad map. Yellow flagging tape with Cultural Surveys Hawaii temporary site numbers (CSH1-6) were left at each site.

C. Project Area Description

The proposed West Hawaii Landfill project area that is included within the present assessment (approximately 550 acres) is located entirely within Pu'uanahulu, North Kona District, Island of Hawaii (TMK: 3-7-1-1). The project area is situated between ca. 75 ft. AMSL along the *makai* (western) boundary and ca. 300 ft. AMSL at the *mauka* boundary. Terrain within the project area consists of undulating pahoehoe lava with sparse vegetation and rough unvegetated 'a'ā lava. The vegetation associated with the pahoehoe lava consists of various grasses and scattered kiawe trees. Rainfall ranges between 10 and 20 inches per year and the mean annual temperature is approximately

75-80 degrees Fahrenheit (Armstrong, 1983:63). Observed during both the aerial and ground survey were small herds of goats and a few owls. The goats and owls utilize the caves (lava tubes) in the project area for shelter.

The two adjoining a'a flows that comprise the specific landfill site include approximately 200 acres of the 1850 Maunaloa flow and 100 acres of the Kaniku flow. The Mauna Loa flow is relatively narrow and reached the coast as both a'a and pahoehoe lavas in the area of Kiholo to Keawaiki. The Kaniku flow is much larger and includes the coastal area from Kapalaoa in the south to Makaiwa Bay in the north. This coastal zone includes known prehistoric sites within the 'Anaeho'omalu area.

II. Cultural Background

A. Introduction

The *ahupua'a* of Pu'uanahulu is very large, extending from the coast inland (ca. 20 miles) into the saddle region between Mauna Kea and Hualalai. Pu'uanahulu (literally "ten-day hill"; Pukui, Elbert, Mookini, 1974) is within "the broad expanse of lava fields north of Kailua-Kona to 'Anaeho'omalu which was called "Kekaha or Kekaha-wai'ole, desolate land without water" (Kelly, 1973:74). The general settlement pattern for the Kekaha area, based on ethnographic, ethno-historic, and archaeological sources, includes three main zones: coastal, intermediate, and upland. The coastal zone is relatively narrow, with small villages or hamlets at sandy beach areas with associated fish ponds, and with marine exploitation as the principal economy. The intermediate zone, also termed the "barren zone" (Rosendahl, 1973:60), is characterized as "a sloping barren zone of recent volcanics, almost devoid of soil or vegetation" (*Ibid.*). The upland zone is said to have included "extensive agricultural exploitation...with scattered small residential hamlets" (*Ibid.*). However, archaeological evidence of this upland agricultural zone is scarce, due to a number of factors. These factors include a development-based archaeological focus on the coastal zone and destruction of upland sites by residential and agricultural pursuits. The literature concerning Pu'uanahulu confirms this general settlement pattern and indicates a fourth zone of occupation and exploitation. This fourth zone refers to the saddle region (Pōhakuloa Training Area [PTA]) portion of Pu'uanahulu, where habitation of lava tubes (e.g., the Bobcat Trail Habitation Cave Complex) appears to have been based mainly on bird hunting.

B. Pre-historic (pre-A.D. 1778)

Coastal Zone

There are abundant archaeological remains within the coastal zone of Pu'uanahulu. The number and variety of archaeological remains indicate fairly intensive use of the coastal zone during Hawaii's prehistory. Sites within the coastal zone include the clusters of habitation features at Keawaiki, Weliweli, and Kapalaoa. Also associated with each of these locations are fishponds.

At Kapalaoa an archaeological survey (Barrera, 1980) recorded a cluster of 22 sites, representing close to 40 features. Features included petroglyphs, habitation caves, shelters and terraces, quarrying holes, trails, and a possible shrine.

Extensive archaeological research at nearby 'Anaeho'omalu (Waikoloa Resort) has produced a chronological sequence which is also generally applicable to the coastal zone of Pu'uanahulu since the south end of 'Anaeho'omalu Beach is the dividing line between the *ahupua'a* of Pu'uanahulu and Waikoloa. The sequence has an early date – ca. A.D. 900 – for initial occupation at 'Anaeho'omalu (Barrera, 1971:102). Permanent habitation within the immediate coastal zone continued to be the focus at 'Anaeho'omalu until around A.D. 1400 when portions of the intermediate zone began to be occupied. Occupation of the intermediate or barren zone focused on exploiting the natural resource of scoria type lava (Jensen, 1989). During the late prehistoric to early historic period (A.D. 1600-1800) there was probably a stable population of around 40 people at 'Anaeho'omalu (Cordy, 1981:191).

The coastal zone of Pu'uanahulu has not had a comparable level of intensive archaeology. However, the general sequence of prehistoric occupation, possibly starting as early as ca. A.D. 900 to 1000 with permanent habitation and a stable population until the early historic period (ca. 1800), is also applicable to the coastal zone of Pu'uanahulu.

Intermediate Zone

Evidence of use or occupation within the intermediate zone during prehistoric times includes trails, shelter sites, habitation caves, refuge caves and resource (s) procurement. Within Pu'uanahulu's intermediate zone, sites include trails (Sites -940, -501, -1401, -1429) C- and L-shaped shelters (-1419 and 1445), cave shelters (Sites -1402, and -1416), a possible Holua slide (Site -953), and scoria lava work areas (Sites -1400, -1424, and -1428). These sites indicate that the intermediate zone of Pu'uanahulu was utilized fairly extensively during prehistoric times. Chronological information suggests that "an overall time-span estimate of approximately A.D. 1265 to 1855 is indicated for the aboriginal occupation of the various barren zone residential features." (Rosendahl, 1973:55). The nature of the sites within the present project area, including cave shelters (Sites -15,409, -15,410 and -15,414), C-shaped shelter (Site -15,413), and a quarry feature (Site -15,411) generally conforms to the types expected within the intermediate zone.

The Upland Agricultural Zone

Recent archaeological work in the Pu'uanahulu homestead area (Walker and Rosendahl, 1989B) recorded eleven (11) sites, three of which are probably prehistoric. These sites include a possible *heiau* (Site -13,162), a housesite, *papamu*, a water hole (Site -13,163), and a Box C-shape (Site -13,164). Walker and Rosendahl note: "Virtually the entire project area appears to have been mechanically modified. Given the modifications, it is not surprising that there are only a few archaeological sites in the area." No evidence of an extensive upland agricultural field system was noted.

Ethnohistoric sources do indicate however that an agricultural zone with associated habitations did exist. Testimonies for the Boundary Commission concerning Pu'uwa'awa'a, the *ahupua'a* which abuts Pu'uanahulu to the south, record two "old cultivating grounds" along the border. One of the cultivating grounds appears to have been *mauka* (east) of the present Belt Highway (near Pu'uwa'awa'a), the other *makai* (west) of the highway. The testimonies (ca. 1870) also refer to the homestead area of Pu'uanahulu "as a place where people used to live." Though there is little recorded evidence of an extensive upland agricultural zone, one can infer a permanent occupied area from known sites (i.e., possible *heiau*, waterhole(s), house site with *papamu*) and historic sources.

Saddle Region

Prehistoric occupation within this saddle region has been established through archaeological work done in association with the Army's Pohākuloa Training Area (PTA). Sites within Pu'uanahulu include trails (Sites -5006 and -5008), cave shelters (Sites -10,221 and -10,222) and a large complex of features called the Bobcat Trail Habitation Cave and Kipuka Complex (Site -5004). At cave shelter (Site -10,221), analysis of charcoal from oven features produced dates that "represent some of the earliest for the higher elevation areas of Hawai'i Island thus far encountered (A.D. 800s to 1100s)" suggesting "that at least some portions of the Pōhakuloa Training Area and the saddle region may have been prehistorically occupied and/or economically exploited much earlier than previously thought" (Streck, 1986). At Site -5004, "the results indicate that Bobcat Habitation Cave and *Kipuka* was utilized from about the mid-11th century to the historic period, with the most intensive period of occupation occurring between the mid-12th to mid-18th centuries" (Haun, 1986). Excavations within the Bobcat Trail area also yielded over 800 artifacts and abundant midden remains, primarily bird bone (*Ibid.*).

The archaeological remains and literature sources suggest that all zones (coastal, intermediate, upland agricultural, and saddle region), were being utilized, possibly as early as A.D. 900. Dates, both at the coast and saddle regions are indicative of this early range. Settlement patterns during the prehistoric period follow the generally accepted model: Permanent habitation within the coastal zone, temporary or transit occupation of the intermediate zone, and permanent habitation and associated agriculture for the upland zone (though not well-documented archaeologically). Added to this model, for Pu'uanahulu is the saddle region where temporary and recurrent-use occupation focused on avian exploitation.

C. Early Historic Period

The coastal zone of Pu'uanahulu remained the site of a number of villages during the early historic period (ca. A.D. 1780-1820s). In general this portion of the Kona coast was an important seat of power. Two of Kamehameha I's closest allies and counselors, the twin brothers Kamanawa and Kame'eiamoku, were in control of Kekaha during this time (1780s to 1800s). Kamanawa was a sometime-resident of Kiholo and Kame'eiamoku resided at Kaupulehu (Kelly, 1973:95, 99). In 1810 a large fishpond, attributed to Kamehameha I, was built at Kiholo.

In 1823 the Rev. William Ellis visited two of the coastal villages of Pu'uanahulu – Kapalaoa and Wainanalii. "About nine am I stopped at Kaparao (Kapalaoa), a small village on the beach, containing twenty-two houses At Kaparaoa I saw a number of curiously carved wooden idols, which formerly belonged to the adjacent temple" (Ellis,

1963:294-296). At Wainanalii Ellis was the guest of the local chief "Waipo" who gathered an audience for Rev. Ellis to speak to.

There is little information concerning the other zones for the early historic period. However, based on radiocarbon dates for the intermediate and saddle region zones it is inferred that utilization of all zones continued into the early historic period and exploitation of resources was similar to the late prehistoric period.

D. Mid-1800s

Lists of lands recorded prior to the Division of Land (Mahele) document Pu'uanahulu as belonging to the King (Kamehameha III). (Interior Department Document Dec. 15, 1847; list compiled by Namauu). However, Pu'uanahulu became Government Land (Indices 1929) during the Mahele (1848) and became available for leases through the Interior Department. No individual *kuleana* parcels, Land Commission Awards (LCAs) were awarded within Pu'uanahulu.

In 1859, a lava flow from Mauna Loa's western slope swept through Pu'uanahulu and spread out along the coast. At the coast it covered portions of two villages – Kapalaoa and Wainanalii (Kelly, 1973). In 1865 Pu'uanahulu is described by an agent for the Interior Department as "about 16 miles from sea inland with an area of approximately 50,000 acres, 1/2 of which is grazing land (mostly pili) with the other part having very little vegetation and that the 'a'ā lava flow (1859) covered a considerable part of this land, presently it is leased to 3 natives for 30 years" (Letter from S.C. Wiltse to Minister of Interior, Sept 5 1865). This same letter refers to pasturage specifically for goats.

Starting in the late 1860s, and lasting until the early 1890s, Francis Spencer or his daughter Frances Tasmania Spencer had the lease on Pu'uanahulu as well as other lands. Francis Spencer was an early entrepreneur involved mainly in cattle ranching. The beginning of ranching, however, was of goats and wild cattle (bullocks). In 1856, exported from Kawaihae were some 1,200 bullock hides, 5,000 goat skins and 35,000 lbs of tallow. Along with leases for the land, Francis Spencer also procured exclusion rights from "all unbranded cattle and horses" in the government lands of Pu'uanahulu and Kaohe (Int. Dept. Aug. 7, 1865).

In general, the mid 1800s was a time of change from a subsistence-based economy to a market-based economy. It appears that during the beginning of the period (ca. 1840) the traditional settlement pattern was dissolving. There are of course many factors involved, such as depopulation, migration to trade centers and change in the economic base. The outcome of these factors appears to be that virtually the entire inland portion of Pu'uanahulu – including the intermediate, upland agricultural, and saddle region zones is depopulated. The early 1890s boundary testimonies consistently refer to "old cultivating grounds" or "where people used to live". One of the informants, Kahinalei, states that he was born in the adjoining *ahupua'a* Pu'uwa'awa'a "at the time of the building of Kiholo [ca. 1810?], and lived here till 1865 when I moved to Kawaihae" (Boundary Commission, Pu'uwa'awa'a). Also the absence of *kuleana* awards both along the coast and within the agricultural zone is suggestive of the lack of people actively living and working the land. The coastal zone was probably not totally vacant however, but the 1859 lava did affect a major portion of the shoreline. In reference to the effects of the 1859 flow, the Rev. Lorenzo Lyons wrote: "We are not aware that any valuable land has been overrun, unless it be near the village of Wainanalii" (Lyons, 1872:224, from

Kelly 1983:92). The absence of awards along the coast and within the agricultural zone is suggestive of a lack of people actively living and working the taro.

E. Turn of the Century

The lease of Pu'uanahulu was taken over in the 1890s by Eben Low and Robert Hind. These two men started Pu'uwa'wa'a Ranch which included the leases of the adjoining *ahupua'a* of Pu'uwa'awa'a and Pu'uanahulu. Low and Hind had a butcher shop in North Kohala which supplied meat to the sugar plantations there. Wild cattle and sheep still remained an important resource – in 1902 Robert Hind petitioned the Government to keep trespassers – "sheep and cattle killers" – out of the forest reserve as the ranch is supposed to have exclusive rights (Ex & F.O, 1902).

In 1903, Robert Hind, Jr. bought out Eben Low and continued on as sole proprietor of Pu'uwa'awa'a Ranch.

During this period, 1890 to 1910, the Government granted (sold) homestead lots in the Napuu area of Pu'uanahulu. Homesteaders were mainly families involved with Pu'uwa'awa'a Ranch. Homesteaders included Eben Low and Robert Hind but mainly grants were allotted to persons with Hawaiian surnames.

The Walker and Rosendahl (1989) survey report on the homestead area includes an on-site informant interview with a former homesteader, Mr. Robert Keakealani. Mr. Keakealani confirmed that "at the turn of the century the area was homesteaded by several Hawaiian families" (Walker and Rosendahl, 1989:4).

From the late 1800s until the early 1900s the economic focus was on cattle ranching. Pu'uwa'awa'a Ranch was the impetus for the repopulation of the Napuu (Homestead) area or the upland agricultural zone of Pu'uanahulu. The coastal zone probably had a few permanent residents but the focus had shifted to a ranch-oriented lifestyle.

F. Modern Era

The Hinds remained in control of Pu'uwa'awa'a Ranch, which includes the lease of Pu'uanahulu, until the late 1950s. The ranch was purchased by Dillingham Ranch Ltd. which held control until the early 1970s when the present owner Newell Bohnett took over.

The ranch, which at one time had some 15,000 head of cattle on 40,000 acres, utilized Pu'unnahulu for pasturage and the growing of corn. The coast was utilized for recreational purposes, except a portion of Keawaiki, which has a permanent residence that belongs to the Zadoc Brown family.

The intermediate zone is essentially unutilized as is the saddle region in the modern era.

III. Previous Research

Archaeological research within Pu'uanahulu has, as previously stated, focused mainly on the coastal zone. This research includes Reinecke (1930), Emory (1970), Barrera (1980), Cordy (1981), and Walker and Rosendahl (1989a).

Essentially, the coastal zone includes a number of clustered village sites with associated ponds or pools. Sites include a full range of features from habitation to religious/ceremonial.

Archaeological research within the intermediate or barren zone includes Ching (1971), Rosendahl (1973), Kirch (1974), and McEldowney (1976). Generally, the types of sites identified include temporary shelters and trails. There are exceptions which include areas associated with scoria lava procurement and large habitation/refuge caves. Scoria quarrying is discussed at length in reports concerning the Waikoloa Resort, 'Anaeho'omalu, Waikoloa (see Jensen 1989). Though no major habitation or refuge caves have been reported within the barren zone of Pu'anahulu, Cave -900 (refuge cave) is located just *mauka* of Queen Ka'ahumanu Hwy close to the border of Pu'uwa'awa'a and Pu'anahulu. During salvage work at Cave -900 over 1,700 artifacts and abundant midden were recovered, suggesting long-term intensive occupation.

Archaeological work specific to the upland agricultural zone that is presently available includes only the Walker and Rosendahl (1989b) Royal Vistas Estates Survey. Sites recorded include historic cemeteries, those of former homestead families, and three possible prehistoric sites — one of which may be a *heiau*.

The Pōhakuloa Training Area (PTA) has been the focus of recent archaeological research; for a summary of this work see Hammatt and Shideler (1991). The

Pu'uanahulu portion of the PTA includes trails, temporary shelters, and the Bobcat Trail Habitation Cave and *Kipuka* Complex (Site 50-10-30-5004).

The implications of the previous research, including determinations of site densities, settlement patterns and chronology, have been incorporated into the historic background section of this report.

IV. Survey Results

There were a total of six sites observed during the survey. All six sites were situated on pahoehoe lava. Figure #4 shows the location of the identified sites. Table 1 provides a summary of sites types, probable functions, probable ages and significance assessments.

Site types include lava tubes (3), a cave shelter (1), a C-shaped shelter (1), and a quarrying site (1).

Table 1: Summary of Sites

State Site# 50-10-10-	Temporary Site #	Type	Function	Age	Significance	Comment
15,409	CSH1	lava tube	habitation	prehis	C,D	Midden & artifacts observed
15,410	CSH2	lava tube	shelters	prehis	D	Midden & artifacts observed
15,411	CSH3	modified ridge	quarry	prehis	D	
15,412	CSH4	lava tube	shelter	prehis	D	
15,413	CSH5	C-shape	shelter	prehis	NLS	
15.414	CSH6	caves	shelters	prehis	D	Midden & artifacts observed

The following are site-specific descriptions:

Site -15,409 (CSH1; Fig. 5) - This site is a large lava tube system with one apparent entrance. The entrance is located on the *makai* side of a large sink approximately 10 meters in diameter with the *mauka* side collapsed. Two features

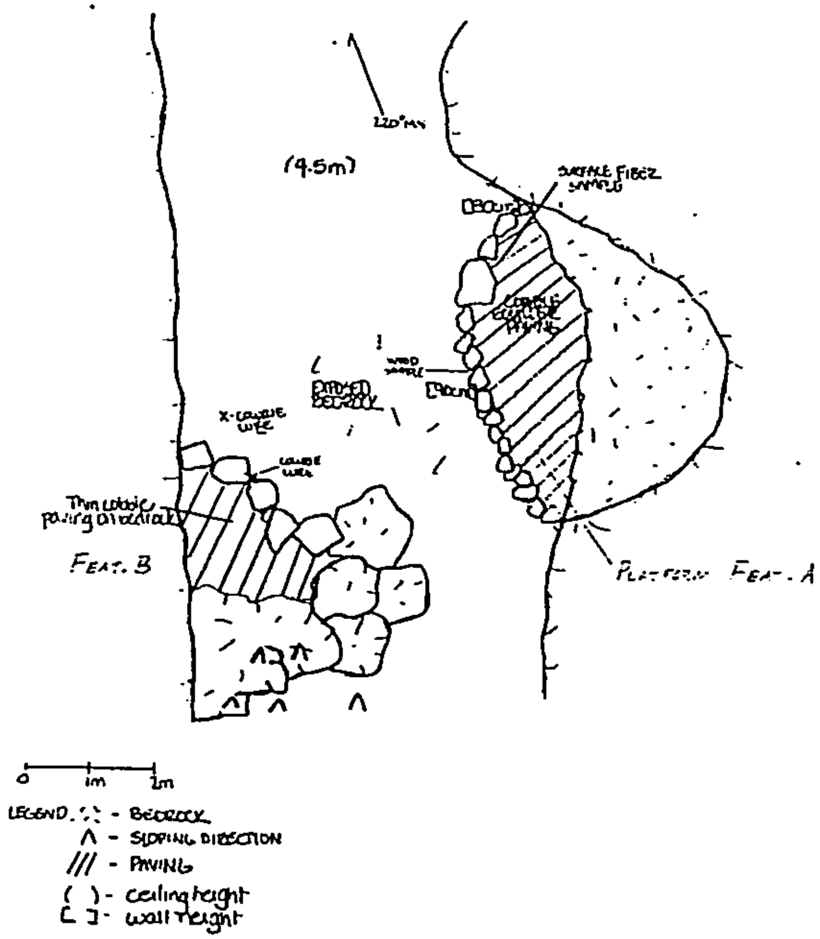

Fig. 5 Plan View of Site -15,409 Showing Features A and B

located in the interior of the *makai* tube have been designated Features A and B. Feature A is a stacked boulder platform abutting the north face of the tube. The platform is roughly 2.5 m. E/W by 4.5 m. N/S. Its surface is level and is partially covered with remains of dried grass, probably placed there for padding or matting. A fiber sample and wood sample were both collected from the surface of Feature A.

Adjacent to the south tube wall, Feature B consists of a cobble-paved area on bedrock delineated by large boulders and incorporating large bedrock boulders. This feature is roughly 3 m. E/W by 1.5 m. N/S.

Two cowry shell lures were collected: one from the surface of Feature B and one directly to the south of Feature B.

The tube continues in a southwesterly direction in excess of 1,500 ft. with numerous side branches. No cultural material was observed past the light zone. The tube eventually extends underneath the 1859 lava flow which would have sealed other entrances, however no evidence of any other entrances was observed. The formal nature of features A and B and the artifacts observed suggest a more than temporary shelter function for this site. This site may represent a permanent recurrent-use site where people would consistently (seasonally?) re-occupy it.

Lava Tube Site -15,410 (CSH2; Fig. 6). This lava tube system has multiple levels and branches of tubes accessible through two adjacent collapsed sinks. The *mauka* sink provides access to the upslope section of the tube system within which are roughly defined areas on the rock floor. The *mauka* tube contains a 9 meter in diameter chamber with a 2.1 m. ceiling height. This chamber branches to the north where kukui nut and shell midden were observed. Midden was also observed on the surface of the *mauka* tube near

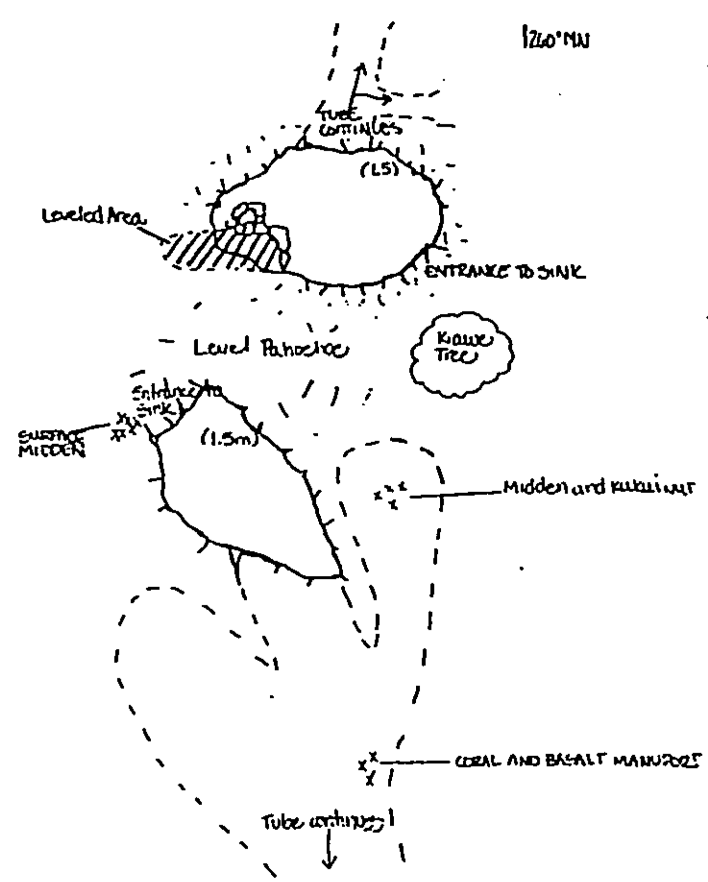

Fig. 6 Plan View of Site -15,410

the entrance to the sink area. The *makai* open sink area has a leveled area (1.5 m. by 2.5 m.) constructed upon the roof fall rubble in the SE portion of the sink.

The *makai* tube has multiple levels of tubes. The tube first branches to the north as near the entrance extends *makai* and then splits to upper and lower levels. The lower tube extends back to the east while the main chamber continues to the west. No cultural material was observed past the entrance area or light zone of either tube section. This site is tentatively identified as a temporary shelter.

Quarry Site -15,411 (CSH). This site is a quarry area approximately 45 m. N/S by 30.4 m. E/W along a large pressure ridge. Scoria was being quarried in the fissure along the ridge top and edges. No associated abrader basins or shelter features were observed suggesting minimal use of this quarry site.

Lava Tube Site -15,412 (CSH4). This site is a large lava tube that extends through the southern portion of the survey area. There are five collapsed sinks providing access to the tube. No cultural deposits were found within the surveyed portion of this large tube. However, a stacked boulder *ahu*, measuring 1.5 m. in height and .7 m. in diameter, was located on the *makai* edge of the roof-fall in the fourth (from *mauka*) sink. Though only this stacked boulder *ahu* was observed at this site it is tentatively identified as a possible shelter.

C-Shape Site -15,413 (CSH5; Fig. 7). This site is a small C-shape constructed with boulder uprights and cobbles. It measures 2 m. by 1.3 m. and stands 70 cm. high. This shelter was constructed directly on bedrock. No cultural material was observed.

Overhang Shelter Site -15,414 (CSH6; Figs. 8 and 9). This site is a multiple overhang shelter site with six designated features. Feature A is a small sink or collapsed

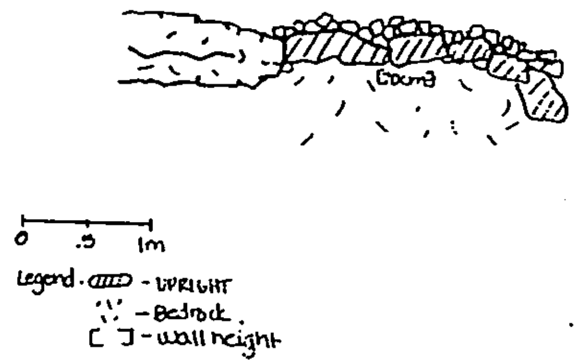

Fig. 7 Plan View of Site -15,413, C-Shaped Shelter

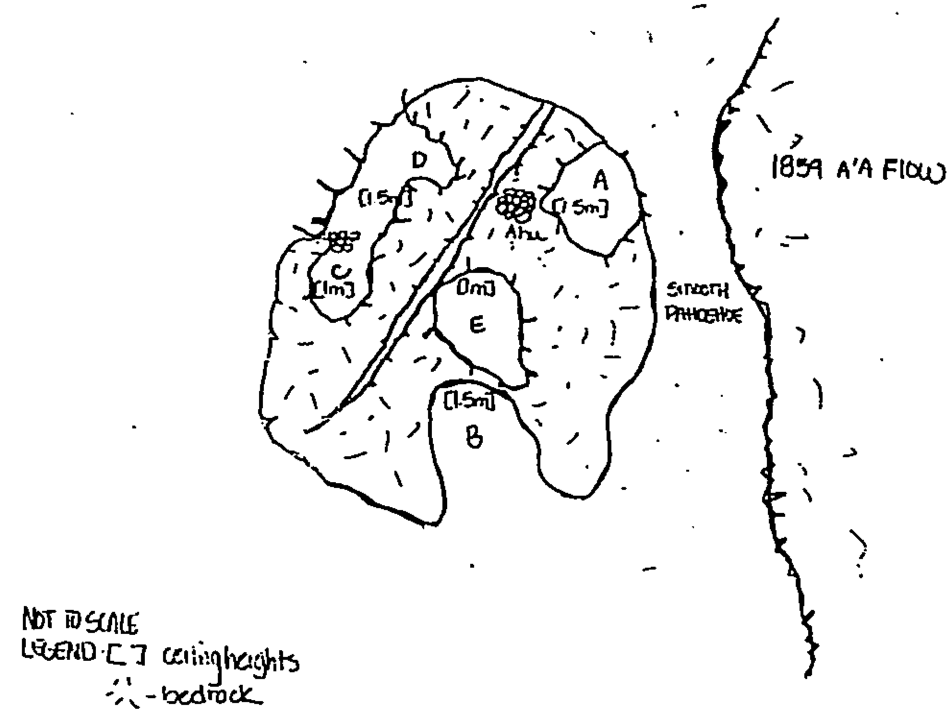

Fig. 8 Schematic Plan View of Site -15,414 Shelters

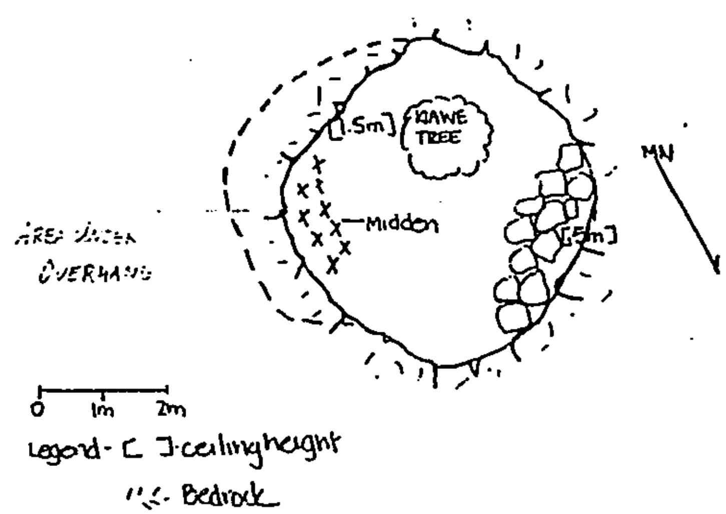

Fig. 9 Plan View of Site -15,414A

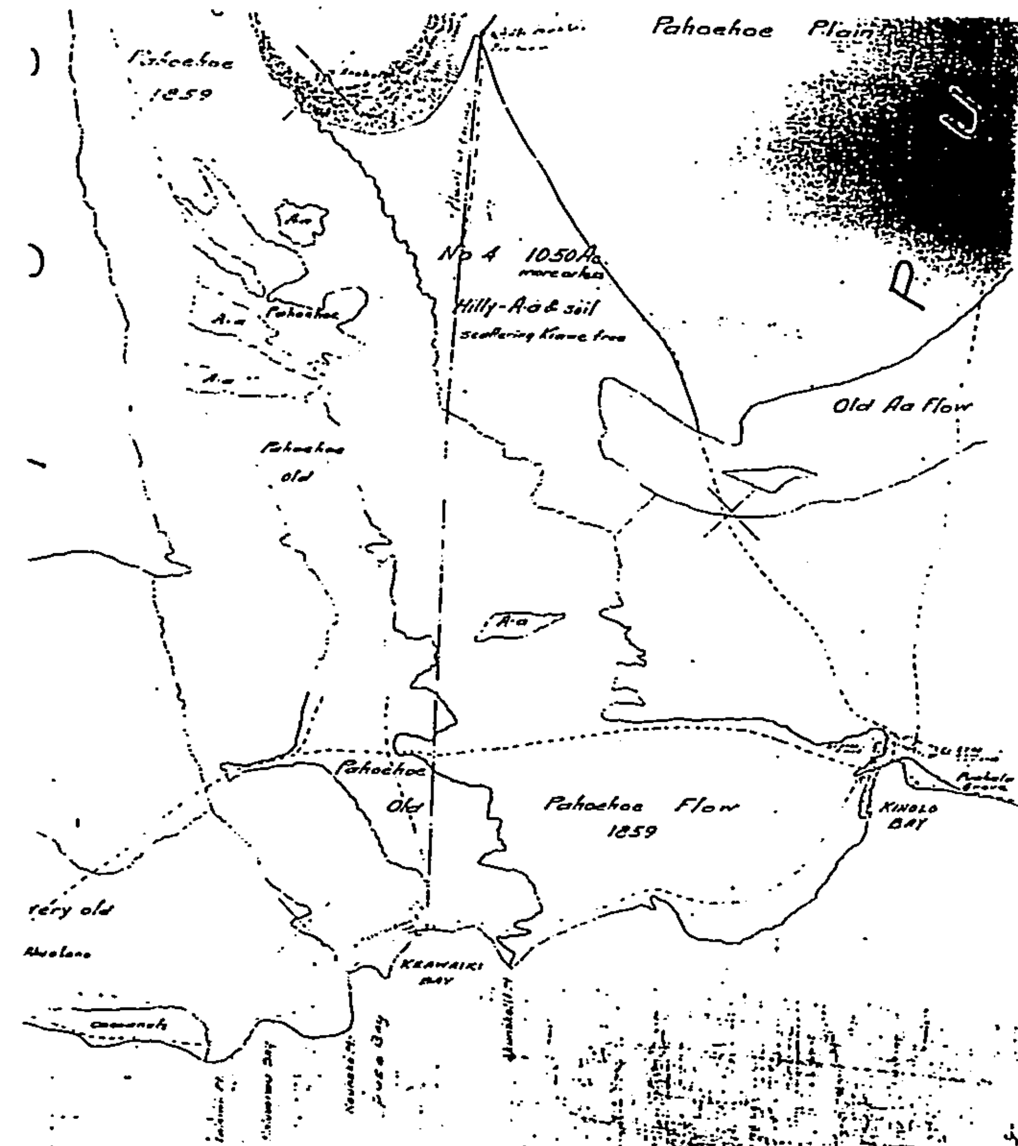

Fig. 10 Portion of Map by G.F. Wright (ca. 1906) (RM# 2633) Showing Trail Routes in Pu'uanahulu

road was probably developed by ranching interests as a link between the uplands and the sandy beaches associated with 'Anaeho'omalu. This ranch road does not appear on either of the historic maps (1278 or 2633) mentioned previously.

V. Summary and Recommendations

The review of archaeological and historical literature indicates that Pu'uanahulu contained certain zones within which specific types of occupation took place. The zones include coastal, intermediate, upland, and saddle regions. The proposed West Hawaii Land Fill project area is situated within the intermediate zone.

The six sites located within the survey area correlate closely with known sites in the intermediate zone. The intermediate zone, a zone between the coastal habitation/marine exploitation zone and the upland agricultural zone, is characterized as having: (1) temporary shelter occupation for travelers between the coast and uplands and (2) temporary and extended residential occupation in larger, natural cave features by people engaged in various coastal zone marine exploitation activities (Rosendahl, 1973:66). Sites -15,410, -15,412, -15,413, and -15,414 appear to represent temporary shelters; Site -15,409 represents an extended-use cave feature.

The project area probably never had any long-term permanent habitation sites within it. Settlement patterns as they relate to Pu'uanahulu indicate a prehistoric pattern of permanent coastal habitation, intermediate/barren zone temporary occupation, permanent upland habitation with associated agriculture, and a saddle region occupation based on bird hunting.

This pattern dissolves by the mid 1800s with depopulation and the change from subsistence economy to a market economy. In Pu'uanahulu, ranching replaced the traditional lifestyle. The only stable permanent settlement during the ranching era was at an area of former habitation, Napuu, or the Pu'uanahulu Homestead area. This is essentially the pattern today with the exception of a few residences at the coast.

General significance assessment for the six archaeological sites are presented in Table 1. The assessments are based on National Register criteria. Sites -15,410, -

15,412, -15,413, and -15,414 are deemed significant solely for their informational content, criterion D ("site may be likely to yield information important in prehistory or history). Site -15,409 is assessed as significant according to Criteria D and C ("Site is an excellent example of a site type"). Site -15,409 may not be an exceptional example when compared to other major cave sites (e.g., cave -900) but within this specific project area it does represent the best example of a style type. Site -15,413, a small C-shape with no cultural deposit (since it is constructed directly on exposed bedrock), is characterized as No Longer Significant (NLS). This is based on its having been documented by photographs, notes on construction style, measurements, and accurate locational information during the present survey.

Recommendations

The present proposed land fill site was configured to avoid archaeological sites that were located during this survey. Sites -15,410 through -15,413 are well outside of the newly proposed land fill site. Preservation "as is" is the recommended treatment for these sites.

Sites -15,409 and -15,414 are recommended for further data recovery work. These sites, although outside of the new project area, are close enough to be affected by secondary impacts such as unauthorized dumping, inadvertent destruction and, possibly, looting. Site -15,409 is also recommended for "as is" preservation after data recovery.

Finally, a Data Recovery and Preservation Plan should be made in consultation with the State Historic Preservation Division of the Department of Land and Natural Resources to address the tentative recommendations detailed above. The plan should include details on data recovery, interim protection, and long-term protection (i.e. preservation) for Site -15,409.

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Map References:

R.M.#1278 J.S. Emerson, 1882

R.M.#2633 G.F. Wright, ca. 1900

Photographic Appendix

Fig. 11 Aerial View of 1859 'A'ā, Looking *Mauka* (East)

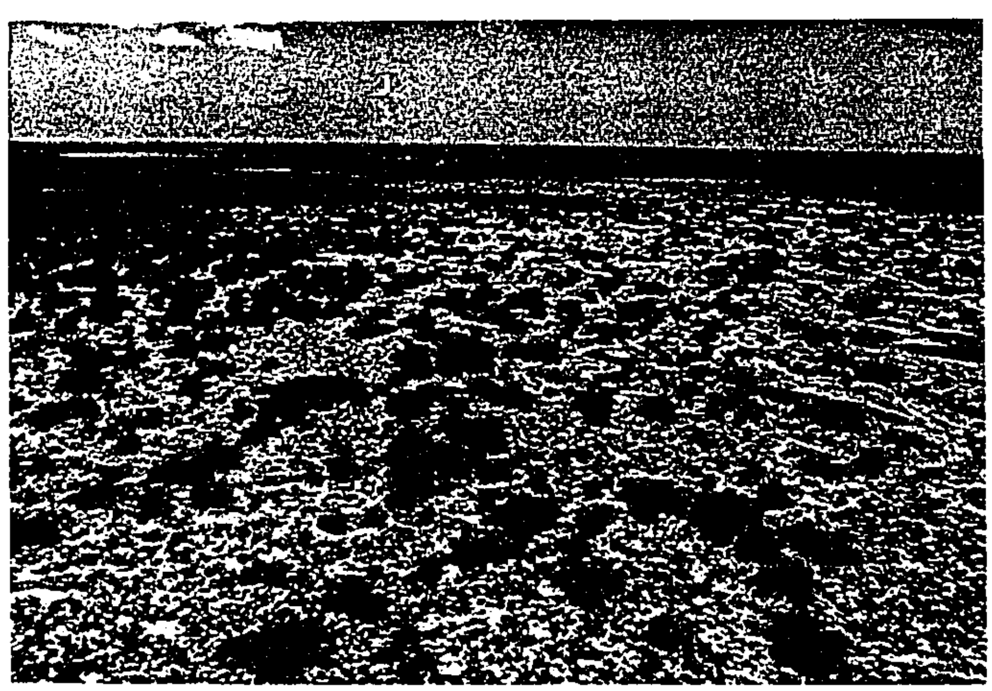

Fig. 12 Aerial View of Pahoehoe Lava with Lava Tube Site -15,412 Visible Down Center of Photo, Looking *Makai* (Southwest)

Fig. 13 Site -15,409 (CSH1) Sink Area, View to Southwest

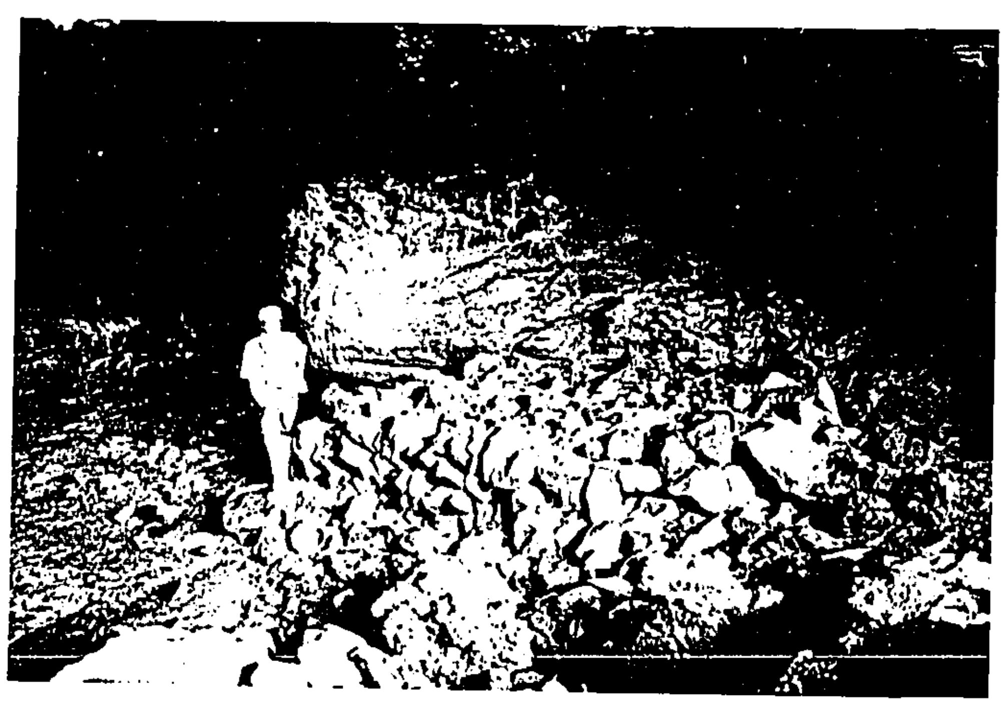

Fig. 14 Site -15,409 (CSH1) Interior View, Showing Feature A

Fig. 15 Aerial View of Large sink, Part of Site -15,412 (CSH4), View to Southwest)

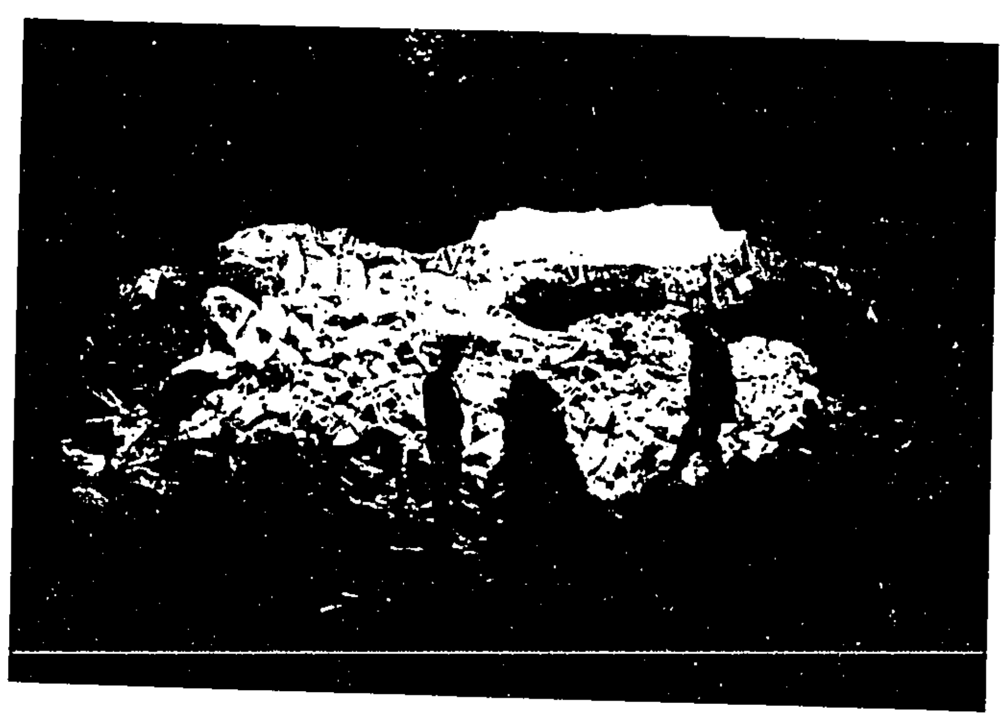

Fig. 16 Interior View of Site -15,412 (CSH4), Showing *Ahu*

Fig. 17 Site -15,413 (CSH5) C-Shaped Shelter (View to East)

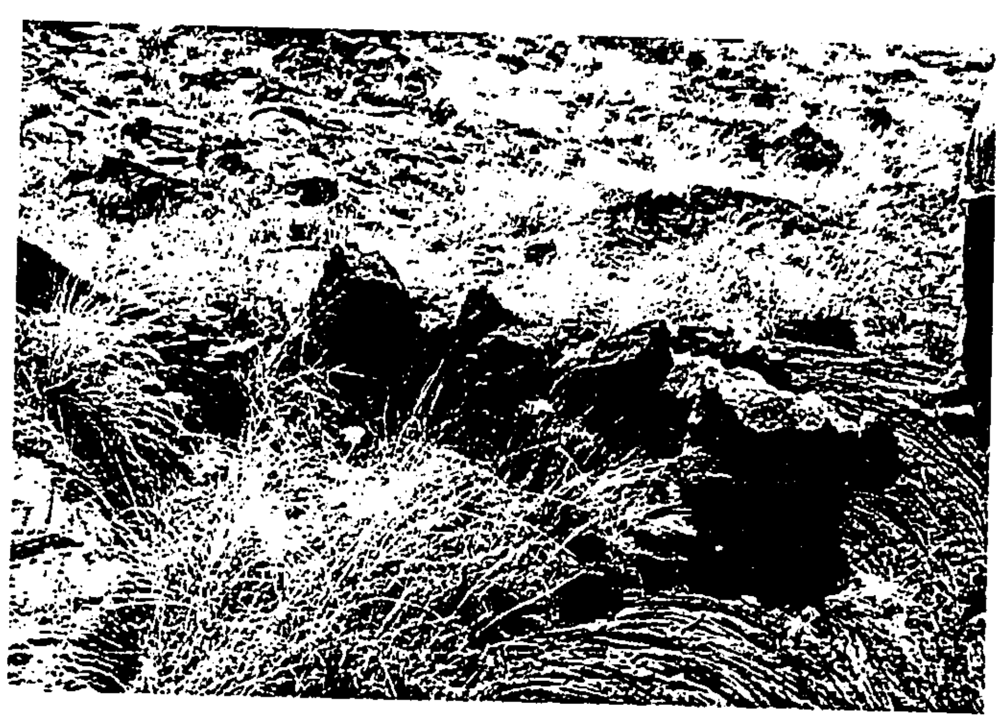

Fig. 18 Site -15,413 (CSH5) C-Shaped Shelter

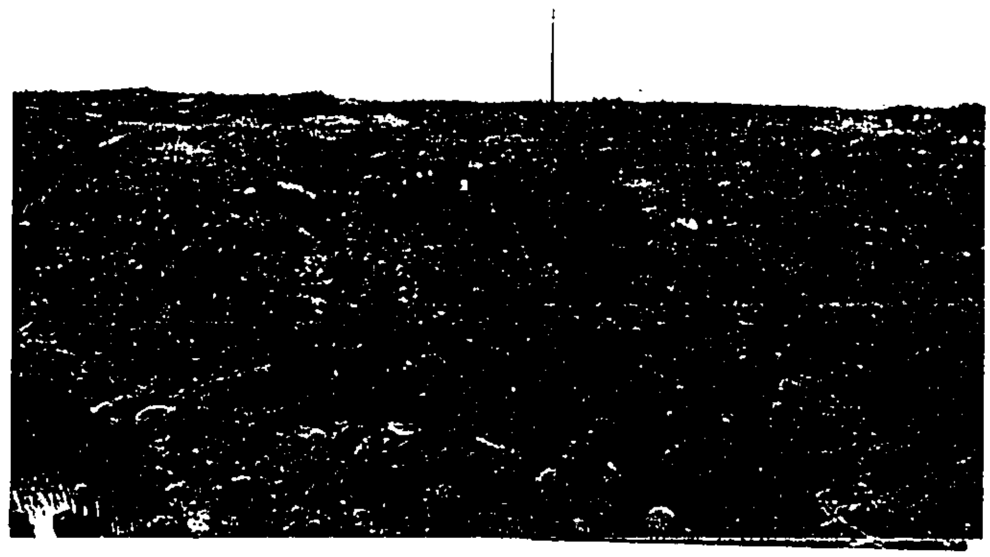

Fig. 19 Kaniku A'a Terrain, View to Northwest

Fig. 20 Interface between 1850 A'a (on Left) and Kaniku A'a (on Right), View to West

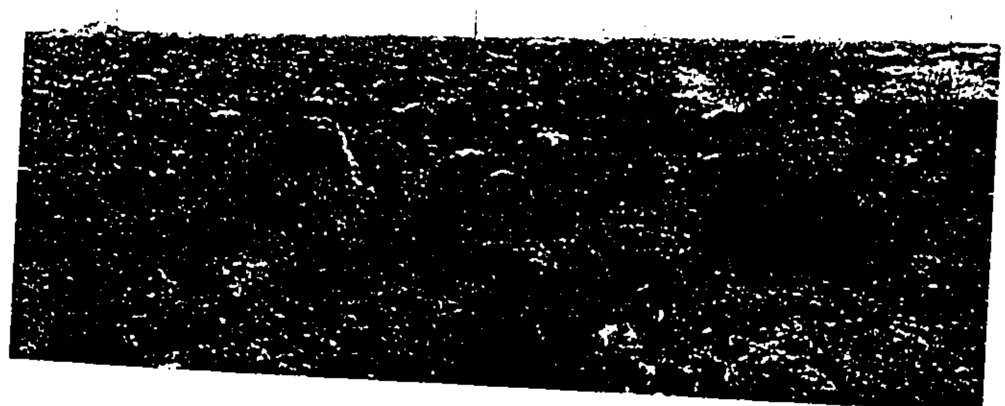

Fig. 21 Kaniku A'a along Access road Corridor, Center Line Stake in Center of Photo, View to West

Fig. 22 Access Road Corridor, Looking at Intersection with Queen Ka'ahumanu Hwy, View to West

APPENDIX C

TRAFFIC AND IMPACT ASSESSMENT

TRAFFIC IMPACT ASSESSMENT REPORT

for

WEST HAWAII SANITARY LANDFILL

North Kona, Hawaii

Revised
June 6, 1991

Prepared for:

R.M. Towill Corporation

Prepared by:

Pacific Planning & Engineering, Inc.
1221 Kapiolani Boulevard, Suite 740
Honolulu, Hawaii 96814

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EXECUTIVE SUMMARY

Pacific Planning & Engineering, Inc. (PPE) was engaged to undertake a study to identify and assess traffic impacts caused by the proposed West Hawaii Sanitary Landfill.

This report identifies and evaluates the probable impacts to the roadway network due to forecasted traffic and project generated traffic. This report presents the findings and recommendations of the study.

Project Description

The County of Hawaii is proposing the West Hawaii Sanitary Landfill to replace the Kailua Landfill, which is presently used for solid waste disposal. The present landfill is near its planned capacity and is expected to be closing in 1992.

The landfill will serve the North and South Kohala and North and South Kona districts of the island of Hawaii. The districts of North Kona and South Kohala are currently experiencing rapid growth.

The project site is located between Queen Kaahumanu Highway and Mamalahoa Belt Highway approximately 6,500 feet mauka of Keawaiki Bay. The proposed site is about 300 acres in size. The new West Hawaii Sanitary Landfill is expected to become operational in 1992 and have a 25 year life.

PROJECT DESCRIPTION

The County of Hawaii is proposing the West Hawaii Sanitary Landfill to be used for solid waste disposal. The proposed landfill will be servicing the North and South Kohala districts as well as the North and South Kona districts. The project site is located between Queen Kaahumanu Highway and Mamalahoa Belt Highway approximately 6,500 feet mauka of Keawaiki Bay. The landfill is estimated to be 300 acres in size. Figure 1 shows the general project location and roadway network in the vicinity.

The County of Hawaii is presently hauling solid waste from the Waimea, Kohala, Puako, Keauhou, Waiea, Keei, and Kailua Transfer Stations to the existing Kailua Landfill. The Kailua Landfill is nearing its capacity and will be closed around the year 1992. The proposed West Hawaii Sanitary Landfill will replace the existing facility and is planned to be ready for operation by the year 1992 with an expected life of 25 years.

Access to the project site will be from Queen Kaahumanu Highway. The access road will be a paved 2-lane road with a 50-foot right-of-way. Entry into the West Hawaii Sanitary Landfill will be gate-controlled. The facility will be operated by the County of Hawaii and the hours of operations will be from 6:30 am to 3:30 pm.

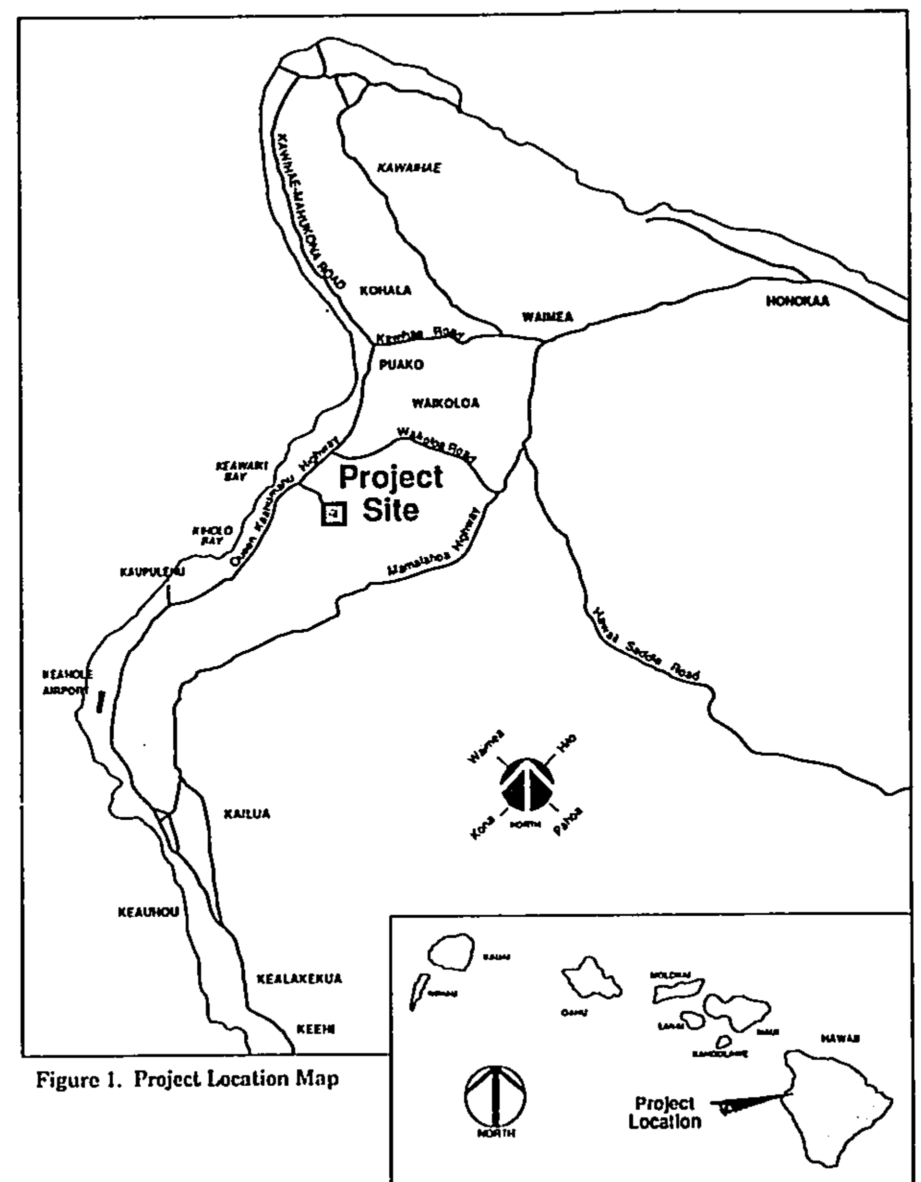


Figure 1. Project Location Map

Methodology

Analysis was conducted to determine the relative impact of the proposed project on the local roadway system. The following facilities were studied:

- Intersection of Queen Kaahumanu Highway with the project access roads.
- Segments of Queen Kaahumanu Highway in the vicinity of the project.

Future traffic was forecasted at the study intersections by adding the following:

- Existing traffic volumes at the study intersections,
- Increasing traffic along Queen Kaahumanu Highway by the historical traffic growth rate,
- Traffic generated by other developments in the immediate area, and
- Traffic generated by the Project.

This study assesses the impact on each intersection by determining the level-of-service (LOS) for existing, 1992 forecast without the project, and 1992 forecast with the project traffic conditions.

Conclusion and Recommendations

The proposed West Hawaii Sanitary Landfill is not expected to have a significant impact on traffic flow at the proposed intersection of Queen Kaahumanu Highway and the project access road, when the project begins operations in 1992, with the following intersection recommendations, as shown in Figure 5.

We recommend that the proposed intersection of the landfill access road to Queen Kaahumanu Highway be channelized with left-turn storage lanes for safety and to maximize roadway capacity. Deceleration and acceleration lanes are also recommended, due to the high speed of traffic on this stretch of highway.

Presently, Queen Kaahumanu is operating at stable traffic flow conditions, LOS C. Even without the project, the LOS will drop to LOS D, which is still stable flow. With the project it will remain at LOS D.

The analysis results indicate that traffic along Queen Kaahumanu Highway will not be delayed beyond normal driving conditions at the project access road intersection. The left turn movement from Queen Kaahumanu Highway into the landfill access road will operate at excellent level-of-service. The right turn movements from the landfill access road will also operate at very good level-of-service. Vehicles attempting left turns out of the landfill access road, however, will experience long delays, LOS E.

West Hawaii Landfill traffic is expected to grow by year 2016, however, it would have little impact on traffic conditions at the study intersection. The controlling factors would be the growth in traffic on Queen Kaahumanu Highway and the physical condition of Queen Kaahumanu Highway by the year 2016, such as number of lanes.

The State Department of Transportation has a policy of uninterrupted flow along Queen Kaahumanu Highway, therefore no signalization, only grade separated interchanges will be permitted. In the event that Queen Kaahumanu is widened with frontage roads, consideration should be given to connecting to the frontage road system.

EXISTING CONDITIONS

An inventory of existing conditions was conducted to better understand the traffic impact of the proposed project. The review included the land uses in the area, roadway facilities, and existing traffic conditions. The study focuses on the proposed intersection of the landfill access road with Queen Kaahumanu Highway.

Land Uses

The proposed site for the West Hawaii Sanitary Landfill is located in the North Kona district between Waikoloa Resort and Keahole Airport. The area is characterized by large barren masses of lava and patches of vegetation. The terrain is varied and ranges from level to extremely sloping. The major land use classifications for the area surrounding the proposed landfill is "agricultural". Presently, the area is undeveloped and open.

Roadway Facilities

The main roadways servicing the North Kona region are Queen Kaahumanu Highway and Mamalahoa Highway. Queen Kaahumanu and Mamalahoa Highways are parallel facilities.

Queen Kaahumanu Highway is the main highway in the North Kona region running in a north-south direction along the coastline between Kailua-Kona and Kawaihae. It is a two-lane undivided highway with 24 foot-wide pavement and a speed limit varying from 35 to 55 mph. Queen Kaahumanu Highway is maintained by the State Department of Transportation. The major intersections along Queen Kaahumanu Highway are channnelized with left-turn storage lanes, deceleration and acceleration lanes.

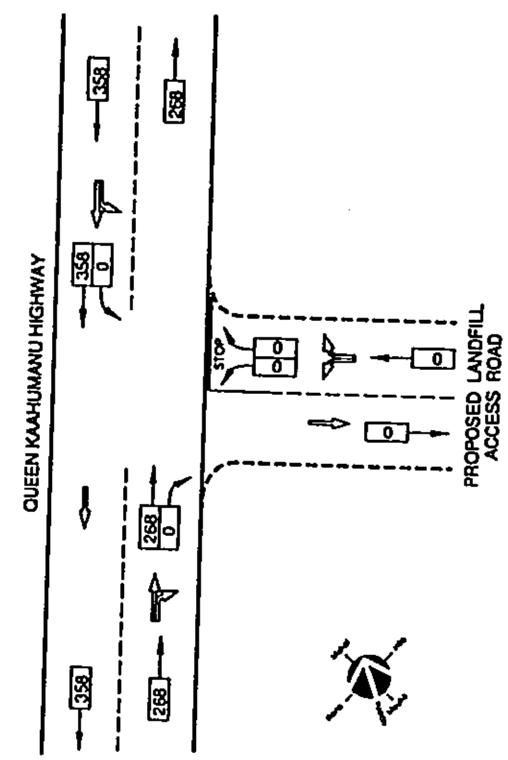
Mamalahoa Highway is a two-lane roadway running in a north-south direction parallel to Queen Kaahumanu Highway. Mamalahoa Highway services the higher elevated areas between Waimea and North Kona.

Traffic Conditions

Traffic counts along Queen Kaahumanu Highway taken over a 24-hour period were obtained from the State Department of Transportation (DOT). The DOT counts indicated that the weekday morning and afternoon peak hour occurs from 6:30 to 7:30 am and 3:15 to 4:15 pm respectively.

The hours of operation for the landfill will be from 6:30 am to 3:30 pm. During the morning peak hour, traffic generated by the landfill is expected to be very light. During the afternoon peak hour, the landfill will be open for only the first fifteen minutes of the peak hour. The greatest volume of traffic on Queen Kaahumanu Highway during landfill operation occurs between 2:30 and 3:30 pm.

Traffic volumes at the study intersection were taken from manual traffic counts taken at the intersection of Queen Kaahumanu Highway and the Kona Village entrance on January 30, 1991 during the afternoon peak period. The resultant afternoon peak hour traffic volumes are shown in Figure 2. The manual traffic count data are summarized in Appendix B



1992 Existing Afternoon Peak Hour Traffic

PACIFIC PLANNING

Source:

Figure 2

FUTURE CONDITIONS

A survey of approved planned developments and improvements to transportation facilities was conducted to estimate future traffic conditions at the study intersections.

Future Land Uses

Traffic generated by the proposed developments, listed in Table 1 below, within the immediate area will impact the study intersections by the year 1992.

Table 1. Future Developments

Development	Land Uses
Waikoloa Resort	
Condominiums	
Bay Club	172 units
Vista Waikoloa	122 units
Commercial Center	
King's Shop	56,000 Sq. Ft.
Waikoloa Village	
Condominiums	
Fairways	51 units
Knolls	17 units
Single Family Dwellings	
Kopona Hills	62 units
Sunset Ridge	161 units
Individual Vacant Lots	70 units
Waikoloa Knolls	
Single Family Dwellings	
Phase I	177 units
Phase II	60 units
Kona Village	
Hotel	120 rooms

Future Roadway Facilities

The State Department of Transportation has plans to widen Queen Kaahumanu Highway to a four lane divided highway from Palani Road to Kawaihae. However, the plans are not definite at this time.

Queen Kaahumanu Highway is planned to be a limited access highway with frontage roads and interchanges at selected locations.

PROJECTED TRAFFIC CONDITIONS

Future traffic was forecasted for traffic conditions without and with the West Hawaii Sanitary Landfill. Traffic forecasts were estimated for the year 1992 when the project is expected to be completed.

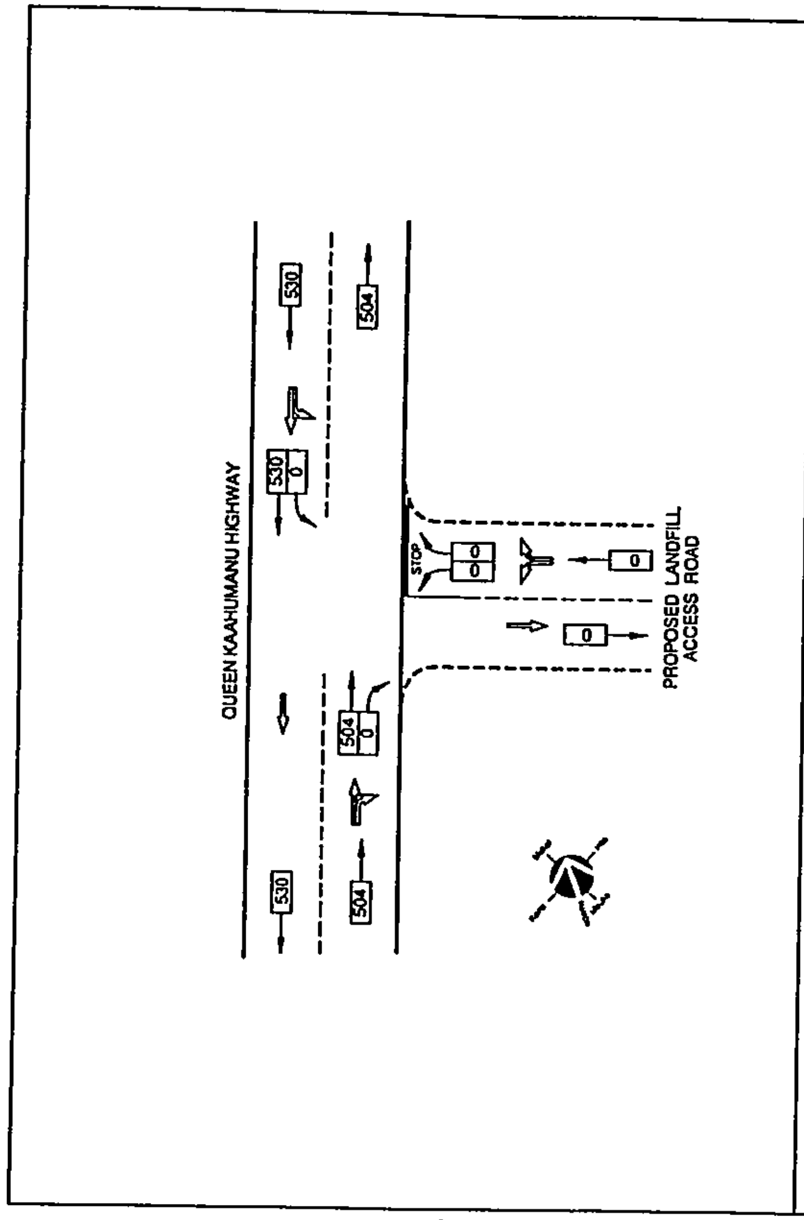
Future Traffic Without Project

Future traffic without the project was forecasted by adding the following: 1) existing peak hour traffic volumes; 2) increasing the existing traffic volumes along Queen Kaahumanu Highway by the historical growth rate; 3) traffic generated by other developments in the vicinity that would be completed by 1992. The resulting afternoon peak hour traffic volume without project in 1992 is shown in Figure 3.

Growth in Traffic Along Queen Kaahumanu Highway

The growth in traffic along Queen Kaahumanu Highway was forecasted based upon the historical growth trend. The historical growth trend was estimated using a linear regression analysis and historical data from DOT count station 8-H (Queen Kaahumanu Highway with Waikoloa Road) for the past 11 years.

The results of the analysis indicates an annual growth rate of approximately 7.5% a year along Queen Kaahumanu Highway. Due to the short time frame of the project (2 years), this growth rate was deemed reasonable. The existing afternoon peak hour traffic volumes on Queen Kaahumanu Highway were increased by 15% (7.5% per year for 2 years).



1992 Afternoon Traffic Without Project

PACIFIC PLANNING

Source:

Figure 3

Traffic Generated by Other Developments

A three-step procedure of trip generation, trip distribution, and traffic assignment was used to estimate traffic from other developments listed in Table 1.

The trip generation step estimates the number of vehicle trips that would be generated based upon the amount land use for each development and data from the Institute of Transportation Engineers (ITE) Trip Generation Report (4th Edition, 1987). Table 2 shows the resulting trip generation.

Table 2. Trip Generation for Other Developments

Land Use	Amount	Afternoon Peak Hour Enter	Afternoon Peak Hour Exit
Waikoloa Resort			
Condominiums			
Bay Club	172 units	64	33
Vista Waikoloa	122 units	49	25
Commercial Center			
King's Shop	56,000 Sq. Ft.	227	227
Waikoloa Village			
Condominiums			
Fairways	51 units	24	12
Knolls	17 units	10	5
Single Family Dwellings			
Kopona Hills	62 units	45	25
Sunset Ridge	161 units	106	60
Individual Vacant Lots	70 units	50	28
Waikoloa Knolls			
Single Family Dwellings			
Phase I	177 units	116	65
Phase II	60 units	44	25
Kona Village			
Hotel	120 rooms	25	42

The trips for the Waikoloa Resort, the Waikoloa Village and the Kona Village shown on table 2 were reduced to account for an estimated 80% occupancy rate.

Based on data from the ITE Trip Generation Report, it was estimated that about 40% of the trips generated by the King's Shop will consist of pass-by trips. These trips were not added to Queen Kaahumanu because they reflect vehicle trips already on the highway. The remaining 60% are primary trips and were added to the roadway because they consist of new vehicle trips by residents to the shopping center.

The trip distribution step assigns vehicle trips to their predicted origins and destinations. The distribution of primary trips generated by the other developments was determined based upon the distribution of existing resident population and vehicle counts in the Waikoloa area using available information. Table 3 shows the distribution for the other developments.

Table 3. Trip Distribution for Other Developments

Land Use Trips	To/From Kailua	To/From Kawaihae	Capture between Waikoloa Resort & Village
Bay Club	45%	30%	25%
Vista Waikoloa	45%	30%	25%
King's Shop	45%	30%	25%
Waikoloa Knolls	45%	30%	25%
Fairways	45%	30%	25%
Knolls	60%	40%	n/a
Kopona Hills	45%	30%	25%
Sunset Ridge	45%	30%	25%
Individual Vacant Lots	45%	30%	25%
Kona Village	45%	55%	n/a

The traffic assignment step assigns vehicle trips to specific routes on the roadway network that will take the driver from origins to destinations. Traffic was assigned based upon the shortest route or travel time between origins and destinations.

Future Traffic With Project

Future traffic with the project was forecasted by adding traffic generated by the West Hawaii Sanitary Landfill project to the forecasted traffic without the project. The resulting afternoon peak hour forecast traffic volumes with the the project in 1992 are shown in Figure 4.

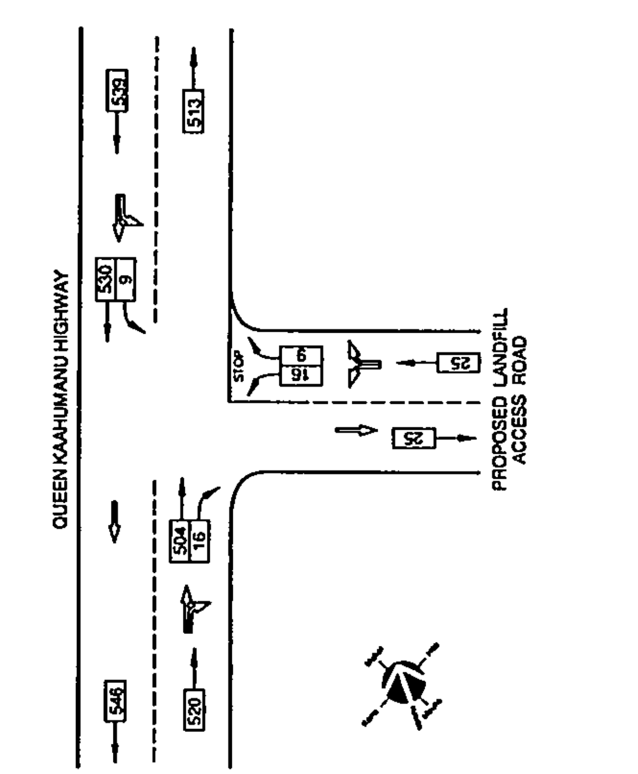
The three-step procedure of trip generation, trip distribution, and traffic assignment was used to forecast future afternoon peak hour traffic generated by the proposed project.

The number of trips generated by the West Hawaii Sanitary Landfill was estimated using data derived from manual vehicular counts taken at the Kailua Landfill facility by the County of Hawaii during the week of March 7 to 13, 1988. About 95% of the vehicles entering the Kailua Landfill were trucks including semi-trailers, dump trucks, container trucks, half and quarter ton trucks, and pickup trucks. The remaining 5% were passenger vehicles.

The data collected indicates that the peak trip generation period for the Kailua Landfill occurs between 2:30 and 3:30 pm. Table 4 shows the trip generation for the West Hawaii Sanitary Landfill. The manual vehicle counts taken at the Kailua Landfill are displayed in Appendix B.

Table 4. Trip Generation for West Hawaii Sanitary Landfill Afternoon Peak Hour

Land Use	Units	Enter	Exit
West Hawaii Sanitary Landfill	300 acres	25	25



1992 Afternoon Traffic With Project

PACIFIC PLANNING

Source:

Figure 4

The distribution of trips for the project traffic was based upon predicted origins and destinations considering location of population in West Hawaii and existing travel patterns. The resulting distribution patterns for the project generated traffic is shown below in Table 5.

Table 5. Trip Distribution for Project Traffic - Afternoon Peak Hour

	Entering		Exiting	
Project Traffic Type	From Kailua	From Kawaihae	To Kailua	To Kawaihae
West Hawaii Sanitary Landfill	65%	35%	65%	35%

Trips generated by the project were assigned to Queen Kaahumanu Highway based upon the shortest route or travel time between origins and destinations. The West Hawaii Sanitary Landfill will only access Queen Kaahumanu Highway, therefore all vehicle trips generated by the development were assigned to Queen Kaahumanu Highway.

Trip Generation for year 2016

Trips generated by the proposed landfill are expected to increase from the year 1992 to the year 2016 as West Hawaii grows. By the year 2016, it is estimated that the landfill will receive a total of 134,000 tons of refuse per year compared to an initial solid waste volume of 46,300 tons per year in 1992. The increase in solid waste is almost three-fold and there would be a corresponding increase in landfill traffic as shown in Table 6.

The level of landfill traffic by year 2016, however, would have little impact on traffic conditions at the study intersection. The controlling factors would be the growth in traffic on Queen Kaahumanu Highway and the physical conditions of Queen Kaahumanu Highway by the year 2016, such as number of lanes.

Table 6. Project Trip Generation For Year 2016 - Afternoon Peak Hour

Land Use	Units	Enter	Exit
West Hawaii Sanitary Landfill	300 acres	75	75

TRAFFIC IMPACTS

Queen Kaahumanu Highway and the proposed project intersection were analyzed to determine the relative impact of the West Hawaii Sanitary Landfill project on the roadway system. The analysis was conducted for existing conditions, and 1992 forecasted conditions without and with the project.

Analysis Methods

Impacts on traffic resulting from the proposed West Hawaii Sanitary Landfill on Queen Kaahumanu Highway were measured by the change in Level-of-Service (LOS) using the methodology for analyzing two-lane rural highways from the Highway Capacity Manual (HCM) Special Report 209, 1985. A segment of Queen Kaahumanu Highway in the vicinity of the project was analyzed.

The study intersection was analyzed using methods for unsignalized intersections from the HCM. This analysis method is based on the estimated number of vehicle turning movements which could proceed through a conflicting traffic stream. The LOS is determined by the amount of vehicle reserve capacity available for a particular turning movement. A lower amount of reserve capacity indicates a poorer level of service.

The LOS for two-lane rural highways and unsignalized intersection analysis are classified into six categories ranging from A to F, where LOS A being the premium condition and LOS F the worst. Appendix A provides a descriptive summary for each LOS category. The level of service for both analysis are not comparable since they are based on different measures. The rural highway analysis is based on volume of vehicles in an hour period, whereas the unsignalized intersection analysis is based on delay.

Analysis Results

The results of the two-lane rural highway analysis are shown in Table 7. The analysis for the intersection of Queen Kaahumanu Highway and the project access road is shown in Table 8.

Table 7. Two-Lane Rural Highway Analysis - Queen Kaahumanu Highway

Intersection	1991 Existing	1992 Without Project	1992 With Project
Queen Kaahumanu Highway	C	D	D
Actual Flow Rate	680	1112	1146

LOS	Service Flow Rate	Volume/Capacity
A	380	.15
B	675	.27
C	1070	.43
D	1620	.64
E	2525	1.00

Table 8. Level-of-Service for Queen Kaahumanu Highway with Project Access Road

Intersection		1991 Existing	1992 Without Project	1992 With Project
Queen Kaahumanu Highway with Project Access Road				
Queen Kaahumanu Highway				
Southbound (To Kailua)	LT	n/a	n/a	A
Project Access Road				
Westbound (Makai BD)	LT	n/a	n/a	E
	RT	n/a	n/a	A

n/a - Not Applicable

Highway Analysis

Present: Queen Kaahumanu Highway currently operates at LOS C, which is stable flow along the highway.

1992 without Project: The LOS on Queen Kaahumanu Highway drops from LOS C to LOS D. LOS D is still stable flow however, passing becomes difficult.

1992 with Project: The LOS on Queen Kaahumanu Highway remains the same as the without project condition, LOS D.

Study Intersection

The intersection of Queen Kaahumanu Highway and the proposed project access road operates very good, LOS A except for the left turns out of the project access road which experiences long delays, LOS E.

CONCLUSION AND RECOMMENDATIONS

The proposed West Hawaii Sanitary Landfill is not expected to have a significant impact on traffic flow at the proposed intersection of Queen Kaahumanu Highway and the project access road, when the project begins operations in 1992, with the following intersection recommendations, as shown in Figure 5.

We recommend that the proposed intersection of the landfill access road to Queen Kaahumanu Highway be channelized with left-turn storage lanes for safety and to maximize roadway capacity. Deceleration and acceleration lanes are also recommended, due to the high speed of traffic on this stretch of highway.

Presently, Queen Kaahumanu is operating at stable traffic flow conditions, LOS C. Even without the project, the LOS will drop to LOS D, which is still stable flow. With the project it will remain at LOS D.

The analysis results indicate that traffic along Queen Kaahumanu Highway will not be delayed beyond normal driving conditions at the project access road intersection. The left turn movement from Queen Kaahumanu Highway into the landfill access road will operate at excellent level-of-service. The right turn movements from the landfill access road will also operate at very good level-of-service. Vehicles attempting left turns out of the landfill access road, however, will experience long delays, LOS E.

West Hawaii Landfill traffic is expected to grow by year 2016, however, it would have little impact on traffic conditions at the study intersection. The controlling factors would be the growth in traffic on Queen Kaahumanu Highway and the physical condition of Queen Kaahumanu Highway by the year 2016, such as number of lanes.

The State Department of Transportation has a policy of uninterrupted flow along Queen Kaahumanu Highway, therefore no signalization, only grade separated interchanges will be permitted. In the event that Queen Kaahumanu is widened with frontage roads, consideration should be given to connecting to the frontage road system.

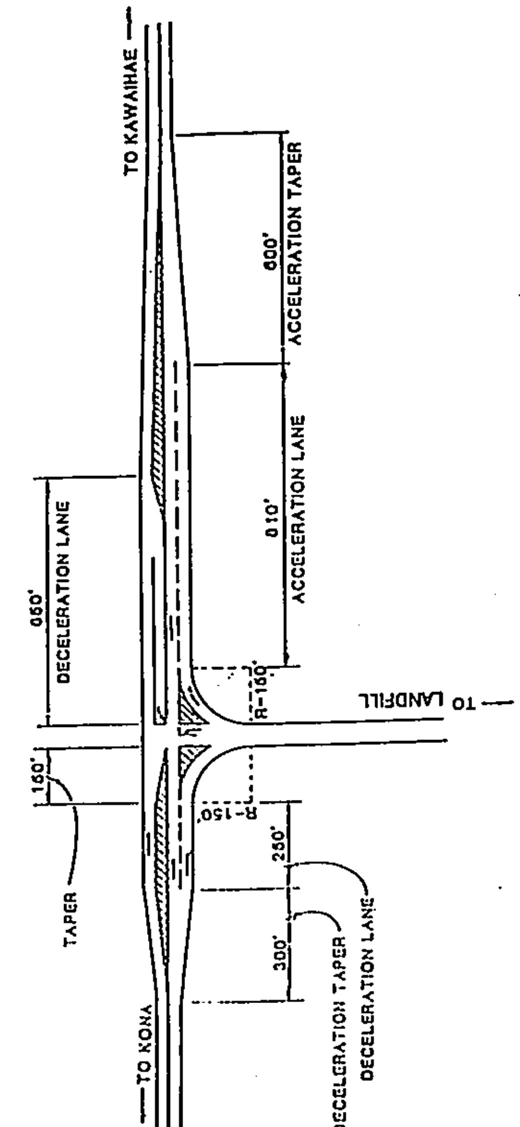


Figure 5. Schematic Intersection Layout

APPENDIX A

LEVEL-OF-SERVICE DEFINITIONS FOR TWO-LANE HIGHWAYS AND UNSIGNALIZED INTERSECTIONS

DEFINITION OF LEVEL-OF-SERVICE FOR TWO-LANE HIGHWAYS

Level of service for two-lane highways is defined in terms of *percent time delay.*

Level-of service A describes completely free-flow conditions. Motorists are able to drive at their desired speed. Driver would be delayed no more than 30 percent of the time by slow-moving vehicles. A maximum flow rate of 420 pcph, total in both directions, may be achieved under ideal conditions.

Level-of-service B characterizes the region of traffic flow wherein speeds of 55 mph or slightly higher are expected on level terrain. Drivers are delayed up to 45 percent of the time on the average. Service flow rates of 750 pcph, total in both directions, can be achieved under ideal conditions.

Level-of-service C characterizes the region of traffic flow wherein speeds of 52 mph or slightly higher are expected on level terrain even though unrestricted passing demand exceeds passing capacity. Traffic flow is still stable. Drivers are delayed up to 60 percent of the time on the average. Service flow rates of 1200 pcph, total in both directions, can be achieved under ideal conditions.

Level-of-service D borders on unstable flow. Speeds of 50 mph or slightly higher can still be achieved on level terrain under ideal conditions. Passing demand is very high while passing capacity approaches zero. Traffic flow is still stable. Drivers are delayed up to 75 percent of the time on the average. Service flow rates of 1800 pcph, total in both directions, can be achieved under ideal conditions.

Level-of-service E is defined as traffic flow conditions on two-lane highways having a percent time delay of greater than 75 percent. Under ideal conditions, speeds will drop below 50 mph. Average travel speeds on highways with less than ideal conditions will be slower, as low as 25 mph on sustained upgrades. Under ideal conditions, capacity is 2800 pcph, total in both directions.

Level-of-service F represents heavily congested flow with traffic demand exceeding capacity. volumes are lower than capacity, and speeds are below capacity speed.

REFERENCE: Highway Capacity Manual (Special Report 209, 1985)

DEFINITION OF LEVEL-OF-SERVICE FOR UNSIGNALIZED INTERSECTIONS

For unsignalized intersections, the traffic most impacted will be the minor or cross-street with the stop or yield control. The major roadway will have the right-of-way. The level-of-service is the amount of delay expected for the average vehicle desiring to cross or enter the major road. The following gives a general description of the measure.

The concept of levels of service is defined as a qualitative measure describing operational conditions within a traffic stream, and their perception by motorists and/or passengers. A level of service definition generally describes these conditions in terms of such factors as speed and travel time, freedom to maneuver, traffic interruptions, comfort and convenience, and safety.

Six levels of service are defined for each type of facility for which analysis procedures are available. They are given letter designations, from A to F, with level-of-service A representing the best operating conditions and level-of-service F the worst.

Level-of-Service definitions--In general, the various levels of service are defined as follows for uninterrupted flow facilities:

Level-of-service A represents free flow. Individual users are virtually unaffected by the presence of others in the traffic stream. Freedom to select desired speeds and to maneuver within the traffic stream is extremely high. The general level of comfort and convenience provided to the motorist, passenger, or pedestrian is excellent.

Level-of-service B is in the range of stable flow, but the presence of other users in the traffic stream begins to be noticeable. Freedom to select desired speeds is relatively unaffected, but there is slight decline in the freedom to maneuver within the traffic stream from LOS A. The level of comfort and convenience provided is somewhat less than at LOS A, because the presence of others in the traffic stream begins to affect individual behavior.

Level-of-service C is in the range of stable flow, but marks the beginning of the range of flow in which the operation of individual users becomes significantly affected by interactions with others in the traffic stream. The selection of speed is now affected by the presence of others, and maneuvering within the traffic stream requires substantial vigilance on the part of the user. The general level of comfort and convenience declines noticeably at this level.

Level-of-service D represents high-density, but stable, flow. Speed and freedom to maneuver are severely restricted, and the driver or pedestrian experiences a generally poor level of comfort and convenience. Small increases in traffic flow will generally cause operational problems at this level.

Level-of-service E represents operating conditions at or near the capacity level. All speeds are reduced to a low, but relatively uniform value. Freedom to maneuver within the traffic stream is extremely difficult, and it is generally accomplished by forcing a vehicle or pedestrian to "give way" to accommodate such maneuver. Comfort and convenience levels are extremely poor, and driver or pedestrian frustration is generally high. Operations at this level are usually unstable, because small increases in flow or minor perturbations within the traffic stream will cause breakdowns.

Level-of-service F is used to define forced or breakdown flow. This condition exists wherever the amount of traffic approaching a point exceeds the amount which can traverse the point. Queues form behind such locations. Operations within the queue are characterized by stop-and-go wave, and they are extremely unstable. Vehicles may progress at reasonable speeds for several hundred feet or more, then be required to stop in a cyclic fashion. Level-of-service F is used to describe the operating conditions within the queue, as well as the point of the breakdown. It should be noted, however, that in many cases operating conditions of the vehicles or pedestrians discharged from the queue may be quite good. Nevertheless, it is the point at which arrival flow exceeds discharge flow which causes the queue to form, and level-of-service F is an appropriate designation for such points.

These definitions are general and conceptual in nature, and they apply primarily to uninterrupted flow. Levels of service for interrupted flow facilities vary widely in terms of both the user's perception of service quality and the operational variables used to describe them.

REFERENCE: Highway Capacity Manual (Special Report 209, 1985)

APPENDIX B

MANUAL TRAFFIC COUNT DATA

APPENDIX B

MANUAL TRAFFIC COUNT DATA

Date: January 30, 1991

Location: Queen Kaahumanu Hwy and Kona Village Driveway

	Queen Kaahumanu Hwy						Kona Village Driveway					
	Northbound			Southbound			Makai bound			Mauka bound		
Time (am)	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
5:30-5:45	2	22	0	0	11	2	0	0	0	0	0	0
5:45-6:00	5	31	0	0	20	0	0	0	0	0	0	0
6:00-6:15	9	73	0	0	20	3	0	0	0	2	0	1
6:15-6:30	13	102	0	0	32	2	0	0	0	0	0	1
6:30-6:45	4	106	2	0	33	0	0	0	0	0	0	0
6:45-7:00	7	99	0	0	40	0	0	0	0	0	0	2
7:00-7:15	5	88	0	0	42	1	0	0	0	0	0	0
7:15-7:30	4	84	0	0	46	0	0	0	0	0	0	1
Peak Hour 6:15-7:15												
Totals	29	395	2	0	147	3	0	0	0	0	0	3

Date: January 29, 1991

Location: Queen Kaahumanu Hwy and Kona Village Driveway

	Queen Kaahumanu Hwy						Kona Village Driveway					
	Northbound			Southbound			Makai bound			Mauka bound		
Time (am)	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
3:00-3:15	5	56	0	0	84	0	0	0	0	2	1	6
3:15-3:30	2	73	0	0	94	1	0	0	0	0	0	5
3:30-3:45	2	46	0	0	113	1	0	0	0	2	0	5
3:45-4:00	4	56	0	0	111	2	2	0	0	0	0	7
4:00-4:15	5	52	0	0	129	1	0	0	0	0	0	3
4:15-4:30	7	51	0	2	99	0	0	0	0	0	0	4
4:30-4:45	5	59	0	0	96	1	0	1	0	0	0	3
4:45-5:00	4	41	0	0	94	0	0	0	0	0	0	3
Peak Hour 3:15-4:15												
Totals	13	227	0	0	447	5	2	0	0	2	0	20

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RECEIVED WASTE DATA SHEET

Facility: [✓]Landfill. [ ]Transfer Station Location: Kona Landfill Date: 3/7/98

Weather: [✓]Clear [ ]Rain [ ]Cloudy Prepared by: Gary Shirota

VEHICLE CODES: CD - Commercial Dumpster; ST - Semi-trailer; DT - Dump Truck; FB - Flatbed Trucks & Trucks 3/4 ton; T.5 - 1/2 ton Truck; T.25 - 1/4 ton Truck; P - Passenger Vehicle; O - Other

TIME	VEH TYPE	HOUSEHOLD REFUSE	COMMERCIAL REFUSE	CONSTRUCTION WASTE	VEGETATIVE WASTE	TOTAL	WHITE GOODS	CH REF TRAILER	ABAND VEHIC
6:30 am TO 8:30 am (2 HRS.)	CD	:	III		I	3			
	ST								
	DT	:	III		I	4			
	FB			I		1			
	T.5	II	I	I	I	5			
	T.25	I				1			
	P								
	O								
8:30 am TO 10:30 am (2 HRS.)	CD	IIII	I	I		7			
	ST			II		2		I	
	DT			I	I	2			
	FB			III	I	4			
	T.5	I	I	III	II	7			
	T.25		I	II	III	6			
	P			I	I	2			
	O								

19/87

RECEIVED WASTE DATA SHEET

Facility: [✓]Landfill [ ]Transfer Station Location: Kona Landfill Date: 3/7/39

Weather : [✓]Clear [ ]Rain [ ]Cloudy Prepared by: Gary Shirota

VEHICLE CODES: CD - Commercial Dumpster FB - Flatbed Trucks & Trucks 3/4 ton T.25 - 1/4 ton Truck
ST - Semi-trailer P - Passenger Vehicle
DT - Dump Truck T.5 - 1/2 ton Truck O - Other

TIME	VEH TYPE	HOUSEHOLD REFUSE	COMMERCIAL REFUSE	CONSTRUCTION WASTE	VEGETATIVE WASTE	TOTAL	WHITE GOODS	CH REF TRAILER	ABAND VEHIC
10:30 a pm TO 12:30 am (pm) (2 HRS.)	CD		𝍸 II			7			
	ST		I			1			
	DT			II	I	3			
	FB		IIII		II	6			I
	T.5	I	IIII	𝍸 I	I	12			
	T.25	𝍸	I		III	9	I		
	P								
	O								
12:30 pm TO 2:30 am (pm) (2 HRS.)	CD	I	II			3			
	ST							II	
	DT		II		III	5			
	FB	I	I	II		4	II		
	T.5			III	𝍸	8			II
	T.25		IIII	I	IIII	9			
	P		I	I		2			
	O								

4/19/87

RECEIVED WASTE DATA SHEET

Facility: [✓]Landfill [ ]Transfer Station Location: Kona Landfill Date: 3/7/39

Weather : [ ]Clear [ ]Rain [✓]Cloudy Prepared by: Gary Shirota

VEHICLE CODES: CD - Commercial Dumpster FB - Flatbed Trucks & Trucks 3/4 ton T.25 - 1/4 ton Truck
ST - Semi-trailer P - Passenger Vehicle
DT - Dump Truck T.5 - 1/2 ton Truck O - Other

TIME	VEH TYPE	HOUSEHOLD REFUSE	COMMERCIAL REFUSE	CONSTRUCTION WASTE	VEGETATIVE WASTE	TOTAL	WHITE GOODS	CH REF TRAILER	ABAND VEHIC
2:30 am ( ) TO [illegible]:30 am (pm) (2 HRS.)	CD		III			3			
	ST								
	DT								
	FB	I	I		I	3	II		
	T.5			𝍸 I	I	7			
	T.25	I	I	III	III	3			
	P	I		I		2			
	O								
__:__ am pm TO __:__ am pm (2 HRS.)	CD								
	ST								
	DT								
	FB								
	T.5								
	T.25								
	P								
	O								

/19/87

RECEIVED WASTE DATA SHEET

acility: [√]Landfill [ ]Transfer Station Location: Kona Landfill Date: 3/8/88

ther : [ ]Clear [ ]Rain [√]Cloudy Prepared by: G. Shirota

HICLE CODES: CD - Commercial Dumpster; ST - Semi-trailer; DT - Dump Truck; FB - Flatbed Trucks & Trucks 3/4 ton; T.5 - 1/2 ton Truck; T.25 - 1/4 ton Truck; P - Passenger Vehicle; O - Other

<table>
<tr><th>IME</th><th>VEH TYPE</th><th>HOUSEHOLD REFUSE</th><th>COMMERCIAL REFUSE</th><th>CONSTRUCTION WASTE</th><th>VEGETATIVE WASTE</th><th>TOTAL</th><th>WHITE GOODS</th><th>CH REF TRAILER</th><th>ABAND VEHIC</th></tr>
<tr><td rowspan="8">6:30 am pm TO 8:30 am pm (2 HRS.)</td><td>CD</td><td></td><td>卌|||</td><td></td><td>|</td><td>6</td><td></td><td></td><td></td></tr>
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<tr><td>T.5</td><td></td><td>|</td><td></td><td>||</td><td>3</td><td></td><td></td><td></td></tr>
<tr><td>T.25</td><td>||</td><td>|</td><td>||</td><td>|</td><td>6</td><td></td><td></td><td>|</td></tr>
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<tr><td rowspan="8">8:30 am pm TO 10:30 am pm (2 HRS.)</td><td>CD</td><td></td><td>|||</td><td></td><td></td><td>3</td><td></td><td></td><td></td></tr>
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<tr><td>DT</td><td></td><td></td><td>||||</td><td>||</td><td>6</td><td></td><td></td><td></td></tr>
<tr><td>FB</td><td></td><td>|</td><td>|</td><td>|</td><td>3</td><td></td><td></td><td>|</td></tr>
<tr><td>T.5</td><td></td><td>||</td><td>||</td><td>||||</td><td>8</td><td></td><td></td><td></td></tr>
<tr><td>T.25</td><td>||</td><td></td><td>卌|</td><td>卌||</td><td>25</td><td></td><td></td><td></td></tr>
<tr><td>P</td><td></td><td>|</td><td>|</td><td></td><td>2</td><td></td><td></td><td></td></tr>
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/19/87

RECEIVED WASTE DATA SHEET

Facility: [√]Landfill [ ]Transfer Station Location: Kona Landfill Date: 3/9/88

Weather : [√]Clear [ ]Rain [ ]Cloudy Prepared by: G. Shirota

HICLE CODES: CD - Commercial Dumpster; ST - Semi-trailer; DT - Dump Truck; FB - Flatbed Trucks & Trucks 3/4 ton; T.5 - 1/2 ton Truck; T.25 - 1/4 ton Truck; P - Passenger Vehicle; O - Other

<table>
<tr><th>TIME</th><th>VEH TYPE</th><th>HOUSEHOLD REFUSE</th><th>COMMERCIAL REFUSE</th><th>CONSTRUCTION WASTE</th><th>VEGETATIVE WASTE</th><th>TOTAL</th><th>WHITE GOODS</th><th>CH REF TRAILER</th><th>ABAND VEHIC</th></tr>
<tr><td rowspan="8">10:30 am pm TO 12:30 am pm (2 HRS.)</td><td>CD</td><td></td><td>||</td><td></td><td>|</td><td>2</td><td></td><td></td><td></td></tr>
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<tr><td>T.25</td><td></td><td></td><td>卌||</td><td>||||</td><td>11</td><td></td><td></td><td></td></tr>
<tr><td>P</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
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/19/87

RECEIVED WASTE DATA SHEET

Facility: [✓]Landfill [ ]Transfer Station Location: Kona Landfill Date: 3/8/88

Weather: [✓]Clear [ ]Rain [ ]Cloudy Prepared by: G. Shirota

VEHICLE CODES: CD - Commercial Dumpster; ST - Semi-trailer; DT - Dump Truck; FB - Flatbed Trucks & Trucks 3/4 ton; T.5 - 1/2 ton Truck; T.25 - 1/4 ton Truck; P - Passenger Vehicle; O - Other

TIME	VEH TYPE	HOUSEHOLD REFUSE	COMMERCIAL REFUSE	CONSTRUCTION WASTE	VEGETATIVE WASTE	TOTAL	WHITE GOODS	CH REF TRAILER	ABAND VEHIC
2:30 am (pm) TO 3:30 am (pm) (2 HRS.)	CD			I		1			
	ST								
	DT		I	I	I	3			
	FB			I	III	4			
	T.5	II	I	I	II	6	I		
	T.25	I		II	III	6			
	P	I				1			
	O								
__:__ am pm TO __:__ am pm (2 HRS.)	CD								
	ST								
	DT								
	FB								
	T.5								
	T.25								
	P								
	O								

/19/87

RECEIVED WASTE DATA SHEET

Facility: [✓]Landfill [ ]Transfer Station Location: Kona Landfill Date: 3/9/88

Weather: [✓]Clear [ ]Rain [ ]Cloudy Prepared by: G. Shirota

VEHICLE CODES: CD - Commercial Dumpster; ST - Semi-trailer; DT - Dump Truck; FB - Flatbed Trucks & Trucks 3/4 ton; T.5 - 1/2 ton Truck; T.25 - 1/4 ton Truck; P - Passenger Vehicle; O - Other

TIME	VEH TYPE	HOUSEHOLD REFUSE	COMMERCIAL REFUSE	CONSTRUCTION WASTE	VEGETATIVE WASTE	TOTAL	WHITE GOODS	CH REF TRAILER	ABAND VEHIC
6:30 (am) pm TO 8:30 (am) pm (2 HRS.)	CD		III		I	4			
	ST							I	
	DT		II		I	3			
	FB	I				1			
	T.5	I			II	3			
	T.25	II		II		4			
	P	I			I	2			
	O								
8:30 (am) pm TO 10:30 (am) pm (2 HRS.)	CD		𝍸 I	I		7			
	ST			I		1			
	DT			I	II	3			
	FB	I		I	I	3			
	T.5		I	II	III	6			
	T.25			III	𝍸	8			
	P	I				1			
	O								

/19/87

RECEIVED WASTE DATA SHEET

Facility: [✓]Landfill [ ]Transfer Station Location: Kona Landfill Date: 3/2/88

Weather: [ ]Clear [ ]Rain [✓]Cloudy Prepared by: G. Shirota

VEHICLE CODES: CD - Commercial Dumpster, ST - Semi-trailer, DT - Dump Truck, FB - Flatbed Trucks & Trucks 3/4 ton, T.5 - 1/2 ton Truck, T.25 - 1/4 ton Truck, P - Passenger Vehicle, O - Other

TIME	VEH TYPE	HOUSEHOLD REFUSE	COMMERCIAL REFUSE	CONSTRUCTION WASTE	VEGETATIVE WASTE	TOTAL	WHITE GOODS	CH REF TRAILER	ABAND VEHIC
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RECEIVED WASTE DATA SHEET

Facility: [✓]Landfill [ ]Transfer Station Location: Kona Landfill Date: 3/2/88

Weather: [ ]Clear [ ]Rain [✓]Cloudy Prepared by: G. Shirota

VEHICLE CODES: CD - Commercial Dumpster, ST - Semi-trailer, DT - Dump Truck, FB - Flatbed Trucks & Trucks 3/4 ton, T.5 - 1/2 ton Truck, T.25 - 1/4 ton Truck, P - Passenger Vehicle, O - Other

TIME	VEH TYPE	HOUSEHOLD REFUSE	COMMERCIAL REFUSE	CONSTRUCTION WASTE	VEGETATIVE WASTE	TOTAL	WHITE GOODS	CH REF TRAILER	ABAND VEHIC
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RECEIVED WASTE DATA SHEET

Facility: [✓]Landfill [ ]Transfer Station Location: Kona Landfill Date: 3/10/89

Weather : [✓]Clear [ ]Rain [ ]Cloudy Prepared by: G. Shiroto

VEHICLE CODES: CD - Commercial Dumpster, ST - Semi-trailer, DT - Dump Truck, FB - Flatbed Trucks & Trucks 3/4 ton, T.5 - 1/2 ton Truck, T.25 - 1/4 ton Truck, P - Passenger Vehicle, O - Other

TIME	VEH TYPE	HOUSEHOLD REFUSE	COMMERCIAL REFUSE	CONSTRUCTION WASTE	VEGETATIVE WASTE	TOTAL	WHITE GOODS	CH REF TRAILER	ABAND VEHIC
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RECEIVED WASTE DATA SHEET

Facility: [✓]Landfill [ ]Transfer Station Location: Kona Landfill Date: 3/10/89

Weather : [✓]Clear [ ]Rain [ ]Cloudy Prepared by: G. Shiroto

VEHICLE CODES: CD - Commercial Dumpster, ST - Semi-trailer, DT - Dump Truck, FB - Flatbed Trucks & Trucks 3/4 ton, T.5 - 1/2 ton Truck, T.25 - 1/4 ton Truck, P - Passenger Vehicle, O - Other

TIME	VEH TYPE	HOUSEHOLD REFUSE	COMMERCIAL REFUSE	CONSTRUCTION WASTE	VEGETATIVE WASTE	TOTAL	WHITE GOODS	CH REF TRAILER	ABAND VEHIC
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RECEIVED WASTE DATA SHEET

Facility: [✓]Landfill [ ]Transfer Station Location: Kona Landfill Date: 3/10/99

Weather : [ ]Clear [ ]Rain [✓]Cloudy Prepared by: G. Shirota

VEHICLE CODES: CD - Commercial Dumpster; ST - Semi-trailer; DT - Dump Truck; FB - Flatbed Trucks & Trucks 3/4 ton; T.5 - 1/2 ton Truck; T.25 - 1/4 ton Truck; P - Passenger Vehicle; O - Other

TIME	VEH TYPE	HOUSEHOLD REFUSE	COMMERCIAL REFUSE	CONSTRUCTION WASTE	VEGETATIVE WASTE	TOTAL	WHITE GOODS	CH REF TRAILER	ABAND VEHIC
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Page 1 of 3

RECEIVED WASTE DATA SHEET

Facility: [✓]Landfill [ ]Transfer Station Location: Kona Landfill Date: 3/11/99

Weather : [ ]Clear [ ]Rain [ ]Cloudy Prepared by: G. Shirota

VEHICLE CODES: CD - Commercial Dumpster; ST - Semi-trailer; DT - Dump Truck; FB - Flatbed Trucks & Trucks 3/4 ton; T.5 - 1/2 ton Truck; T.25 - 1/4 ton Truck; P - Passenger Vehicle; O - Other.

TIME	VEH TYPE	HOUSEHOLD REFUSE	COMMERCIAL REFUSE	CONSTRUCTION WASTE	VEGETATIVE WASTE	TOTAL	WHITE GOODS	CH REF TRAILER	ABAND VEHIC
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0089E

Facility: [✓]Landfill [ ]Transfer Station Location: Kona Landfill Date: 3/11/83
Weather : [ ]Clear [ ]Rain [✓]Cloudy Prepared by: G. Shirota

VEHICLE CODES: CD - Commercial Dumpster; ST - Semi-trailer; DT - Dump Truck; FB - Flatbed Trucks & Trucks 3/4 ton; T.5 - 1/2 ton Truck; T.25 - 1/4 ton Truck; P - Passenger Vehicle; O - Other

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0089E

RECEIVED WASTE DATA SHEET

Facility: [✓]Landfill [ ]Transfer Station Location: Kona Landfill Date: 3/11/83
Weather : [ ]Clear [ ]Rain [✓]Cloudy Prepared by: G. Shirota

VEHICLE CODES: CD - Commercial Dumpster; ST - Semi-trailer; DT - Dump Truck; FB - Flatbed Trucks & Trucks 3/4 ton; T.5 - 1/2 ton Truck; T.25 - 1/4 ton Truck; P - Passenger Vehicle; O - Other

TIME	VEH TYPE	HOUSEHOLD REFUSE	COMMERCIAL REFUSE	CONSTRUCTION WASTE	VEGETATIVE WASTE	TOTAL	WHITE GOODS	CH REF TRAILER	ABAND VEHIC
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RECEIVED WASTE DATA SHEET

Facility: [√]Landfill [ ]Transfer Station Location: Kono Landfill Date: 3/12/83

Weather : [√]Clear [ ]Rain [ ]Cloudy Prepared by: G. Shirota

VEHICLE CODES: CD - Commercial Dumpster; ST - Semi-trailer; DT - Dump Truck; FB - Flatbed Trucks & Trucks 3/4 ton; T.5 - 1/2 ton Truck; T.25 - 1/4 ton Truck; P - Passenger Vehicle; O - Other

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RECEIVED WASTE DATA SHEET

Facility: [√]Landfill [ ]Transfer Station Location: Kono Landfill Date: 3/12/83

Weather : [ ]Clear [ ]Rain [√]Cloudy Prepared by: G. Shirota

VEHICLE CODES: CD - Commercial Dumpster; ST - Semi-trailer; DT - Dump Truck; FB - Flatbed Trucks & Trucks 3/4 ton; T.5 - 1/2 ton Truck; T.25 - 1/4 ton Truck; P - Passenger Vehicle; O - Other

TIME	VEH TYPE	HOUSEHOLD REFUSE	COMMERCIAL REFUSE	CONSTRUCTION WASTE	VEGETATIVE WASTE	TOTAL	WHITE GOODS	CH REF TRAILER	ABAND VEHIC
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	T.25		II	II	IIII	8			
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Page 2 of 2

RECEIVED WASTE DATA SHEET

Facility: [✓]Landfill [ ]Transfer Station Location: Kona Landfill Date: 3/12/83

Weather: [ ]Clear [ ]Rain [✓]Cloudy Prepared by: G. Shirota

VEHICLE CODES: CD - Commercial Dumpster, ST - Semi-trailer, DT - Dump Truck, FB - Flatbed Trucks & Trucks 3/4 ton, T.5 - 1/2 ton Truck, T.25 - 1/4 ton Truck, P - Passenger Vehicle, O - Other

TIME	VEH TYPE	HOUSEHOLD REFUSE	COMMERCIAL REFUSE	CONSTRUCTION WASTE	VEGETATIVE WASTE	TOTAL	WHITE GOODS	CH REF TRAILER	ABAND VEHIC
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Page 1 of 2

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RECEIVED WASTE DATA SHEET

Facility: [✓]Landfill [ ]Transfer Station Location: Kona Landfill Date: 3/13/83

Weather: [✓]Clear [ ]Rain [ ]Cloudy Prepared by: G. Shirota

VEHICLE CODES: CD - Commercial Dumpster, ST - Semi-trailer, DT - Dump Truck, FB - Flatbed Trucks & Trucks 3/4 ton, T.5 - 1/2 ton Truck, T.25 - 1/4 ton Truck, P - Passenger Vehicle, O - Other

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RECEIVED WASTE DATA SHEET

acility: [✓]Landfill [ ]Transfer Station Location: Kona Landfill Date: 3/13/93

Weather : [✓]Clear [ ]Rain [ ]Cloudy Prepared by: G. Shirota

EHICLE CODES: CD - Commercial Dumpster; ST - Semi-trailer; DT - Dump Truck; FB - Flatbed Trucks & Trucks 3/4 ton; T.5 - 1/2 ton Truck; T.25 - 1/4 ton Truck; P - Passenger Vehicle; O - Other

TIME	VEH TYPE	HOUSEHOLD REFUSE	COMMERCIAL REFUSE	CONSTRUCTION WASTE	VEGETATIVE WASTE	TOTAL	WHITE GOODS	CH REF TRAILER	ABAND VEHIC
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RECEIVED WASTE DATA SHEET

acility: [✓]Landfill [ ]Transfer Station Location: Kona Landfill Date: 3/13/93

Weather : [ ]Clear [ ]Rain [✓]Cloudy Prepared by: G. Shirota

EHICLE CODES: CD - Commercial Dumpster; ST - Semi-trailer; DT - Dump Truck; FB - Flatbed Trucks & Trucks 3/4 ton; T.5 - 1/2 ton Truck; T.25 - 1/4 ton Truck; P - Passenger Vehicle; O - Other

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APPENDIX C

TRIP GENERATION

APPENDIX C
TRIP GENERATION

Land Use	Amount	Units	Afternoon Peak Hour Enter	Afternoon Peak Hour Exit
Based upon ITE				
Bay Club	172	units	64	33
Vista Waikoloa	122	units	49	25
Fairways	51	units	24	12
Knolls	17	units	10	5
King's Shop	56	1,000 Sq. Ft. GLA	227	227
Sunset Ridge	161	units	106	60
Kopona Hills	62	units	45	25
Independent Lots	70	units	50	28
Waikoloa Knolls				
Phase I	177	units	116	65
Phase II	60	units	44	25

Land Use	Independent Variable	Total Number of Trips	Enter	Exit
Residential Condominium	dwelling units	$Ln(T) = 0.818 * Ln(A) + 0.368$	66%	34%
Used for: *Bay Club, Vista Waikoloa, Fairways and Knolls*				
Shopping Center	1,000 Sq. Ft. GLA	$Ln(T) = 0.637 * Ln(A) + 3.553$	50%	50%
Used for: *King's Shop*				
Single Family Detached Housing	dwelling units	$Ln(T) = 0.902 * Ln(A) + 0.528$	64%	36%
Used for: *Sunset Ridge, Kopona Hills, Independent Lots, Waikoloa Knolls Phase I & II*				

T = Total number of trips
A = Quantity of independent variable

APPENDIX D

AVIFAUNA AND FERAL ANIMAL SURVEY

SURVEY OF THE AVIFAUNA AND FERAL MAMMALS AT THE PROPOSED WEST HAWAII SANITARY LANDFILL, NORTH KONA, HAWAII

Prepared for

R.M. Towill Corp.

by

Phillip L. Bruner
Assistant Professor of Biology
Director, Museum of Natural History
Environmental Consultant Fauna (Bird and Mammal) Surveys

5 June 1991

INTRODUCTION

The purpose of this report is to summarize the findings of a two day (1-2 June 1991) bird and mammal field survey of property proposed for a sanitary landfill located in North Kona, Hawaii. Also included are references to pertinent literature as well as unpublished faunal reports from similar lands in West Hawaii.

The objectives of the field survey were to:

1- Document what bird and mammal species occur on the property or may likely occur given the type of habitats available.

2- Provide some baseline data on the relative (estimated) abundance of each species.

3- Determine the presence or likely occurrence of any native fauna particularly any that are considered "Endangered" or "Threatened". If such occur or may likely be found on or near the property identify what features of the habitat may be essential for these species.

4- Identify any special or unique habitats for wildlife that may occur on the site and note what importance these areas may have for the fauna in this region of the island.

GENERAL SITE DESCRIPTION

Figure One indicates the limits of the property. The site is primarily open lava flows with dry grass and scattered Kiawe trees (Prosopis pallida). The topography of this area is relatively flat. Elevation at this location is approximately 200 feet. No wetlands occur on the property.

Weather during the field survey was generally clear with cool mornings and some afternoon clouds. Wind was from the NE at 10-20 mph.

STUDY METHODS

Field observations were made with the aid of binoculars and by listening for vocalizations. These observations were concentrated during the peak bird activity periods of early morning and late afternoon. Attention was also paid to the presence of tracks and scats as indicators of bird and mammal activity. At various locations (see Fig.1) eight minute counts were made of all birds seen or heard. Between these count (census) stations observations of birds seen or heard were also noted. These data provide the basis for the relative (estimated) abundance figures given in this report (Table 1). Published and unpublished reports of birds

known from similar habitat on lands close to this site and elsewhere in West Hawaii were also consulted in order to acquire a more complete picture of the possible species that might occur in the area (Bruner 1979, 1980, 1984a, 1984b, 1984c, 1985a, 1985b, 1986, 1988a, 1988b, 1989a, 1989b, 1989c, 1990a, 1990b, 1990c, 1990d, 1990e; Pratt et al. 1987; Hawaii Audubon Society 1989; David 1989, 1990). Observations of feral mammals were limited to visual sightings and evidence in the form of scats and tracks. No attempts were made to trap mammals in order to obtain data on their relative (estimated) abundance and distribution. Two evenings were devoted to searching for the presence of owls and the Hawaiian Hoary Bat (Lasiurus cinereus semotus).

Scientific names used herein follow those given in the most recent American Ornithologist's Union Checklist (A.O.U. 1983); Hawaii's Birds (Hawaii Audubon Society 1989); A Field Guide to the Birds of Hawaii and the Tropical Pacific (Pratt et al. 1987); Mammals Species of the World (Honacki et al. 1982) and Hawaiian Coastal Plants (Merlin 1977).

RESULTS AND DISCUSSION

Resident Endemic (Native) Birds:

No Short-eared Owl or Pueo (Asio flammeus sandwichensis) were observed but this bird could potentially occur on occasion at this location. Pueo are relatively common on the island of Hawaii particularly at higher elevations (Berger 1972); Pratt et al. 1987; Hawaii Audubon Society 1989).

'Io or Hawaiian Hawk (Buteo solitarius) may also forage in this area, although none were seen over the course of the survey. 'Io are an endangered species. They can, however, be seen fairly regularly in open coastal habitats as well as upland agricultural fields and forest.

No wetlands occur on the property, therefore no native waterbirds would be expected. The disturbed nature of the habitat and its location make it highly unlikely that any other endemic birds, aside from the two mentioned, would utilize this property.

Migratory Indigenous (Native) Birds:

Migratory shorebirds winter in Hawaii between the months of August through May. Some juveniles will stay through the summer months as well (Johnson and Johnson 1983). Of all the shorebirds species which winter in Hawaii the Pacific Golden Plover (Pluvialis fulva) are the most abundant. Plover prefer open areas such as exposed intertidal reef, rocky shorelines, mud flats, lawns pastures, plowed fields and sparce grasslands. They arrive in Hawaii in early August and depart to their arctic breeding grounds during the last week of April (Johnson et al. 1981). Bruner (1983) and Johnson et al. (1989) have also shown plover are extremely site-faithful on their wintering grounds and many establish

foraging territories which they defend vigorously. Such behavior makes it possible to acquire a fairly good estimate of the abundance of plover in any one area. These populations likewise remain relatively stable over many years (Johnson et al. 1989). No plover were recorded during the survey. Most shorebirds would be in the arctic at this time of the year. A few plover, usually juveniles, will remain in Hawaii over the summer. Ruddy Turnstone (Arenaria interpres) is the only other common migrant that would be expected in upland grassland habitat. None were recorded on this survey.

Resident Indigenous (Native) Birds:

No indigenous species were recorded. The only species in this category is the Black-crowned Night Heron (Nycticorax nycticorax). The absence of wetland habitat precludes the occurrence of this species.

Resident Indigenous (Native) Seabirds:

No seabirds were observed on the property. The presence of predators make this site unsuitable for nesting or roosting seabirds.

Exotic (Introduced) Birds:

A total of 13 species of exotic birds were recorded during the field survey. The most abundant species were Yellow-fronted Canary (Serinus mozambicus), Warbling Silverbill (Lonchura malabarica) and Japanese White-eye (Zosterops japonicus).

Given the habitats found on the property as well as data from surveys elsewhere in West Hawaii (Bruner 1979, 1980, 1984a, 1984b, 1984c, 1985a, 1985b, 1986, 1988a, 1988b, 1989a, 1989b, 1989c, 1990a, 1990b, 1990c, 1990d, 1990e, and information provided in Berger (1972); Pratt et al. 1987; Hawaii Audubon Society 1989 and David (1989, 1990) the following exotic bird species might also be expected to occur on or near the property: Barn Owl (Tyto alba), Ring-necked Pheasant (Phasianus colchicus), California Quail (Callipepla californica), Japanese Quail Coturnix japonica), Lavender Waxbill (Estrilda caerulescens), Eurasian Skylark (Alauda arvensis) and Nutmeg Mannikin (Lonchura punctulata).

Feral Mammals:

Small Indian Mongoose (Herpestes auropunctatus) were seen and scats of cats and dogs were also found on the survey. Feral Goats (Capra hircus) were common. A total of 47 goats were recorded. No trapping was conducted in order to assess the relative abundance of mammals.

Records of the endemic and endangered Hawaiian Hoary Bat are sketchy but the species has been reported from the district of North Kona (Tomich 1986; Kepler and Scott 1990). None were observed on this field survey despite evening searches of the area. This species roosts primarily in trees. Much remains to be known about the natural history of this bat and its ecological requirements here in Hawaii.

CONCLUSION

A brief field survey such as this one can at best provide only a limited perspective of the wildlife which utilize the area. Not all species will necessarily be observed and information on their use of the site must be sketched together from brief observations and the available literature. The number of species and the relative abundance of each species may vary throughout the year due to available resources and reproductive success. Species which are migratory will quite obviously be a part of the faunal picture only at certain times during the year. exotic species sometimes prosper for a time only to later disappear or become a less significant part of the ecosystem (Williams 1987; Moulton et al. 1990). Thus only long term studies can provide a comprehensive view of the bird and mammal populations in a particular area. However, when brief field studies are viewed in the light of data gathered from other similar habitats the value of the conclusions drawn can be significantly increased.

The following are some general conclusions related to bird and mammal activity on the property:

1- All representative types of habitat found on the property were censused. The more densely forested sections of the property support the greatest number and diversity of birds.

2- No endemic birds were found at this site. Migratory birds were absent due to the time of year.

3- The property supports the typical array of exotic species of birds one would expect in this type of environment in West Hawaii. Some potential species were not recorded. This could have been due to the fact that the survey was too brief, or that their numbers are so low that they went undetected or a combination of these and other factors. It is also possible that these species do not at present occur at this site.

4- In order to obtain more definitive data on mammals a trapping program would be required. Feral goats are common at this location. No sightings of the Hawaiian Hoary Bat were obtained.

5- No special or unique environmental resources were discovered. Disturbed habitats of the sort found on this site are common in this region of the island. For the most part native floral and faunal communities have been replaced by introduced plants and animals.

6- Habitat alteration as the result of development of a landfill will decrease the attractiveness of the area for certain introduced species of birds such as Yellow-fronted Canary and Warbling Silverbill while at the same time increase the suitability of the property for other species. Common Myna (<u>Acridotheres tristis</u>) and Zebra Dove (<u>Geopelia striata</u>) will increase dramatically with development of this area. Landfills are also attractive to feral cats and dogs as well as rodents. It is likely these mammals will increase in abundance unless there is an active control program implemented.

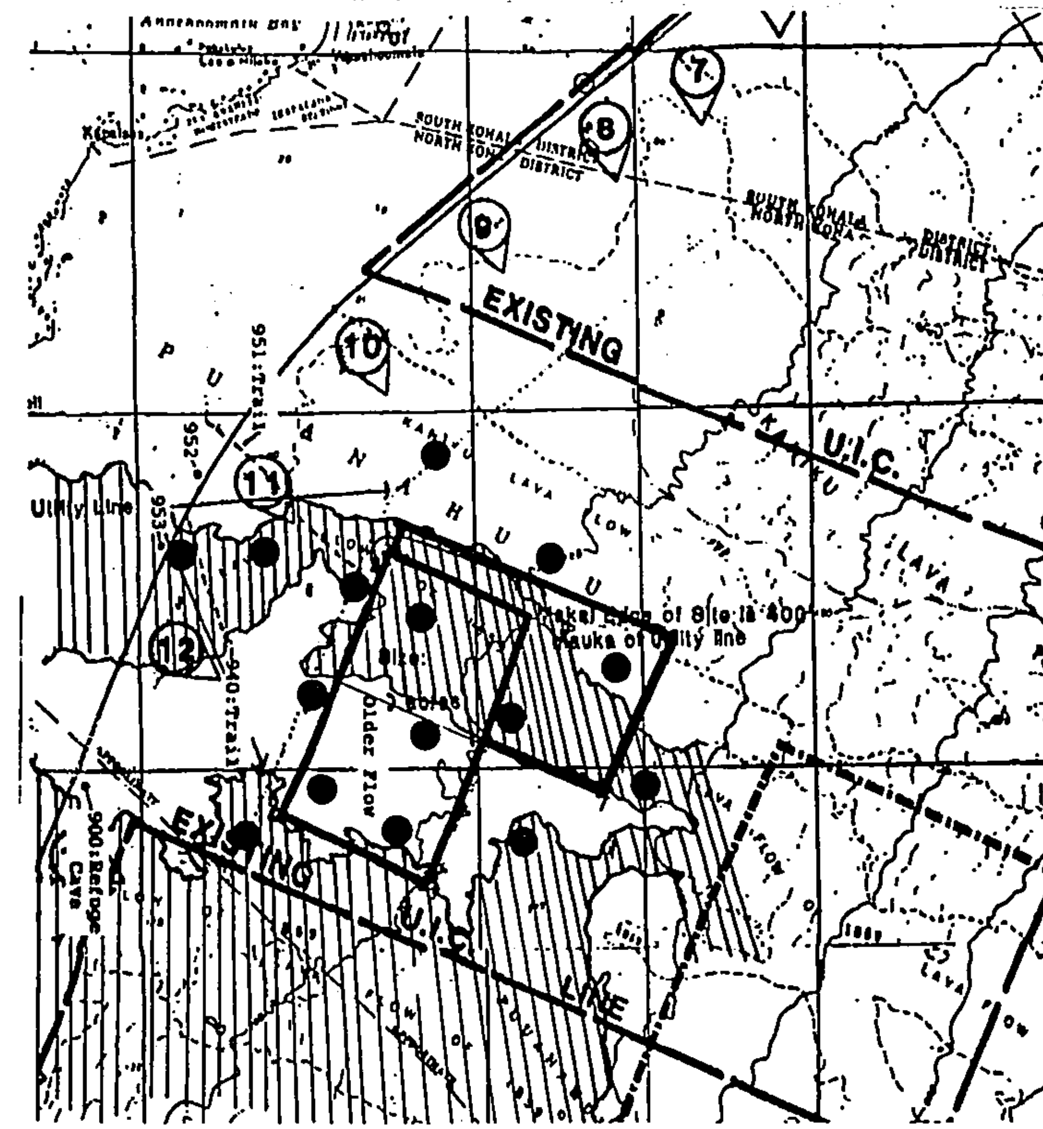

Fig. 1. Location of proposed sanitary landfill with faunal census stations shown as solid circles.

TABLE 1

Exotic (introduced) birds recorded at the location of a proposed sanitary landfill in North Kona, Hawaii

COMMON NAME	SCIENTIFIC NAME	RELATIVE ABUNDANCE*
Black Francolin	Francolinus francolinus	C= 9
Gray Francolin	Francolinus pondicerianus	U= 4
Spotted Dove	Streptopelia chinensis	R= 9
Zebra Dove	Geopelia striata	U= 4
Common Myna	Acridotheres tristis	R= 2
Yellow-billed Cardinal	Paroaria capitata	R= 8
Northern Cardinal	Cardinalis cardinalis	C= 7
Northern Mockingbird	Mimus polyglottus	R= 2
Japanese White-eye	Zosterops japonicus	A= 10
Yellow-fronted Canary	Serinus mozambicus	A= 14
Saffron Finch	Sicalis flaveola	R= 4
Warbling Silverbill	Lonchura malabarica	A= 20
House Finch	Carpodacus mexicanus	U= 3

* (see page 11 for key to symbols)

KEY TO TABLE 1

Relative (estimate) abundance = number of times observed during survey or average number on eight minute counts.

A= abundant (ave. 10+) number which follows is average of data from all survey days

C= common (ave. 5-10) number which follows is average of data from all survey days

U= uncommon (ave. less than 5) number which follows is average of data from all survey days

R= recorded (seen or heard at times other than on 8 min. counts or on one count only) number which follows is the total number seen or heard over the duration of the survey.

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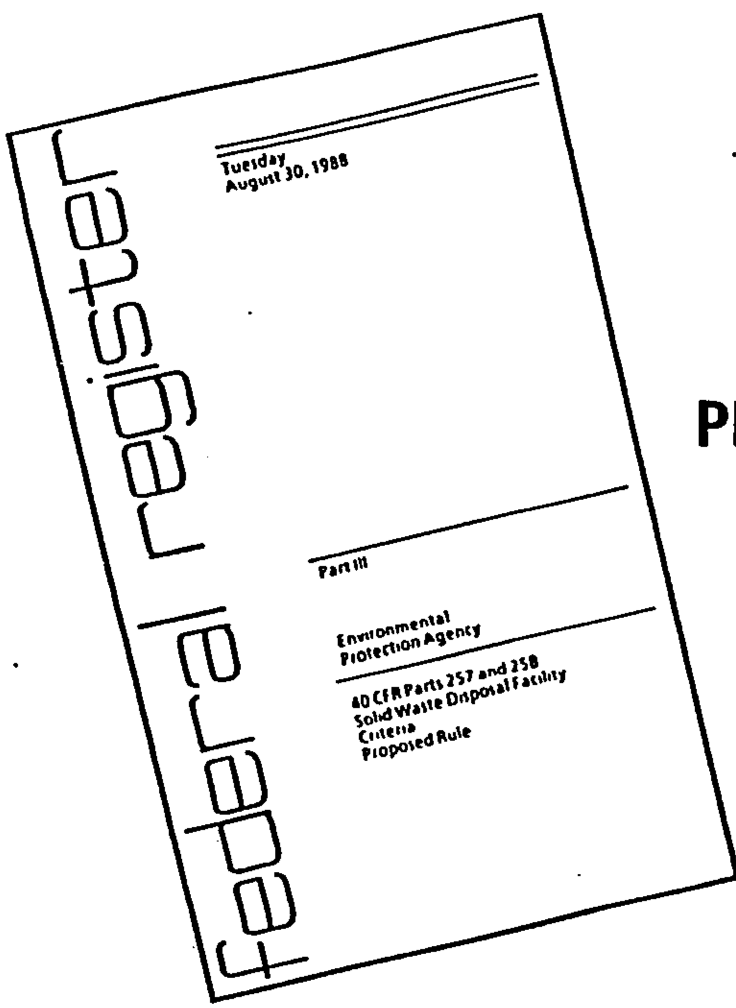
APPENDIX E

WEST HAWAII ADVISORY COMMITTEE ON SOLID WASTE DISPOSAL

APPENDIX III.—CARCINOGENIC SLOPE FACTORS (CSF's) AND REFERENCE DOSES (RfD's) FOR SELECTED HAZARDOUS CONSTITUE

CAS No.	Class	Chemical name	Health based levels for: Systemic toxicants—RFD (mg/kg/day)	Health based levels for: Carcinogens—(mg/kg/day)
67-64-1		Acetone	1.0×10^{-1}	
75-05-8		Acetonitrile	6.0×10^{-3}	
98-86-2		Acetophenone	1.0×10^{-1}	
107-13-1	(B1)	Acrylonitrile		5.4×10^{-1}
309-00-2	(B2)	Aldrin	3.0×10^{-5}	17
62-53-3	(C)	Aniline		$2.6 \times 10^{[illegible]}$
7440-36-0		Antimony	4.0×10^{-4}	
7440-39-3		Barium *	5.0×10^{-2}	
71-43-2	(A)	Benzene *		2.9×10^{-2}
7440-41-7		Beryllium	5.0×10^{-3}	
111-44-4	(B2)	Bis(chloroethyl)ether		1.1
117-81-7	(B2)	Bis(2-ethylhexyl)phthalate	2.0×10^{-2}	8.4×10^{-3}
75-27-4		Bromodichloromethane	2.0×10^{-2}	
75-25-2		Bromoform	2.0×10^{-2}	
74-83-9		Bromomethane	4.0×10^{-4}	
75-15-0		Carbon disulfide	1.0×10^{-1}	
56-23-5	(B2)	Carbon tetrachloride *	7.0×10^{-4}	1.3×10^{-1}
57-74-9	(B2)	Chlordane	5.0×10^{-5}	1.3
108-90-7		Chlorobenzene	3.0×10^{-2}	
67-66-3	(B2)	Chloroform	1.0×10^{-2}	6.1×10^{-3}
16065-83-1		Chromium (III) *	1	
7440-47-3		Chromium (VI) *	5.0×10^{-3}	
108-39-4		Cresol, meta	5.0×10^{-2}	
95-48-7		Cresol, ortho	5.0×10^{-2}	
106-44-5		Cresol, para	5.0×10^{-2}	
57-12-5		Cyanide	2.0×10^{-2}	
72-55-9	(B2)	DDE		3.4×10^{-1}
72-54-8	(B2)	DDD		2.4×10^{-1}
50-29-3	(B2)	DDT	5.0×10^{-4}	3.4×10^{-1}
124-48-1		Dibromochloromethane	2.0×10^{-2}	
84-74-2		Dibutyl phthalate	1.0×10^{-1}	
924-16-3	(B2)	Dibutylnitrosamine (N-Nitrosodi-n-butylamine)		5.4
75-71-8		Dichlorodifluoromethane	2.0×10^{-1}	
107-06-2	(B2)	1,2-Dichloroethane *		9.1×10^{-2}
75-35-4	(C)	1,1-Dichloroethylene *	9.0×10^{-3}	0.6
120-83-2		2,4-Dichlorophenol	3.0×10^{-3}	
60-57-1	(B2)	Dieldrin	5.0×10^{-5}	16
84-66-2		Diethyl phthalate	8.0×10^{-1}	
55-18-5	(B2)	Diethylnitrosamine (N-Nitrosodiethylamine)		150
60-51-5		Dimethoate	2.0×10^{-4}	
62-75-9	(B2)	Dimethylnitrosamine (N-Nitrosodimethylamine)		51
51-28-5		2,4 Dinitrophenol	2.0×10^{-3}	
88-85-7		Dinoseb	1.0×10^{-3}	
122-39-4		Diphenylamine	3.0×10^{-2}	
298-04-4		Disulfoton	4.0×10^{-5}	
100-41-4		Ethylbenzene	1.0×10^{-1}	
76-44-8	(B2)	Heptachlor	5.0×10^{-4}	4.5
1024-57-3	(B2)	Heptachlor epoxide		9.1
87-68-3	(C)	Hexachlorobutadiene	2.0×10^{-4}	7.8×10^{-2}
319-84-6	(B2)	Hexachlorocyclohexane—alpha (alpha—BHC)		6.3
319-85-7	(C)	Hexachlorocyclohexane—beta (beta—BHC)		1.8
58-89-9	(C)	Hexachlorocyclohexane—gamma (Lindane) *	3.0×10^{-4}	1.3
77-47-4		Hexachlorocyclopentadiene	7.0×10^{-3}	
67-72-1	(C)	Hexachloroethane	1.0×10^{-3}	1.4×10^{-2}
78-83-1		Isobutyl alcohol	3.0×10^{-1}	
78-59-1		Isophorone	2.0×10^{-1}	
126-98-7		Methacrylonitrile	1.0×10^{-4}	
78-93-3		Methyl ethyl ketone	5.0×10^{-2}	
108-10-1		Methyl isobutyl ketone	5.0×10^{-2}	
298-00-0		Methyl parathion	3.0×10^{-4}	
75-09-2	(B2)	Methylene chloride	6.0×10^{-2}	7.5×10^{-3}
10595-95-6	(B2)	N-Nitroso-N-methylethylamine		22
621-64-7	(B2)	N-Nitrosodi-N-propylamine		7.0
86-30-6	(B2)	N-Nitrosodiphenylamine		4.9×10^{-3}
930-55-2	(B2)	N-Nitrosopyrrolidine		2.1
7440-02-0		Nickel	2.0×10^{-2}	
98-95-3		Nitrobenzene	5.0×10^{-4}	
56-38-2		Parathion	3.3×10^{-4}	
608-93-5		Pentachlorobenzene	8.0×10^{-4}	
82-68-8		Pentachloronitrobenzene	3.0×10^{-3}	
87-86-5		Pentachlorophenol	3.0×10^{-2}	
108-95-2		Phenol	4.0×10^{-2}	
1336-36-3	(B2)	Polychlorinated biphenyls		7.7
23950-58-5		Pronamide	8.0×10^{-2}	
110-86-1		Pyridine	1.0×10^{-3}	
7440-22-4		Silver *	3.0×10^{-3}	
100-42-5	(B2)	Styrene	2.0×10^{-1}	3.0×10^{-2}



SOLID WASTE DISPOSAL FACILITY CRITERIA: PROPOSED REVISIONS

and the environment. Interim measures should, to the extent practicable, be consistent with the objectives of and contribute to the performance of any remedy that may be required pursuant to § 258.57. The following factors may be considered by the State in determining whether interim measures are necessary:

(i) Time required to develop and implement a final remedy;

(ii) Actual or potential exposure of nearby populations or environmental receptors to hazardous constituents;

(iii) Actual or potential contamination of drinking water supplies or sensitive ecosystems;

(iv) Further degradation of the ground water that may occur if remedial action is not initiated expeditiously;

(v) Weather conditions that may cause hazardous constituents to migrate or be released;

(vi) Risks of fire or explosion, or potential for exposure to hazardous constituents as a result of an accident or failure of a container or handling system; and

(vii) Other situations that may pose threats to human health and the environment.

(b) The State may determine, based on information developed by the owner or operator after implementation of the remedy has begun or other information, that compliance with a requirement(s) for the remedy selected under § 258.57 is not technically practicable. In making such determinations, the State shall consider:

(1) The owner or operator's efforts to achieve compliance with the requirement(s); and

(2) Whether other currently available or new and innovative methods or techniques could practicably achieve compliance with the requirements.

(c) If the State determines that compliance with a remedy requirement is not technically practicable, the State may require that the owner or operator:

(1) Implement alternate measures to control exposure of humans or the environment to residual contamination, as necessary to protect human health and the environment; and

(2) Implement alternate measures for control of the sources of contamination, or for removal or decontamination of equipment, units, devices, or structures required to implement the remedy that are:

(i) Technically practicable; and

(ii) Consistent with the overall objective of the remedy.

(d) All solid wastes that are managed pursuant to a remedy required under § 258.57, or an interim measure required under § 258.58(a)(4), shall be managed in a manner:

(1) That is protective of human health and the environment; and

(2) That complies with applicable RCRA requirements.

(e) Remedies selected pursuant to § 258.57 shall be considered complete when the State determines that:

(1) Compliance with the ground-water protection standards established under § 258.57(e) have been achieved, according to the requirements of § 258.57(f); and

(2) All actions required to complete the remedy have been satisfied.

(f) Upon completion of the remedy, the owner or operator shall submit to the State a certification that the remedy has been completed in accordance with the requirements of § 258.58(e). The certification must be signed by the owner or operator and by an independent professional(s) skilled in the appropriate technical discipline(s).

(g) When, upon receipt of the certification, and in consideration of any other relevant information, the State determines that the corrective action remedy has been completed in accordance with the requirements under paragraph (e) of this section, the Sta[te] shall release the permittee from the requirements for financial assurance [for] corrective action under § 258.32.

§ 258.59 (Reserved).

Appendix I—Volatile Organic Constituents for Ground-Water Monitoring

Acetone
Acrolein
Acrylonitrile
Benzene
Bromochloromethane
Bromodichloromethane
cis-1,3-Dichloropropene
Trans-1,3-Dichloropropene
1,4-Difluorobenzene
Ethanol
Ethylbenzene
Ethyl methacrylate
4-Bromofluorobenzene
Bromoform
Bromomethane
2-Butanone (Methyl ethyl ketone)
Carbon disulfide
Carbon tetrachloride
Chlorobenzene
Chlorodibromomethane
Chloroethane
2-Chloroethyl vinyl ether
Chloroform
Chloromethane
Dibromomethane
1,4-Dichloro-2-butane
Dichlorodifluoromethane
1,1-Dichloroethane
1,2-Dichloroethane
2-Hexanone
Iodomethane
Methylene chloride
4-Methyl-2-pentanone
1,1-Dichloroethene
trans-1,2-Dichloroethene
Styrene
1,1,2,2-Tetrachloroethane
Toluene
1,1,1-Trichloroethane
1,1,2-Trichloroethane
Trichloroethene
Trichlorofluoromethane
1,2,3-Trichloropropane
Vinyl acetate
Vinyl chloride
Xylene

Appendix II—Hazardous Constituents

Systematic name	CAS RN	Common name
Acenaphthylene	208-96-8	Acenaphthalene.
Acenaphthylene, 1,2-dihydro-	83-32-9	Acenaphthene.
Acetamide, N-(4-ethoxyphenyl)-H	62-44-2	Phenacetin.
Acetamide, N-9H-fluoren-2-yl	53-96-3	2-Acetylaminofluorene.
Acetic acid ethenyl ester	108-05-4	Vinyl acetate.
Acetic acid (2,4-5-trichloro-phenoxy)-	93-76-5	2,4,5-T.
Acetic acid (2,4-dichloro-phenoxy)-	94-75-7	2,4-Dichlorophenoxy-acetic acid.
Acetonitrile	75-05-8	Acetonitrile.
Aluminum	7429-90-5	Aluminum (total).
Anthracene	120-12-7	Anthracene.
Antimony	7440-36-0	Antimony (total).
Aroclor 1016	12674-11-2	Aroclor 1016.
Aroclor 1221	11104-28-2	Aroclor 1221.
Aroclor 1232	11141-16-5	Aroclor 1232.
Aroclor 1242	53469-21-9	Aroclor 1242.
Aroclor 1248	12672-29-6	Aroclor 1248.
Aroclor 1254	11097-69-1	Aroclor 1254.

Systematic name	CAS RN	Common name
Cyclohexane, 1,2,3,4,5,6-hexachloro-, (1a,2B,3a,4B,5a,6B)-	319-85-7	beta-BHC.
Cyclohexane, 1,2,3,4,5,6-hexachloro-, (1a,2a,3a,4B,5a,6B)-	319-86-8	delta-BHC.
Cyclohexane, 1,2,3,4,5,6-hexachloro-(1a,2a,3B,4a,5a,6B)-	58-89-9	gamma-BHC.
2-Cyclohexen-1-one, 3,5,5-trimethyl	78-59-1	Isophorone.
1,3-Cyclopentadiene, 1,2,3,4,5,5-hexachloro-	77-47-4	Hexachlorocyclopent-adiene.
Dibenz[a,h]anthracene	53-70-3	Dibenz(a,h)anthracene.
Dibenzo[b,e][1,4]dioxin, 2,3,7,8-tetrachloro-	1746-01-6	2,3,7,8-Tetrachlorodi benzo-p-dioxin; Hexachlorodibenzo-p-dioxin- lachlorodi-benzo-p-dioxins; Tetra-chlorodibenzo-p-dioxins.
Dibenzo[b,def]chrysene	189-64-0	Dibenzo(a,h)pyrene.
Dibenzofuran	132-64-9	Dibenzofuran, Hexa-chloro-dibenzofurans; Penta-chlorodibenzo-furans; Tetrachlorodi-benzofurans.
2,7:3,6-Dimethanonaphth [2,3-b]oxirene, 3,4,5,6,9,9-hexachloro-la,2,2a,3,6,6a,7,7a-octahydro, 1aa,2B,2aa,3B,6B,6aa,7B,7aa)-.	60-57-1	Dieldrin.
2,7:3,6-Dimethanonaphth [2,3-b]oxirene, 3,4,5,6,9,9-hexachloro-1a,2,2a,3,6,6a,7,7a-octahydro, 1aa,2B,2aB,3a,6a,6aB,7B,7aa)-.	72-20-8	Endrin.
1,4:5,8-Dimethanonaphthalene, 1,2,3,4,10,10-hexachloro-1,4,4a,5,8,8a-hexahydro-, 1aa,4a,4aB,5a,8a,8aB)-.	309-00-2	Aldrin.
1,4:5,8-Dimethanonaphthalene, 1,2,3,4,10,10-hexachloro-1,4,4a,5,8,8a-hexahydro-, 1aa,4a,4aB,5B,8B,8aB)-.	465-73-6	Isodrin.
1,4-Dioxane	123-91-1	1,4-Dioxane.
Ethanamine, N-ethyl-N-nitroso	55-18-5	N-Nitrosodiethylamine.
Ethanamine, N-methyl-N-nitroso-	10595-95-6	N-Nitrosomethylethylamine.
Ethane, 1,1-dichloro-	75-34-3	1,1-Dichloroethane.
Ethane, 1,1'-[methylenebis (oxy)]bis[2-chloro-	111-91-1	Bis(2-chloroethoxy) methane.
Ethane, 1,1'-oxybis[2-chloro-	111-44-4	Bis(2-chloroethyl) ether.
Ethane, 1,1'-trichloro-	71-55-6	1,1,1-Trichloroethane.
Ethane, 1,1,1,2-tetrachloro-	630-20-6	1,1,1,2-Tetrachloroethane.
Ethane, 1,1,2-trichloro-	79-00-5	1,1,2-Trichloroethane.
Ethane, 1,1,2,2-tetrachloro-	79-34-5	1,1,2,2-Tetrachloroethane.
Ethane, 1,2-dibromo-	106-93-4	1,2-Dibromoethane.
Ethane, 1,2-dichloro-	107-06-2	1,2-Dichloroethane.
Ethane, chloro-	75-00-3	Chloroethane.
Ethane, hexachloro-	67-72-1	Hexachloroethane.
Ethane, pentachloro-	76-01-7	Pentachloroethane.
1,2-Ethanediamine, N,N-dimethyl-N'-2-pyridinyl-N'-(2-thienylmethyl)-	91-80-5	Methapyrilene.
Ethanone, 1-phenyl-	98-86-2	Acetophenone.
Ethene, (2-chloroethoxy)-	110-75-8	2-Chloroethyl vinyl ether.
Ethene, 1,1-dichloro-	75-35-4	1,1-Dichloroethylene.
Ethene, 1,2-dichloro- (E)-	156-60-5	trans-1,2-Dichloro ethene.
Ethene, chloro-	75-01-4	Vinyl chloride.
Ethene, tetrachloro-	127-18-4	Tetrachloroethene.
Ethene, trichloro-	79-01-6	Trichloroethene.
Fluoranthene	206-44-0	Fluoranthene.
Fluoride	16984-48-8	Fluoride.
9H-Fluorene	86-73-7	Fluorene.
2-Hexanone	591-78-6	2-Hexanone.
Hydrazine, 1,2-diphenyl-	122-66-7	1,2-Diphenylhydrazine.
Indeno[1,2,3-cd]pyrene	193-39-5	Indeno(1,2,3-cd)pyrene.
Iron	7439-89-6	Iron (total).
Lead	7439-92-1	Lead (total).
Magnesium	7439-94-4	Magnesium (total).
Manganese	7439-96-5	Manganese (total).
Mercury	7439-97-6	Mercury (total).
Methanamine, N-methyl-N-nitroso	62-75-9	N-Nitrosodimethylamine.
Methane, bromo-	74-83-9	Bromomethane.
Methane, bromodichloro-	75-27-4	Bromodichloromethane.
Methane, chloro-	74-87-3	Chloromethane.
Methane, dibromo-	74-95-3	Dibromomethane.
Methane, dibromochloro-	124-48-1	Chlorodibromomethane.
Methane, dichloro-	74-09-2	Dichloromethane.
Methane, dichlorodifluoro-	75-71-8	Dichlorodifluoromethane.
Methane, iodo-	74-88-4	Iodomethane.
Methane, tetrachloro-	56-23-5	Carbon tetrachloride.
Methane, tribromo-	75-25-2	Tribromomethane.
Methane, trichloro-	67-66-3	Chloroform.
Methane, trichlorofluoro-	75-69-4	Trichloromonofluoromethane.
Methanesulfonic acid, methyl ester	66-27-3	Methyl methanesulfonate.
Methanethiol, trichloro-	75-70-7	Trichloromethanethiol.
4,7-Methano-1H-indene-1,2,4,5,6,7,8,8-octachloro-2,3,3a,4,7,7a-hexahydro.	57-74-9	Chlordane.
4,7-Methano-1H-indene-1,4,5,6,7,8,8-heptachloro-3a,4,7,7a-tetrahydro-	76-44-8	Heptachlor.
2,5-Methano-2H-indeno[1,2-b] oxirene, 2,3,4,5,6,7,7-heptachloro-1a,1b,5,5a,6,6a-hexahydro-, (1aa,1bB,2a,5a,5aB,6B,6aa).	1024-57-3	Heptachlor epoxide.
6,9-Methano-2,4,3-benzo-dioxathiepin, 6,7,8,9,10,10-hexachloro-1,5,5a,6,9,9a-hexahydro-, 3-oxide, (3a,5aB,6a,9a,9aB).	959-98-8	Endosulfan I.
6,9-Methano-2,4,3-benzo-dioxathiepin, 6,7,8,9,10,10-hexachloro,1,5,5a,6,9,9a-hexahydro-, 3-oxide, (3a,5aa,6B,9B,9aa).	33213-65-9	Endosulfan II.
1,3,4-Metheno-2H-cyclobuta[cd]pentalen-2-one, 1,1a,3,3a,4,5,5,5a,5b,6-decachloro-octahydro-.	143-50-0	Kepone.
1,2,4-Methanocyclopenta[cd] pentalene-5-carboxaldehyde, 2,2a,3,3,4,7-hexachloro-decahydro-, (1a,2B,2aB,4B,4aB,5B,6aB,6bB,7R*).	7421-93-4	Endrin aldehyde.
Morpholine, 4-nitroso-	59-89-2	N-Nitrosomorpholine.

procedures, in combination with the designated sampling requirement, to determine a statistically significant increase:

(i) A parametric analysis of variance (ANOVA) followed by multiple comparisons procedures to identify statistically significant evidence of contamination. The procedure must include estimation and testing of the contrasts between each downgradient well's mean and the background mean level for each constituent;

(ii) An analysis of variance based on ranks followed by multiple comparisons procedures to identify statistically significant evidence of contamination. The procedure must include estimation and testing of the contrasts between each downgradient well's mean and the background mean level for each constituent;

(iii) Tolerance or prediction interval procedure in which a tolerance interval for each constituent is established from the distribution of the background data, and the level of each constituent in each downgradient well is compared to the upper tolerance or prediction limit;

(iv) A control chart approach that gives control limits for each constituent; and

(v) Another statistical test procedure that is protective of human health and the environment and meets the ground-water protection standard of § 258.52(b).

(3) The State may establish an alternative sampling procedure and statistical test for any of the constituents listed in Appendix II or parameters listed in § 258.54(b), as required to protect human health and the environment. Factors to consider for establishing this alternative statistical procedure include:

(i) If the distributions for different constituents differ, more than one procedure may be needed. The owner or operator must show that the normal distribution is not appropriate if using a nonparametric or other methodology not requiring an assumption of normality. For any statistic not based on a normal distribution, a goodness of fit test shall be conducted to demonstrate that the normal distribution is not appropriate. Other tests shall be conducted to demonstrate that the assumptions of the statistic or distribution are not grossly isolated;

(ii) Each parameter or constituent is to be tested for separately. Each time that a test is done, the test for individual constituents shall be done at a type I error level or less than 0.01. A multiple comparison procedure may be used at a type I experiment-wide error rate no less than 0.05. The owner or operator must evaluate the ability of the method to detect contamination that is actually present and may be required to increase the sample size to achieve an acceptable error level.

(iii) The monitoring well system should be consistent with § 258.51. The owner or operator must ensure that the number, location, and depth of monitoring wells will detect hazardous constituents that migrate from the municipal solid waste landfill unit;

(iv) The statistical procedure should be appropriate for the behavior of the parameters or constituents involved. It should include methods for handling data below the limit of detection. The owner or operator should evaluate different ways of dealing with values below the limit of detection and choose the one that is most protective of human health and the environment. In cases where there is a high proportion of values below limits of detection, the owner or operator may demonstrate that an alternative procedure is more appropriate; and

(v) The statistical procedure used should account for seasonal and spatial variability and temporal correlation.

(4) If contamination is detected by any of the statistical tests, and the State or the owner or operator suspects that detection is an artifact caused by some feature of the data other than contamination, the State may specify that statistical tests of trend, seasonal variation, autocorrelation, or other interfering aspects of the data be done to establish whether the significant result is indicative of detection of contamination or resulted from natural variation.

(i) The owner or operator must determine whether or not there is a statistically significant increase (or decrease, in the case of Phase I) over background values for each parameter or constituent required in the particular ground-water monitoring program that applies to the landfill unit, as determined under §§ 258.54(a) or 258.55(a) of this part. The owner or operator must make these statistical determinations each time he assesses ground-water quality at the boundary designated under § 258.40 of this part.

(A) In determining whether a statistically significant increase or decrease has occurred, the owner or operator must compare the ground-water quality of each parameter or constituent at each monitoring well designated pursuant to § 258.51 to the background value of that parameter or constituent, according to the statistical procedures specified under paragraph (h) of this section.

(B) Within a reasonable time period after completing sampling (as determined by the State), the owner or operator must determine whether there has been a statistically significant increase or decrease over background at each monitoring well.

§ 258.54 Phase I monitoring program.

(a) Phase I monitoring is required at municipal solid waste landfill units except as otherwise provided in §§ 258.55 and 258.58 of this Part.

(b) At a minimum, a Phase I monitoring program must include the following monitoring parameters or constituents:

(1) Ammonia (as N)
(2) Bicarbonate (HCO_3)
(3) Calcium
(4) Chloride
(5) Iron
(6) Magnesium
(7) Manganese, dissolved
(8) Nitrate (as N)
(9) Potassium
(10) Sodium
(11) Sulfate (SO_4)
(12) Chemical Oxygen Demand (COD)
(13) Total Dissolved Solids (TDS)
(14) Total Organic Carbon (TOC)
(15) pH
(16) Arsenic
(17) Barium
(18) Cadmium
(19) Chromin
(20) Cyanide
(21) Lead
(22) Mercury
(23) Selenium
(24) Silver
(25) The volatile organic compounds (VOCs) listed in Appendix I of this part.

(c) The State must determine an appropriate monitoring frequency on a site-specific basis by considering aquifer flow rate and resource value of the ground water. The minimum monitoring frequency for all parameters specified in paragraph (b) of this section is semiannual except during the post-closure care when minimum monitoring frequency shall be determined by the State on a site-specific basis.

(d) If the owner or operator determines, pursuant to § 258.53(h) of this part, that there is a statistically significant increase or decrease over background for two or more of parameters (1) to (15) specified in paragraph (b) of this section, at any monitoring well at the boundary specified under § 258.51(a), or a statistically significant increase over background for any one or more of parameters (16) to (24) specified in paragraph (b) of this section or the VOCs listed in Appendix I, at any under this paragraph, the owner or operator must:

(i) Notify the State in writing within 7 days of determining statistically significant evidence of contamination that (s)he intends to make a demonstration under this paragraph:

(ii) Within 90 days, or an alternate time period approved by the State, submit to the State a report that demonstrates that a source other than a municipal solid waste landfill unit caused the contamination or that the increase resulted from error in sampling, analysis, or evaluation: and

(iii) Continue to monitor in accordance with the Phase II monitoring program.

§ 258.56 Assessment of corrective measures.

(a) An assessment must be conducted by the owner or operator when any of the constituents listed in Appendix II has been detected at a statistically significant level exceeding the ground-water trigger levels defined under § 258.52 of this part during the Phase II monitoring program.

(b) The owner or operator must continue to monitor in accordance with the Phase II monitoring program. The State may require the owner or operator to conduct additional monitoring in order to characterize the nature and extent of the plume.

(c) The State shall specify the scope of the assessment, which may include the following:

(1) Assessment of the effectiveness of potential corrective measures in meeting all of the requirements and objectives of the remedy as described under § 258.57;

(2) Evaluation of performance, reliability, ease of implementation, and potential impacts of appropriate potential remedies, including safety impacts, cross-media impacts, and control of exposure to any residual contamination:

(3) Assessment of the time required to begin and complete the remedy:

(4) Estimation of the costs of remedy implementation:

(5) Assessment of institutional requirements such as State or local permit requirements or other environmental or public health requirements that may substantially affect implementation of the remedy(s); and

(6) Evaluation of public acceptability.

(d) The State may require the owner or operator to evaluate as part of the corrective measure study one or more specific potential remedies. These remedies may include a specific technology or combination of technologies, that, in the State's judgment, achieve the standards for remedies specified in § 258.57.

(e) The owner or operator shall submit a report to the State on the remedies evaluated pursuant to paragraphs (a)–(d). The State shall then select a remedy based on the criteria described in § 258.57.

(f) If at any time during the assessment described under paragraphs (a)–(e) of this section the State determines that the facility poses a threat to human health or the environment, the State may require the owner or operator to implement measures defined under § 258.58(a)(3) and/or (a)(4) to protect human health and the environment.

§ 258.57 Selection of remedy and establishment of ground-water protection standard.

(a) Based on the results of the corrective measure study conducted under § 258.56, the State must select a remedy that, at a minimum, meets the standards listed in paragraph (b) below.

(b) Remedies must:

(1) Be protective of human health and the environment:

(2) Attain the ground-water protection standard as specified pursuant to paragraphs (e) and (f) of this section:

(3) Control the source(s) of releases so as to reduce or eliminate, to the maximum extent practicable, further releases of Appendix II constituents into the environment that may pose a threat to human health or the environment: and

(4) Comply with standards for management of wastes as specified in § 258.58(d).

(c) In selecting a remedy that meets the standards of § 258.57(b), the State, as appropriate, shall consider the following evaluation factors:

(1) Any potential remedy(s) shall be assessed for the long- and short-term effectiveness and protectiveness it affords, along with the degree of certainty that the remedy will provide successful. Factors to be considered include:

(i) Magnitude of reduction of existing risks:

(ii) Magnitude of residual risks in terms of likelihood of further releases due to waste remaining following implementation of a remedy:

(iii) The type and degree of long-term management required, including monitoring, operation, and maintenance:

(iv) Short-term risks that might be posed to the community, workers, or the environment during implementation of such a remedy, including potential threats to human health and the environment associated with excavation, transportation, an' redisposal or containment:

(v) Time until full protection is achieved:

(vi) Potential for exposure of huma and environmental receptors to remaining wastes, considering the potential threat to human health and environment associated with excavation, transportation, redisposa or containment:

(vii) Long-term reliability of the engineering and institutional controls and

(viii) Potential need for replacemen the remedy.

(2) Effectiveness of the remedy in controlling the source to reduce furthe releases. The following factors shoul be considered:

(i) The extent to which containment practices will reduce further releases:

(ii) The extent to which treatment technologies may be used.

(3) The ease or difficulty of implementing a potential remedy(s) shall be assessed by considering the following types of factors:

(i) Degree of difficulty associated wi constructing the technology:

(ii) Expected operational reliability the technologies:

(iii) Need to coordinate with a obtain necessary approvals and perm from other agencies:

(iv) Availability of necessary equipment and specialists: and

(v) Available capacity and location c needed treatment, storage, and disposa services.

(4) Practicable capability of the owne or operator including a consideration o: the technical and economic capability.

(5) The degree to which community concerns are addressed by a potential remedy(s) shall be assessed.

(d) The State shall specify as part of the selected remedy a schedule(s) for initiating and completing remedial activities. The State will consider the following factors in determining the schedule of remedial activities:

(1) Extent and nature of contamination:

(2) Practical capabilities of remedial technologies in achieving compliance with ground-water protection standards established under § 258.57(e) and other objectives of the remedy:

(3) Availability of treatment or disposal capacity for wastes managed during implementation of the remedy:

(4) Desirability of utilizing technologies that are not currently available, but which may offer significant advantages over already available technologies in terms of

§ 258.40(a)–(b), if applicable, until leachate no longer is generated;

(3) Monitoring the ground-water in accordance with the requirements of § 258.50 and maintaining the ground-water monitoring system; and

(4) Maintaining and operating the gas monitoring system in accordance with the requirements of § 258.23.

(b) Following the period described in § 258.31(a), the owner or operator must conduct a second phase of post-closure care at each municipal solid waste landfill unit that consists of, at a minimum, ground-water monitoring and gas monitoring. The length of this period is determined by the State and must be sufficient to protect human health and the environment.

(c) The owner or operator of a municipal solid waste landfill must prepare a written post-closure plan that describes monitoring and routine maintenance activities that will be carried out during each phase of the post-closure care period in accordance with the requirements of § 258.31(a) and (b). The post-closure plan must include, at a minimum, the following information:

(1) A description of the monitoring and maintenance activities required in § 258.31 (a) and (b) for each unit, and the frequency at which these activities will be performed;

(2) Name, address, and telephone number of the person or office to contact about the facility during both phases of the post-closure period; and

(3) A description of the planned uses of the property during both phases of the post-closure care period. Post-closure use of the property must never be allowed to disturb the integrity of the final cover, liner(s), or any other components of the containment system, or the function of the monitoring systems, unless, upon the demonstration by the owner or operator, the State determines that the activities will not increase the potential threat to human health or the environment or the disturbance is necessary to reduce a threat to human health or the environment. The owner or operator must obtain approval from the State in order to remove any wastes or waste residues, the liner, or contaminated soils from the land.

(d) The post-closure plan must be prepared as of the effective date of the rule, or by the initial receipt of solid waste, whichever is later, and must be approved by the State. Any subsequent modification to the post-closure plan must also be approved by the State. A copy of the most recent approved post-closure plan must be kept at the facility or at an alternate location designated by the owner or operator until completion of the post-closure care period has been certified in accordance with § 258.31(f) and the owner or operator has been released from financial assurance for post-closure care under § 258.32(g).

(e) Following closure of the entire municipal solid waste landfill, the owner or operator must record a notation on the deed to the landfill property, or some other instrument that is normally examined during title search. The owner or operator may request permission from the State to remove the notation from the deed if all wastes are removed from the facility in accordance with paragraph (c)(3) of this section. The notation on the deed must in perpetuity notify any potential purchaser of the property that:

(1) The land has been used as a municipal solid waste landfill; and

(2) Its use is restricted under paragraph (c)(3) of this section.

(f) Following completion of the two-phase post-closure care period for each unit, the owner or operator of an MSWLF must submit to the State a certification that objectively verifies that both phases of post-closure care have been completed in accordance with the approved post-closure plan, based on a review of the landfill unit by a qualified party.

§ 258.32 Financial assurance criteria.

(a) The requirements of this section apply to the owner and operator of each municipal solid waste landfill, except an owner or operator who is a State or Federal government entity whose debts and liabilities are the debts and liabilities of a State or the United States.

(b) The owner or operator must have a detailed written estimate, in current dollars, of the cost of hiring a third party to close the municipal solid waste landfill in accordance with the closure plan developed to satisfy the closure requirements in § 258.30 of this part.

(1) The estimate must equal the cost of closing the landfill at the point in the municipal solid waste landfill's active life when the extent and manner of its operation would make closure the most expensive, as indicated by its closure plan (see § 258.30(b) of this part).

(2) During the active life of the municipal solid waste landfill, the owner or operator must annually adjust the closure cost estimate for inflation.

(3) The owner or operator must increase the closure cost estimate and the amount of financial assurance provided under paragraph (f) of this section if changes to the closure plan or landfill conditions increase the maximum cost of closure at any time over the active life of the municipal solid waste landfill.

(4) The owner or operator may req[uest] a reduction in the closure cost estim[ate] and the amount of financial assuran[ce] provided under paragraph (f) of this section if he can demonstrate that th[e] cost estimate exceeds the maximum [cost] of closure at any time over the life of [the] landfill.

(5) The owner or operator must kee[p a] copy of the latest closure cost estima[te] at the landfill until the owner or operator has been notified by the Stat[e] that he has been released from closur[e] financial assurance requirements und[er] paragraph (f) of this section.

(c) The owner or operator must hav[e a] detailed written estimate, in current dollars, of the cost of hiring a third pa[rty] to conduct each phase of post-closure monitoring and maintenance of the municipal solid waste landfill in accordance with the post-closure plan developed to satisfy the post-closure requirements in § 258.31 (a) and (b) of this part. The post-closure cost estimat[e] for each phase of post-closure care use[d] to demonstrate financial assurance in paragraph (g) of this section is calculated by multiplying the annual cost estimate for each phase of post-closure care by the number of years of post-closure care required in that phase.

(1) The cost estimate for each phase [of] post-closure care must be based on the most expensive costs of post-closure care during that phase.

(2) During the active life of the municipal solid waste landfill, the owne[r] or operator must annually adjust the post-closure cost estimate for inflation.

(3) The owner or operator must increase the amount of the post-closure care cost estimate and the amount of financial assurance provided under paragraph (g) of this section if changes in the post-closure plan or landfill conditions increase the maximum costs of post-closure care.

(4) The owner or operator may request a reduction in the post-closure cost estimate and the amount of financial assurance provided under paragraph (g) of this section if he can demonstrate that the cost estimate exceeds the maximum costs of post-closure care remaining over the post-closure care period.

(5) The owner or operator must keep a copy of the latest post-closure care cost estimate at the landfill until he has been notified by the State that he has been released from post-closure financial assurance requirements for the entire landfill under paragraph (g) of this section.

(d) An owner or operator of a municipal solid waste landfill required to undertake a corrective action program under § 258.58 of this part must

[Note to § 258.40(b): EPA is considering alternatives to the 1×10^{-4} to 1×10^{-7} risk range. The Agency specifically requests comment on a fixed risk level of 1×10^{-6} or an upper bound risk level of 1×10^{-5} (with the States having discretion to be more stringent) as alternatives to the proposed risk range. A fixed risk level of 1×10^{-6} would provide a uniform level of protection across all States. On the other hand, setting an upper bound risk level of 1×10^{-5} would allow States greater flexibility in establishing more stringent risk levels based on site specific conditions].

(c) When establishing the design necessary to comply with paragraph (a) of this section, the State shall consider at least the following factors:

(1) The hydrogeologic characteristics of the facility and surrounding land;

(2) The climatic factors of the area;

(3) The volume and physical characteristics of the leachate;

(4) Promixity of gound-water users; and

(5) Quality of ground water.

(d) A State may establish an alternative boundary to be used in lieu of the waste management unit boundary. The alternative boundary shall not exceed 150 meters from the waste management unit boundary and shall be located on land owned by the owner or operator of the MSWLF. The establishment of the alternative boundary shall be based on analysis and consideration of at least the following factors:

(1) The hydrogeologic characteristics of the facility and surrounding land;

(2) The volume and physical and chemical characteristics of the leachate;

(3) The quantity, quality, and direction of flow of ground water;

(4) The proximity and withdrawal rate of the ground-water users;

(5) The availability of alternative drinking water supplies;

(6) The existing quality of the ground water, including other sources of contamination and their cumulative impacts on the ground water;

(7) Public health, safety, and welfare effects; and

(8) Practicable capability of the owner or operator.

(e) Existing municipal solid waste landfill units must be equipped at closure with a final cover system that is designed to prevent infiltration of liquid through the cover and into the waste.

§§ 258.41–258.49 [Reserved]

Subpart E—Ground-Water Monitoring and Corrective Action

§ 258.50 Applicability.

(a) The requirements in this Part apply to municipal solid waste landfill units, except as provided in paragraph (b) of this section.

(b) Ground-water monitoring requirements under § 258.51 through § 258.55 of this Part will be suspended for an MSWLF unit if the owner or operator can demonstrate to the State that there is no potential for migration of hazardous constituents from that unit to the uppermost aquifer during the active life, including the closure period, of the unit and during post-closure care. This demonstration must be certified by a qualified geologist or geotechnical engineer, and must incorporate reliable site-specific data. If detailed hydrogeologic data are unavailable, the owner or operator must provide an adequate margin of safety in the prediction of potential migration of hazardous constituents by basing such predictions on assumptions that maximize the rate of hazardous consitutent migration.

(c) Within 6 months of the effective date of the rule, the State must specify a schedule for the owners or operators of MSWLF units to comply with the ground-water monitoring requirements specified in §§ 258.51–258.55. This schedule must be specified to ensure that 25 percent of MSWLF units are in compliance within 2 years of the effective date of this rule; 50 percent (50%) of landfill units are in compliance within 3 years of the effective date of this rule; 75 percent of the landfill units are in compliance within 4 years of the effective date of this rule; and all landfill units are in compliance within 5 years of the effective date of this rule. In setting the compliance schedule, the State must consider potential risks posed by the MSWLF unit to human health and the environment. The following factors should be considered in determining potential risk:

(1) Proximity of human and environmental receptors;

(2) Design of the landfill unit;

(3) Age of the landfill unit; and

(4) Resource value of the underlying aquifer, including:

(i) Current and future uses;

(ii) Proximity and withdrawal rate of users; and

(iii) Ground-water quality and quantity.

(d) If the State does not set a schedule for compliance as specified in paragraph (c) of this Section, the following compliance schedule shall apply:

(1) Existing landfill units less than 1 mile from a drinking water intake (surface or subsurface) must be in compliance with the ground-water monitoring requirements specified in §§ 258.51–258.55 within 3 years of the effective date of this rule;

(2) Existing landfill units greater than 1 mile but less than 2 miles from a drinking water intake (surface or subsurface) must be in compliance with the ground-water monitoring requirements specified in §§ 258.51–258.55 within 4 years of the effective date of this rule;

(3) Existing landfill units greater than 2 miles from a drinking water intake (surface or subsurface) must be in compliance with the ground-water monitoring requirements specified in §§ 258.51–258.55 within 5 years of the effective date of this rule; and

(4) A new landfill unit must be in compliance with the ground-water monitoring requirements specified in §§ 258.51–258.55 before waste can be placed in the unit.

(e) Once established at a unit, ground-water monitoring shall be conducted throughout the active life and post-closure care of that municipal solid waste landfill unit as specified in § 258.31.

§ 258.51 Ground-water monitoring systems.

(a) A ground-water monitoring well system approved by the State must be installed at the closest pacticable distance from the waste management unit boundary or the alternative boundary specified by the State unc § 258.40. Where subsurface conditions cause hazardous constituents to migrate horizontally past the boundary specified under this paragraph before descending to the uppermost aquifer, the State can designate another appropriate downgradient location for the ground-water monitoring wells.

(b) A ground-water monitoring system must consist of a sufficient number of wells, installed at appropriate locations and depths, to yield ground-water samples from the uppermost aquifer that:

(1) Represent the quality of background ground water that has not been affected by leakage from a landfill unit; and

(2) Represent the quality of ground water passing the locations specified under paragraph (a) of this section.

(c) If approved by the State, separate ground-water monitoring systems are not required for each landfill unit when the facility has several landfill units, provided the multi-unit ground-water monitoring system will be as protective of human health and the environment as individual monitoring systems for each unit.

(d) Monitoring wells must be cased a manner that maintains the integrity the monitoring well bore hole. This

7. A new Part 258 is added as set forth below:

PART 258—CRITERIA FOR MUNICIPAL SOLID WASTE LANDFILLS

Authority: 42 U.S.C. 6907(a)(3), 6944(a) and 6949(c); 33 U.S.C. 1345 (d) and (e).

Subpart A—General

§ 258.1 Purpose, scope, and applicability.

(a) The purpose of this part is to establish minimum national criteria under the Resource Conservation and Recovery Act (RCRA or the Act), as amended, for municipal solid waste landfills and under the Clean Water Act, as amended, for municipal solid waste landfills that are used to dispose of sludge. These minimum national criteria ensure the protection of human health and the environment.

(b) These criteria apply to owners and operators of new and existing municipal solid waste landfills, except as otherwise specifically provided in this part; all other solid waste disposal facilities and practices that are not regulated under Subtitle C of RCRA are subject to the criteria contained in Part 257.

(c) These criteria do not apply to closed units (as defined in this section) of municipal solid waste landfills that close prior to the effective date of this part.

(d) Municipal solid waste landfills failing to satisfy these criteria are considered open dumps for purposes of State solid waste management planning under RCRA.

(e) Municipal solid waste landfills failing to satisfy these criteria constitute open dumps, which are prohibited under section 4005 of RCRA.

(f) Municipal solid waste landfills containing sewage sludge and failing to satisfy these criteria violate sections 309 and 405(e) of the Clean Water Act.

(g) The effective date of this part is [*insert date 18 months after the promulgation date*], unless otherwise specified.

§ 258.2 Definitions.

Unless otherwise noted, all terms contained in this part are defined by their plain meaning. This section contains definitions for terms that appear throughout this part; additional definitions appear in the specific sections to which they apply.

"Active life" means the period of operation beginning with the initial receipt of solid waste and ending at completion of closure activities in accordance with § 258.30 of this part.

"Active portion" means that part of a facility or unit that has received or is receiving wastes and that has not been closed in accordance with § 258.30 of this part.

"Aquifer" means a geological formation, group of formations, or portion of a formation capable of yielding significant quantities of ground water to wells or springs.

"Closed unit" means any solid waste disposal unit that no longer receives solid waste as of the effective date of this part and has received a final layer of cover material.

"Commercial solid waste" means all types of solid waste generated by stores, offices, restaurants, warehouses, and other nonmanufacturing activities, excluding residential and industrial wastes.

"Existing unit" means any solid waste disposal unit that is receiving solid waste as of the effective date of this part and has not received a final layer of cover material.

"Facility" means all contiguous land and structures, other appurtenances, and improvements on the land used for the disposal of solid waste.

"Ground-water" means water below the land surface in a zone of saturation.

"Household waste" means any solid waste (including garbage, trash, and sanitary waste in septic tanks) derived from households (including single and multiple residences, hotels and motels, bunkhouses, ranger stations, crew quarters, campgrounds, picnic grounds, and day-use recreation areas).

"Industrial solid waste" means solid waste generated by manufacturing or industrial processes that is not a hazardous waste regulated under Subtitle C of RCRA. Such waste may include, but is not limited to, waste resulting from the following manufacturing processes: Electric power generation; fertilizer/agricultural chemicals; food and related products/by-products; inorganic chemicals; iron and steel manufacturing; leather and leather products; nonferrous metals manufacturing/foundries; organic chemicals; plastics and resins manufacturing; pulp and paper industry; rubber and miscellaneous plastic products; stone, glass, clay, and concrete products; textile manufacturing; transportation equipment; and water treatment. This term does not include mining waste or oil and gas waste.

"Landfill" means an area of land or an excavation in which wastes are placed for permanent disposal, and that is not a land application unit, surface impoundment, injection well, or waste pile, as those terms are defined under § 257.2.

"Lateral expansion" means a horizontal expansion of the waste boundaries of an existing landfill unit.

"Leachate" means a liquid that has passed through or emerged from solid waste and contains soluble, suspended, or miscible materials removed from such waste.

"Municipal solid waste landfill" means any landfill or landfill unit that receives household waste. This landfill also may receive other types of RCRA Subtitle D wastes, such as commercial

(c) As used in paragraph (a) of this section, the "maximum horizontal acceleration in lithified material" means the maximum expected horizontal acceleration depicted on a seismic hazard map, with a 90 percent or greater probability that the acceleration will not be exceeded in 250 years, or the maximum expected horizontal acceleration based on a site-specific seismic risk assessment.

§ 258.15 Unstable areas.

(a) The owner or operator of a municipal solid waste landfill unit located in an unstable area must demonstrate to the State that engineering measures have been incorporated into the unit's design to ensure the stability of the structural components of the unit. The owner or operator must consider the following factors, at a minimum, when determining whether an area is unstable:

(1) On-site or local soil conditions that may result in significant differential settling;

(2) On-site or local geologic or geomorphologic features; and

(3) On-site or local human-made features or events (both surface and subsurface).

(b) As used in this section, "structural components" means liners, leachate collection systems, final covers, run-on/run-off systems, and any other component necessary for protection of human health and the environment.

(c) Existing units of a municipal solid waste landfill located in unstable areas that cannot make the demonstration specified in paragraph (a) of this section must close within 5 years of the effective date of this part in accordance with § 258.30 of this part and conduct post-closure activities in accordance with § 258.31 of this part.

(d) The deadline for a closure required by paragraph (c) of this section may be extended by the State after considering, at a minimum, the following factors:

(1) Availability of alternative disposal capacity; and

(2) Potential risk to human health and the environment.

§§ 258.16–258.19 [Reserved].

Subpart C—Operating Criteria

§ 258.20 Procedures for excluding the receipt of hazardous waste.

(a) The owner or operator of a municipal solid waste landfill unit must implement a program at the facility for detecting and preventing the disposal of regulated hazardous wastes as defined in Part 261 of this title and polychlorinated biphenyls (PCB) wastes as defined in Part 761 of this title. This program must include at a minimum:

(1) Random inspections of incoming loads;

(2) Inspection of suspicious loads;

(3) Records of any inspections;

(4) Training of facility personnel to recognize regulated hazardous waste; and

(5) Procedures for notifying the proper authorities if a regulated hazardous waste is discovered at the facility.

(b) As used in this section, "regulated hazardous waste" means a solid waste that is a hazardous waste, as defined in 40 CFR 261.3, that is not excluded from regulation as a hazardous waste under 40 CFR 261.4(b) or was not generated by a conditionally exempt small quantity generator as defined in § 261.5 of this title.

§ 258.21 Cover material requirements.

(a) The owner or operator of a municipal solid waste landfill unit must cover disposed solid waste with suitable materials at the end of each operating day, or at more frequent intervals if necessary, to control disease vectors, fires, odors, blowing litter, and scavenging.

(b) The State may grant a temporary waiver from the requirement of paragraph (a) of this section if the State determines that there are extreme seasonal climatic conditions that make meeting such requirements impractical.

§ 258.22 Disease vector control.

(a) The owner or operator of a municipal solid waste landfill unit must prevent or control on-site populations of disease vectors using techniques appropriate for the protection of human health and the environment.

(b) For purposes of this section, "disease vectors" means any rodents, flies, mosquitoes, or other animals, including insects, capable of transmitting disease to humans.

§ 258.23 Explosive gases control.

(a) The owner or operator of a municipal solid waste landfill unit shall ensure that:

(1) The concentration of methane gas generated by the facility does not exceed 25 percent of the lower explosive limit for methane in facility structures (excluding gas control or recovery system components); and

(2) The concentration of methane gas does not exceed the lower explosive limit for methane at the facility property boundary.

(b) The owner or operator of a municipal solid waste landfill unit must implement a routine methane monitoring program to ensure that the standards of paragraph (a) of this section are m

(1) The type and frequency of monitoring must be determined based on the following factors:

(i) Soil conditions;

(ii) The hydrogeologic conditions surrounding the disposal site;

(iii) The hydraulic conditions surrounding the disposal site; and

(iv) The location of facility structures and property boundaries.

(2) The minimum frequency of monitoring shall be quarterly.

(c) If methane gas levels exceeding the limits specified in paragraph (a) of this section are detected, the owner or operator must:

(1) Take all necessary steps to ensure immediate protection of human health;

(2) Immediately notify the State of the methane gas levels detected and the immediate steps taken to protect human health; and

(3) Within 14 days, submit to the State for approval a remediation plan for the methane gas releases. The plan shall describe the nature and extent of the problem and the proposed remedy. The plan shall be implemented upon approval by the State.

(d) As used in this section, "lower explosive limit" means the lowest percent by volume of a mixture of explosive gases in air that will propagate a flame at 25°C and atmospheric pressure.

§ 258.24 Air criteria.

(a) A municipal solid waste landfill shall not violate any applicable requirements developed under a State Implementation Plan (SIP) approved or promulgated by the Administrator pursuant to section 110 of the Clean Air Act, as amended.

(b) Open burning of solid waste, except for the infrequent burning of agricultural wastes, silvicultural wastes, land-clearing debris, diseased trees, debris from emergency clean-up operations, or ordnance, is prohibited at municipal solid waste landfill units.

§ 258.25 Access requirement.

The owner or operator of a municipal solid waste landfill unit must control public access and prevent unauthorized vehicular traffic and illegal dumping of wastes to protect human health and the environment using artificial barriers, natural barriers, or both, as appropriate.

§ 258.26 Run-on/run-off control systems.

(a) The owner or operator of a municipal solid waste landfill unit m design, construct, and maintain:

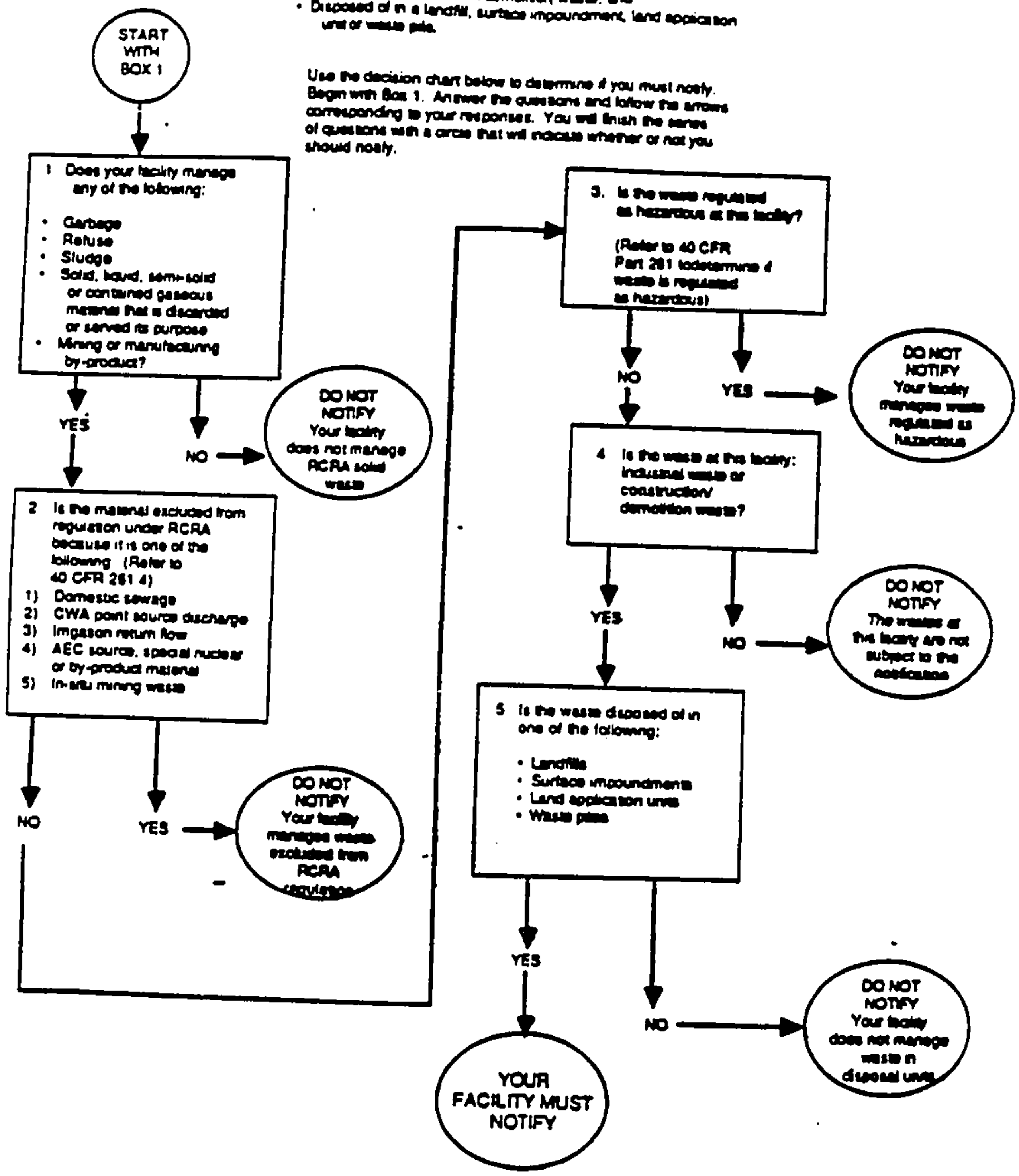
EXHIBIT A

WHO MUST NOTIFY?

You must notify if your facility manages RCRA solid waste that is:

- Not regulated as hazardous under Subtitle C of RCRA, and
- Industrial or construction/demolition waste, and
- Disposed of in a landfill, surface impoundment, land application unit or waste pile.

Use the decision chart below to determine if you must notify. Begin with Box 1. Answer the questions and follow the arrows corresponding to your responses. You will finish the series of questions with a circle that will indicate whether or not you should notify.



MS-8005

Construction/Demolition Waste is waste building materials, packaging, and rubble resulting from the construction, remodelling, repair, and demolition operations on pavements, houses, commercial buildings, and other structures. Such wastes include, but are not limited to, bricks, concrete, other masonry materials, soil, rock, lumber, road spoils, rebar, paving material, and tree stumps.

Disposal is the discharging, depositing, injecting, dumping, spilling, leaking, or placing solid waste into or on any land or water so that such solid waste or any constituent thereof, may enter the environment, be emitted into the air, or discharged into any waters, including ground waters.

Downgradient Well is a well located in the flow path of ground water that has passed under a facility.

Facility means all contiguous land and structures, other appurtenances, and improvements on the land used for the disposal of solid waste. A facility may include more than one unit. Units found at a facility include the following

- *Land application unit* is an area where wastes are applied onto or into the soil surface (excluding manure-spreading operations) for agricultural purposes or for treatment and disposal. Common names are landspreading, landfarming, or land treatment.
- *Surface impoundment* is a natural or human-made depression in the ground formed mainly of earthen materials and is designed to hold liquid wastes or wastes containing free liquid. Common names are ponds, pits, or lagoons.
- *Waste pile* is a noncontainerized mass of solid, nonflowing waste material that may or may not be enclosure by a fence, a cover, or some other structure. Waste piles can be used for treatment or storage.
- *Landfill* is an area of land or an excavation in which wastes are placed for permanent disposal, and that is not a land application unit, surface impoundment, injection well, or waste pile.

Hazardous Waste is solid waste regulated under 40 CFR Part 261. The regulatory definition of hazardous waste is found at 40 CFR 261.3.

Household Solid Waste is any solid waste including garbage, trash, and sanitary wastes in septic tanks generated by single or multiple residences, hotels, motels, bunkhouses, ranger stations, crew quarters, or any recreational areas such as campgrounds and picnic grounds.

Industrial Solid Waste is solid waste generated by manufacturing or industrial processes that is not a hazardous waste regulated under Subtitle C of RCRA. Such waste may include, but is not limited to, wastes resulting from the following manufacturing processes: electric power generation; fertilizer/agricultural chemicals; food and related products/by-products; inorganic chemicals; iron and steel manufacturing; leather and leather products; nonferrous metals manufacturing/foundries; organic chemicals; plastics and resins manufacturing; pulp and paper industry; rubber and miscellaneous plastic products; stone, glass, clay, and concrete products; textile manufacturing; transportation equipment; and water treatment. This term does not include mining waste or oil and gas waste.

Infectious Waste is any disposable equipment, instruments, utensils, or fomites (substances that may carry pathogenic organisms) from rooms of patients who have been diagnosed or are suspected of having a communicable disease; laboratory wastes such as tissues, blood specimens, excreta, and secretions from patients or laboratory animals;

Part 258)—Subtitle D of the Resource Conservation and Recovery Act (RCRA). July 1988 (draft).

(5) *U.S. EPA, OSW.* Design Criteria (Subpart D)—Criteria for Municipal Solid Waste Landfills (40 CFR Part 258)—Subtitle D of the Resource Conservation and Recovery Act (RCRA). July 1988 (draft).

(6) *U.S. EPA, OSW.* Ground-Water Monitoring and Corrective Action (Subpart E)—Criteria for Municipal Solid Waste Landfills (40 CFR Part 258)—Subtitle D of the Resource Conservation and Recovery Act (RCRA). July 1988.

(7) *U.S. EPA, OSW.* Case Studies on Ground-Water and Surface Water Contamination from Municipal Solid Waste Landfills—Criteria for Municipal Solid Waste Landfills (40 CFR Part 258)—Subtitle D of the Resource Conservation and Recovery Act (RCRA). July 1988 (draft).

(8) *U.S. EPA, OSW.* Summary of Data on Municipal Solid Waste Landfill Leachate Characteristics—Criteria for Municipal Solid Waste Landfills (40 CFR Part 258)—Subtitle D of the Resource Conservation and Recovery Act (RCRA). July 1988.

(9) *U.S. EPA, OSW.* Updated Review of Selected Provisions of State Solid Waste Regulations—Criteria for Municipal Solid Waste Landfills (40 CFR Part 258)—Subtitle D of the Resource Conservation and Recovery Act (RCRA). July 1988.

B. Regulatory Impact Analysis

(10) *U.S. EPA, OSW.* Draft Regulatory Impact Analysis (RIA) of Proposed Revisions to Subtitle D Criteria for Municipal Solid Waste Landfills—Criteria for Municipal Solid Waste Landfills (40 CFR Part 258)—Subtitle D of the Resource Conservation and Recovery Act (RCRA). August 1988.

C. Guidance Documents

(11) *U.S. EPA, OSW.* Criteria for Identifying Areas of Vulnerable Hydrogeology Under the Resource Conservation and Recovery Act. Statutory Interpretative Guidance. Guidance Manual for Hazardous Waste Land Treatment, Storage, and Disposal Facilities. Interim Final. July 1986.

(12) *U.S. EPA, OSW.* Guidance Document on Classifying Solid Waste Disposal Facilities. SW-828. March 1980.

(13) *U.S. EPA, OSW.* Permit Writers' Guidance Manual for Hazardous Waste Land Storage and Disposal Facilities. Phase I Criteria for Location Acceptability and Existing Applicable Regulations. final draft. February 1985.

D. Other References

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(15) *Farrell, J. B. and G. K. Dotson.* "The Effects of Municipal Wastewater Sludge on Leachates and Gas Production From Sludge-Refuse Landfills. U.S. EPA/ORD. 1987.

(16) *Franklin Associates, Ltd.* Characterization of Municipal Solid Waste in the United States, 1960 to 2000. U.S. Environmental Protection Agency, Washington, DC June 1986.

(17) *Franklin Associates, Ltd.* Characterization of Municipal Solid Waste in the United States, 1960 to 2000. (1986 Update) U.S. Environmental Protection Agency, Washington, DC. March 1988.

(18) *GCA Corporation and Booz, Allen & Hamilton Inc.* Review of Federal and State Regulations and Other Information on Disposal of Solid Waste in Wetlands. Contract No. 68-01-6871. U.S. Environmental Protection Agency, Washington, DC December 1986.

(19) *ICF Incorporated.* Case Studies of State Financial Responsibility Programs for Subtitle D Solid Waste Disposal Facilities (Draft). March 1987.

(20) *ICF Incorporated.* The Liner Location Risk and Cost Analysis Model: Phase II. (Draft) 1986.

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(22) *PEI Associates, Inc.* State Subtitle D Regulations on Solid Waste Landfills, Surface Impoundments, Land Application Units and Waste Piles. Contract No. 68-01-7075/02-3090. U.S. Environmental Protection Agency, Washington, DC 1986.

(23) *Planning Research Corporation.* Evaluation of NPL/Subtitle D Landfill Data. U.S. Environmental Protection Agency, Washington, DC. May 1986.

(24) *Fohlend, F. G. and F. R. Harper.* Critical Review and Summary of Leachate and Gas Production From Landfills. August 1986.

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(26) *Science Applications International Corporation.* Summary of Data on Industrial Nonhazardous Waste Disposal Practices. Contract No. 68-01-7050. U.S. Environmental Protection Agency, Washington, DC 1985.

(27) *SCS Engineers.* A Survey of Household Hazardous Wastes and Related Collection Programs. Contract No. 68-01-6621. U.S. Environmental Protection Agency, Washington, DC October 1986.

(28) *U.S. EPA, OSW.* Subtitle D Study Phase I Report. EPA/530-SW-86-054. October 1986.

(29) *U.S. EPA, OSW.* Industrial Subtitle D Facility Study. List of Questions in Telephone Survey. September 1986.

(30) *U.S. EPA, OSW.* Survey of Solid Waste (Municipal) Landfill Facilities. August 1986.

(31) *U.S. EPA, OSWER.* Understanding the Small Quantity Generator Hazardous Waste Rules: A Handbook for Small Business. September 1986.

(32) *U.S. EPA, OSW.* Notification of Hazardous Waste Activity. Form 8700-12 and Instructions. Revised November 1985.

(33) *U.S. EPA.* EPA Journal. Vol 12, No. 1. January/February 1986.

(34) *U.S. EPA, OSW.* Test Methods for Evaluating Solid Waste Physical/Chemical Methods (SW-846). September 1986.

(35) *U.S. EPA, OSW.* Water Balance Method for Predicting Leachate Generation from Solid Waste Disposal Sites. EPA publication number 530/SW-168. 1975.

(36) *U.S. EPA, OSW.* Lining of Waste Impoundment and Disposal Facilities (SW-870). 1983.

(37) *U.S. EPA, OWPO. "Financial Capability Guidebook." February 1983.*

(38) *WESTAT, Inc.* Census of State and Territorial Subtitle D Nonhazardous Waste Programs. Contract No. 68-01-7047. U.S. Environmental Protection Agency, Washington, DC 1986.

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XIII. List of Subjects

A. 40 CFR Part 257

Reporting and record keeping requirements, Waste disposal.

B. 40 CFR Part 258

Reporting and record keeping requirements, Household hazardous waste, Waste disposal, Security measures, Water pollution control, Liquids in landfills, Small quantity generators, Corrective action, Liner requirements.

APPENDIX I

EPA

United States Environmental Protection Agency
Washington, D.C. 20460

Notification for Industrial Solid Waste Disposal Facilities and Construction/Demolition Waste Landfills

Form Approved

Agency Use Only

ID Number

Date Received

I. Owner and Locational Information

1. Facility Owner	2. Location of Facility
Owner Name *(Corporation, Individual, Public Agency, or Other Agency).* Street Address or P.O. Box, City, State, and Zip Code	Establishment or Facility Name and Address *(Street Address or Location Description (not P.O. Box) (e.g., 3 miles west of the intersection of Highway 355 and Route 54), City/County, State, and Zip Code)*
	Telephone Number *(Including Area Code and Extension)*

Telephone Number *(Including Area Code and Extension)*	Latitude		Longitude	
	Degrees	Minutes	Degrees	Minutes

3. Name of Contact Person *(Mark the box if contact person is owner)* ☐ — Telephone Number *(Including Area Code and Extension)*

4. If this establishment is a facility operated or owned by the Federal Government, enter the GSA Identification Number | | | | | | | | | |

II. General Facility Information

1. Which of the Following Unit Types Are at This Facility? *Enter the number of each unit type at this facility. If this facility does not have a unit type, enter "0."*

Type of Unit	Number at Facility
Construction/Demolition Waste Landfill	
Industrial Solid Waste Landfill	
Industrial Solid Waste Surface Impoundment	
Industrial Solid Waste Land Application Unit	
Industrial Solid Waste Pile	

2. Waste Types Disposed of at This Facility *(Check all that apply. Include wastes that currently are accepted or have been accepted in the past)*

- ☐ Municipal Solid Waste
- ☐ Asbestos-Containing Waste Material
- ☐ Infectious Wastes
- ☐ Small Quantity Generator Waste
- ☐ Sewage Sludge
- ☐ Municipal Incinerator Ash
- ☐ Other Incinerator Ash
- ☐ Industrial Solid Waste
- ☐ Construction/ Demolition Waste
- ☐ Other

3. Total Annual Amount Disposed of at This Facility *(Enter the quantity and check the appropriate unit of measurement.)*

☐ Tons ☐ Gallons ☐ Cubic Yards

Quantity

EPA Form 9410-1 (7-88)

this risk level when all exposure is assumed to occur at the 10-meter boundary.

The results of the analysis identify several factors that are important in determining risk, namely facility size, distance to nearest well, and environmental setting. These factors interact with many others in a complex manner to produce risk.

Higher levels of contamination and, thus, higher risks are associated with larger facilities that have a greater mass of waste. The high percentage of small facilities (less than 30 tons per day) in the regulated universe tends to weigh the overall distribution to lower risk levels. However, the Agency's economic impact results indicate that smaller communities will have incentive to regionalize their landfill operations in order to share the burden of cost increases with other communities as well as to take advantage of the economies of scale associated with larger facilities. Regionalization would shift the overall risk distribution towards the higher risks associated with larger facilities, although the total number of facilities would be reduced.

All other factors held constant, risk decreases with increasing distance from the facility. Contaminant concentrations diminish over distance due to degradation, dispersion, and attenuation. While the closest wells present the greatest risk, results from the Facility Survey indicate that this occurrence is relatively rare: 54 percent of existing MSWLFs have no wells within one mile, 15 percent have wells within 300 meters, and 25 percent have wells within 500 meters. However, as stated above, the proximity of wells to MSWLFs likely will increase in the future and thus baseline risks and the risk reduction attributable to the proposal would be greater than the estimates based on the current well distribution.

Wetter climates are associated with higher release volumes and consequently greater risks. However, because landfills are almost equally likely to be found in wet or arid climates, no one infiltration rate setting has a dominant influence on the overall risk distribution. Hydrogeologic characteristics of the aquifer also exert a strong influence on risk. Aquifer properties affect the extent of dilution of the leachate and the retardation and degradation of specific pollutants. Aquifers with slow velocities (i.e., one meter per year) generally allow for no pollutant breakthrough at the more distant wells and for considerable pollutant degradation before breakthrough at nearby wells. In the high-velocity flow fields (i.e., 1,000 and 10,000 meters per year), considerably more water flows through the aquifer, which affords more dilution of the leachate. Intermediate velocity aquifers (i.e., 10 and 100 meters per year) have higher risk profiles because they neither allow for much degradation nor provide for much dilution or pollutant dispersion.

Although these factors (i.e., facility size, distance from the facility, infiltration rate, aquifer characteristics) are strong determinants of risk, no single factor is responsible for most of the variability. All of these factors, plus others that were not accounted for in EPA's risk modeling, interact in a complex manner to produce risk.

(2) Regulatory Options. This Subpart will present first the results for the 10-meter POC modeled at 10 meters from the waste boundary and then the 150-meter POC modeled at 150 meters from the waste boundary.

For the 10-meter POC, EPA estimated that, for about 61 percent of all landfills, vegetative covers alone are sufficient to meet a 1×10^{-6} risk-based performance standard. Synthetic covers are sufficient for 11 percent of the landfills, while synthetic liners with leachate collection systems and synthetic covers are needed at the remaining 28 percent. About 40 percent of the landfills with synthetic liners and covers (11 percent of all landfills) trigger corrective action under the proposal.

About 0.1 percent of the landfills have risks exceeding 1×10^{-4} under the proposal, compared to 5.6 percent in the baseline and about 35 percent have risks between 1×10^{-4} and 1×10^{-6}. Population risks for the proposal are 0.0210 cancer cases per year (over the 300-year modeling period), down from a baseline of 0.0770 cases per year.

At the 150-meter POC, EPA estimated that about 79 percent of the landfills are in compliance with the performance standard in the baseline (compared to 61 percent with the 10-meter POC). About 9 percent need synthetic covers and the remaining 13 percent need synthetic liners and covers. About 5 percent of all landfills trigger corrective action.

As with the 10-meter POC, the number of landfills with risks exceeding 1×10^{-4} is reduced from 5.6 percent in the baseline to about 0.1 percent at the 150-meter POC. About 88 percent of the landfills have risks lower than 1×10^{-6} under this option, compared to 83 percent in the baseline. Population risks are 0.0227 cancer cases per year (over the 300-year modeling period), down from a baseline of 0.0770 cases per year.

Under Alternative 1, less than 1 percent of the MSWLFs have high risk (greater than 1×10^{-4}), compared to 5 percent in the baseline. Approximate 6.1 percent have moderate risks ($1 \times$ to 1×10^{-6}) compared to 11.8 percent the baseline; 15.2 percent have low ris (1×10^{-6} to 1×10^{-7}); and the remain 78.7 percent have very low or no risks

Corrective action is never triggered during the first 50 years under Alternative 1, so all of the risk reduc results from the containment system a cover. Overall, about 9 percent of the landfills trigger corrective action unde Alternative 1. The cover reduces the amount of infiltration entering the landfill. Before leachate is released fro the MSWLF, both synthetic membrane must fail, and the leachate then must travel through three feet of clay. Due to this delay, which ranges from 52 to ove 100 years, some of the pollutant mass that would otherwise have been released is not released during the modeling period. The delay also results in additional pollutant degradation pric to release. The leachate collection systems remove some of the pollutant mass from the landfill.

EPA estimates that population risks under Alternative 1 are 0.0086 cancer cases per year (over the 300-year modeling period), reduced from the estimate of 0.0770 cancer cases per yea in the baseline.

Under Alternative 2, risk shifts from the moderate- and high-risk ranges to the low and very low categories. Only 0.03 percent of the landfills have risks exceeding 1×10^{-4}, and 7.9 percent have risks between 1×10^{-4} and 1×10^{-6}, compared to 5.6 and 11.8 percent in the baseline, respectively. The percentage o landfills with risks below 1×10^{-6} increases from about 83 percent in the baseline to about 92 percent under Alternative 2. The expected number of cancer cases under Alternative 2 is 0.0105 per year (over the 300-year modeling period), compared to 0.0770 in the baseline.

Under Alternative 3, 0.003 percent of landfills have risks higher than 1×10^{-4}, and 1.8 percent have risks between 1×10^{-4} and 1×10^{-6}. The percentage with risks between 1×10^{-4} and 1×10^{-6} decreases from 11.8 in the baseline to 8.7 percent under Alternative 3. Population risks under this alternative are 0.0216 cancer cases per year over the 300-year modeling period.

Of all the alternatives considered, EPA believes the proposed rule is likely to effectively reduce risk because of the performance standard nature of the proposal. Risk depends on a complex interaction among site-specific factors. This variability affects not only the occurrence of risk, but also the baseline. The percent of landfills with resource damage between $0.2 million and $1 million decreases from 15.1 percent in the baseline to 12.8 percent under Alternative 2. About 35 percent of the landfills have no resource damage. The total resource damage across all landfills decreases from $2.58 billion in the baseline to $570 million under Alternative 2 for a reduction of $2.01 billion.

Alternative 3 eliminates the occurrence of replacement costs higher than $4 million. About 6.4 percent of the landfills have replacement costs between $1 million and $4 million. The number of landfills with no resource damage remains virtually unchanged from the baseline at about 29 percent. The total resource damage across all landfills under Alternative 3 drops from $2.58 billion to $1.57 billion as a result of corrective action.

In summary, all of the regulatory options reduce resource damage from baseline levels. For each option, the largest reductions occur for those facilities that currently have downgradient wells (i.e., resource damage is measured in terms of use value) and install preventive measures to control releases. At these facilities, the reduction and delay in releases to the subsurface reduce plume size and/or delay formation of plumes. Because replacement costs are discounted, delay in plume formation translates directly into reduced resource damage. Those facilities with no current wells have smaller baseline resource damage (measured as option value), but also have proportionately smaller damage reductions because they are not as strongly affected by the delay in leachate release. Table 10 presents the resource damage results, across all 6,034 new MSWLFs, for the regulatory options.

TABLE 10.—TOTAL RESOURCE DAMAGES FOR 6,034 NEW FACILITIES

[Present value in billions of dollars]

Regulatory scenario	Resource damage	Damage reduction
Baseline	$2.58	
Proposal (10-meter POC)	1.27	$1.31
Proposal (150-State POC)	1.60	0.98
Alternative 1	0.41	2.17
Alternative 2	0.57	2.01
Alternative 3	1.57	1.01

B. Regulatory Flexibility Act

The Regulatory Flexibility Act (RFA) requires Federal regulatory agencies to evaluate the impacts of regulations on small entities. The RFA requires an initial screening analysis to determine whether the proposed rule will have a significant impact on a substantial number of small entities.

This section presents the methodology and results of the Agency's screening analysis for the proposed rule at the 10-meter point of compliance.

1. Methodology

The RFA provides some guidance in developing definitions of what constitutes a substantial number of small entities, what size criteria define a small entity, and what is a significant impact, although it allows the Agency to develop a more appropriate definition if necessary. The Act defines a "substantial number" as more than 20 percent of the affected population of small entities. The RFA provides a definition of a small governmental entity as any government serving a population of less than 50,000.

The RFA allows for several indicators (e.g., compliance costs as a percentage of production costs, compliance costs as a percentage of sales, number and proportion of small entities likely to close) to be used to assess significant impacts. When a recommended threshold is exceeded for a given indicator, *this constitutes* a "significant impact."

For this RFA screening analysis, the Agency used the same measures and threshold levels as those used in the economic impact analysis. These indicators (and the corresponding threshold values) are cost as a percentage of expenditures (1-percent), cost per household ($220 per year), and cost as a percentage of median household income (1-percent).

2. Results

As stated in the economic impact analysis results, the threshold values are never exceeded for CPH or at the 10-meter POC for the proposed rule. Tables 11 and 12 present data on cost per household and cost as a percentage of expenditures for the proposed rule at the 10-meter POC. (The pattern of impacts is very similar for costs as a percentage of median household income and is not displayed.) The two indicators show similar patterns of impact with the greatest impacts on communities with populations of 5,000 or less. The threshold value for significant impact is exceeded for the cost as a percentage of expenditures indicator.

TABLE 11.—COST PER HOUSEHO[illegible] YEAR FOR PROPOSED RULE (1[illegible] POC)

[Percent of households by community size]

Population size	CPH range (in percent)			
	<$25	$25–$50	$50–$100	>$[illegible]
Less than 1,000	72.9	25.2	1.9	
1,001–5,000	80.8	15.9	3.1	
5,001–15,000	87.5	10.8	1.7	
15,001–50,000	88.9	9.9	1.1	
50,001–100,000	88.5	11.5	0.0	
More than 100,000	98.0	2.0	0.0	

TABLE 12.—COMPLIANCE COST AS PE[illegible]CENTAGE OF EXPENDITURES FOR PR[illegible]POSED RULE (10-METER POC)

[Percent of communities by community size]

Population size	Percent of expenditures		
	0–1%	1–2%	>2[illegible]
Less than 1,000	78.8	18.9	2
1,001 to 5,000	86.8	10.5	4
5,001 to 15,000	90.0	7.8	2.
15,001 to 50,000	90.9	5.6	3
50,001 to 100,000	87.7	12.3	0
Greater than 100,000	100.0	0.0	.

Although the RFA is aimed primarily at mitigating adverse effects on small businesses, it also includes a definition of small governmental entities as any government serving a population of less than 50,000. The municipal data base of primary providers of local government services used for this analysis contains about 29,017 entities, 97.8 percent of these represent a population of 50,000 or smaller. Because such a large proportion of affected entities under the proposed rule meets the 50,000 population criterion suggested in the RFA, and since significant adverse impacts are less on entities with a population larger than 5,000, an alternative definition of a small entity is appropriate. There are 22,191 entities in the data base with populations of 5,000 or less; this represents 77 percent of the total. The proposed regulation will have its most severe impacts on governments serving less than 1,000 people, which include 46 percent of primary local governments. Therefore, the Agency determined that an appropriate size definition for small entities for the purpose of this analysis falls somewhere between governments of 5,000 persons and 1,000 persons.

The Agency determined that the proposed rule is likely to impose under each regulatory scenario that have compliance costs exceeding one percent of total current community expenditures, the percentage of all people that reside in these communities, and the maximum CPE under each option.

TABLE 6.—COSTS AS PERCENTAGE OF EXPENDITURES

[Regulatory Options]

Regulatory scenario	Percent of communities with CPE>1%	Percent of people with CPE>1%	Maximum CPE (percent)
Proposal: 10-meter POC	16	7	4.0
Proposal: 150-meter POC	11	4	5.3
Alternative 1	68	34	14.0
Alternative 2	33	12	6.3
Alternative 3	10	3	6.6

EPA estimates that greater than one-half of all communities under Alternative 1 have CPE exceeding one percent. Under Alternative 2, 33 percent of all governmental entities have CPEs that fall in this category. The percentage of municipalities with costs above 1-percent of current expenditures under the proposal is much lower: 16 percent and 11 percent, given the 10-meter POC and 150-meter POC, respectively. Because most of these severely-impacted communities are small, the percentage of the total U.S. population that resides in these communities is much smaller than the percentage of communities affected (as shown in Table 6).

Several factors will tend to mitigate the actual impact of the alternatives on communities with high CPE. One important factor is the relatively small proportion of the municipal budget that is usually devoted to municipal solid waste disposal. Although CPE greater than 1-percent indicates that municipal solid waste disposal expenditures may double in many communities, after regulation these expenditures will still represent less than 2-percent of the total municipal budget in most communities. Although it may be difficult for communities to cope with large percentage increases in municipal solid waste disposal costs in the short run, once the initial adjustment is made, these costs should be easier for communities to absorb because they comprise a very small portion of communities' total budgets.

Table 7 shows the average CPH across the entire nation, maximum CPH, and percentage of all communities with costs per household exceeding $100 per year (the moderate impact level). The Agency estimates that average incremental CPH across the entire nation ranges from $5 under Alternative 3 to $40 under Alternative 1. For the proposal, EPA estimates that the average CPH is $11 at the 10-meter POC and $8 at 150-meter POC.

TABLE 7.—AVERAGE COST PER HOUSEHOLD PER YEAR

(Regulatory Options)

Regulatory scenario	Average CPH	Percent of communities with CPH < $100 (percent)	Maximum CPH
Proposal: 10-meter POC	$11	0.2	$119
Proposal: 150-meter POC	8	2.1	253
Alternative 1	40	23.5	335
Alternative 2	17	0.1	180
Alternative 3	5	0.2	178

EPA has selected, for this analysis, a threshold level for severe impacts on households of $220 per year. The Agency estimates that this threshold is exceeded under Alternative 1 and at the 150-meter POC for the proposal, but only by fewer than 0.1 percent of all communities in both cases. When the $100 per year threshold is considered, EPA estimates that, for all regulatory options except Alternative 1, the percentage of communities that exce[...] this level is low (i.e., less than 3-percent). However, under Alternative [...] EPA estimates that 23.5 percent of a[...] communities experience increases in CPH of greater than $100 per year.

Cost per household as a percentage MHI is relatively low across all of the regulatory options. The Agency estimates that the 1-percent threshold level is exceeded under the proposal the 150-meter POC and under Alternative 1. Even under these regulatory options, fewer than 2-perce[...] of all households fall into the high impact-category (0.1 percent exceed th[...] threshold at the 150-meter POC and 1. percent for Alternative 1). EPA estimates that the maximum CPMHI is 1.3 percent under the proposal at the 150-meter POC and 1.7 percent under Alternative 1.

Impacts on households also depend on who owns the landfill that serves those households. Table 8 indicates th[...] number of communities and landfills b[...] each major ownership category—county, city, village or town, private, and other. (The other category covers landfills owned by nonlocal governments including special districts, States, and the Federal government.) The distribution of communities by ownership type looks somewhat *different* than the distribution of landfills by ownership type because county-owned and private landfills ten[...] to serve a larger number of communitie[...] than city or town landfills. The table indicates that communities served by village or town landfills have much higher CPH than average. These landfills tend to serve only one or two communities and are commonly very small, thus the CPH is higher. Communities served by private landfills tend to have lower than average CPH. These landfills usually serve many communities and, on average, are larger than publicly owned landfills. Smaller communities could reduce the regulatory burden by participating in larger regional landfills.

TABLE 8.—NUMBER OF COMMUNITIES AND LANDFILLS BY TYPE OF OWNER

[Average Community CPH for Proposed Rule]

Owner	Communities		Landfills		Average number of communities per landfill	Average Community CPH	
	Number	Percent	Number	Percent		Fed POC	State POC
County	10,618	37	1,780	29	6.0	$18	$13
City	6,622	23	1,743	29	3.8	16	15
Village or Town	2,115	7	1,182	20	1.8	34	31
Private	8,556	30	912	15	9.4	10	10
Other	1,087	4	427	8	2.6	15	15
Total	29,998 [a]	100 [a]	6,024 [b]	100 [a]	4.8	$16	$14

[a] Totals may not add to 100 percent because of rounding.

[b] Data are missing for 10 landfills in 19 communities.

10-inch, and 20-inch) and two categories of ground-water depths (deep and shallow). These two parameters are important in affecting the release rate of leachate to the unsaturated zone and ultimately the aquifer. Net infiltration represents the amount of water that can enter the landfill as a result of precipitation. Ground-water table depth represents the potential for pollutant attenuation and degradation to occur in the unsaturated zone. In addition, for facilities that are seasonally inundated with ground water, the inundation depth determines the rate at which ground water can flow through the waste.

EPA performed a statistical analysis of USGS data for each infiltration category to determine the mean depth to ground water and the average annual ground-water fluctuation. Shallow and deep water table depths are represented by the 50th and percentiles, respectively.

For transport through the saturated zone, EPA developed 11 generic ground-water flow fields to represent the range of hydrogeologic conditions in the United States. The flow fields are based on data collected from ground-water supply reports for each of the USGS regions. The flow fields vary in terms of aquifer configuration, materials, and flow velocity. Five of the flow fields are single-layer aquifer systems, two contain two adjacent aquifers, three consist of an aquifer overlaid with a nonaquifer, and one contains two aquifers separated by a nonaquifer.

EPA assigned each surveyed landfill to a net infiltration region based on its precipitation level (obtained from the nearest National Weather Station) and other climatic data. Each of these MSWLFs also was assigned a DRASTIC (Ref. 39) setting to select appropriate ground-water table depths and flow fields. These assignments were used to develop a frequency distribution for each environmental setting. EPA used these frequency weights to scale up the risk model results to obtain national estimates.

(c) Exposure Distance and Populations. EPA selected seven well distances for modeling risk: 10 meters, 60 meters, 200 meters, 400 meters, 800 meters, 1,000 meters, and 1,500 meters. Preliminary results from the Facility Survey were used to develop a frequency distribution of distance from the MSWLF to the closest drinking water well at each site. This distribution (i.e., distance to closest well) was used to estimate risk to the maximum exposed individual (MEI). Approximately 54 percent of the MSWLFs were reported to have no downgradient drinking water well within one mile of the facility. For the other 46 percent of MSWLFs: 12.8 percent reported wells within 300 meters, 22.5 percent reported wells within 500 meters, and 40.3 percent reported wells within 1,250 meters of the facility boundary.

EPA used the preliminary Facility Survey data on distance to all wells within one mile downgradient and the number of people served at each well to calculate the total population risk (i.e., number of predicted cancer cases). EPA calculated the mean number of well-using people per acre (i.e., 1.6) using facility survey results for private and/or public wells. The land area associated with each exposure well was multiplied by this population density to estimate the size of the exposed population for each affected well.

Ground-water concentrations of chemical constituents released from landfills can cause human exposure via drinking water. All exposed individuals are assumed to weigh 70 kilograms and drink two liters of water per day. The lifetime dose is calculated as the running 70-year average over an individual's lifetime.

(d) Impacts: Human Health Risk. For this analysis, reported risk is the average lifetime maximum exposed individual risk (i.e., the mean of the average lifetime (70-year) risks over the 300-year modeling period).

Of the eight COC selected for modeling human health risk, five are carcinogens and one is a noncarcinogen. The approach for estimating risks for carcinogenic effects is consistent with the Agency's cancer risk assessment guidelines. Carcinogenic potencies are from the Agency's Carcinogenic Assessment Group (i.e., 95th percentile upper-bound slopes based on a linearized multistage model).

For noncarcinogenic effects, the Weilbull equation was used with a threshold to predict a probability of effect. Below the threshold, risk equals zero. At doses above the threshold, risk depends on the dose, the constituent-specific threshold, and the shape of the dose-response curve.

(e) Impacts: Resource Damage. The measure of resource damage in the model is based on the cost to replace contaminated ground water that currently is used, or may be used, for drinking water. Resource damage is determined by plume area, the density of drinking water wells, the source of replacement water and its distance from the affected wells, the time the plume first appears, and whether ground water currently is used.

The Agency assumed that the replacement source is nearby ground water located one mile distant. The replacement well system was using the mean population den... people per acre that also was used the human health risk estimates.

Resource damage was estimated under two scenarios: use value and option value. Use value assumes tha the population currently is using the ground water, whereas option value used when the population is not currently using the resource but may wish to do so in the future. For optio value, the resource damage measure recognizes the probabilistic nature o future use: replacement costs are multiplied by an estimated probabili of use in each time period. The prese value for both option and use value is then determined at a 3-percent real discount rate.

(f) Correcti... ction. Under the proposed rule, corrective action can b triggered if a constituent of concern is detected in the uppermost aquifer at levels exceeding the applicable MCL; an MCL does not exist, a risk-based o background level is used as the standard.

In the corrective action analysis for this RIA, ground-water monitoring we are located at the POC, which can var between the landfill unit and the property boundary depending o. regulatory scenario. EPA estimate... th effects of corrective action based on detection of constituents of concern in the uppermost aquifer at levels exceeding a 1×10^{-6} risk level.

As stated in the cost methodology, only ground-water recovery wells wer modeled as the corrective action technology. The submodel assumes tha the corrective action technology is in place one year after the trigger levels are reached and operates at its specific efficiency for the remainder of the modeling period. The model calculates downgradient well concentration profiles following implementation of th corrective action and recalculates risk and resource damage estimates. These results are compared to the estimates calculated for the baseline (i.e., no corrective action scenario) to determine the reductions in risk and resource damage achieved by corrective action.

(2) Risk Model Inputs. EPA modeled three MSWLF sizes for risk and resourc damage: 10 TPD, 175 TPD, and 750 TPD. Each size category is characterized by the total volume of waste placed in the landfill, the number of phases used to dispose of the waste, and the dimensions of the landfill at capacity (e.g., surface area, depth, height). waste volumes and dimensions fo h capacity category are consistent with

assumed to be installed one year after the corrective action has been triggered.

For existing contamination, EPA estimated corrective action costs for two types of responses. The first response consists of active restoration of the plume using ground-water recovery wells (i.e., the approach modeled for new facilities). EPA assumed that this approach will be utilized for larger plume sizes as the most effective remedial measure. To partially account for the flexibility provided by the corrective action requirement in terms of the timing and response to contaminant plumes, the second response represents a passive approach for smaller plumes. EPA assumed that this passive approach would consist of providing an alternative water supply to affected user of the gound water. EPA recongizes that alternative technologies or remedies may be employed for cleanup of affected ground water. Corrective action costs were added to the design and operating costs to derive total costs for a given regulatory option.

To obtain incremental regulatory costs, EPA first characterized MSWLF baseline practices. Baseline practices are those design and operating practices that exist prior to the imposition of the requirements in today's proposed rule. EPA characterized baseline conditions using preliminary results from the Facility Survey and results from the State Census. For purposes of this analysis (including the economic impact and risk analyses discussed later), EPA characterized the baseline facility as an unlined landfill with a vegetative cover at closure, no environmental monitoring, no post-closure care, and no corrective action. However, as described below, EPA adjusted compliance costs to account for existing State requirements with respect to liners, leachate collection systems, and ground-water monitoring well requirements. The MSWLF population is extremely diverse in terms of its technical characteristics (e.g., presence of environmental controls, design capacity, remaining life), which is due in part to a broad range of State requirements that vary in both scope and detail. EPA reviewed the State requirements to identify those States that require containment (i.e., liners, leachate collection systems) and ground-water monitoring well requirements that would likely satisfy the conditions in today's proposed rule. EPA identified 22 States with similar liner and LCS requirements and 24 States that have similar ground-water monitoring well requirements. EPA adjusted the regulatory compliance cost estimates for facilities in these States. The adjustment for State liner and leachate collection system requirements was made only for analyzing the costs of the proposed rule: the costs for all regulatory options accounted for the existence of State requirements for ground-water monitoring wells. To the extent that other existing State requirements are similar to those in today's proposed rule, the estimated compliance costs will be overstated. Although EPA adjusted the national compliance cost estimates to reflect these State requirements, the risk and resource damage estimates were not adjusted to reflect the presence of containment systems in the baseline. The benefits of the regulatory options in protecting ground water as a drinking water source (presented in this section and in the RIA) will likely be overstated by not incorporating the presence of these State requirements; however, EPA has not analyzed the benefits of the regulatory options in reducing risk from other routes of exposure (e.g., surface water, subsurface gas, risks to the ecosystem). Therefore, the net benefits of the rule will likely be understated.

The Agency estimated compliance costs for each Facility Survey respondent. EPA assigned each respondent a weighting factor that represents the frequency of that type of facility in the total national regulated population of 6,034 active MSWLFs. The weighting factors were used to scale respondent facility costs up to national compliance costs for the regulatory options. EPA estimated compliance costs separately for new and existing requirements. In addition, EPA combined the new and existing MSWLF estimates to produce a compliance cost figure that represents an average cost for existing units and their new replacement landfills. New landfills are assumed to be perpetually replaced for this combined estimate.

For new MSWLFs, all regulatory costs are assumed to apply from the time construction begins. A new landfill is assumed to operate for 20 years and compliance costs (in present value terms) are annualized over this time period. For those facilities with longer operating lives (approximately 60 percent of all MSWLFs as reported in the Facility Survey), the annualized costs will be lower due to an increased amortization period for capital costs.

For existing MSWLFs, the regulatory costs are applied over the remaining operating life as reported in the Facility Survey. (Existing MSWLFs that were reported in the Facility Survey to be closing before the effective date of the proposed rule were not assigned existing requirement costs. These landfills were assumed to be replaced with new facilities to which appropriate requirements were applied.) EPA annualized the regulatory costs for an existing MSWLF over the remaining life of the facility. EPA assumed that revenues are generated to pay for regulatory costs during the operating life. Although this is likely to be true for private landfills, publicly owned facilities may have the option of passing on the costs (for facilities with short remaining lives) to future facilities and thus reduce the cost impact. Existing landfill costs will tend to be overstated for these facilities that amortize the costs over a period that extends past the reported remaining life.

To develop a combined estimate of average annualized compliance costs for the regulatory options, costs for existing units plus their new replacement landfills have been discounted to one present value that spans the existing landfill's remaining life plus the ongoing life of a new landfill that is replaced every 20 years. (Replacement of all existing MSWLFs with new MSWLFs does not account for the current trend away from siting new landfills; moreover, it is unlikely that each of the existing 6,034 MSWLFs will have a replacement landfill in perpetuity. Regionalization, recycling, shifts to resource recovery, and better siting of landfills in "good" locations will result in fewer new MSWLFs than estimated in this analysis. EPA has not incorporated these factors into the analysis because they involve simulating site-specific local decisions that are difficult to analyze. EPA's costs will tend to be overstated by not including these factors.) EPA assumed that the new MSWLF would be built at the same location such that the required designs remain the same. EPA then annualized this present value as a perpetuity to obtain an annualized combined compliance cost estimate for a given regulatory option. Although this figure does not represent the actual cash flow (i.e., for capital outlays) that would likely result from regulation, it does represent a level annual payment as if the facility operator had borrowed funds to pay the capital costs. This annualized combined cost estimate is used in the economic impact analysis of the regulatory options. Compliance costs specific to new and existing requirements are presented in detail in the RIA; however, costs (and economic impacts) presented in this section of the preamble only reflect the combined estimates.

the evapotranspiration, vary the slope of the cover to increase run-off, use heavier soils from off site, or install a clay or synthetic layer with a drainage collection system beneath the vegetative cover. These decisions involve site-specific factors and are difficult to analyze. Thus, EPA limited the options for cover type to either vegetative or synthetic. EPA assumed that MSWLFs with positive annual net precipitation (precipitation minus potential evapotranspiration) will use a synthetic cover. EPA assumed that landfills with zero or negative net precipitation use the same cover design that was simulated for the baseline, except that the cost includes additional fees for quality assurance. (Potential evapotranspiration was determined using the Thornwaithe-Mather equation.) Using this approach, EPA estimates that 67 percent of all MSWLFs have positive net precipitation and thus are assigned synthetic covers; the remaining 33 percent are assumed to achieve the performance standard with vegetative covers. EPA applied costs for these covers to both new and existing units.

Alternative 2 assumes that all MSWLFs in location Categories II and IV (34 percent of all facilities) must have a leachate collection system; units in location Categories I and III must collect leachate if more than one foot of leachate is generated over the active life. The Agency determined the leachate generation for Facility Survey respondants in Categories I and III using the approach described in EPA publication 530/SW–168. The Agency estimates that 63 percent of the landfills in these two categories (or 41 percent of all facilities) would need an LCS. Thus, across all MSWLFs, the Agency estimates that 75 percent will be required to have an LCS.

Under Alternative 2, the need for a containment system for MSWLFs in location Categories I and II only is related to the need for an LCS since they already have a long time-of-travel. A containment system is necessary if the native soil does not have a sufficiently low permeability to allow the LCS to function properly. EPA assumed that MSWLFs in these categories that need an LCS and that reported clay as their primary natural soil type in the Facility Survey do not need a liner (estimated as 10 percent of all MSWLFs). EPA assigned the remaining units (four percent of all facilities) that need an LCS in these categories a synthetic liner so that the LCS would perform efficiently.

MSWLFs in Categories III and IV that need an LCS (estimated as 61 percent of all facilities) also must have a containment system that will increase the time of travel to greater than the active life or 20 years. Although a clay liner could possibly meet the performance standards, EPA assigned a synthetic liner, which would be less expensive in most cases, to these units.

MSWLFs that do not need an LCS (estimated as 25 percent of all MSWLFs) are all in Categories I and III. Those facilities that are in Category I (20 percent of all MSWLFs) have a long time of travel, and thus do not need a liner. For those in Category III (five percent of all MSWLFs), EPA assigned a two-foot thick clay liner that should provide sufficient delay to meet the performance standard. Moreover, even if clay had to be brought from off site, a clay liner is less expensive than synthetic given that a synthetic liner would also require installation of a leachate collection system.

Although these assignments of designs to meet the performance standards for Alternative 2 do not reflect the inherent flexibility of performance requirements, EPA believes that they do provide an indication of how these standards would be met. The general facility standard requirements (and resulting compliance costs) for Alternative 2 are identical to those analyzed for the proposed rule.

Alternative 3 consists of uniform criteria applied to both new and existing landfills. This regulatory alternative is similar to the statutory minimum mandated under HSWA and includes analysis of ground-water monitoring (throughout an extended post-closure care period) and corrective action requirements; however, EPA has not incorporated any location standards into the analysis for this alternative. Alternative 3 is the only regulatory option that does not include general facility standards. EPA assumed that ground-water monitoring would begin on the effective date of the regulation. A more detailed discussion of the cost analysis for each of the regulatory options is included in the RIA.

b. Cost Results. The Agency estimates that the proposed rule will result in an annualized cost of approximately $860.0 million at the 10-meter POC and $691.4 million at the 150-meter POC. Thus, based on the $100 million annual cost threshold established in E.O. 12291, today's proposal is a "major" regulation.

Table 3 shows the size distribution of MSWLFs across the seven facility sizes modeled in the cost analysis, as well as the annualized cost of the proposed rule for each facility size. EPA estimates that the smallest size category (i.e., 10 … while accounting for 51.3 percent … MSWLFs, only accounts for 6-percent and 7-percent of the total cost of the proposed rule under the 10-meter and 150-meter POCs, respectively. The two largest size categories modeled (750 and 1,500 TPD) account for only 5.7 percent of all MSWLFs, but 35 percent to 38 percent of the total cost under either POC.

TABLE 3.—ANNUALIZED COMBINED COST BY SIZE, PROPOSED RULE

[Dollars in millions]

Size category (TPD)	Percentage of all MSWLFs	Annualized cost: 10-meter POC	150-meter POC
10	51.3	$52.3	$47.3
25	17.0	65.8	72.2
75	13.1	134.0	107.6
175	7.3	128.5	95.6
375	5.5	148.7	130.3
750	3.1	137.3	93.4
1,500	2.6	193.4	145.0
Total	[1] 100.0	860.0	691.4

[1] Does not add due to rounding.

EPA estimates that, under the 10-meter (150-meter) POC, *approximate* 46.7 percent (52.5 percent for the 150-meter POC) of all MSWLFs will incur an incremental cost increase of less than $10 per ton; 49.2 percent (45 percent for 150-meter POC) face an increase between $10 and $25 per ton, and 4.8 percent (1.4 percent for 150-meter POC) will incur a compliance cost between $25 and $50 per ton. Under the 150-meter POC, EPA estimates that 1.2 percent of all MSWLFs will incur cost increases of greater than 50 percent per ton due to expensive corrective actions that are triggered.

Table 4 shows the total annualized combined costs for today's proposed rule and the three regulatory alternatives. The annualized costs, including corrective action, range from $419 million for Alternative 3 up to $3,341 million for Alternative 1. The costs for the proposed rule, under either POC, falls near the lower end of the range. Corrective action is triggered under all the regulatory options and represents from 2-percent (under Alternative 1) to 72 percent (under Alternative 3) of the total costs. Corrective action represents 11 percent and 19 percent of the total cost of the proposed rule for the 10-meter and 150-meter POCs, respectively. The relative costs across options are affected by the stringency of the requirements only.

Proposed § 258.58(d) requires that wastes generated during the implementation of corrective action be managed in a manner that is protective of human health and the environment. In particular, the waste management practices must be in compliance with all applicable RCRA requirements.

According to proposed § 258.58(e), the remedy is considered complete when the GWPS has been achieved according to the requirements of § 258.57(h) and all other actions required in the remedy have been completed (e.g., source control measures). After the required remedy is complete, the owner or operator must submit a statement that certifies that the remedy has been completed in accordance with requirements under § 258.58(e). In addition to the owner or operator's signature the certification must contain the signature of an independent professional engneer geologist, or other appropriate technically trained person. According to § 258.58(g), after the State receives the certification and is satisfied that the remedy is complete, the State releases the owner or operator from the requirements for financial assurance for corrective action.

The Agency considered an alternative approach to the corrective action program proposed today. The alternative would involve the following steps. First: the owner or operator would be required to do three activities: (1) Report to the State any concentration of hazardous constituents in the ground water above trigger levels, (2) investigate the nature and extent of the contamination, and (3) take all necessary actions to abate any immediate risks to human health and the environment. Second, after the owner or operator submitted the results of the investigation, the State would assess, site-specifically, the risks to human health and the environment posed by the ground water contamination. Based on this assessment, the State would set site-specific requirements for clean up of the ground water (including cleanup levels). Next the owner or operator would be required to submit to the State for approval a plan for meeting the cleanup requirements. The owner or operator then must implement the approved plan. Modifications to the plan would be allowed, if needed, based on site-specific considerations. The approach would present fewer specific Federal requirements for cleanup. The Agency requests comment on this alternative approach as well as the proposed corrective action requirements discussed above.

X. Effective Date, Implementation, and Enforcement of the Revised Criteria

Subtitle D of RCRA, as amended by HSWA in 1984, requires the Administrator to revise the Criteria for sanitary landfills under § 4004(a) and the solid waste management guidelines under section 1008(a) for facilities that may receive HHW or hazardous wastes from SQGs. Subtitle D also contains specific requirements with respect to the implementation and enforcement of the revised Criteria for facilities that may receive these wastes. Of particular significance is the provision in § 4005(c) requiring that States adopt and implement, within 18 months of the promulgation of the revised Criteria, a facility permit program or other system of prior approval to ensure compliance with the revised Criteria. In addition, this section provides that "In any state that the Administrator determines has not adopted an adequate program * * * the Administrator may use the authorities available under section 3007 and 3008 of [Subtitle C] to enforce the prohibition contained in subsection (a) of this section with respect to such facilities." A discussion of the issues regarding the implementation and enforcement of the revised Criteria and the options the Agency is considering for addressing these issues is set forth below.

A. Effective Date of the Revised Criteria

EPA today is proposing that the revised Criteria become effective 18 months after their promulgation. The Agency considered an alternative two-stage approach, which is described below, but decided that 18 months is the most appropriate time period for several reasons.

1. Eighteen-month Period

First, the 18-month time period would coincide with the period within which States, under section 4005(c) of RCRA, are to adopt and implement a permit program or other system of prior approval to ensure that facilities comply with the revised Criteria. Congress provided this 18-month period after the promulgation of the revised Criteria to provide States adequate time in which to adopt new or revise existing applicable State standards and to institute a permit process for ensuring facility compliance. Because the States are given the lead responsibility for implementing the revised Criteria under these provisions, EPA believes it is critical to set an effective date for the revised Criteria that coincides with the date the States are required by RCRA to have their implementation mechanism in place.

Second, the 18-month period would provide MSWLF owners and operato: with sufficient time to take the necessary measures at their facilities bring them into compliance. EPA recognizes that certain of the revised Criteria proposed today may require substantial efforts on the part of the facility owner and operator both in modifying management practices at a: existing MSWLF and in planning full compliance for a new one. The fact th. most MSWLFs are owned and run by local governments, which have limitec resources, also is a consideration. Congress directed EPA to take into account the "practicable capability" o facilities in revising the Criteria. EPA believes that the proposed 18-month period for allowing MSWLFs to come into compliance recognizes the practicable capability of MSWLFs to meet certain of the revised Criteria.

Although EPA recognizes that some the revised Criteria could be implemented in shorter periods of time i.e., six or 12 months, EPA believes tha a uniform effective date of 18 months would minimize confusion on the part the regulated community. Also, while the 18-month period before the effectiv *date proposed today would postpone* application of the revised Criteria to MSWLFs, it would not leave these facilities unregulated. The current part 257 Criteria and applicable State standards would remain in effect for these facilities until the revised Criteri become effective. In addition, some States may adopt the revised Criteria, making them effective under their owr authorities, before the 18-month perioc expires.

EPA recognizes that there are some limitations with this approach. EPA is concerned that the 18-month period between the promulgation and the effective date of the revised Criteria might allow some MSWLFs to close tc avoid meeting the new requirements. The Agency does not intend for this period to be a window of escape for marginal MSWLFs. Experience shows however, that MSWLFs do not open a close overnight. In fact, the long operating lives of most existing MSWLFs and years of advance plann needed for siting and permitting new facilities significantly mitigate against such actions. The Agency is aware th: some closures may occur, however, ar intends to work with the States to gua against closures performed in an unsatisfactory manner that may pose threats to human health and the environment.

others, to bring legal actions for noncompliance with RCRA requirements. Thus, once the revised Criteria become effective, they have the full force of law and may constitute the basis for citizen enforcement actions against facilities that fail to comply. Citizens would be able to bring actions against facilities for failure to comply with the Criteria and actions against States for failure to develop and implement permit or other prior approval programs as required by RCRA section 4005.

2. Federal Enforcement

Section 4005(c)(2) of RCRA, as amended by HSWA in 1984, provides authority for EPA enforcement of the revised Criteria under authority of sections 3007 and 3008 of Subtitle C. This provision is significant in that it represents the first authority for EPA enforcement of regulatory requirements under Subtitle D. According to section 4005(c)(2), EPA enforcement is contingent on an EPA determination that a State has not adopted an adequate permit or other prior approval program to ensure the compliance of facilities with the revised Criteria by 18 months from the date of promulgation of the revised Criteria. Having made this determination, EPA may use the inspection and enforcement authorities under sections 3007 and 3008 to enforce against facilities failing to comply with the revised Criteria. Disposal of solid waste at facilities that do not comply with the revised Criteria constitutes open dumping. These authorities provide EPA with the necessary tools to enforce Subtitle D's prohibition against open dumping.

EPA expects the States to assume the primary responsibility for implementing and enforcing the revised Criteria, and a major EPA enforcement program for Subtitle D is not envisioned. If States fail to assume their responsibility with respect to the revised Criteria, however, EPA may step in to ensure compliance with Part 258 as necessary to protect human health and the environment. As explained above, EPA is soliciting comments on the criteria and procedures that it should use to determine whether a State has adopted an adequate program.

EPA has determined that it is necessary to formulate an enforcement strategy with respect to the revised Criteria and welcomes public comment on the overall role of EPA enforcement under Subtitle D, the proper elements of an enforcement policy for ensuring compliance with the revised Criteria, and strategies for targeting MSWLFs that pose the greatest threat to human health and the environment. EPA is soliciting public comment on the specific circumstances and situations of facility noncompliance with the revised Criteria that should precipitate direct EPA enforcement actions. In addition, the Agency is particularly interested in comments on circumstances under which the Agency should act to enforce criteria once the Administrator has determined that the State's program is inadequate pursuant to section 4005(c)(1)(C).

D. Other Implementation Issues

1. Implementation Strategy

In conjunction with the development of this rule, the Agency is preparing an implementation strategy. This strategy will serve as a planning document for EPA and the States in understanding what actions are necessary to modify the management of their regulatory programs to accommodate the revised Criteria. This strategy is designed to limit future implementation problems by anticipating potential problems or obstacles and crafting implementation options to resolve or minimize these issues before they emerge.

The Agency currently is identifying implementation issues and needs concerning permitting, compliance monitoring, and enforcement activities; public education and outreach activities; guidance and training needs; resource needs; and EPA/State roles and responsibilities. In particular, the Agency requests comments on the following implementation concerns: (1) What types of education-outreach programs are needed for State and local officials, the regulated community, and the general public? (2) In what areas is there a need for guidance and training? What types of technical assistance activities are needed? (3) What is an appropriate and practical EPA role if the States do not adopt and implement the revised Criteria?

The Agency also solicits comment on whether additional issues should be considered in developing this strategy.

2. Co-disposal of Sewage Sludge

One of the major disposal practices for sewage sludge is disposal at a municipal solid waste landfill. Approximately 6,800 POTWs dispose of their sewage sludge in this manner. By promulgating the Part 258 requirements jointly under RCRA and CWA section 405, questions arise as to the extent to which the Part 258 criteria would be implemented through NPDES permits issued to POTWs. Under RCRA Subtitle D (section 4005(c)), the Part 258 criteria are to be imposed by States on the owner or operator of an MSWLF. Sta[illegible] are to impose the criteria by a [illegible] prior approval and conditions, [illegible] issuance of a permit to the MSWLF. [illegible] Agency has selected this approach to reconcile the two programs in a way that would minimize duplicative regulation while best ensuring compli[illegible] coverage under both statutes. This approach would be consistent with section 1006(b) of RCRA, which requ[illegible] EPA to integrate the provisions of RC[illegible] for purposes of administration and enforcement, and to avoid duplication[illegible] the maximum extent practicable, with the appropriate provisions of the CW[illegible] and other environmental laws administered by EPA.

Under this proposal, the Part 258 criteria applicable to the characteristi[illegible] of sewage sludge that must be met if sewage sludge is placed in an MSWL[illegible] would be implemented through permi[illegible] issued to POTWs pursuant to section 405(f) of the CWA. The Part 258 criter[illegible] applicable to the landfill site would be implemented under the RCRA Subtitle program. This would mean that the POTW permit would prohibit the disposal in an MSWLF of sludge found to be hazardous (§ 258.20), and would require that the sludge pass the Paint Filter Liquids Test (§ 258.28). The POT[illegible] permit also would prohibit the P[illegible] from sending its sludge to MSWL[illegible] are not in compliance with the applicable Federal and State regulations. Thus, to obtain a permit authorizing disposal of sludge at a landfill, the POTW would have to ascertain that the MSWLF either has [illegible] permit under Part 258 or otherwise is authorized to operate as an MSWLF b[illegible] the State in which it exists, as prescribed by RCRA.

EPA believes that this implementati[illegible] scheme fulfills the goals and policies o[illegible] both RCRA and the CWA and is a rational way to reconcile overlapping programs. EPA also considered separa[illegible] implementation of the Part 258 criteria under each program. Under the sludge management program of the CWA, thi[illegible] method would involve implementation of all Part 258 criteria, including those applicable to location, design, and operation of the landfill, through perm[illegible] issued to the POTWs. The Agency decided against this approach for two reasons. First, it would establish duplicative coverage without apparen[illegible] corresponding environmental benefits. Typically, sewage constitutes a small proportion of the wastes disposed at [illegible] MSWLF. Compared to other waste[illegible] to an MSWLF, such as household hazardous waste and hazardous w[illegible] from very small quantity generators.

Section § 258.57(b)(3) is the source control standard for remedies. A critical objective of remedies must be to reduce further environmental degradation by controlling or eliminating further releases that may pose a threat to human health and the environment. In some cases, unless source control measures are taken, efforts to clean up releases may be ineffective. EPA is persuaded that effective source control actions are an essential part of ensuring the effectiveness and protectiveness of corrective actions at MSWLFs.

The standard of § 258.57(b)(3) requires that further releases from sources of contamination that may pose a threat to human health or the environment be controlled to the "maximum extent practicable." This qualifier is intended to account for the practicable capabilities of the owner or operator and the technical limitations that may, in some cases, be encountered in achieving source controls. For some very large MSWLFs, engineering solutions such as treatment or capping to prevent further leaching may not be technically feasible or completely effective in eliminating further releases above health-based contamination levels. In such cases, source control may need to be combined with other measures, such as plume management or exposure controls, to be an effective and protective remedy.

The Agency does not intend this source control requirement to disrupt solid waste disposal at operating MSWLFs that have contaminated ground water. The Agency believes that, until the MSWLF is closed with an appropriate final cover (pursuant to § 258.40), other effective measures may be implemented. For example, depending on the source(s) of the release(s), capping inactive cells or units may help to control further releases. As mentioned above, plume management and exposure controls also may be needed, especially while the facility is continuing to receive waste.

The concept of effective source control as a remedial objective, as expressed by this remedy standard in § 258.57(b)(3), is closely linked to the CERCLA preference for Superfund remedial actions that utilize "permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable."

The proposed remedy standard of § 258.57(b)(4) requires that remedial activities that involve management of wastes must comply with the requirements for solid waste management, as specified in § 258.58(d) in today's proposed rule. Remedies may involve treatment, storage, or disposal of wastes, particularly in the context of source control actions. This standard will ensure that management of wastes during remedial activities will be conducted in a protective manner. The Agency requests comment on the four proposed standards for remedies.

Proposed § 258.57(c) specifies general factors to be considered by the State in selecting a remedy that meets the four standards for remedies. These factors, which generally are consistent with the evaluation criteria specified in SARA, are discussed briefly below. The Agency requests comment on these factors.

These factors are meant to aid the States in evaluating the data provided by the owner or operator as a result of the assessment of corrective measures. The general decision factors are: (1) Long- and short-term effectiveness and protectiveness, (2) reduction of future releases, (3) implementability, (4) practicable capability of the owner or operator, and (5) community concerns.

The first two factors described under § 258.57(c) are directly linked to the standards for the remedy. The long- and short-term effectiveness and protectiveness of the remedy is a measure of whether human health and the environment will be protected while the remedy is being implemented and once it is completed. It also is a measure of whether the GWPS can be met. The second factor, the reduction of future releases, should be used in evaluating how well the source control standard has been met. The practicable capability of the owner or operator also may be considered when evaluating to what extent source control can be achieved.

The Agency believes that the implementability of potential remedies also must be considered by the State when evaluating remedies. Factors that may affect the implementability of a remedy included: (1) The degree of difficulty associated with constructing the technology, (2) the expected operational reliability of the technologies, (3) the availability of necessary equipment and specialists, and (4) the available capacity and location of needed treatment, storage, and disposal services.

The practicable capability of the owner or operator is another remedy selection factor. As described elsewhere in this preamble, practicable capability includes both economic and technical capability of the owner or operator. The consideration of practicable capability allows the State to choose the remedy or combination of remedies that can meet the overall goal of protection of human health and the environment. This may affect the timing of corrective action, and, therefore, practicable capability has been listed as a factor for the States to consider in establishing the cleanup time frame (see preamble discussion of § 258.57(d)). In addition, as mentioned previously, the practicable capability of the owner or operator may be considered by the State in defining to what extent the source of releases will be controlled.

Community concerns is another factor that the Agency believes must be considered by the State when selecting a remedy. It is very important that the community has confidence in the remedy, how it was chosen, and the party responsible for implementation. The success of the corrective action process with regard to community involvement may significantly affect the siting of future MSWLFs in that community.

Any remedy proposal developed during the assessment of corrective measures presented to the State for final remedy selection must, at a minimum, meet the four standards of § 258.57(b). The State then will evaluate those remedies. The decision factors discussed above will be used by the State in selecting the appropriate remedy. The relative weight given to any one of the factors will vary from facility to facility. For example, short-term effectiveness considerations may be of particular concern where remedial activities will be conducted in densely populated areas, or where waste characteristics are such that risks to workers are high and special protective measures are needed. Implementability factors will often play a substantial role in shaping remedies—some technologies will require State or local permits prior to construction, which may increase the time needed to implement the remedy.

Proposed § 258.57(d) would require the State to specify a schedule for initiating and completing remedial activities as a part of the selection of remedy process. This provision gives the States the flexibility to prioritize MSWLF cleanups within their borders. The Agency believes that the flexibility these factors (described below) allow is essential considering the practicable capability of many MSWFs. Further, the Agency believes that the use of these factors will not in any way compromise protection of human health or the environment.

The Agency is proposing that the State consider numerous factors in determining the cleanup time frame. First, threats to human health or the environment from exposure to contamination during implementation of the corrective action program must be meeting the design standard (see preamble discussion of § 258.40).

The second factor is actual or potential exposure threats to sensitive environmental receptors. Frequently, levels set for protection of human health also will be protective of the environment. However, there may be instances where adverse environmental effects may occur at or below levels that are protective of human health. Sensitive ecosystems or threatened or endangered species' habitats should be considered in establishing the GWPS.

The next factor is other site-specific exposures to the contaminated ground water. For example, residents living near a municipal solid waste landfill may receive unusually high exposures of hazardous constituents from other sources (e.g., lead from a lead smelter). These other exposures should be considered when developing the GWPS.

The last consideration is remedy-specific factors. The State must consider the reliability, effectiveness, practicability, and other relevant factors of the remedy when establishing a GWPS. For example, a remedy that can treat constituents in ground water down to concentrations posing a 1×10^{-6} risk level may be selected in preference to another remedy that might achieve a 1×10^{-6} risk level, but that relies on technology that has not been successfully demonstrated or may be unreliable for other reasons.

There also are technical limitations that must be considered, in addition to scientific information about the hazards to human health and the environment, in establishing ground-water protection standards. For example, GWPSs should not be set lower than detectable levels.

Proposed § 258.57(e)(5)(i) establishes that a GWPS hould not be set below background levels unless the State determines that cleanup to levels below background is necessary to protect human health or the environment. In general, the Agency believes that it may not be reasonable to require the owner or operator to reduce the concentrations of hazardous constituents to levels below background. In many cases such a reduction would not be technically feasible. Today's proposal, however, does not allow MSWLFs located in contaminated areas to ignore incrementally significant facility contributions to the contamination unless a determination is made under proposed § 258.57(f) that remediation is not required.

Proposed § 258.57(f) identifies three situations in which the State may decide not to require cleanup of a release to ground water of hazardous waste or hazardous constituents from an MSWLF, thus obviating the need to establish ground-water protection standards. These situations are limited to cases where there is no threat of exposure to releases from MSWLFs, or cases where cleanup will not result in any reduction in risk to human health or the environment. In any case, the State may impose under § 258.57(g) source control requirements to minimize or eliminate further releases from the MSWLF even if remediation is not required. The Agency does not believe that continued further degradation of the environment is warranted, even in those situations where cleanup may not be required.

In some cases, MSWLFs releasing hazardous constituents to the ground water will be located in areas that already are significantly contaminated. Where releases from the MSWLFs are trivial compared to the overall area-wide contamination, or where remedial measures aimed at the MSWLF would not significantly reduce risk, EPA believes that remediation of releases from the MSWLF would not be necessary or appropriate. In these situations, proposed § 258.57(f)(1) would allow the facility owner or operator to provide the State information demonstrating that remediation would provide no significant reduction *in risk*. If the demonstration were made, the State should determine that remediation is not necessary.

For example, ground water below a leaking MSWLF might be heavily contaminated from off-site sources. In this case, removal of the MSWLFs contribution to the contamination might have very limited benefit, particularly if that contribution was relatively minor. Control of the MSWLF releases might do very little, in such a case, to improve the overall situation in the area, yet (in the case of an operating unit) might be extremely burdensome to the owner or operator.

Two points should be stressed here, however. First, the facility owner or operator would be required to remediate the ground water where it could have a significant effect on reducing risks—for example, as part of an area-wide cleanup strategy. Second, in any case, under § 258.57(g) source control may be required to prevent further releases.

The Agency has not attempted to define "significant reductions" in risk in this rulemaking, and believes the decision is best made on a case-by-case basis by the State. However, the Agency seeks comment on whether a more specific definition is necessary for the purposes of this rulemaking.

Under proposed § 258.57(f)(2), the State may determine that a hazardous constituent that has been released from an MSWLF to ground water does pose a threat to human health and environment and, therefore, does not require remediation if: (1) The ground water is not a current or potential source of drinking water and (2) the ground water is not hydraulically connected with waters to which the hazardous constituents are migrating or are likely to migrate in a concentration(s) that represents a statistically significant increase over background concentrations.

In interpreting whether the aquifer meets these criteria, the State may use the approach outlined in the Agency's Ground-Water Protection Strategy (August 1984) as guidance. Typically, Class III ground water will be considered to meet the requirements specified in § 258.57([illegible]). Class III ground waters are ground waters not considered potential sources of drinking water. They are ground waters that are heavily saline, with TDS levels over 10,000 mg/L or are otherwise contaminated beyond levels that allow cleanup using methods reasonably employed in public water system treatment. These ground waters also must not migrate to Class I or II ground waters or have a discharge to surface water that could cause degradation. The need to remediate Class III ground waters should be assessed on a case-by-case basis.

Proposed § 258.57(f)(3) would allow the State to make a determination that remediation of a release is not required when remediation is technically impracticable or when remediation presents unacceptable cross-media impacts. Such a determination may be made, for example, in some cases where the nature of the hydrogeologic setting would prevent installation of a ground-water pump and treat system (or other effective cleanup technology), e.g., in Karst formations or where heavily fractured bedrock lies under the facility. In these situations, the installation of such a system could possibly increase environmental degradation by introducing the contaminant into ground water that was not previously affected by the release. The Agency is persuaded that in this and other situations remediation should not be required. The Agency is specifically soliciting comment today on the types of situations that might warrant a determination that remediation of a release is technically impracticable or presents unacceptable impacts and would not, therefore, be required.

Proposed § 258.57(h) outlines the Agency's proposed approach to chemistry and possible precursors to other more hazardous constitutents that may be released later from MSWLFs. Furthermore, States typically require routine monitoring of one or more of these parameters (1) to (15) at MSWLFs as the primary means of detecting ground-water contamination. The major cations and anions on the Phase I parameter list are those used to classify ground water into geochemical facies. These parameters are, therefore, useful for tracking changes in the ground-water geochemistry that may occur as the result of leakage from an MSWLF. In addition, the Agency is proposing to require semiannual monitoring for the metals (arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver), cyanide, and 46 VOCs.

The Agency believes that these VOCs in Appendix I constitute the first group of potentially hazardous constituents that would be present in the ground water prior to other, less mobile, constituents proposed for Phase II (see Appendix II of the proposed rule.) Due to their chemical nature, these VOCs generally would not migrate any faster than the non-VOC Phase I parameters, but do migrate faster than most of the Phase II constituents. Research by EPA and other institutions that supports these statements is summarized in the background document to this Subpart.

Heavy metals and cyanide also can exist under certain conditions in a well-defined leachate ground-water plume, depending on the waste present in the landfill. It is not certain whether heavy metal concentration would be as significant in leachate plumes from newer MSWLFs as they tend to be attenuated more than other constituents, such as VOCs. MSWLF leachates containing heavy metals can, however, pose serious threats to human health and to aquatic environments; therefore, the Agency is proposing to include the heavy metals that are included in the primary drinking water standards along with cyanide and the VOCs as the minimum Phase I monitoring parameters.

The reader is referred to the background document for this Subpart for more information.

The Agency is proposing to include the following as the minimum Phase I parameters that must be monitored for at least semiannually:

(1) Ammonia (as N)
(2) Bicarbonate (HCO_3)
(3) Calcium
(4) Chloride
(5) Iron
(6) Magnesium
(7) Manganese (dissolved)
(8) Nitrate (as N)
(9) Postassium
(10) Sodium
(11) Sulfate
(12) Chemical Oxygen Demand (COD)
(13) Total Dissolved Solids (TDS)
(14) Total Organic Carbon (TOC)
(15) pH
(16) Arsenic
(17) Barium
(18) Cadmium
(19) Chromium
(20) Cyanide
(21) Lead
(22) Mercury
(23) Selenium
(24) Silver
(25) Volatile Organic Compounds listed in Appendix I

The Agency specifically requests comment on the proposed set of Phase I monitoring parameters and the monitoring frequency. EPA is proposing that the frequency of monitoring during Phase I be determined by considering aquifer flow rates in the vicinity of the monitoring wells and the resource value of the aquifer. Semiannual sampling is proposed as a minimum frequency during the active life and closure of a unit. This frequency also is the minimum specified in the ground-water monitoring requirements (40 CFR Part 264) for hazardous waste landfills. The Agency believes that a six-month maximum interval between sampling events is reasonable in terms of protection of human health and the environment and the burden on the regulated community. During post-closure care, a State may set a different minimum monitoring frequency.

Today's proposal does not set a minimum frequency for ground-water monitoring during post-closure care. Because of the variable length of the post-closure care period and the variability of site-specific conditions, the Agency believes it is more appropriate to allow States to determine the frequency of ground-water monitoring on a site-specific basis.

Section 258.54(d) states that a Phase I ground-water monitoring program must be expanded to Phase II ground-water monitoring when two or more of the parameters (1) to (15) are detected at levels that significantly differ from background levels. Because the parameters (1) to (15) are monitored to detect changes in ground-water chemistry beneath an MSWLF, both increases and decreases in these parameters may be significant. The Agency is not implying that decreased levels of any of these parameters indicate degradation of ground water, just that further monitoring should be done to determine what is causing the change in ground-water chemistry. For example, a change in water chemistry, such as a decrease in pH and sulfate, may indicate the release of liquids from a landfill. The Agency is proposing to use increases or decreases of any two or more of the parameters (1) to (15) to trigger Phase II monitoring because preliminary analysis of ground-water samples taken at MSWLFs show that: (1) Substantiated leachate contamination of ground water from MSWLFs normally involves more than one of those Phase I parameters and (2) levels of a single one of those Phase I parameters in backgroud ground-water samples in some areas of the country are highly variable, which could lead to false indications of contamination. Section 258.55(a) states that if anyone of parameters (16) to (24) or the VOCs listed in Appendix I is detected at levels that are statistically significant above background, the unit must begin Phase II monitoring. During Phase II monitoring, the owner and operator has the opportunity to revert back to Phase I monitoring if it is found that there has not been a statistically significant increase over background levels of relevant parameters (see § 258.55(e)).

Once an MSWLF has triggered Phase II monitoring, the owner or operator is not required to monitor parameters (1) to (15). States may require an owner or operator who has entered a Phase II monitoring program to continue occasional monitoring for parameters (1) to (15), particularly if that State has established corrective action requirements that involve those parameters. The Agency does not intend to require any corrective action for Phase I parameters (1) to (15) because: (1) It is not apparent that these parameters would ever occur at high levels without corresponding increases over background levels for many of the constitutents listed in Appendix II of the proposed regulations, (2) it is difficult to assign a target level for cleanup of the non-VOC, nonmetal Phase I parameters, since none of them are hazardous to human health at levels found in MSWLF leachate, and (3) cleanup of any Appendix II constituents is likely to result in concurrent cleanup of the other Phase I parameters to acceptable levels.

Section 358.54(d)(3) of today's proposal allow the MSWLF owner or operator to demonstrate that detection of significant changes in ground-water quality during Phase I monitoring was caused by sampling and analytical error or by a source other than the MSWLF. The Agency included this provision in water monitoring under Subtitle C of RCRA, and is particularly applicable to Subtitle D, under which the practicable capability of the owner or operator can be considered. The Agency realizes that it can be very difficult to prove that error in sampling or analysis caused the indication of a statistically significant increase above background levels of a ground-water monitoring parameter. If such an error were to occur and could not be proven to be the cause, a unit would be triggered into a higher and more costly phase of ground-water monitoring. The owner or operator would be forced to pay for a more costly monitoring program for an indefinite time period, with no added benefit to human health or the environment. Allowing a unit to revert to a previous phase of monitoring when no constituents have been detected above background levels eases the financial burden of the owner or operator without harming human health or the environment. A specific time period over which monitoring must be conducted before reverting to a previous monitoring phase has not been proposed, based on the concept that the appropriate time period should be site-specific. A minimum time period also was not proposed, but the Agency requests comments on the appropriateness of a minimum time period.

It should be noted that the criterion for returning to Phase I monitoring (i.e., background levels for Appendix II constituents) is consistent with those for facilities that have never entered Phase II monitoring. Therefore, an MSWLF may not return to Phase I monitoring merely by maintaining concentration levels at the trigger levels that initiate corrective measures assessment. Instead, before returning to Phase I monitoring, the concentration levels for Appendix II constituents must be at or below the background, which is the level that initiates phase II monitoring for a reasonable time period determined by the State.

If any Appendix II constituents are detected at statistically significant levels above background, § 258.55(f) requires the owner or operator of the MSWLF to notify the State of this fact in writing within 14 days; and, within 90 days of the finding, he or she must submit to the State a report containing all data necessary for establishing a ground-water trigger level.

Section 258.55(f)(2) of today's proposal requires that each hazardous constituent that is present at levels exceeding background concentrations must be analyzed from ground-water samples taken on a quarterly basis. The Agency believes that the presence of hazardous constituents over background signals the need for a more thorough assessment of the ground-water condition, necessitating more frequent monitoring than for Phase I. Thus, the Agency is proposing quarterly monitoring at a minimum to provide the earliest possible indication of when the trigger level has been excceeded. This approach is consistent with the approach taken in other Agency ground-water monitoring programs, such as under Subtitle C of RCRA. More frequent monitoring may be required by the State depending on site-specific conditions, such as ground-water flow rates and directions. The Agency considered alternatives that would require more stringent minimum frequencies, but these alternatives would have been unnecessarily burdensome at sites where ground water travels a distance of only a few feet per year. Therefore, today's proposed minimum frequency balances the need for early detection and thorough assessment with the statutory need to consider the "practicable capability" of the regulated community.

In addition to the quarterly monitoring for those constituents exceeding background, § 258.55(d) requires that each MSWLF monitor other Phase II constituents (Appendix II constituents) on a periodic basis to determine if any additional constituents have entered the ground water at concentrations that significantly exceed background levels. The frequency for monitoring these other Phase II constituents is determined by the State. These periodic analyses are essential for use in determining whether the design of an ongoing corrective action program must be changed to accommodate the treatment or removal of additional constituents. The Agency considered requiring annual Appendix II analyses at all MSWLFs, but the Agency believes selecting an appropriate frequency based on site-specific factors is essential given that Phase II constituent analyses may approach $3,000 per sample. The "practicable capability" of the owner or operator needs to be considered. The Agency's decision to allow State determination of the frequency for periodic Appendix II analyses also is based on the fact that site-specific conditions will have a significant impact on the release of any new constituents to the ground water from an MSWLF. The State also must determine the frequency for Phase II constituent analyses during post-closure care for those constituents that have exceeded background concentrations.

Under § 258.55(g), if the periodic analyses of Appendix II constituents reveals additional constituents in the ground water that are present at above-background levels, the owner or operator must notify the State within 14 days and, within 90 days, must submit a report on the concentrations of these new constituents. The MSWLF also must begin monitoring these new constituents at the minimum quarterly rate, which is required for all Phase II parameters that have exceeded background levels. Under § 258.55(h), if any Phase II parameters are detected at concentrations that exceed the ground-water trigger level, the MSWLF owner or operator must notify the State of this finding within 14 days. The owner or operator of the MSWLF also must begin to assess corrective measures as required under § 258.56 and continue to follow the Phase II monitoring program requirements.

The proposed Phase II monitoring requirements under § 258.55(h)(4) allow the owner or operator to demonstrate that an increase over the ground-water trigger level was caused by a sampling or analytical error or by a source other than the MSWLF. The rationale for including this demonstration in today's proposal is provided under the discussion of the Phase I monitoring program in this preamble.

3. Section 258.56 Assessment of Corrective Measures

An assessment of corrective measures is required whenever concentrations of hazardous constitutents in the ground water exceed trigger levels. Trigger levels are health- and environmental-based levels established by the State as indicators for protection of human health and the environment (see preamble discussion for § 258.52).

The State shall specify the scope of the corrective measures study. Factors that generally may be appropriate are listed in § 258.56(c). The purpose of the assessment is to study potential corrective measures. In general, the extensiveness of the assessment (i.e., the number and type of alternatives evaluated) should be commensurate with the complexity of the site. (The reader is directed to the Background Document for Subpart E for a more detailed discussion of what may be appropriate for specific situations.) There may be some situations where a limited assessment is appropriate. For example, if the ground water is known to be Class III ground water (see preamble discussion for § 258.57(f)(2))

The proposal requires that all new and existing MSWLFs begin their ground-water monitoring programs by complying with the Phase I monitoring requirements. When a change in ground-water chemistry is indicated by an increase or decrease of two in more of parameters (1) to (15), or when any one of parameters (16) to (24) or the volatile organics (VOCs) listed in Appendix I is detected at statistically significant levels above background, Phase II monitoring is triggered. Phase II requires monitoring an expanded list of hazardous constituents (see Appendix II). If any of the Phase II parameters are detected at statistically significant levels above background, the owner or operator must compare those levels to the appropriate ground-water trigger levels. The State will set the ground-water trigger levels as specified in § 258.52. These "trigger levels" trigger the assessment of corrective measures and establishment of the ground-water protection standard. Corrective action continues until the owner or operator demonstrates compliance with the GWPS for a period of time determined by the State to be appropriate, based on site-specific factors. The Agency is considering changing its Subtitle C requirements from a three-year period to one that is site-specific. EPA requests comment on the appropriateness of a minimum period of compliance for Subtitle D.

The Agency is proposing that ground-water monitoring, once initiated, continue through post-closure care. Adequate post-closure care is essential for continued protection of human health and the environment, and ground-water monitoring is necessary in determining the effectiveness of post-closure care. The Agency has not set minimum monitoring frequencies during the post-closure period, instead leaving that determination entirely up to the State. This decision was based on the idea that the appropriate frequency at which to monitor during post closure will vary significantly not only among units, but also over time. Site-specific information should be evaluated by the State when determining post-closure monitoring frequency. Factors that should be considered by the State include the hydrogeology of the site, the age and design of the landfill, and the operating history of the landfill. During the early years of post-closure care (e.g., 10 years), it may be appropriate to monitor as frequently as during the operating period. In many cases it may be appropriate to lessen the frequency of monitoring in the latter years of post-closure care. If during post closure a unit triggers the next phase of ground-water monitoring, it would be appropriate for the State to set a monitoring frequency the same as the minimum frequency designated for the operating period.

Comments are requested on whether individual monitoring wells at a landfill unit should be allowed to be in different phases of monitoring. The Agency is not proposing this option today, but believes that this option could be appropriate in situations where the unit is very large, and only a few monitoring wells have triggered the next phase of monitoring. Once corrective action had been triggered in one well, however, all of the ground-water surrounding the particular unit would be subject to corrective action provisions.

a. § 258.51 Ground-Water Monitoring Systems. Section 258.51 of the proposed Criteria specifies requirements pertaining to appropriate methods for constructing and placing ground-water monitoring wells. The purpose of these requirements is to ensure that consistent, reliable ground-water monitoring systems are installed at all MSWLFs. The Agency has specified the use of well systems because other technologies may not be as reliable as well systems for detecting changes in ground-water quality. In making this determination, the Agency reviewed many other methods of ground-water monitoring, including resistivity, ground penetrating radar, and lysimeters. Detailed discussions of the strengths and weaknesses of these methods for use in monitoring ground water at MSWLFs are provided in the background document for Subpart E of today's proposal.

The monitoring well system must be designed so as to monitor the performance of the landfill design in terms of its ability to meet the design goal (as defined in § 258.40(b)) in the aquifer at the waste management unit boundary or the alternative boundary as specified by the State pursuant to § 258.40. As such, well location is linked directly to the performance standard for the design of the landfill unit. If the unit is designed to meet the design goal at the waste management unit boundary, wells should be installed at the waste management unit boundary. On the other hand, if the unit is designed to meet the design goal at an alternative boundary, the wells should be installed at the alternative boundary.

Section 258.51 allows the placement of wells at the closest practical distance from the waste management unit or alternative boundary to account for the presence of important structures, such as run-off controls, anchors for liners, and gas lines, that would be impaired or destroyed by well installations in the area. Other factors can affect the exact placement of monitoring wells. In some hydrogeologic settings, perched water tables and/or other hydrogeologic phenomena may cause leachate from an MSWLF to travel horizontally for a significant distance before reaching uppermost aquifer. Therefore, § 258.51(a) specifies that the State select the closest practical distance downgradient from the waste management unit boundary or the alternative boundary (as specified by the State) if the State determines, based on site-specific hydrogeologic evaluations required in § 258.51, that the uppermost aquifer would not be affected directly beneath the appropriate boundary by release of leachate from the MSWLF.

In some cases, several discrete units may constitute the MSWLF. Because of topographic conditions and design limitations, constructing discrete cells may be the only means of constructing a landfill on the property. Section 258.51(c) states that separate monitoring systems are not required for each landfill unit at a multi-unit facility if the State approves the grouping of units. Such approval would be allowed only if the multi-unit ground-water monitoring system will be protective of human health and the environment. If local conditions make it infeasible or impractical to install a monitoring system around each landfill unit, the State may allow the grouping of units within one monitoring system. Factors that the State should consider when deciding whether more than one unit should be within a monitoring system include: the number of units, the spacing of the units, the orientation of the units to one another, the age of the units, and the hydrogeologic setting. The State should not approve the grouping of units within one monitoring system if the downgradient portion of the system would be located more than 150 meters from any landfill unit.

The Agency does not believe that there are any differences between MSWLFs and hazardous waste land disposal units with respect to the factors used to determine appropriate types of well materials or well construction techniques. Therefore, today's proposed performance standards for ground-water monitoring system design found in § 258.51(d) are similar to those specified for hazardous waste disposal facilities in 40 CFR Part 264. This similarity ensures consistent design and construction standards for monitoring wells at all RCRA landfill facilities.

statistically or biologically significant effect in an animal bioassay test. The RfD is derived by dividing the "no observed adverse effect level" (NOAEL) by a suitable scaling or uncertainty factor. Confidence in the RfD is dependent on a number of factors, including the quality and duration of the animal study. The derivation of RfDs has been evaluated and verified by internal Agency review. Applying the standard drinking water exposure assumptions (i.e., a 70 kg person drinks two liters of water a day for 70 years) to RfDs yields the ground-water concentration limit. Appendix III lists the RfDs (mg/kg-day) for several hazardous constituents.

The use of the RfD is appropriate only for noncarcinogenic constituents. EPA science policy suggests that no threshold dose exists for carcinogens; in other words, no matter how small the dose, some risk remains. The dose-response assessment for carcinogens usually entails an extrapolation from an experimental high-dose range where carcinogenic effects in an animal bioassay have been observed, to a dose range where there are no observed experimental data by means of a preselected dose response model. The carcinogenic slope factors (CSFs), estimated by EPA's Carcinogen Assessment Group, may be used to calculate a dose that corresponds to a given risk level by dividing the risk level (e.g., 1×10^{-6}) by the CSF. CSFs for selected carcinogens are provided in Appendix III. This dose is called a risk-specific dose (RSD). An RSD is an estimate of the daily dose of a carcinogen that, over a lifetime, will result in an incidence of cancer equal to a given risk level.

The ground-water concentration, in milligrams per liter, can be calculated by multiplying the RSD by the average adult body weight (70 kg) over the average water intake (two liters of water per day). Chemicals that cause cancer also may evoke other toxic effects. These constituents may have both an RfD and RSD available. In these cases, the lower level (i.e., more protective) should be used as the trigger level.

EPA has developed a classification scheme for carcinogens based on the weight of evidence for carcinogenicity. This scheme is presented in the Agency's cancer guidelines (51 FR 3992). Appendix III includes the class for each carcinogen listed. Known or probable human carcinogens are designated as Class A and Class B carcinogens, respectively, under the Agency guidelines. Constituents for which the weight of evidence of carcinogenicity is weaker are known as Class C, or possible human carcinogens under the Agency's guidelines.

Examples are included in Appendix III to illustrate how the States may use RfDs and CSFs to set trigger levels. For carcinogens, the State may use the CSF to determine a trigger level anywhere within the protective risk range. (See discussion in Section IX.D.1.a. of today's preamble concerning the design goal and EPA's request for comment on alternative risk ranges.)

The Agency believes that the protective risk range is appropriate for setting a trigger level for carcinogens without a MCL. For new MSWLFs, the State should consider using the same risk level for trigger levels as was used for the design goal. For example, if the MSWLF was designed to meet a 1×10^{-6} risk level at the chosen boundary, then the MSWLF should be triggered into an assessment of corrective measures once that risk level (for carcinogens with no MCL) is exceeded. For existing MSWLFs, to ease implementation, the Agency suggests that the State choose one risk level to be used at an MSWLF for all carcinogens that do not have an MCL. The State may consider choosing a risk level to use at all MSWLFs within the State. As discussed in the preamble discussion for the design goal, the Agency is requesting comment on two alternatives to the protective risk range. Any change made to the proposed design goal criteria would most likely be made for the trigger level. For example, if a fixed risk level of 1×10^{-5} was required as a design goal, then the trigger levels for carcinogens without MCLs would also be required to be set at 1×10^{-5}.

RfDs and RSDs will be available soon through the Integrated Risk Information System (IRIS), a computer-housed, electronically communicated catalogue of Agency risk assessment and risk management information for chemical substances. IRIS is designed especially for Federal, State, and local environmental health agencies as a source of the latest information about Agency health assessments and regulatory decisions for specific chemicals. The risk assessment information (i.e., RfDs and RSDs) contained in IRIS, except as specifically noted, has been reviewed and agreed upon by intra-Agency review groups, and represents an Agency consensus. As EPA continues to review and verify risk assessment values, additional chemicals and data components will be added to IRIS. A hard copy of IRIS soon will be available through the National Technical Information Service. T[illegible] background document for Subpa[illegible] contains further information on IR[illegible].

If MCLs or other health-based levels meeting the proposed criteria are not available or cannot be developed for us[illegible] as trigger levels, § 258.52(b)(3) allows the State to establish a trigger level that acts as an indicator for protection of human health and the environment. In many cases, partial data or data on structural analogs will allow the State to estimate whether the detected level of a contaminant is likely to cause a problem. In other cases, other contaminants will be present at high levels (triggering an assessment of corrective measures in any case), and it will be clear that the constituent for which no level is available is not a driving factor in determining the risk at the site, even under worst-case assumptions concerning its toxicity. In such cases, it may not be necessary to specify a trigger level for that constituent.

Finally, background concentrations may be used as the trigger level when no health-based level or indicator is available or when background is higher than any health-based level.

c. Section 258.53 Ground-Water Sampling and Analysis. Section 25[illegible] of today's proposed Criteria revision includes requirements for consistent sampling and analysis procedures that are designed to ensure accurate ground-water monitoring results. Also included in this section are requirements for determining ground-water flow rate and direction, establishing background ground-water quality and applying appropriate statistical analyses to detect any changes in ground-water quality beneath an MSWLF.

Section 258.53(a) requires that the sampling and analysis techniques used by owners and operators of MSWLFs be sufficient to provide an accurate representation of ground-water quality in the uppermost aquifer beneath the landfill. At a minimum, these procedures must address sample collection, preservation, shipment, chain-of-custody, and quality assurance and quality control (QA/QC). The Agency recommends Chapter 2 of the "RCRA Technical Enforcement Guidance Document" (TEGD) for use in complying with this section. Although this chapter of the TEGD contains a number of references to the hazardous waste requirements under 40 CFR Part 264, the recommended sampling and analytical procedures are appropriate for any so[illegible] waste disposal facilities, including MSWLFs. These recommendations provide clear descriptions of how to

In Categories I and III, the low P value indicates that the potential for leachate generation is less than in Categories II and IV. This low potential is not to imply that leachate will not be generated in quantities sufficient to warrant a collection system at facilities in low P areas. The demonstration described earlier to determine if an LCS is necessary should be conducted.

In Categories II and IV, high P values indicate that climatic conditions are conducive to the continual generation of leachate. Leachate control, therefore, is necessary in order to prevent the buildup of a hydraulic head within the unit during the active life of the facility. Any leachate generated after the active life of the unit also must be collected.

In addition, the Agency believes that LCSs are necessary when flexible membrane liners are installed. FMLs are very efficient hydraulic barriers, and an LCS is necessary to remove the hydraulic head that accumulates over time. FMLs installed without such systems will ultimately result in the "bathtub" effect.

Facilities sited in Category I and II locations have overburdens that already satisfy the requirements that T at least equals the active life of the unit. Therefore, modifications to the overburden would not be necessary at these sites. Some Category I and II locations, however, may need a liner if they need an LCS and if the natural overburden material does not have a permeability low enough to allow the LCS to properly function. For example, a site may have an adequate thickness of silty sand to be classified as Category II, but the permeability of this silty sand may be inadequate to allow the LCS to function properly. The base of the unit may need to be modified.

Facilities sited in Category III and IV locations have overburden materials that do not have T values that are at least equal to the active life of the unit or 20 years, whichever is greater. These units should install earthen or synthetic liners or modify the existing subbase such that, in combination with the overburden, the composite T value meets the standard. This may require measures such as soil amendments, recompaction of existing materials, and installation of synthetic membranes.

As discussed earlier, under this approach a final cover system that prevents liquid filtration into the water after closure is necessary. Acceptable methods for determining the design for such a final cover were discussed in a previous section.

(3) Empirical Methodology. A third approach for determining the landfill design characteristics necessary to comply with this rule's design goal relies on the use of ground-water monitoring data from existing MSWLFs. Under this approach, an owner or operator planning lateral expansions of an existing facility or planning to build new units in similar locations to an existing unit could use ground-water monitoring results from existing units to determine if the new or expanded units need to employ designs that are more protective than the existing unit. If the concentration of constituents detected in the existing units' ground-water monitoring wells do not exceed the design goal (and leachate from the unit could be reasonably expected to have reached the monitoring wells), then the new or expanded unit would not have to apply a more elaborate containment design than the existing unit has to comply with this rule's design goal.

Four conditions would have to be met before this approach could be used. First, the new or expanded unit must have sufficiently similar location and waste characteristics to the existing unit to not pose greater threats to human health and the environment than the existing unit. Second, the existing unit must have operated ground-water monitoring wells over a long enough period to allow for leachate generation and release (accounting for the time required for failure of any liners) and migration through the unsaturated and saturated zones to the monitoring wells. Third, the ground-water monitoring data must address the Phase I parameters (and Phase II parameters, if Phase II has been triggered). Fourth, the monitoring data must be supplemented with appropriate modeling to predict the fate of hazardous constituents over a time period equivalent to the post-closure care period proposed today. This approach would be used most frequently for expansions of existing MSWLFs that have conducted ground-water monitoring over a long period of time.

The Agency recognizes that all three approaches are new methodologies that have not been a part of permitting programs. Comment is requested on the appropriateness of these approaches to a specific permit program or an individual landfill design. Comment is requested on the overall approaches and on ways to modify any approach to make it easier to incorporate into an existing permitting program.

E. Subpart E—Ground-Water Monitoring and Corrective Action

EPA today is proposing ground-water monitoring and corrective action requirements to ensure that ground-water contamination at new and existing MSWLFs will be detected and cleaned up as necessary to protect human health and the environment. These requirements reflect Congressional intent, as interpreted through HSWA and the accompanying legislative history, that protection of ground water be a prime concern of the revised Criteria. HSWA specifically directed EPA to require ground-water monitoring as necessary to detect contamination and corrective action, as appropriate, to protect human health and the environment.

The existing Criteria under § 257.3-4 require that a facility or practice shall not contaminate an underground drinking water source beyond the solid waste boundary or beyond an alternate boundary established by the State. The existing Criteria define "contaminate" to mean the introduction of a substance that would cause: (1) An MCL for any of 10 inorganic chemicals, four chlorinated hydrocarbons, or two chlorophenoxys to be exceeded or (2) a background level be exceeded for any of these 16 constituents when such background concentration already exceeds an MCL. The existing Part 257 does not specifically require facilities to monitor ground water beneath their units or to implement a corrective action program when ground-water contamination has occurred. Facilities that are in violation of the current Criteria, however, are required to close or enter into a compliance schedule with their respective State.

Today's proposed Criteria revisions completely replace the existing criteria for MSWLFs under 40 CFR 257.3-4, providing ground-water monitoring and corrective action requirements under 40 CFR Part 258 for all new and existing MSWLF units. The proposed requirements call for assessment of the hydrogeology beneath landfill units, ground-water monitoring, reports on ground-water quality, the establishment of ground-water trigger levels and ground-water protection standards, and corrective action. These requirements are discussed separately below.

The corrective action program proposed today addresses releases to ground water only. In section 4010 of HSWA, Congress specifically instructs the Agency to evaluate the current Subtitle D criteria (40 CFR Part 257) for their adequacy to protect human health and the environment from ground-water contamination. Congress clearly considers ground-water contamination to be the major concern, and indeed, requires the new criteria (today's proposal) to provide for ground-water monitoring to detect contamination and corrective action, as appropriate. For restriction for unmonitorable areas in the final rule.

Section 258.50(b) specifies that ground-water monitoring requirements of § 258.50 through § 258.55 will be suspended for owners and operators who can demonstrate that there is no potential for migration of hazardous constituents from the landfill unit to the uppermost aquifer during the active life, closure, or post-closure periods. The requirements of § 258.56 through § 258.58 are never suspended, however. The proposed limited suspension of the ground-water monitoring requirements provided in the § 258.50(b) is designed for MSWLF units located in hydrogeologic settings that prevent leachate migration to ground water for very long periods of time. In such a setting, leachate from the MSWLF should not be able to reach the uppermost aquifer during the active life, closure, or during post closure care. Because of the very favorable hydrogeologic conditions, such settings are highly desirable for the location of MSWLFs and the Agency wishes to encourage the use of these settings. Furthermore, requiring ground-water monitoring in these settings would place an additional financial burden on the owner or operator with very little added protection to human health and the environment. The financial burdens placed on owners or operators in these settings would be high because of increased drilling costs caused by the extreme depths to ground water that are typical in these settings.

The Agency intends to ensure that there is a high degree of confidence in the demonstration that no leachate will reach the uppermost aquifer before an exemption from the ground-water monitoring requirements is allowed. Therefore, today's proposal requires that the demonstration be conducted by a qualified geologist or geotechnical engineer based on site-specific hydrogeologic information or, where that is insufficient, based on assumptions that maximize the rate of hazardous constituent migration.

While § 258.50(a) of today's proposal requires ground-water monitoring at all MSWLFs, except in the rare circumstances described above, the Agency is proposing to ease the burden of this requirement by phasing in the ground-water monitoring requirements over time. The Agency is proposing this approach because the thousands of wells that will be needed at the approximately 6,000 existing MSWLFs are expected to cause shortfalls in the availability of competent hydrogeologists and drilling companies who must assist the owner or operator in sampling and analyzing the landfill's hydrogeology, provide recommendations on well placement, drill the appropriate bore holes and monitoring well holes, and install the monitoring wells.

Furthermore, the Agency recognizes that the proper review and evaluation of proposed ground-water monitoring programs will place significant demands on State resources. Therefore, § 258.50(c) of today's proposal requires States to establish compliance schedules for each facility within six months of the effective date of this rule. This six-month period is the maximum amount of time that a State should take in setting compliance schedules. The sooner an owner or operator knows when the MSWLF must be in compliance with the ground-water monitoring requirements, the better the necessary activities can be planned. The Agency has set goals for the percentage of existing units that must be in compliance after the effective date of this rule. Within two years of the effective date, 25 percent of the existing landfill units must be in compliance; within three years of the effective date, 50 percent of the existing landfill units must be in compliance; within four years of the effective date, 75 percent of the existing units must be in compliance; and all landfill units must be in compliance within five years of the effective date. Any new unit must be in compliance with the ground-water monitoring requirements before accepting waste.

States should set compliance schedules for each facility based on an evaluation of the potential risks posed by the facility. Risks posed to human health and the environment can be weighed by considering the proximity of human and environmental receptors, design of the landfill unit, age of the landfill unit, and resource value of the underlying aquifer. The Agency believes that ground-water monitoring is critical at existing facilities that pose a threat to human health or the environment and expects States to move aggressively to address these facilities as soon as possible.

If a State does not set a schedule of compliance for MSWLF units, § 258.50(d) specifies a compliance schedule for owners or operators of landfills. This "fall-back" schedule is based on distance to the nearest drinking water intake. While this method of setting priorities does not ascertain potential risk as well as the method outlined in § 258.50(c), it is objective and easy for an owner or operator to determine.

2. Sections 258.51–55 Overview of Ground-Water Monitoring Requirements

Today's proposed Criteria revisions require a system of monitoring wells to be installed at new and existing MSWLFs. The proposed Criteria revisions also provide procedures for sampling these wells and methods for statistical analysis of analytical data derived from the well samples to detect the presence of hazardous constituents released from MSWLFs. The Agency is proposing a two-phased ground-water monitoring program and a corrective action program. This phased approach to ground-water monitoring allows proper consideration of the transport characteristics of MSWLF leachates in ground water, while protecting human health and the environment. As shown in Figure 3, the proposed monitoring and corrective action programs provide for a graduated response over time to the problem of ground-water contamination as the evidence of such contamination increases, thereby keeping down costs.

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plays an important role in potential evaporation and potential evapotranspiration for a given location; the values for these factors incorporate the effects of temperature.

Run-off, although not a climatic factor, normally is expressed as the amount of water that will migrate from the site in the form of overland flow. Major land surface conditions affecting surface run-off include topography, cover material, vegetation, soil permeability, antecedent soil moisture, and artificial drainage.

In order to achieve the overall goal of this methodology (preventing leachate from reaching the aquifer during the active life of the unit), it is necessary to determine the factor or factors that best represent the potential amount of moisture available for entering the waste, thereby generating leachate. The Agency evaluated the above factors to determine which factor or factors best characterized the climatic elements relevant to leachate generation. The objective of the evaluation was to determine the potential for leachate generation during the active life of a unit. As stated earlier, the Agency believes that once the MSWLF is properly closed and covered, leachate generation should be minimal. No single factor or combination of factors could be found that adequately characterized climatic elements such that leachate generation during the active life could be estimated. EPA, therefore, selected a simple two-step process that can be used to categorize locations based on climate. This process uses mean annual precipitation as the factor in the first step.

The first step of the process requires that the mean annual precipitation (P) for an area be determined. P was chosen because: (1) It is easily determined, (2) it does not necessarily require the collection of new data, and (3) it conservatively describes the amount of water potentially available for infiltration and leachate generation. Using P conservatively estimates the amount of leachate formed because it does not consider evaporation or run-off. Values of P can be obtained from the National Weather Service, the National Oceanographic and Atmospheric Administration (NOAA), and/or USGS Water Atlases. These sources have collected rainfall data over extended periods of time, so values from these sources should be representative of annual rainfall in an area.

The Agency believes that there is a relationship between precipitation and leachate generation. Based on an evaluation of MSWLFs in different climatic settings, EPA has concluded that areas that receive more than 40 inches or precipitation per year generate leachate in quantities sufficient to warrant collection. Therefore, under the categorical approach, units located in areas that receive more than 40 inches of precipitation annually would be required to have leachate collection. For areas that receive less than 40 inches of precipitation per year, the evaluation indicates that leachate may not always be generated in amounts necessitating collection. Therefore, the second step of the process is to estimate the amount of leachate formed in areas receiving less than 40 inches of precipitation to determine if enough leachate is generated to warrant collection.

This estimate incorporates factors that determine the potential for leachate accumulation at a specific landfill. The factors used include P, PET, actual evapotranspiration, soil moisture holding capacity, waste moisture holding capacity, and run-off. Because MSWLFs are ongoing construction projects, the relationship among these factors relative to leachate accumulation continually changes. Therefore, a demonstration method that evaluates the potential amount of leachate accumulation at different stages of landfill construction is necessary. Under this method, the evaluation would be based on the projected landfill configuration at the end of each operating year. The Agency believes that some facilities in low precipitation locations may be able to eliminate the need for leachate collection by adjusting operational characteristics of the site.

The following steps are needed to determine when an LCS is necessary:

Step 1: Estimate topographic contours of the unit at the end of each operating year throughout the active life until final cover has been installed.

Step 2: Compute the quantity of leachate generated for each year of active life using the water balance method. This step may require dividing the landfill unit into discrete areas to take into account differing grades and variations in surface run-off. If so desired, the moisture-holding capability of soil layers used for cover could be considered. Most active portions of a landfill will have no vegetative cover, so moisture loss by evapotranspiration should not be considered in the water balance calculation. Moisture loss from active portions should be accounted for by using estimates of evaporation from bare soil as described in an EPA guidance document (Ref. 35).

Step 3: Calculate the total accumulation of leachate at the base of the unit by adding the amount of leachate generated to the amount predicted for each previous year.

Step 4: If total accumulation of leachate at the base of the unit (as determined by Step 3) exceeds or equa[ls] one foot at any stage of the landfill construction, an LCS is necessary. For example, for a unit that has a three-yea[r] active life: for year one, it is estimated that one foot of field capacity of the waste remains and no leachate is generated. For year two, it is determine[d] that one foot of field capacity remains and, again, no leachate is generated. However, for year three, before final cover is installed, it is determined that field capacity for the portion of unit planned to be built that year will be exceeded and four feet of leachate will be generated. Presuming that the year three portion of the unit is on top of the year two and year one portions of the unit, the total effect will be to negate unused moisture holding capacity of previous two years and result in a hea[d] build-up of two feet at the base of the unit, which is sufficient to require the installation of an LCS. This method is further discussed in the backgound document supporting this proposal (Ref. 5).

(b) Geologic Factors. The nature and extent of the geologic material underlying a given MSWLF site strongly influence the fate of any leachate generated. The categorical approach estimates the effects of various geologic materials based on the time it takes water to move through the material above the aquifer. Because leachate is an aqueous solution EPA believes it is reasonable to model water movement rather than leachate movement in the subsurface. The Agency believes this simplifying assumption is conservative. This simplified approach does not include consideration of the variability of MSWLF leachate over time. Also some factors that retard constituent movement, such as absorption, chemical precipitation, degradation, and attenuation, that can result in slower movement of the constituent than the solute (i.e., water) are not a part of this simplified approach. Therefore, the Agency believes that considering only the rate of liquid movement is a conservative approach.

Certain geologic characteristics control the rate at which leachate will migrate to the aquifier. For the categorical approach, the rate must be determined so that design features can be added when the natural conditions do not give adequate protection to the aquifier. The geologic factors evaluated included the following: Depth, saturated facility is approximately 30 years, and a facility usually consists of more than one unit. EPA therefore selected 20 years as the average life of a unit. T values that are long when compared to the active life of the unit would not need liner systems, while units with T values shorter than the active life of that unit would need liners.

The T value should be determined for each unit rather than for an entire facility. For example, an MSWLF may have a total life of 50 years but comprise several units with active lives less than 50 years each. The T for each of these units is a separate calculation.

(c) Relationship to Design Requirements. Combining P and T values results in a matrix comprising four blocks that correspond to separate categories, as shown in Figure 2. Each location category describes a hydrogeologic and climatic setting with unique characteristics that affect landfill design. For example, Category I has both good climatic characteristics for a landfill (limited precipitation indicated by the low P) and good hydrogeology (acceptable overburden characte[illegible] evidenced by high T value). On [illegible] hand, Category IV represents loca[illegible]on with poor climate and hydrogeology t[illegible] require specific landfill designs (liners and LCSs) to compensate for the poor locational characteristics. The two key measures of precipitation and time-of-travel to the aquifer are used not only establish the location categories, but to identify the landfill design requirement needed for a particular location.

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would be in compliance with the performance standard. If the calculated risk exceeds the design goal, the owner or operator could choose a new site for the landfill, change the proposed dimensions of the landfill, or employ more stringent control systems (e.g., bottom liners, leachate collection systems, different cover types). The effects of changes in location on risk potential could be calculated using the risk-based algorithm, while the effects of more stringent containment and cover systems could not. EPA recommends that a more rigorous State-selected assessment (either risk- or technology-based) be used to specify the mix of containment and cover system components capable of meeting the design goal.

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The risk-based algorithm is as follows:

$$R = 4.5 \cdot 10^{[illegible]} (Q_R/Q_A)^{[illegible]} e^{[illegible]}$$

where:

R = lifetime risk posed by consumption of ground water at designated compliance point.

Q_R = predicted leachate release rate to the uppermost aquifer, m^3/yr.

Q_A = ground-water flow rate for the uppermost aquifer, m^3/yr.

TOT = time-of-travel for leachate in this aquifer from the unit boundary to the compliance point, years (TOT = 0 for unit boundary compliance point).

In essence, the risk-based algorithm states that the risk associated with ground-water contamination from an MSWLF is a function of the rate of leachate release from the site and the attenuation (i.e., dispersion and degradation) of this leachate in the aquifer. Q_R represents the annual leachate release rate, while Q_A and TOT account for the dilution, dispersion and degradation of contaminants in ground water. Methods for calculating Q_R, Q_A, and TOT are described later.

EPA acknowledges several limitations of this approach. First, this approach is dervied by assuming that the MSWLF risk results produced by the Subtitle D Risk Model represent "true" risks and fitting a simplified mathematical model (i.e., the risk-based algorithm) to these results. The Subtitle D Risk Model is currently unverified for predicting ground-water contamination resulting from MSWLFs. However, EPA believes the model is technically correct and believes that it can adequately characterize the risk from MSWLFs.

Second, the approach assumes that the leachate produced from a particular landfill will have a composition and constituent concentrations similar to that used in the Subtitle D Risk Model. The initial leachate constituent concentrations used in the model represent the median concentrations for six constituents found in samples of leachate from numerous MSWLFs (see Section XI of preamble). (A complete discussion of the leachate constituent selection process, including the dose-response parameters used for the constituents, is contained in the draft Regulatory Impact Analysis.) The risk-based algorithm should not be used for proposed MSWLFs that have expected leachate characteristics substantially different from those used in the Subtitle D Risk Model. EPA recommends that, at these landfills, a State-selected Risk Model or other approach be used.

Third, the risk-based algorithm never predicts risks higher than 4.5×10^{-4}. This value was derived from the Subtitle D Risk Model results for approximately 500 distinct combinations of landfill size, environmental and hydrogeologic setting, and exposure distance. In about 5 percent of these scenarios, the modeled risks were higher, although none exceeded 10^{-3}.

Fourth, although the risk-based algorithm is relatively powerful in a statistical sense (i.e., its predicted risks correlate well to the Subtitle D Risk Model's predicted risks), its use introduces some additional uncertainty.

The State might account for some of the uncertainty in the approach by setting the risk-based algorithm goal somewhat lower than the actual design goal. For instance, if the State determines that the actual design goal should be 1×10^{-6}, it could state that any MSWLF with calculated risks exceeding 1×10^{-7} would be required to perform a more detailed site-specific assessment. Such a margin of safety (in this example, one order-of-magnitude) would allow the States and owners and operators to identify low-risk MSWLFs relatively quickly and focus more effort on borderline or high-risk MSWLFs. EPA recommends that the States determine the acceptable margin of safety between the risk-based algorithm-predicted risk and the design goal.

Fifth, the risk-based algorithm does not apply to sites with complex hydrogeology. The ground-water concentrations in sites characterized by fractured, folded, or faulted rock, karst terrain, tidally-induced changes in ground-water flow, or similar complex conditions are not represented in the underlying Subtitle D Risk Model, and thus the risk-based algorithm does not predict them. In these conditions, EPA recommends more sophisticated analytical techniques be used.

Sixth, characterizing the variables needed to solve the algorithm for an individual site may be both costly and difficult. However, some simple methods are available to make these determinations, as discussed later.

These limitations thus relate to the ease of implementation and the uncertainty embodied in the approach. EPA has attempted to propose the risk-based algorithm in a form that strikes a reasonable balance between the desire for accuracy and certainty on the one hand, and timely, moderate-cost implementation on the other.

In order to develop the risk-based algorithm, the Agency identified from case studies, damage cases, field observation, Subtitle D risk modeling results, and other sources several environmental factors that affect leachate generation, leachate release, migration, exposure, and risk. The factors include landfill size, net infiltration, subgrade permeability, depth to ground water, aquifer flow rate and time-of-travel from the unit to a potential exposure point. Using the list of key environmental factors, EPA conducted an analysis of variance (ANOVA) and a regression analysis. The ANOVA allowed EPA to determine the importance of each of the environmental variables in explaining the variation in the predicted MSWLF's risk. The regression analysis, coupled with an understanding of the physiochemical processes that affect risk, allowed EPA to establish a simple equation, using the key environmental variables identified in the ANOVA, to predict a facility's risk.

For the purpose of the ANOVA and regression analysis, EPA used the risks predicted from the Subtitle D Risk Model. For this application, the model simulated approximately 500 exposure scenarios comprising unique combinations of infiltration rates, facility size, depth to water table, hydrogeologic conditions (aquifer velocity and configuration), and exposure point. For each scenario, EPA predicted the highest lifetime health risk that would be experienced over a 300 year simulation period.

In establishing the importance of the environmental variables, the Agency generated a series of ANOVA tables displaying the relationship between the identified (independent) environmental variables and risk, the dependent variable. The ANOVA tables provided EPA with a means to evaluate the strength of the association between risk and the various independent variables.

The ANOVA results indicated that none of the environmental variables alone explains more than 10 percent of the variability in risk. EPA then combined some of the related variables to test the relationship between risk and three "top" parameters: leachate flux (Q_R), aquifer flux (Q_A), and TOT. Q_R is a function of several variables including the facility size, the infiltration rate, and the subgrade permeability. QA is a function of the aquifer velocity (i.e., permeability and hydraulic gradient), aquifer thickness, and effective porosity. It accounts for the dilution and attenuative capacity of the aquifer, and is measured at the downgradient point of compliance. TOT is a function of the aquifer velocity and distance to the downgradient compliance point. Using these "top" parameters, EPA analyzed several forms of the equation used to predict MSWLF risks.

For the above reasons, EPA believes the 150-meter maximum alternative POC allows for consideration of the practicable capability of the regulated community and State flexibility in setting design criteria while ensuring protection of human health and the environment. The Agency requests comment specifically on the use of this distance to establish an alternative boundary.

In implementing today's proposed performance standard under § 258.40(a), States have two options. Under the first option, the State may establish a performance standard (including the design goal and point of compliance within the limits prescribed in § 258.40(a)) for each facility on a case-by-case basis. For example, after considering site-specific factors, the State may set a performance standard for one MSWLF that specifies a design goal of 1×10^{-5} risk to be met at the waste management unit boundary, while at another MSWLF, the State may require a design goal of 1×10^{-4} to be met at an alternative boundary. In setting this alternative boundary, the State must fully consider the factors specified in § 258.40(d).

Under the second option, a State may establish one performance standard (including the design goal and point of compliance) that applies to all MSWLFs in the State. For example, the State may elect to establish a performance standard that requires all new MSWLFs in the State to be designed to meet a risk level of 1×10^{-6} at the waste management unit boundary. If a State wishes to incorporate an alternative boundary (i.e., other than the waste management unit) into its State-wide performance standard, the State must carefully consider all the facility-specific factors required under § 258.40(d). The Agency believes that this method may be difficult in States that have a large number of MSWLFs.

Regardless of whether the performance standard is set on a site-specific basis or a State-wide basis, the State must still determine MSWLF designs that meet the performance standard. Section 258.40(d) requires the State to consider at least the following factors in determining the specific design necessary to meet the performance standard: (1) The hydrogeologic characteristics of the facility and surrounding land, (2) the climatic factors of the area, (3) the volume and physical characteristics of the leachate, (4) proximity of ground-water users, and (5) ground-water quality. Various methods for considering these factors and determining appropriate designs are discussed later in this preamble (see Part 5 of this section).

In certain cases, the State may find that MSWLF designs required under its existing regulations adequately meet a State-wide performance standard established in accordance with Subpart D of today's proposal. In such cases, the State may use its existing regulations to implement today's proposed requirements for new MSWLF design. The Agency specifically requests comments on the approach to State implementation of today's proposed § 258.40(a) performance standard.

b. Existing Units. The Agency is proposing a different performance standard for existing units than for new units. For existing units, § 258.40(e) of today's proposal would require installation of a final cover system that prevents infiltration of liquids through the cover and into the waste. In proposing a different standard for existing units, the Agency is taking into account the practicable capability of owners and operators of MSWLFs. EPA recognizes that most existing units have not been specifically designed to meet the design goal at the waste management unit boundary. However, some States have design and performance requirements for MSWLFs that, if properly implemented, may have resulted in landfill designs that are capable of meeting the design goal for new units. Further, MSWLFs constructed after the promulgation of the 1979 Criteria (40 CFR Part 257) should have been designed and operated to ensure that the concentration of contaminants introduced to the ground water did not exceed the MCLs specified in the Part 257.

EPA believes that to require existing units to meet the same performance standard as new units would seriously strain the resources of the regulated community. First, the data necessary to make the determination of whether the existing unit meets the design goal, such as the geology beneath the unit or the original design specifications, may not be readily available or may be very costly to obtain. This lack of information was evident in several of the case studies EPA reviewed in developing of this proposal. Second, if the design of the existing unit was determined to be incapable of meeting the design goal, retrofitting would be necessary. The Agency believes retrofitting for Subtitle D facilities should not be required because (1) the procedure is impractical because it requires the excavation and temporary storage or disposal of wastes, (2) the excavation of the waste may create its own set of public health problems (e.g., dangers to workers, contaminated run-off), and (3) such retrofitting would disrupt existing solid waste management activities. Retrofitting may be particularly disruptive if a large number of existing facilities are found to be unable to meet the design goal.

The final cover requirement for existing units could be met by a wide range of designs based on site-specific conditions. These designs range from a cap consisting of soils with adequate moisture-holding capacity, planted with the proper vegetative cover to handle the wettest month at this location and sloped to maximize surface run-off without causing significant erosion problems, to a cap containing a hydraulic barrier, such as a flexible membrane liner to prevent infiltration into the waste.

As with new units, many factors are involved in designing the final cover. These include precipitation, potential and actual evapotranspiration soil moisture holding capacity, vegetation, and run-off. There are several methodologies available that use these factors to estimate the amount of infiltration that may enter the waste. These methods are discussed in the background documents that support today's rule (Ref. 5).

2. Rationale for Proposed Approach

The primary goals of this rule are to establish standards that are protective of human health and the environment, provide flexibility to the States, and minimize disruption of current solid waste management practices by considering the practicable capability of the regulated community. The Agency believes that a performance standard approach for the design of MSWLF units best ensures that these goals can be achieved.

Today's proposed requirements would allow the owner or operator to take into account site-specific conditions when designing the unit to ensure that the concentration of contaminants at a specified compliance point (e.g., the waste management unit boundary) meets the design goal. Furthermore, use of a performance standard allows for the consideration of innovative technologies that may be developed in the future.

Today's performance standard would also provide States the flexibility to make the final decision as to how the standard would be achieved. Many States currently have standards that utilize a performance standard approach

This alternative could be enforced easily through citizen suits; however, this option does not allow consideration of the practicable capabilities of the regulated community and could limit State flexibility by not allowing States to consider site-specific conditions when determining the point of compliance. Further, by not allowing consideration of site-specific conditions, this alternative could result in over-regulation and could exceed the practicable capability of the regulated community to comply.

The second alternative, requiring MSWLFs to meet the design goal at the unit boundary or a State-selected alternative, would provide more flexibility to account for the practical capability of the regulated community. It would be less burdensome to the regulated community because site-specific factors could be considered, thereby avoiding over-regulation and increased costs; however, it would be less protective of ground water because it would allow for a greater area extent of ground water to be contaminated than the first alternative. This alternative also could be difficult to enforce through citizen suits because no one alternative boundary would be specified in the rule for all MSWLFs.

The Agency believes that today's proposal provides a balance of the positive aspects of the above alternatives. It limits the potential area extent of ground-water contamination by placing a distance cap on the alternative boundary. In addition, it provides State flexibility, minimizes the potential for over-regulation, and considers the practicable capability of the regulated community. Finally, it would be enforceable at the Federal level or through citizen suits because it would set limits at the point of compliance.

b. Uniform Design Standards. The Agency also considered establishing uniform design standards for MSWLFs. Under this approach, requirements for liners, LCSs, and final cover systems would have been delineated in the regulation and would have been the same for all units. This approach is the same as that used in the Subtitle C regulations. This approach can simplify permitting because the same specific design requirement applies to all units regardless of site-specific differences. The Agency rejected this type of standard for MSWLFs because it would not consider site-specific location factors nor the practicable capability of the regulated community to comply, resulting in possible over-regulation in some areas. Further, it would severely limit State flexibility.

The Agency also considered uniform design standards with variances to allow variation of designs based on site-specific factors. In particular, the Agency considered proposing for all new MSWLFs composite liner and leachate collection system requirements similar to those proposed today only for those MSWLFs that recirculate leachate or gas condensate. As stated previously, the composite liner system would consist of a flexible membrane liner as the upper component and a compacted soil layer as the lower component. The soil layer would be at least three-feet thick with a hydraulic conductivity of no more than 1×10^{-7} cm/sec. The leachate collection system would need to be constructed to maintain less than a 30-cm depth of leachate over the liner. A variance mechanism would be provided to allow use of alternative designs based on site-specific considerations. These variances would be based on the hydrogeological characteristics of the landfill, alternative operating methods, the resource value of ground water, the nature of the alternative design, and other factors. The combination of these factors would have to provide a level of environmental protection equal to the standard design.

The Agency recognizes that this approach would likely be easier to implement and enforce and may provide greater assurance of protection of human health and the environment than other options considered; EPA is not proposing this approach because of concern regarding the difficulty in granting variances and the resulting potential over-regulation of some facilities. The Agency also is concerned that this approach would limit the States' ability to adequately consider the practicable capability of the regulated community.

c. Risk-Based Algorithm. The use of a risk-based algorithm is based on the development of a predictive equation that can be used to determine, on a site-specific basis, the potential human health risks from a proposed landfill. Such an approach could be simple to implement and could incorporate a large number of site-specific factors; however, the development of a valid predictive equation is difficult and its reliability would be limited by the quality of data employed in it. Furthermore, one equation may not be appropriate for all site-specific situations.

d. Categorical Approach. Another alternative considered by EPA, which is described in detail in the next section of this preamble, is an approach that would categorize locations based on hydrogeologic and climatic condi[illegible] Specific designs would be identifi[illegible] each category, and methods for categorizing locations and their corresponding requirements would be specified. This approach would be relatively easy to implement and would allow the consideration of site-specific conditions. The approach allows the consideration of climatic factors and geologic conditions, but no aquifer characteristics and ground-water resource value. Also, this approach might not adequately account for the practicable capability of the regulated facilities to comply. In addition, this approach would restrict State flexibility by prescribing a methodology States would use in establishing design requirements for various locations. While EPA has not proposed this approach today, EPA also is presenting this approach, along with the risk algorithm, as possible methods for determining adequate designs for meeting the performance standard proposed in § 258.40(a).

The Agency recognizes that the choice of a particular type of standard is a very controversial decision and is interested in obtaining public comment on today's selection. The selection was based on an attempt to balance several factor[illegible] including the practicable capability [illegible] the regulated community to comply, States flexibility in implementing Subtitle D regulatory programs, and Federal or citizen suit enforceability. Commentors may wish to consider additional factors when providing comment and/or submit other factors for EPA's consideration.

4. Implementation of Performance Standard for New Units

Today's proposal would require that new MSWLF units be designed with liners, LCSs, and final cover systems as necessary to meet the performance standard described above. The specific type of design needed would vary depending on the characteristics of the particular location. In some settings, comprehensive liners and LCSs would be needed, whereas in other settings, minimal engineering controls may b[illegible] needed. This section provides a bri[illegible] background on engineering controls [illegible] describes various methods for determining the landfill design necessary to achieve today's proposed performance standard.

a. Overview of Engineering Controls. The purpose of lining an MSWLF unit is to prevent leachate from seeping from the site and entering the aquifer. A line[illegible] is a hydraulic barrier that prevents or when the extent and manner of its operation would make closure (as described in the closure plan) the most expensive. For example, if an owner or operator operates the MSWLF on a cell-by-cell basis, the estimate should account for closing the maximum area of the landfill ever open at any time.

The Agency is proposing that the owner or operator develop estimates of the costs of hiring a third party to conduct post-closure care activities for each phase of the post-closure care period. The cost estimate for each phase must be based directly on the activities described in the post-closure care plan required under § 258.31(c) and account for the entire landfill. The estimate for each phase would be derived by multiplying the annual costs (in current dollars) of the activities by the number of years of care required in that phase. This approach is similar to the Subtitle C calculation of the post-closure care cost estimate, in which the cost estimate is determined by multiplying the annual post-closure cost estimate by the number of years of post-closure care. Because not all post-closure care activities are conducted on an annual basis (e.g., cap replacement or monitoring well replacement may only be required periodically), the total cost estimate must be adjusted to include these periodic costs as well as the annual costs. To ensure that adequate funds would be available for the entire post-closure care period, the Agency is requiring that the post-closure care cost estimates for each phase of post-closure care account for the most expensive costs of routine post-closure care. For example, the costs of monitoring during the first 30-year phase should account for the most extensive monitoring likely to be required.

As noted above, Subpart E of today's rule proposes to require that whenever the ground-water protection level at the MSWLF is exceeded, an owner or operator must conduct corrective action. Once a release has been detected, the owner or operator must prepare an estimate of the cost of the corrective action program, calculated by multiplying the annual costs of remedial actions and the number of years required to complete the corrective action program.

The proposed rule would require the closure and post-closure cost estimates to be adjusted annually for inflation until the entire landfill has been closed. The cost estimate for corrective action activities must be updated for inflation until the end of the corrective action period even if it extends beyond closure of the MSWLF. These requirements are consistent with the Subtitle C requirements. Also consistent with Subtitle C requirements, today's proposal would not require the owner or operator to update the post-closure cost estimate after the entire landfill has been closed; however, the Agency requests comment on the desirability of requiring annual adjustments of the post-closure cost estimate during the post-closure care period to prevent a significant shortfall in funds, which could result from not accounting for future inflation.

The Agency suggests that the States require the use of inflation factors that are readily available to owners and operators (e.g., Implicit Price Deflator for Gross National Product as published in the "Survey of Current Business," a Department of Commerce publication) or specify other inflation factors that must be used to adjust the estimates. States may wish to refer to the provisions in 40 CFR 264.142 and 264.144 and the accompanying guidance materials in developing these requirements.

In addition to updating estimates for inflation, today's proposed rule also would require that the owner or operator increase the closure and post-closure cost estimates when changes to the plans or changes at the facility during the active life *increase the cost* estimates (e.g., increase in design capacity, increase in the maximum area open, more extensive monitoring requirements). Similarly, today's rule proposes that an owner or operator must increase the corrective action cost estimate anytime a change in the corrective action program or in the facility conditions increases the cost estimate.

Whenever the cost estimates are increased, the owner or operator must increase the level of financial assurance required under § 258.32 (f), (g) and (h). If the owner or operator can demonstrate that changes in the facility result in a decrease in the maximum costs of closure over the active life of the landfill (e.g., reduction in size of the area to be used for the landfill), the owner or operator may submit a request to the State to reduce the closure cost estimate. The owner or operator may request a reduction in the amount of the post-closure care cost estimate if the owner or operator can demonstrate that the cost estimate exceeds the maximum cost of post-closure care over the remaining post-closure care period. Because the proposed rule would not require the post-closure cost estimate to be adjusted for inflation during the post-closure care period, the State should account for future inflation in determining if the estimate exceeds the remaining costs to be incurred over the length of the period. Because the corrective action cost estimate is adjusted for inflation until the completion of the program, the owner or operator may more easily be able to demonstrate that the original estimate exceeds the remaining costs to be incurred.

The Agency is not proposing procedures or deadlines for estimating and adjusting cost estimates. However the Agency encourages States to do so and refers them to the Subtitle C provisions in 40 CFR 264.142 and 264.144 for guidance. In addition, the Agency strongly encourages States to consider carefully all requests for reductions in cost estimates to ensure that shortfalls in coverage do not result. The Agency asks for comments on whether the revised Criteria should include procedures or deadlines for estimating and adjusting cost estimates.

For recordkeeping purposes, the owner or operator must maintain copies of the most recent cost estimates for closure, post-closure care, and corrective action for known releases at the landfill unit until the owner or operator has been released from financial assurance for that activity under *§ 258.32 (f), (g), and (h)*. These provisions are consistent with requirements under Subtitle C.

c. Performance Standard for Financial Assurance. In order to minimize the number of specific procedural requirements applicable to demonstrating financial assurance and provide maximum flexibility to the States, the Agency is not specifying in the proposed regulation the types of financial assurance mechanisms that would be allowable; however, the Agency is concerned that the mechanisms allowed by the States (e.g., trust funds, letters of credit, State fund) satisfy the overall objectives of financial assurance, i.e., to ensure that adequate funds are readily available to cover the costs of conducting closure, post-closure care, and corrective action for known releases if the owner or operator fails to do so. Therefore, the Agency is proposing in § 258.32(e) of today's rule a performance standard for financial assurance that must be satisfied to demonstrate financial assurance under § 258.32 (f), (g), and (h).

Under the performance standard, financial assurance mechanisms allowed by a State must: (1) Ensure that the amount of funds assured is sufficient to cover the costs of closure, post-closure care, and corrective action for

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when the extent and manner of its operation would make closure (as described in the closure plan) the most expensive. For example, if an owner or operator operates the MSWLF on a cell-by-cell basis, the estimate should account for closing the maximum area of the landfill ever open at any time.

The Agency is proposing that the owner or operator develop estimates of the costs of hiring a third party to conduct post-closure care activities for each phase of the post-closure care period. The cost estimate for each phase must be based directly on the activities described in the post-closure care plan required under § 258.31(c) and account for the entire landfill. The estimate for each phase would be derived by multiplying the annual costs (in current dollars) of the activities by the number of years of care required in that phase. This approach is similar to the Subtitle C calculation of the post-closure care cost estimate, in which the cost estimate is determined by multiplying the annual post-closure cost estimate by the number of years of post-closure care. Because not all post-closure care activities are conducted on an annual basis (e.g., cap replacement or monitoring well replacement may only be required periodically), the total cost estimate must be adjusted to include these periodic costs as well as the annual costs. To ensure that adequate funds would be available for the entire post-closure care period, the Agency is requiring that the post-closure care cost estimates for each phase of post-closure care account for the most expensive costs of routine post-closure care. For example, the costs of monitoring during the first 30-year phase should account for the most extensive monitoring likely to be required.

As noted above, Subpart E of today's rule proposes to require that whenever the ground-water protection level at the MSWLF is exceeded, an owner or operator must conduct corrective action. Once a release has been detected, the owner or operator must prepare an estimate of the cost of the corrective action program, calculated by multiplying the annual costs of remedial actions and the number of years required to complete the corrective action program.

The proposed rule would require the closure and post-closure cost estimates to be adjusted annually for inflation until the entire landfill has been closed. The cost estimate for corrective action activities must be updated for inflation until the end of the corrective action period even if it extends beyond closure of the MSWLF. These requirements are consistent with the Subtitle C requirements. Also consistent with Subtitle C requirements, today's proposal would not require the owner or operator to update the post-closure cost estimate after the entire landfill has been closed; however, the Agency requests comment on the desirability of requiring annual adjustments of the post-closure cost estimate during the post-closure care period to prevent a significant shortfall in funds, which could result from not accounting for future inflation.

The Agency suggests that the States require the use of inflation factors that are readily available to owners and operators (e.g., Implicit Price Deflator for Gross National Product as published in the "Survey of Current Business," a Department of Commerce publication) or specify other inflation factors that must be used to adjust the estimates. States may wish to refer to the provisions in 40 CFR 264.142 and 264.144 and the accompanying guidance materials in developing these requirements.

In addition to updating estimates for inflation, today's proposed rule also would require that the owner or operator increase the closure and post-closure cost estimates when changes to the plans or changes at the facility during the active life increase the cost estimates (e.g., increase in design capacity, increase in the maximum area open, more extensive monitoring requirements). Similarly, today's rule proposes that an owner or operator must increase the corrective action cost estimate anytime a change in the corrective action program or in the facility conditions increases the cost estimate.

Whenever the cost estimates are increased, the owner or operator must increase the level of financial assurance required under § 258.32 (f), (g) and (h). If the owner or operator can demonstrate that changes in the facility result in a decrease in the maximum costs of closure over the active life of the landfill (e.g., reduction in size of the area to be used for the landfill), the owner or operator may submit a request to the State to reduce the closure cost estimate. The owner or operator may request a reduction in the amount of the post-closure care cost estimate if the owner or operator can demonstrate that the cost estimate exceeds the maximum cost of post-closure care over the remaining post-closure care period. Because the proposed rule would not require the post-closure cost estimate to be adjusted for inflation during the post-closure care period, the State should account for future inflation in determining if the estimate exceeds the remaining costs to be incurred over the length of the period. Because the corrective action cost estimate is adjusted for inflation until the completion of the program, the owner or operator may more easily be able to demonstrate that the original estimate exceeds the remaining costs to be incurred.

The Agency is not proposing procedures or deadlines for estimating and adjusting cost estimates. However the Agency encourages States to do so and refers them to the Subtitle C provisions in 40 CFR 264.142 and 264.144 for guidance. In addition, the Agency strongly encourages States to consider carefully all requests for reductions in cost estimates to ensure that shortfalls in coverage do not result. The Agency asks for comments on whether the revised Criteria should include procedures or deadlines for estimating and adjusting cost estimates.

For recordkeeping purposes, the owner or operator must maintain copies of the most recent cost estimates for closure, post-closure care, and corrective action for known releases at the landfill unit until the owner or operator has been released from financial assurance for that activity under § 258.32 (f), (g), and (h). These provisions are consistent with requirements under Subtitle C.

c. Performance Standard for Financial Assurance. In order to minimize the number of specific procedural requirements applicable to demonstrating financial assurance and provide maximum flexibility to the States, the Agency is not specifying in the proposed regulation the types of financial assurance mechanisms that would be allowable; however, the Agency is concerned that the mechanisms allowed by the States (e.g., trust funds, letters of credit, State fund) satisfy the overall objectives of financial assurance, i.e., to ensure that adequate funds are readily available to cover the costs of conducting closure, post-closure care, and corrective action for known releases if the owner or operator fails to do so. Therefore, the Agency is proposing in § 258.32(e) of today's rule a performance standard for financial assurance that must be satisfied to demonstrate financial assurance under § 258.32 (f), (g), and (h).

Under the performance standard, financial assurance mechanisms allowed by a State must: (1) Ensure that the amount of funds assured is sufficient to cover the costs of closure, post-closure care, and corrective action for mechanisms, the Agency has sought to minimize inconsistencies with the approximately 20 States that already have financial assurance requirements for MSWLFs. The Agency recently conducted case studies of nine such programs (Ref. 19). The study found considerable variation among State programs both in the types of mechanisms allowed and in the procedural requirements for the financial assurance mechanisms. For additional detail on the results of the case studies, see the financial assurance background document to this rulemaking (Ref. 19). Today's proposal is, therefore, designed to accommodate the variations among existing State programs, while ensuring that all programs meet the performance standard for financial assurance. The Agency requests comments on the proposed financial assurance performance standard, including the use of this standard rather than identifying a list of acceptable financial assurance mechanisms.

d. Financial Assurance Provisions for Local Governments. As noted in the previous section, the Agency is not proposing specific financial mechanisms in today's rule in order to provide maximum flexibility to the States. The Agency believes that the Subtitle C provisions can be used as models for States in developing their rules. Unlike Subtitle C, however, the majority of MSWLFs are owned by local governments. While Subtitle C allows a financial test to be used to demonstrate financial assurance, the test in 40 CFR 264.143 and 264.145 is designed primarily for corporate firms and is not directly applicable to local governments. Therefore, because of the large number of MSWLFs owned by local governments, the Agency considered for today's rule the feasibility of developing a financial test that would exempt local governments able to pass the test from having to obtain a third-party financial assurance mechanism (or contribute to a State Fund, if applicable).

A financial test designed specifically for local governments was considered during the development of the Subtitle C regulations but was not included due to difficulties in interpreting and verifying municipal accounting information, concern over the use of bond ratings as a measure of fiscal strength, and concern over the accessibility of allocated tax revenues. However, since the promulgation of the Subtitle C requirements, many local governments have developed more sophisticated financial management practices. Because of these changes, the Agency is examining possible approaches a State might use in developing such a test specifically for local governments. For example, the Agency is examining the feasibility of developing a special test that takes into account fiscal, institutional, and other factors. Although the Agency is not proposing a financial test for local governments in today's rule, the financial assurance background document discusses a framework that States may wish to use in specifying criteria for a financial test for local governments (Ref. 4). If a State decides to allow a financial test for local governments, the framework should be useful in choosing appropriate measures of a local government's financial strength.

The Agency requests comments on the use of a financial test for local governments. Specifically, EPA requests information on standards that might be used to measure a local government's financial strength, the measures that might be taken to establish such a financial test, and whether any States currently allow a financial test for local governments.

e. Financial Assurance Requirements. As noted in Sections 13.b and c, site-specific cost estimates are used to determine the amount of financial assurance required. The mechanisms used to demonstrate this amount of coverage must satisfy the performance standard specified in § 258.32(e).

The amount of closure financial assurance must be based directly on the most recent closure cost estimate adjusted for inflation in accordance with § 258.32(b). Financial assurance for post-closure care must cover the costs of conducting both phases of the post-closure care period for the entire landfill. The amount of financial responsibility required for each phase of post-closure care is calculated by multiplying the most recent annual post-closure cost estimate for each phase of post-closure care by the number of years in that phase. The sum of these two estimates is the amount of financial assurance required for post-closure care. This approach is similar to the Subtitle C calculation of the post-closure care cost estimate, in which the cost estimate is determined by multiplying the annual post-closure cost estimate by the number of years of post-closure care.

EPA is proposing in § 258.32(h) to require corrective action financial assurance for known releases in an amount equal to the most recent annual corrective action cost estimate in § 258.32(d) times the number of years required to complete the corrective action program. The Agency is proposing that financial assurance for corrective action be demonstrated af[illegible] the cost estimate has been prepar[illegible] accordance with § 258.32(d), cons[illegible] with Subtitle C. Before adopting this timing requirement, the Agency considered the feasibility of requiring some minimal level of financial responsibility for corrective action as soon as the need for corrective action was demonstrated but before the corrective action measures and costs were determined. This latter approach has been proposed for Subtitle I because the statute requires financial assurance for corrective action for a specified amount ($1 million) before there is any known contamination. The Agency concluded, however, that it still does n[illegible] have the data sufficient to estimate the cost of corrective action in advance and is delaying the requirement until a release has been detected and the estimates of costs have been developed. States may wish to require some level of financial assurance to cover the costs of interim measures that may be taken prior to the completion of the corrective action plan and the approved cost estimate.

Release from financial assurance requirements for closure, post-closure care, and corrective action is triggered by State approval of the certification submitted to the State under §§ 258.30(e), 258.31(f), and 258.32(h). Following the receipt of the certification from the owner or operator that verifies that closure, post-closure care, or corrective action have been completed in accordance with the approved plans, today's rule proposes in § 258.32 (f), (g), and (h) that the State notify the owner or operator in writing that he no longer is required to demonstrate financial responsibility for these activities. If the State has reason to believe that the activities have not been conducted in accordance with the approved plan, it must notify the owner or operator and include a detailed statement of reasons for not releasing the owner or operator from the financial assurance requirements.

D. Subpart D—Design Criteria

1. Overview of Proposed Standards

a. New Units. Section 258.40(a) of today's proposal would require that new MSWLF units be designed with liner systems, LCS, and final cover systems as necessary to meet the design goal in the aquifer at the waste management unit boundary or an alternative boundary specified by the State. The two key components of this performa[illegible] standard are the design goal, which is a human health- and environmental-based for methane in accordance with § 258.23. That section requires the owner or operator to ensure that methane generated by the landfill unit does not accumulate in landfill structures (excluding gas control or recovery system components) in concentrations in excess of 25 percent of the lower explosive limit for methane. The concentration of methane gas at the MSWLF facility property boundary also must not exceed the LEL.

Following completion of the first phase of post-closure care at each landfill unit, today's proposal would require the owner or operator to conduct a second, less-intensive phase of care. The purpose of this second phase is to ensure that a minimum level of care is continued to detect any release that might occur at an MSWLF in the long term, while at the same time minimizing the burden on the owner or operator of continuing extensive post-closure care activities for an extended period of time. Therefore, the Agency is proposing under § 258.31(b) that the owner or operator must continue, at a minimum, ground-water monitoring and gas monitoring in order to detect any contamination that might occur beyond the first 30 years of post-closure care. States would have the responsibility of specifying the duration of this second phase.

The Agency is proposing this second phase of post-closure care for a number of reasons. First, even the best liner and leachate collection systems will ultimately fail due to natural deterioration, and recent improvements in MSWLF containment technologies suggest that releases may be delayed by many decades at some landfills. For this reason, the Agency is concerned that while corrective action may have already been triggered at many facilities, 30 years may be insufficient to detect releases at other landfills. The Agency, therefore, wants to ensure that any potential release will be detected regardless of when it occurs. Finally, in the absence of sufficient data to follow the Agency to predict with certainty when containment systems are likely to fail, a second phase of reduced post-closure care ensures that releases will be detected while minimizing costs to the regulated community.

The Agency is proposing minimum requirements for this second phase of care to allow States maximum flexibility in tailoring the scope of the requirements and the duration of this period to site-specific circumstances. For example, if a release is detected at an MSWLF during the second phase of care, the State may specify increased post-closure activities to be carried out as necessary. For facilities located in vulnerable environmental settings, the State may wish to require the owner or operator to continue during this second phase of care many of the activities conducted during the first phase. In addition, for vulnerable or high hazard settings, the Agency expects States to specify extended second-phase care periods. In those cases in which corrective action is still underway at the end of the first phase of post-closure care, the Agency expects States to require the second phase of post-closure care to extend for the duration of the corrective action period, at a minimum.

In addition to the minimum post-closure activities specified in today's proposal, the Agency encourages States to specify more detailed post-closure care requirements, such as maintaining the vegetative cover through periodic mowing, replanting, and regrading to preclude erosion that occurs naturally over time and as a result of servere storms, and repairing the cap when necessary to prevent the cap from becoming permeable. Other post-closure care requirements could include security measures if access to the MSWLF facility could pose a health hazard. In addition, the Agency encourages the States to specify deadlines for submitting monitoring data and other recordkeeping requirements to facilitate the detection of potential problems at the site in a timely manner. The Agency requests comment on the appropriateness of incorporating these and other post-closure care requirements.

The types of post-closure care requirements proposed today closely parallel those applicable to Subtitle C facilities. In addition, the post-closure care activities proposed in today's rule are consistent with existing State solid waste management requirements based on the Agency's review of several States' solid waste regulations (Ref. 21). All of the State programs reviewed require, at a minimum, post-closure site maintenance, leachate control, and ground-water monitoring. In addition to these activities, many States surveyed require additional post-closure activities such as surface water monitoring. The Agency in no way means to preclude States from requiring such activities.

b. Length of Post-Closure Care Period. As noted above, the Agency is proposing that, following closure of each MSWLF unit, the owner or operator must conduct two phases of post-closure. In the first phase of post-closure care, the owner or operator must conduct all of the post-closure care activities specified under § 258.31(a) for a minimum of 30 years. The State has the discretion to extend the period beyond 30 years. Subtitle C establishes a 30-year post-closure period and allows the Regional Administrator to either reduce or extend the length of the period based on site-specific demonstrations. As discussed above, the Agency is concerned that releases may not occur until after 30 years. In fact, the Agency currently is considering extending the length of the post-closure care period well beyond 30 years for hazardous waste facilities located in certain environments likely to pose significant threats to human health and the environment. Therefore, today's rule proposes that the first phase of post-closure care must continue for a minimum of 30 years, with the option for States to require a longer period if deemed appropriate.

Section 258.31(b) proposes a second, less intensive phase of post-closure care designed to ensure the detection of releases, but leaves to the States the flexibility to specify the appropriate length of this period. States may specify a standard period of care for all landfill units, or determine an appropriate period on a case-by-case basis (e.g., at the time the MSWLF is applying for a permit or within a specified period after the effective date of the regulations). While the first option would reduce the burden on the States, the second option could allow for better protection against releases of hazardous constituents to the environment by adapting the post-closure care period to site-specific circumstances.

The Agency considered requiring an extended post-closure care period for MSWLFs with an option to reduce the period only if the owner or operator could demonstrate that a reduction in the period would not pose any threat to human health and the environment; however, the Agency was concerned that this approach could be overly stringent and potentially burdensome to the owner or operator and to the State to establish the criteria for terminating the post-closure care period. The Agency also considered allowing the State the discretion of reducing the 30-year post-closure care period based on cause, consistent with the Subtitle C requirement for hazardous waste facilities. As discussed above, however, because improvements in containment technology may delay the detection of releases, the Agency is concerned that reducing the period to less than 30 years could result in future releases not being detected. Finally, the Agency considered requiring periods consistent with some land use be subject to Agency review and approval.

States may wish to specify additional notification requirements for MSWLFs as required under Subtitle C. For example, submission of a survey plat indicating the location and dimension of landfill units, a record of waste including the type, location, and quantity of waste disposed of in each landfill unit, and a certification that the deed notation has been recorded are all required under Subtitle C regulations.

f. Post-Closure Care Certification. The Agency is proposing in § 258.31(f) that following the completion of the second phase of the post-closure care period for each unit, the owner or operator submit to the State, a certification that both phases of post-closure care have been conducted in accordance with the approved post-closure plan. Consistent with the closure certification, the post-closure care certification must objectively verify that post-closure care has been performed in accordance with the post-closure care requirements based on a review of the landfill unit by a qualified party. As discussed above for closure certifications, the Agency is proposing to leave to the State the discretion to specify the types of certifications that would provide such an objective assessment.

Today's proposal requires that the certification be submitted at the completion of the second phase of the post-closure care period for each unit. This requirement is consistent with those for hazardous waste facilities under Subtitle C. Because of the duration of the post-closure care period, the States may wish to require periodic interim certifications (e.g., every five or 10 years or at the time of the permit renewal, if applicable) to confirm that activities are being conducted properly. Alternatively, States may wish to consider requiring a certification after the end of each of the two phases of post-closure care.

13. Section 258.32 Financial Assurance Criteria

Under today's proposed rule, the owner or operator of a new or existing MSWLF would be required to demonstrate financial assurance for the costs of conducting closure, post-closure care, and, if applicable, corrective action for known releases. (Under proposed § 258.57, whenever the ground-water protection standard is exceeded, an owner or operator must conduct a corrective action program to treat in place or remove any Appendix II hazardous constituents exceeding the standard.) The purpose of financial assurance is to ensure that the owner or operator adequately plans for the future costs of closure, post-closure care, and corrective action for known releases, and to ensure that adequate funds will be available when needed to cover these costs if the owner or operator is unable or unwilling to do so. To demonstrate to the State that it has planned for future costs, the owner or operator must prepare written cost estimates. These cost estimates would serve as the basis for determining the amount of financial assurance that must be demonstrated.

Today's proposed financial assurance requirements for closure, post-closure care, and corrective action for known releases at MSWLFs are patterned after the financial assurance provisions for hazardous waste facilities under Subtitle C and proposed provisions for underground storage tanks under Subtitle I. Financial assurance for closure and post-closure care for MSWLFs is currently required in numerous States. Although financial assurance for corrective action is less frequently required by States, the Agency believes that provision of financial assurance to cover the costs of corrective action for known releases is important to ensure that funds for long-term remedial activities are provided by the owner or operator.

The Agency is not proposing at this time to require financial assurance for other than known releases due to the complexity of the analysis that would be required to estimate probable corrective action costs associated with releases from MSWLFs. For example, to require a facility with a high probability of a release to demonstrate financial assurance for corrective action costs in the event of a release would require a characterization of the risks posed by a facility as well as the potential size, impact, and costs to remedy such releases. Such facility risk analyses could require considerable time to complete and also could delay the adoption and implementation of regulations by States. The Agency requests comments on this decision and information concerning how such cost estimates could be derived in the event additional corrective action financial responsibility requirements are proposed in the future.

The Agency also considered requiring owners or operators of MSWLFs to demonstrate financial assurance for third-party liability to compensate injured third parties. For a number of reasons, however, the Agency has decided to defer proposing such liability requirements at this time. First, the Agency is concerned that it does not have sufficient data at this time to specify the amount of liability cov[illegible] that would be appropriate for an MSWLF. Unlike Subtitle I, which mandates a minimum level of coverage for underground storage tanks, the statute does not specify any minimum financial assurance requirements for MSWLFs. To date, few claims data exist concerning third-party awards resulting from releases at MSWLFs. While more data are available to assess potential claims from Subtitle C facilities, the Agency is reluctant to extrapolate from these data or to adopt directly the levels of coverage required for Subtitle C facilities without further analysis comparing the risks and resultant third-party claims from MSWLFs and Subtitle C hazardous waste facilities.

Second, RCRA Section 4010(c) allows the Agency discretion to take into account the practicable capability of MSWLFs when developing the new criteria. Today's proposal applies an extensive set of new regulations to a large universe of waste facilities. Therefore, in light of the costs associated with implementing today's proposed requirements, the lack of available data on awards for third-par[illegible] damages, and the current constraints in the insurance market, the Agency ha[illegible] tentatively decided to defer any thi[illegible] party liability requirements. Instead, Agency has chosen to focus on financial assurance requirements for costs of activities that are certain to be incurred (i.e., closure, post-closure care, and corrective action for known releases). In deferring these requirements, the Agency hopes to provide more time for the liability insurance market to adjust to a new potential market. The Agency adopted a similar approach when promulgating liability coverage requirements for Subtitle C requirements when it phased in the requirements over a three-year period to allow the market to adjust to the demand for increased capacity.

Deferring third-party liability coverage requirements at the time, however, does not preclude the Agency from promulgating such a requirement for MSWLFs at a later date. Further, the Agency encourages States to consider requiring such coverage if they choose. This decision to defer these financial assurance requirements in no way relieves an owner or operator of liability should injury to third parties be shown to have resulted from the operation of MSWLFs.

The Agency requests comments on this decision to defer requirements fo[illegible] financial assurance for third-party liability costs at this time. In particular, the Agency requests information to the implementation of today's proposed design Criteria (Subpart D of today's proposal).

The Agency recognizes that there are potential operational problems associated with leachate and gas condensate recirculation that may result in adverse impacts on human health and the environment. These problems include: (1) An increase in leachate production, (2) clogging of the leachate collection system (LCS), (3) buildup of hydraulic head within the unit, (4) an increase in air emissions and odor problems, and (5) an increase in the potential of leachate pollutant releases due to drift and/or run-off. Therefore, EPA is proposing that only MSWLF units designed and equipped with composite liners and an LCS constructed to maintain less than a 30-cm depth of leachate over the liner be allowed to recirculate leachate and gas condensate.

A composite liner is a system consisting of two components. The upper component must contain a flexible membrane liner (FML), and the lower component must contain at least a three-foot layer of compacted soil with hydraulic conductivity of no more than 1×10^{-7} centimeters per second. The FML component must be installed in direct and uniform contact with the compacted soil component so as to minimize the migration of leachate through the FML if a break should occur. Because of the increased leachate generation due to the increased amounts of liquids and subsequent hydraulic head buildup, EPA believes that the added protection provided by a composite liner is necessary to ensure that contaminant migration to the aquifer is controlled. First, the FML portion of the liner will increase leachate collection efficiency and provide a more effective hydraulic barrier. Second, the soil portion will provide support for the FML and the leachate collection system and act as a back-up in the event of failure of the FML.

The standard for the LCS, i.e., the requirement that it be constructed to maintain less than 30 cm of leachate over the liner, is the same standard required for LCSs at Subtitle C hazardous waste units, and various technologies are available for meeting this requirement (Ref. 3). The appropriate technology depends on the size of the unit, waste permeability, and climatic conditions. LCS design normally consists of a permeable material placed on a sloping surface so as to allow the leachate to be removed and collected. For large units, a pipe drainage system also may be necessary.

The Agency believes that, because of the potential problems associated with leachate recirculation discussed earlier, the design requirements specified above generally are necessary to ensure protection of human health and the environment; however, because the data that EPA has collected on leachate recirculation are limited to laboratory studies (Ref. 24), the Agency is requesting aditional data on leachate recirculation, including pilot studies and field data.

Prior to selecting today's proposed approach, the Agency considered a wide range of options for leachate and gas condensate recirculation and is requesting comment on two additional options. EPA considered allowing waivers to the requirement that an MSWLF have a composite liner in order to recirculate leachate. For example, the waiver could be granted if the owner or operator could demonstrate that: (1) The unit is located over ground water that is not a potential or current underground source of drinking water, and such ground water is not interconnected to a potential or current drinking water source; or (2) recirculation of leachate or gas condensate in the absence of a composite liner or leachate collection system would not result in contamination of ground water; or (3) recirculation of leachate or gas condensate in an existing unit not equipped with a composite liner or leachate collection system would pose lower risks to human health and the environment than disposal of this leachate without recirculation.

Because of the previously mentioned operational problems associated with leachate and gas condensate recirculation and the limited data available, the Agency also is considering a ban on leachate and gas condensate recirculation as an alternative to today's proposal. Under this alternative, for new MSWLF units, the ban could be instituted on the effective date of the revised Criteria and could be phased in for existing units over a period of time, possibly five years, to allow for alternative leachate management practices to be implemented. The Agency recognizes that the area of leachate and gas condensate recirculation will be controversial and, therefore, is seeking comment on a number of issues. The Agency is seeking comment on the appropriateness of the proposed design requirements and whether other designs would provide adequate protection, and whether today's proposed requirement should be modified to allow the State greater flexibility in establishing appropriate design controls. The Agency is requesting comment on the above approaches to granting the waivers and is interested in receiving information on how to develop the necessary waiver demonstrations. Finally, EPA is specifically requesting comments on banning leachate and gas condensate recirculation.

10. Section 258.29 Recordkeeping Requirements

EPA has included a recordkeeping requirement in these proposed Criteria to ensure that a historical record of MSWLF performance is maintained. The owner or operator would be required to maintain the following records: Ground-water monitoring, testing, or analytical data as specified under Subpart E of today's proposal; gas monitoring results; inspection records, training procedures, and State notification procedures as specified under § 258.20 of today's proposal; and closure and post-closure care plans required under proposed §§ 258.30(b) and 258.31(c), respectively. The required information would be recorded as it becomes available, and maintained by the owner or operator of new and existing MSWLFs. This section consolidates the recordkeeping requirements of other sections of today's proposal.

EPA believes that this requirement would ensure the availability of basic types of information that demonstrates compliance with today's requirements. EPA has not defined the time period for retaining these records, required that reports should be submitted, nor specified in what form records should be maintained because the Agency believes it is more appropriate for these requirements to be specified by States, which are directly responsible for implementing these provisions. EPA believes this requirement is flexible enough to allow the States to establish specific requirements for recordkeeping and to determine if additional records should be maintained.

11. Section 258.30 Closure Criteria

Because of the potential threats to human health and the environment posed by MSWLFs, the Agency believes that is necessary to prescribe minimum standards for closing these landfills. Improperly closed landfills, as discussed in a background document (Ref. 3), have the potential for contaminating the environment due to inadequate controls to contain the wastes (e.g., a final cap that erodes and fails to protect the wastes from being exposed). For this operation and an estimate of the maximum amount of waste on site over the active life of the landfill are important to accurately estimate the cost of closure. Financial assurance for closure must be based on the maximum cost of closing the landfill based on site-specific factors. Knowing the maximum cost of closure ensures that adequate funds for closure are available even if closure takes place earlier than expected.

The description of the final cover should include the design of the final cover, the types of materials to be used, and how the final cover will achieve the objectives of the closure performance standard. Finally, the closure schedule should include the total time required to close each landfill unit and the time for intervening closure activities that will allow the progress of closure to be tracked (e.g., estimates of the time required to decontaminate the MSWLF and to place a final cover).

Because today's rule applies only to MSWLFs, the estimate of the maximum extent of operation, maximum amount of inventory, and the corresponding description of procedures for handling these wastes refer only to those wastes and units that are integrally a part of the operation of the MSWLF (e.g., run-off collection ponds). These regulations are not intended to address closure of other structures or units at the facility that may not be part of the landfill operation (e.g., a surface impoundment used as a sludge drying bed).

c. Closure Plan Deadline and Approval. EPA is proposing in § 258.30(c) to require that the closure plan be prepared as of the effective date of the rule or by the initial receipt of solid waste at the landfill, whichever is later. Based on experience with hazardous waste facilities under Subtitle C, the Agency believes that the proposed deadline for preparing the closure plan is sufficient. A responsible owner or operator already should have considered many of the types of activities required at closure as part of routine operations, especially if the landfill is operated on a cell-by-cell basis and cells are filled and closed successively. The owner or operator of an existing MSWLF may be able to rely extensively on records of closure activities of areas no longer active in preparing the plans (e.g., in developing an appropriate final cover or in determining the type of final cover used).

The Agency also is proposing in § 258.30(c) that the closure plan, and any subsequent modifications to the plan, must be approved by the State to ensure that the plan adequately addresses all of the required activities. This proposal is particularly important because the closure cost estimate and the amount of financial responsibility required are based directly on the activities described in the closure plan. To allow the States maximum flexibility in developing procedures for implementing these rules, the Agency is not proposing specific deadlines and procedures for submitting, approving, and modifying closure plans. The Agency recognizes that many States already have approval procedures in place, making specific Federal requirements unnecessary and potentially burdensome. For example, most of the States surveyed approve closure plans as part of the permitting process and require that subsequent modifications to the plans be subject to State approval. Other States require that owners or operators apply for closure permits prior to closure. In developing an approval process, States may wish to review the procedures included in Subpart G of 40 CFR Parts 264 and 265, and the permitting requirements in 40 CFR Parts 124 and 270 that apply to hazardous waste facilities.

For recordkeeping purposes, the Agency is proposing in § 258.30(c) that the owner or operator maintain a copy of the most recently approved closure plan at the MSWLF facility, or at some other place designated by the owner or operator, until the owner or operator has been notified by the State that it has been released from financial assurance for closure of the entire landfill under § 258.32(f).

d. Triggers for Closure. To ensure that MSWLF units are closed in a timely manner after operations at the unit have ceased and to protect against threats to human health or the environment posed by open but inactive landfills, the Agency is proposing in § 258.30(d) that the owner or operator begin closure activities at each unit, in accordance with the approved closure plan, no later than 30 days after the final receipt of wastes at each landfill unit. Thus, if the MSWLF is operated on an individual cell or trench basis, closure of each cell or trench must begin within 30 days following the final receipt of waste at that unit. Extensions may be granted at the discretion of the State, if the owner or operator of the MSWLF demonstrates that the open landfill unit will not pose a threat to human health or the environment. These closure trigger provisions in § 258.30(d) are consistent with the closure trigger mechanisms for hazardous waste facilities under Subtitle C. States may wish to refer to the language in 40 CFR Parts 264 and 265, Subpart G as guidance for developing more detailed provisions.

The Agency encourages States to define "final receipt of wastes" to preclude MSWLF units from remaining inactive for an indefinite period of time without closing. For example, States may wish to adopt the provisions applicable to hazardous waste facilities that specify that closure of each unit must begin no later than 30 days after the final receipt of hazardous wastes, no later than one year after the most recent receipt of hazardous wastes at that unit. Furthermore, States are encouraged to establish specific criteria for granting extensions of the deadline for beginning closure. For example, the Subtitle C regulations for hazardous waste facilities specify that an extension will be granted only if the owner or operator demonstrates, among other requirements, that (1) the facility has remaining capacity, and (2) the owner or operator is operating in compliance with all applicable regulations and will continue to do so.

As noted above, the Agency is allowing the States to develop their own procedural requirements, including provisions for owners or operators to notify the States of their intent to close their landfill units. States are encouraged to establish notification requirements that provide them with sufficient advance notice to inspect the facility and to ensure that the approved closure plan is still applicable to the facility's current conditions. States may wish to adopt the notification provisions included in the Subtitle C regulations that require advance notice prior to closure of each unit of the landfill. If the State allows the owner or operator to gradually fund a trust fund as demonstration of financial assurance, notice of closure is particularly important to ensure that the trust fund is fully funded at the time of closure. For example, Subtitle C requires an estimate of the expected year of closure to be included in the closure plan if the owner or operator expects to close the landfill prior to the end of the required trust fund pay-in period.

While today's proposal specifies when closure must begin, the Agency is not proposing deadlines for completing closure of an MSWLF unit. However, the Agency is concerned that the completion of closure not be delayed unnecessarily and is encouraging States to specify deadlines and interim milestones. For example, the Subtitle C regulations for hazardous waste facilities specify a six-month deadline for completing closure and an interim milestone of three months for managing all inventory at the site. Extensions to these deadlines may be granted if (1) the closure activities the existing Criteria, which do not require routine gas monitoring. The Agency believes many of these instances could have been prevented if routine monitoring had been conducted to detect the dangerous levels prior to the incident. This issue is further discussed in the background document (Ref. 3). Early warning would allow the owner or operator to take action to prevent catastrophic events.

Because methane has been the principal source of explosions associated with solid waste disposal, EPA proposes to require monitoring only for methane at this time. EPA may require monitoring for other gases if new information develops at a later time indicating that there are other gases that pose problems; however, EPA currently does not have sufficient information on other gases generated to justify requiring owners and operators to monitor for them.

EPA is proposing that methane monitoring be conducted at least quarterly. As mentioned earlier, monitoring would provide early warning of potential methane build-up that may lead to explosions. The Agency believes that quarterly monitoring is a reasonable minimum frequency that accounts for the seasonal variations in subsurface gas migration patterns. The Agency recognizes that site-specific conditions may require more frequent monitoring, e.g., when facilities are near residential areas or enclosed in structures, and encourages States to require additional monitoring as necessary. There also may be limited situations (e.g., in very remote areas) where less frequent monitoring may be sufficient. EPA requests comment on these situations and the appropriateness of the minimum monitoring frequency specified in today's proposal.

Monitoring is intended to ensure that the performance standard is being met at the MSWLF. EPA considered specifying the type of monitoring and monitoring devices, but such an approach would not allow the consideration of site-specific factors in establishing the appropriate monitoring system. The proposal would allow State flexibility in determining the appropriate monitoring requirements on a case-by-case basis.

Site-specific factors to be considered when determining the type and frequency of monitoring are discussed in an Agency guidance manual (Ref. 12). Factors to be considered in determining the type and frequency of monitoring include: soil conditions, hydrogeologic conditions surrounding the disposal site, hydraulic conditions surrounding the disposal site, and the location of facility structures and relative to property boundaries. These factors control the rate and extent of gas migration and are discussed further in the guidance manual (Ref. 12).

Monitoring in a facility structure normally should be performed after the building has been closed overnight or for a weekend because these are the times when the most dangerous conditions are likely to exist. Sampling should be done in confined areas where gas may accumulate, such as in basements, crawl spaces, attics near floor cracks, and ground subsurface utility connections. Gas recovery and gas control equipment, however, need not be sampled. If all the readings are less than 25 percent LEL, the MSWLF would be in compliance; however, the presence of any methane in a facility structure, even in concentrations below 25 percent LEL, should be considered a problem that deserves attention and steps should be taken to ensure that the level of methane does not reach explosive levels. EPA recommends that continuous monitoring devices be used in facility structures at the landfill site.

For monitoring along property boundaries, at least two monitoring points should be located along the property boundaries closest to residences or other potentially affected structures. The exact location of these points should take into account any gas-permeable seams. In selecting the sampling points, some of the factors to consider include dry sand or gravel pockets, alignment with an off-site point of concern, proximity of the waste deposit, areas where there is dead or unhealthy vegetation that might be due to gas migration, and areas where underground construction may have created a natural path for gas flow (e.g., utility lines).

Monitoring should be conducted at the property boundaries ideally when the soil surface has been wet or frozen for several days because this is when levels are expected to be greatest (Ref. 12). The results, location, date, and time of monitoring should be recorded. If any of the readings are equal to or greater than the LEL, the facility would not be in compliance. It may be necessary to repeat the tests at a later date or under different climatic conditions to verify the readings. Where active control systems are being used, samples should be taken when all pumps have been shut down for their maximum time during normal operation.

Monitoring at the property boundary could be accomplished by using a permanent well or a portable monitoring device. The device should be determined by the State on a case-by-case basis. EPA has provided additional guidance on types of monitoring devices that could be used (Ref. 12). The Agency suggests that methane at a concentration just below the LEL at a monitoring point may indicate a major problem and should not be ignored. The appropriate action would depend on the proximity of off-site structures, possible pathways, and other factors. In all cases, an evaluation should be made so that the danger of explosion is minimized.

5. Section 258.24 Air Criteria

The existing Criteria in Part 257 prohibit the open burning of solid waste but allow infrequent burning of agricultural wastes, silvicultural wastes, land clearing debris, diseased trees, debris from emergency cleanup operations, and ordnance. Today's proposal under § 258.24 maintains this standard. Requirements for compliance with State Implementation Plans (SIPs) under section 110 of the Clean Air Act (CAA) would remain unchanged from the Part 257 Criteria.

The Agency believes that any infrequent burning of the waste types listed above should be conducted in areas dedicated for that purpose and at a distance away from the landfill unit so as to preclude the accidental burning of other solid waste. For the purposes of this proposal, agricultural waste does not include empty pesticide containers or waste pesticides.

Open burning, which is the uncontrolled or unconfined combustion of solid wastes, is a potential health hazard, damages property, and can be a threat to public safety. For example, smoke from open burning can reduce aircraft and automobile visibility and has been linked to automobile accidents and death on expressways. The air emissions associated with open burning are much higher than those associated with incinerators equipped with air pollution control devices. Combustion in a trench or pit incinerator is considered the equivalent of open burning because particulate emissions from trench and pit incinerators equal or exceed those from open burning.

As stated earlier, EPA originally established the ban on open burning in the 1979 Criteria. Commenters on the proposal to the 1979 Criteria questioned the necessity for that ban, stating that open burning reduces the volume of solid waste and helps control disease vectors. The Agency recognized that some volume reduction is achieved, but no data were provided that disease vectors were significantly reduced. EPA established the ban on open burning of discharge of a 25-year storm. The purpose of the run-on standard is to minimize the amount of surface water entering the landfill facility. Run-on controls prevent: (1) Erosion, which may damage the physical structure of the landfill (2) the surface discharge of wastes in solution or suspension, and (3) the downward percolation of run-on through wastes, creating leachate. Control is accomplished by constructing diversion structures to prevent surface water run-on from entering the active portion of the facility. Diversion structures help prevent liquids, which will eventually generate leachate or leave the site as contaminated run-off, from coming into contact with the waste.

The Agency believes that the main area of concern, with respect to run-on, is the active portion of the landfill, not the landfill facility as a whole. In this proposal, that part of the facility or unit that has received or is receiving wastes and has not been closed as required in § 258.30 is defined as the active portion. It is at active portions that run-on is most likely to: (1) Seep into the exposed waste, contributing to the formation of leachate, or (2) erode wastes, or constituents of them, and carry them away in surface water run-off. Seepage and erosion would not be a problem at inactive portions that have been closed in accordance with the closure Criteria specified in § 258.30. The Agency proposes that surface water run-on be diverted from active portions. Diversion of run-on may be accomplished by locating the active portion in areas where the topography naturally prevents run-on, by sloping or contouring the land, or by constructing ditches, culverts, or dikes. The capacity of diversion structures should be determined by the owner or operator considering site topography, size of the drainage area, and size of the active portions. The Agency chose the 25-year storm as the design parameter to be consistent with the standard in 40 CFR Part 264, which requires active portions of hazardous waste landfills to be protected from the peak discharge of a 25-year storm.

The quantity of run-off from active portions of landfills can be minimized by (1) minimizing run-on, (2) preventing disposal of liquid wastes in the landfill, and (3) minimizing the size of the active portion of the landfill. To address run-off that is generated, the Agency proposes to require that the owner or operator of an MSWLF design, construct, and maintain a run-off control system from the active portion of the landfill to collect and control at least the water volume resulting from a 24-hour, 25-year storm. Run-off from the active portion of the unit must be handled in accordance with § 258.27 of this proposal in order to ensure that the CWA NPDES requirements and CWA Section 208 and 319 requirements are not violated. Again, the Agency chose the 24-hour, 25-year storm design parameter to be consistent with the standards for Subtitle C facilities in 40 CFR Part 264.

By design, almost all trench and area fills in depressions or pits control most run-off because of surface contours. Owners and operators having area fills that do not use depressions can control run-off by building a berm or dike on the low elevation side; however, when landfills using either the trench or area methods become large or substantially above grade, both run-off and leachate seeps, which often occur on the outer slopes of the fill, need to be collected. Run-off that does emerg from active portions may be collected by ditches, berms, dikes, or culverts, which direct it (sometimes by sump pump) to surface impoundments, basins, tanks, or treatment facilities. These collection devices may consist of temporary structures around active portions, because run-off usually has been in contact with waste or leachete seeps from active portions and sometimes is collected via a leachate collection system, it probably will be contaminated. It is difficult to differentiate between rainwater run-off and leachate run-off at the active portion of a landfill unless an elaborate or expensive sampling program is conducted. Once collected, a number of options exist for treating and disposing of run-off. These include land treatment, treatment in surface impoundments (e.g., evaporation), or discharge to a sewer, other treatment facility, or surface waters (if permitted). The background document supporting this section of the rule (Ref. 3) discusses in further detail 25-year storm events and run-on and run-off control requirements.

8. Section 258.27 Surface Water Requirements

Today's proposal would prohibit any MSWLF unit from (1) causing a discharge of pollutants into waters of the U.S., including wetlands, that violates any requirements of the CWA, including, but not limited to, NPDES requirements: and (2) causing a nonpoint source of polution to the waters of the U.S., including wetlands, that violates any requirements of a State-wide or area-wide water quality management plan under Section 208 or Section 319 of the CWA. The surface water criterion currently in Part 257 was retained in today's proposal because EPA believe it provides necessary protection for human health and the environment.

EPA considers it essential that solid waste activities not adversely affect the quality of the nation's surface waters. Rivers, lakes, and streams are important sources of drinking water, recreational resources, and habitat for a wide variety of fish with other aquatic organisms. Solid waste disposal has led to surface water contamination from run-off of leachate, accidential spills, and drift of spray occurring at landfills. In the proposed Criteria, EPA seeks to coordinate its surface water requirements under RCRA, including programs developed under the CWA to restore and maintain the integrity of the waters of the United States.

Under Section 1006 of RCRA, EPA is required to integrate, to the maximum extent practicable, the provisions of RCRA with other statutes, including the CWA Under the CWA, EPA conducts programs designed "to restore and maintain the chemical, physical, and biological integrity of the nation's water." EPA believes that this goal also is a legitimate objective for its regulatory activity under RCRA and that the Agency should use its authority under RCRA to see that CWA goals are achieved. Thus, in establishing the surface water criteria, EPA employed concepts and approaches use under the CWA. The discharge of a nonpoint source of pollution from solid waste disposal activities would be required to conform with any established water quality management plan developed under Section 208 or Section 319 of the CWA. Not all portions of a Section 208 or Section 319 plan are applicable to solid waste disposal activities, and the State would determine which requirements under these plans apply. Similarly, the discharge of pollutants from solid waste disposal activities would be required to comply with other provisions of the CWA, including the NPDES requirements under Section 402.

The provision of § 257.3-3 of the current Criteria, which states that "a facility shall not cause a discharge of dredged material or fill material to waters of the United States that is in violation of the requirements under Section 404 of CWA, as amended," has been included under the wetlands section of today's proposed Part 258 Criteria.

9. Section 258.28 Liquids Restrictions

EPA is proposing a new requirement for liquids restrictions because the intentional introduction of liquids into

5. Section 258.14 Seismic Impact Zones

Today's proposal would require the owner or operator of a new MSWLF unit in a seismic impact zone to design the unit to resist the maximum horizontal acceleration in hard rock at the site. Seismic impact zones are defined as areas having a 10 percent or greater probability that the maximum expected horizontal acceleration in hard rock, expressed as a percentage of the earth's gravitational pull (g), will exceed 0.10g in 250 years.

The National Oceanic and Atmospheric Administration and others have documented structural damages resulting from earthquakes. The potential for damage to MSWLFs from earthquakes can be deduced from similar structures damaged by earthquakes. Such damage includes cracks in foundations and complete collapse of structures. EPA believes that the adverse impact of siting MSWLFs in seismic areas justifies the need for a comprehensive standard to prevent releases from these facilities. Types of failure that may result from ground motion are: (1) Failure of structures from ground shaking; (2) failure of unit components due to soil liquefaction, liquefaction-induced settlement and landsliding, and soil slope failure in foundations and embankments; and (3) landsliding and collapse of surrounding structures. The background document supporting this section of the rule (Ref. 2) provides examples of the potential adverse effects on MSWLFs that may occur in seismic impact zones. The Agency believes that these failures may result in contamination of air, ground water, surface water, and soil. Therefore, in order to protect human health and the environment, all containment structures, including any liners, leachate collection systems, and surface water control systems at new MSWLFs, must be designed to withstand the stresses created by peak ground acceleration at the site from the maximum earthquake based on regional studies and site-specific analyses.

The Agency's proposed requirement translates to a 4-percent probability of exceeding the maximum horizontal acceleration in 100 years. The Agency believes that the areas affected by the proposed "seismic impact zone" requirement represent the areas of the United States with the greatest seismic risk, and, therefore, this proposal would be protective of human health and the environment.

The proposed performance requirement would minimize the risk of slope and liner failure due to seismic activity. By minimizing the risk of failure of the landfill slopes, the potential for exposure of solid waste to the atmosphere and the possible contamination of run-off by contacting exposed solid waste also would be reduced. The Agency further believes that today's proposal would reduce the potential for contamination of ground water beneath the landfill resulting from failure of a liner.

Although § 258.13 of today's proposal would prohibit siting new units on or adjacent to active Holocene faults (faults that have had displacement in Holocene time) to protect against releases of wastes from facility failure due to fault rupture, this standard does not address damage that may occur as a result of earthquake-induced ground motion. Studies indicate that ground motion is more important as a failure mechanism than fault rupture, and not all earthquakes are manifested by surface faulting (Ref. 2). Ground motion resulting from earthquakes without associated surface faulting has been found in some cases to be two or three times that associated with quakes with faulting.

Maps depicting the potential seismic activity across the United States at a constant-probability level have been prepared (U.S. Geological Survey Open-File Report 82-1033). The maps indicate that certain portions of the country are at a higher level of seismic hazard than other areas. For example, portions of the eastern U.S., although not subject to frequent earthquakes, are at a higher level of seismic hazard than portions of the western U.S.

The process of designing earthquake-resistant components may be divided into three steps: (1) Determining expected peak ground acceleration at the site from the maximum quake, based on regional studies and site-specific seismic risk analysis; (2) determining site-specific seismic hazards (e.g., soil liquefaction); and (3) designing the facility to withstand peak ground accelerations. Various methods for accomplishing the above steps are available. Methods appropriate to individual MSWLFs should be selected by the owner or operator, subject to State approval.

While the existing Part 257 Criteria and current Subtitle C requirements do not address seismic impact zones, additional location restrictions for hazardous waste disposal facilities under Subtitle C of RCRA are being developed, and a standard consistent with today's proposal is being considered. The Agency believes that this standard is appropriate for MSWLFs because the concerns relating to failure of containment structures are the same for any landfill regardless of waste type. The Agency requests comment on the approach proposed today.

6. Section 258.15 Unstable Areas

EPA is proposing to require owners and operators of new and existing MSWLF units located in unstable areas to demonstrate to the State the structural stability of the unit. This demonstration must show that engineering measures have been incorporated into the design of the unit to mitigate the potential adverse impacts on the structural components of the unit that may result from destabilizing events.

Structural components include liners, leachate collection systems, final covers, and run-on and run-off collection systems. Facilities located in unstable areas may require extensive repairs and/or corrective action following the occurrence of a natural or human-induced destabilizing event. EPA has reviewed documented events that illustrate the problems of locating waste management units in unstable areas (Ref. 2). The impacts resulting from natural or human-induced destabilizing events observed include rapid dispersion of contaminants over a large area, contamination of municipal water supplies, and seepage of contaminants into basements.

EPA is proposing to define an unstable area as a location that is susceptible to natural or human-induced events or forces capable of impairing the integrity of the landfill structural components responsible for preventing releases. These areas could include: (1) Subsidence-prone areas, such as areas subject to the lowering or collapse of the land surface either locally or over broad regional areas; (2) areas susceptible to mass movement where the downslope movement of soil and rock under gravitational influence occurs; (3) weak and unstable soils, such as soils that lose their ability to support foundations as a result of expansion or shrinkage; and (4) Karst terrains, which are areas where solution cavities and caverns develop in limestone or dolomitic materials.

National maps are available that locate Karst terrains and landslide-susceptible areas, but weak and unstable soils and subsidence-prone areas appear to be mapped only individually or at the local level. Thus, identification of existing MSWLFs in these unstable areas, and determination of whether the proposed site of a new MSWLF is in an unstable area: would controls necessary to protect human health and the environment. During the extension period, the owner or operator would be responsible for meeting all other applicable requirements in today's proposal.

In deciding whether to grant a variance, EPA would expect the State to consider whether (1) it currently is not economically feasible to find, develop, and operate a new site; (2) it currently is not logistically feasible to locate a new MSWLF in a more suitable area (e.g., the only suitable property is already developed or is located too far from collection centers); or (3) legal barriers exist to the siting, acquisition, or operation of the landfill in suitable areas (e.g., jurisdictional restrictions do not allow wastes from one municipality to be disposed of in the jurisdiction of another). If such conditions exist, and the risks associated with continued operation during the extended period of time do not pose undue threats to human health and the environment, a variance may be appropriate. A specific risk level is not being proposed because the Agency believes that such a decision is best left to the States, who must weigh the various alternatives.

The Agency recognizes that States may interpret the above criteria in various ways, and that decisions may be based on site-specific conditions. The Agency believes that this is appropriate, since the States are in a better position than EPA to determine whether a specific facility should be granted an extension.

Although it may be difficult to site a new MSWLF within the proposed five-year period, EPA does not intend that States grant unlimited time extensions to units located in unstable areas. Various alternatives, such as regionalization of disposal facilities, recycling and source reduction, municipal waste combustion (i.e., incineration), and the use of transfer stations, are available to manage wastes. These alternatives can be used to overcome environmental, logistical, legal, or economic barriers to siting new landfills.

EPA requests comments on whether other location restrictions such as these or others in addition to those proposed today should be imposed for MSWLFs.

C. Subpart C—Operating Criteria

The requirements of this Subpart would apply to all new and existing MSWLFs. These requirements address day-to-day activities, such as application of daily cover (necessary to reduce immediate threats to public health), and long-term activities, such as post-closure care (necessary to minimize or eliminate the possibility of the release of contaminants to the environment).

1. Section 258.20 Procedures for Excluding the Receipt of Hazardous Waste

Section 258.20 of today's proposal would require the owner or operator of an MSWLF to implement a program to detect and prevent attempts to dispose of hazardous wastes (regulated under Subtitle C of RCRA) and PCB wastes at the facility (regulated under the Toxic Substances Control Act). EPA does not intend for this regulation to limit the legal disposal in MSWLFs of very small quantity generator (VSQG) hazardous waste (hazardous waste generated at a rate of less than 100 kg per month), certain wastes containing PCBs at concentrations less than 50 ppm, and empty pesticide containers that have been properly rinsed in accordance with the label instructions as specified under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) and regulations in 40 CFR Part 165. Today's proposal also does not restrict the disposal in MSWLFs of HHW, which is exempt from EPA's hazardous waste rules; however, the Agency strongly endorses HHW collection programs and recommends the management of collected HHW in hazardous waste management facilities.

With regard to the disposal of PCBs, regulations promulgated under the Toxic Substance Control Act (TSCA) specify MSWLF disposal as proper for limited categories of PCB materials. Such materials include drained PCB-contaminated electrical equipment (i.e., equipment that formerly contained 50 to 500 ppm of PCBs in dielectric fluids), drained hydraulic and heat transfer equipment, and "PCB articles" (see 40 CFR 761.3 and 761.60(b)(5)) that previously contained 50 to 500 ppm of PCBs and that have been drained of free-flowing liquids. Most significantly, TSCA disposal regulations generally allow the disposal in MSWLFs of "small capacitors" that contain less than three pounds of PCB dielectric. These small capacitors frequently are found in fluorescent light ballasts, high-intensity discharge lighting power supplies, and a variety of consumer appliances, such as microwave ovens and air conditioners.

Measures that MSWLF owners and operators must incorporate in their programs to exclude receipt of hazardous waste include, at a minimum, random inspections of incoming loads, inspection of suspicious loads, recordkeeping of inspection results, training of personnel to recognize hazardous waste, and procedures for notifying the proper State authorities if a regulated hazardous waste is found at the facility. The State may require additional program elements.

The random load checking program is a crucial deterrent to illegal disposal. Such a program might include designation of an inspector to examine several random loads throughout facility operations. The loads could be discharged at a designated location separate from landfilling operations, broken down with hand tools, and visually inspected for indications that suspicious containers may hold Subtitle C hazardous wastes. The rule could require that records be kept of each load inspection. The records should include the date, time, name of the hauling firm, driver, source of the waste, vehicle identification numbers, and all observations made by the inspector.

Each MSWLF would be required to train all necessary personnel to identify potential sources of Subtitle C hazardous wastes. At a minimum, this should include supervisors, spotters, designated inspectors, equipment operators, and weigh station attendants. The training should emphasize familiarity with containers and labels typically used for hazardous wastes and other hazardous materials. If Subtitle C hazardous waste is found in any load inspected, or otherwise found at the facility, the owner or operator should promptly notify the State. The owner or operator should cordon off the area where the material was deposited and make efforts to carry out proper cleanup, transport, and disposal of the material at a permitted hazardous waste management facility.

In developing this proposal, EPA considered specifying the program in detail, delineating all activities and procedures needed to exclude hazardous waste. The Agency decided against a strictly defined program because each landfill will receive different amounts of waste that could contain questionable material. Today's proposal gives States and MSWLF owners and operators flexibility in implementing this requirement.

2. Section 258.21 Cover Material Requirements

EPA proposes to strengthen the cover material criterion imposed under § 257.3-6 of the existing Subtitle D Criteria to require the application of suitable cover material at the end of each operating day, or at more frequent intervals, if necessary, to control disease vectors, fires, odors, blowing litter, and scavenging. MSWLFs receive wastes that consist of a wide variety of materials. In particular, such facilities research to determine if a solids content measure would be an acceptable substitute for the Paint Filter Liquids Test for municipal sewage sludges. EPA specifically requests any data that will assist in evaluating the use of a solids content measure for purposes of this rule.

Municipal Solid Waste Landfill. A municipal solid waste landfill is defined as any new or existing landfill or landfill unit that receives household waste. These may be publicly or privately owned. Landfills owned by municipalities that do not accept household waste are not MSWLFs. MSWLFs also may accept other types of Subtitle D wastes, such as commerical waste, nonhazardous POTW sewage sludge, construction/demolition waste, and industrial solid waste. (Units that accept only these wastes will be addressed in future rulemaking activities.) For example, a unit that receives primarily construction/demolition waste, but also receives some household waste, is an MSWLF under this rule. This definition does not include landfills regulated as hazardous waste units under Subtitle C of RCRA and is not meant to capture industrial solid wate landfills that may receive *office, sanitary, or cafeteria wastes* generated at the site. Finally, the definition of MSWLFs includes any landfill that receives MWC ash including ash monofills (i.e., landfills that receive only ash from MWC facilities) to the extent that MWC ash is generated from the combustion of household waste alone or in combination with other nonhazardous wastes.

3. § 258.3 Consideration of Other Federal Laws

Section 258.3 provides that the owner or operator of an MSWLF unit must comply with any other applicable Federal laws, regulations or requirements. There are numerous other Federal laws that must be considered in siting, designing, and operating MSWLFs. The owner or operator is responsible for ensuring that the requirements of all applicable statutes and regulations, as well as any other requirements, are met. Applicable statutes include, but are not limited to, the following:

- National Historical Preservation Act of 1966, as amended.
- Endangered Species Act.
- Coastal Zone Management Act.
- Wild and Scenic Rivers Act.
- Fish and Wildlife Coordination Act.
- Clean Water Act.
- Clean Air Act.
- Toxic Substances Control Act.

B. Subpart B—Location Restrictions

EPA has identified six types of locations that require special restrictions: sites in the vicinity of airports, 100-year floodplains, wetlands, fault areas, seismic impact zones, and unstable areas. Restrictions for sites near airports and floodplains are included in the original Part 257 Criteria. EPA is proposing to add to the revised Criteria restrictions on siting in wetlands, fault areas, unstable areas, and seismic impact zones because, as discussed below, EPA believes that the additional information that has been developed and reviewed since promulgation of the current Part 257 Criteria supports the need for additional controls in these locations. References to "new MSWLFs" in this section and throughout this preamble refer to new units, as well as to lateral expansions of existing units.

1. Section 258.10 Airport Safety

Under today's proposal, new and existing MSWLFs located within the distance limits specified in Federal Aviation Administration (FAA) Order 5200.5 (10,000 feet for airports handling turbojets and 5,000 feet for airports handling piston-type aircraft) may not pose a bird hazard to aircraft. The proposed requirement is identical to the current § 257.3–8 and is included because MSWLFs receive putrescible wastes that can attract birds despite controls such as daily cover. When solid wastes are disposed of near airports, the birds attracted to the area can present a significant risk of collisions with aircraft. The FAA Order 5200.05, "FAA Guidance Concerning Sanitary Landfills on or Near Airports" (October 16, 1974) states that solid waste disposal facilities have been found by study and observation to be attractive to birds and, therefore, "may be incompatible with safe flight operations" when located near an airport. The background document relevant to this section (Ref. 2) discusses instances of damage resulting from bird strikes that have occurred near landfills.

The distances derived from Order 5200.5 are based on the fact that over 62 percent of all bird strikes occur below altitudes of 500 feet (150 meters) and that aircraft generally are below this altitude within the distances specified.

EPA wishes to make it clear that the "bird hazard" of concern is "an increase in the likelihood of bird/aircraft collisions." Thus, EPA expects that solid waste disposal within the specified distances would occur only if the operation can be managed in such a way as to not increase the risk of collision within the specified distances. EPA recommends that owners and operators of MSWLFs consult with the Fish and Wildlife Service to determine whether specific facilities pose a bird hazard to aircraft. Where appropriate, this determination should be made in consultation with FAA, as well as with the owners and operators of the airports of concern.

2. Section 258.11 Floodplains

EPA proposes to include a floodplain requirement in Part 258 that is identical to the requirement in the current Part 257 Criteria. Thus, EPA is proposing that new and existing MSWLFs located in the 100-year floodplain shall not restrict the flow of the 100-year flood, reduce the temporary water storage capacity of the floodplain, or result in the washout of solid waste so as to pose a hazard to human health and the environment. The Agency's thinking today is consistent with the rationale for the original Criteria, as discussed in 44 FR 53438, dated September 13, 1979. Namely, disposal of solid waste in floodplains may have significant adverse impacts: (1) If not adequately protected from washout, wastes may be carried by flood waters and flow from the site, affecting downstream water quality; (2) filling in the floodplains may restrict the flow of flood waters, causing greater flooding upstream; and (3) filling in the floodplain my reduce the size and effectiveness of the temporary water storage capacity of the floodplain, which may cause a more rapid movement of flood waters downstream, resulting in higher flood levels and greater flood damages downstream. For these reasons, EPA believes that it is desirable to locate disposal facilities outside floodplains. EPA estimates that 14 percent of all existing MSWLFs are located in 100-year floodplains. The Agency made this estimate by mapping MSWLFs nationwide and determining how many MSWLFs fell in areas mapped as floodplains. Case studies, discussed in the background document for this section (Ref. 2), indicate that landfills are subject to design and operational failures as a result of flooding.

Today's proposal would require that new and existing MSWLFs, if located in a 100-year floodplain, be designed and operated to prevent the adverse effects described above. EPA recognizes that locating MSWLFs in floodplains can be expected to have some impact on the flow of the 100-year flood and water storage capacity, regardless of precautions taken. The intent of today's proposed requirement is to require that wetlands. In particular, the guidelines identify filling operations in wetlands as among the most severe environmental impacts covered. For this reason, EPA believes that these guidelines should be used to provide the basis for today's proposal. Moreover, these guidelines are in keeping with Agency policy of maintaining consistency among different EPA programs.

The guidelines in § 230.10(a) state that "no discharge of dredged or fill material shall be permitted if there is a practicable alternative to the proposed discharge would less adversely impact on the aquatic ecosystem, so long as the alternative does not have other significant adverse environmental consequences." An alternative is practicable if it is: (1) Available and (2) feasible, i.e., capable of satisfying the basic or overall purpose of the proposed project, taking cost, logistics, and technology into consideration. For activities that are not water-dependent, i.e., do not require access or proximity to wetlands to fulfill their basic purpose, the guidelines further provide that: (1) Practicable alternatives that do not involve wetlands are presumed to be available, unless clearly demonstrated otherwise; and (2) where a discharge is proposed for a wetland, all practicable alternatives that do not involve a discharge to a wetland are presumed to have a less adverse impact on the aquatic ecosystem, unless clearly demonstrated otherwise. Both of these rebuttable presumptions place a burden on the permit applicant to demonstrate that no practicable alternatives exist.

In addition to the practicable alternatives test, the guidelines also require that "no discharge of dredged or fill material shall be permitted which would cause or contribute to significant degradation of the waters of the United States," including wetlands (40 CFR 230.10(c)). Under the guidelines, effects contributing to significant degradation considered individually or cumulatively include significant adverse effect on: (1) Human health or welfare; (2) life stages of aquatic life and other wetland-dependent wildlife; (3) aquatic ecosystem diversity, productivity, and stability, e.g., a wetland's capacity to assimilate nutrients, purify water, or reduce wave energy, and (4) recreational, aesthetic, and economic values.

Third, § 230.10(c) of the guidelines states that a discharge of dredged or fill material shall not be permitted if it: (1) Causes or contributes to violations of any State water quality standards; (2) violates applicable toxic effluent standards or other Clean Water Act Section 307 standards; (3) jeopardizes species or habitat protected under the Endangered Species Act; or (4) violates any requirement imposed by the Secretary of Commerce to protect marine sanctuaries under the Marine Protection, Research, and Sanctuaries Act.

Moreover, the guidelines provide that a permit should not be issued unless appropriate and practicable steps have been taken to minimize potential adverse impacts of the discharge into wetlands (40 CFR 230.10(d)). Subpart H of the guidelines lists examples of the many types of actions that can be undertaken to minimize the adverse effects of discharges of dredged or fill material.

Because construction of a new landfill essentially is a filling operation, it destroys the wetland, which generally cannot be restored due to the complexities and fragility of the ecosystem. EPA also believes that it is essential to preserve the ecological function of the remaining wetland at an existing facility. Thus, unless the owner or operator can make the demonstration specified in § 258.12(a), new facilities and lateral expansions of existing facilities into wetlands are banned. This demonstration is similar to those established by EPA in the section 404(b)(1) guidelines at 40 CFR 230.10. The importance of these demonstrations is discussed below.

With regard to an owner or operator who wishes to site a new facility or expand an existing facility in wetlands, today's proposal essentially adopts the restrictions on discharges contained in § 230.10 of the guidelines and requires them in the form of prior demonstrations to be made to the State. Failure to make any of the following demonstrations will bar the MSWLF from being sited in a wetlands.

First, the MSWLF owner or operator must consider and evaluate alternative sites outside of wetlands and demonstrate that no environmentally acceptable "practicable alternative" is available. As discussed above, § 230.10(a) of the guidelines provides guidance on the meaning of the term "practicable alternatives." Since a landfill is not a water-dependent activity, the guidelines presume that: (1) Alternatives that do not involve locating MSWLFs in wetlands are available, and (2) such alternatives have a less adverse impact on the aquatic ecosystem. These presumptions make the alternatives analysis a rigorous test for the MSWLF owner or operator to meet.

Second, the MSWLF owner or operator must demonstrate that siting the landfill in the wetland will not cause or contribute to "significant degradation" of the wetlands, as d[illegible] in 40 CFR 230.10(b). Third, the owner or operator must ensure that siting in the wetlands does not violate any provisions of the applicable laws specified in § 230.10(c).

Fourth, the MSWLF owner or operator must demonstrate that, if the MSWLF sited in the wetland after satisfying 40 CFR 230.10 (a), (b), and (c), appropriate and practicable steps have been taken to minimize potential adverse impacts of the MSWLF on the wetlands. These may include careful decisions with respect to the solid waste to be disposed of, any protective technology employed, attention to plant and animal populations, and measures that mitigate unavoidable impacts on wetland values. The guidelines identify a number of possible measures.

Finally, the owner or operator must show that sufficient information is available for making reasonable determinations with respect to these demonstrations; otherwise, the owner or operator cannot make the demonstrations necessary to qualify for the waiver to the ban. This last requirement places the burden for making the required demonstrations squarely on the MSWLF owner or operator.

EPA recognizes the burden that these requirements place on the MSWLF owner or operator who wishes to site a new facility, or expand an existing one, in wetlands. EPA believes, however, that the nation's wetlands are sensitive ecosystems that merit the protection afforded by these requirements. For this reason, the Agency proposes that no new MSWLFs (including internal expansions of existing MSWLFs) should be located in wetlands unless the MSWLFs meet the stringent waiver requirements. Comments are requested on the proposed ban and on the demonstration Criteria for the waiver.

Since the EPA section 404(b)(1) guidelines are prospective in nature, they do not address, or apply to, the question of existing facilities located in wetlands. The issue is whether, and to what extent, the revised Criteria should prohibit or otherwise restrict the operation of existing MSWLFs.

EPA recognizes that requiring existing MSWLFs in wetlands to close would not generally restore the ecological function of the wetland. Further, requiring existing units in wetlands to close would adversely impact waste disposal capacity. EPA estimates that approximately 6 percent of all MSWLFs are in wetlands. This estimate was problems identified with closed sites. EPA specifically is interested in comments on Federal and State strategies that may be used in addressing these closed MSWLFs.

C. Practicable Capability

The Congressional directive to revise the existing Criteria (§ 4010 of RCRA as amended) states that EPA may consider the "practicable capability" of owners and operators of facilities that may receive HHW or SQG waste in determining what these revisions should entail. Congress recognized that the universe of owners and operators of solid waste disposal facilities included many with limited economic and technical capabilities. For example, many MSWLFs are owned and operated by small local governments with limited resources. Development of today's proposal, therefore, included an analysis of how the "practicable capability" of owners and operators should be taken into account when setting appropriate controls for protection of human health and the environment.

The Agency believes that practicable capability encompasses both technical and economic components. The technical component includes both the availability of technology for addressing a particular problem (i.e., technical feasibility), as well as the technical capability of the owner or operator to implement that technology. The economic component refers to the economic resources available to the owner or operator to implement the revised standards.

To assist in characterizing the practicable capability of MSWLFs, EPA collected data on waste disposal, demographics, landfill size, and landfill ownership. These data indicate that most MSWLFs handle relatively small volumes of municipal solid waste (measured in tons per day). EPA estimates that 52 percent of all landfills manage less than 17.5 tons per day (TPD) and account for less than 2 percent of the waste handled by all MSWLFs. However, the largest landfills (2.6 percent of all MSWLFs) handle more than 1,125 TPD and manage 40 percent of all municipal landfill waste.

These data also clearly indicate that most MSWLFs are located in rural areas and these MSWLFs typically serve a limited number of communities relative to landfills located in more urban areas. EPA matched 1982 Census data with geographic location data (longitude and latitude coordinates) to determine whether landfills are located in low- (rural) or high- (urban) density counties. EPA estimates that 69 percent of existing landfills are in counties with population densities of fewer than 100 people per square mile, supporting the conclusion that most landfills are located in "rural" areas. In addition, EPA Facility Survey data (Ref. 36) show that, on average, only 1.8 communities share a landfill at the village or town level, but that at the city level, there are 3.8 communities per landfill.

To address the economic component of practicable capability, EPA assessed the financial capability and current spending practices of municipal governments. EPA assembled financial and demographic data from the "1982 Census of Governments" and the "1983 County and City Data Book." Based on the 1982 Census data, EPA estimates that communities typically spend less than 1 percent of their budgets on solid waste disposal. In comparison with other municipal services, costs at this level represent a very small obligation. For example, as an average percentage of total community expenditures, communities spend 36 percent on education, 5 percent on police protection, and 3 percent on sewage disposal. The 1982 Census data also were used to develop a composite score of nine various financial and economic vitality measures. This score categorizes communities' financial capabilities as weak, average, or strong. EPA used the score to assess the baseline financial condition of governments and the economic impact of various regulatory scenarios. The development and categorization of the composite score and the economic impact analysis is described in detail in Section XI of this preamble and in the draft regulatory impact analysis for today's proposal.

EPA believes that significant disruptions of solid waste management could result unless these technical and economic factors are taken into account where necessary. The Agency, therefore, examined the range of MSWLFs to determine which, if any, might be especially susceptible to technical difficulties or economic hardship. Owners and operators of two classes of MSWLFs were identified as possible candidates for consideration of practicable capability—existing MSWLF units and small MSWLFs.

EPA estimates that there are more than 6,000 MSWLFs currently in operation. Of these existing facilities, about 20 percent are expected to close before 1990 and almost 75 percent are expected to close within 15 years (Ref. 10). EPA evaluated whether requirements should be the same for these facilities as for new MSWLF units.

Regulating new and existing MSWLF units differently allows consideration of practicable capability of the existing MSWLF, although some problems at existing facilities may not be addressed if these units face less stringent requirements. Regulating new and existing units the same way, while conceptually offering greater assurance of protection, could impose very high costs, creating implementation difficulties and posing the prospect of solid waste management disruptions. Comments that EPA received prior to proposal from States, industry groups, and private firms favored different requirements for new and existing units.

Based on these considerations, EPA is proposing today to vary some requirements for new and existing landfill units. These differences fall in three major areas. First, the majority of the location restrictions proposed today would be applicable only to new landfill units (that is, units that have not received wastes prior to the effective date of the rule). EPA believes the application of today's location restrictions to existing units would result in significant disruption of solid waste management in certain areas of the country. However, existing units would be required to comply with the unstable area restrictions (§ 258.15) because the Agency believes these areas pose particular concerns for protection of human health and the environment.

Second, today's proposal does not require that existing units be retrofitted with liners and leachate collection systems. EPA believes that such a requirement would: (1) Exceed the economic capabilities of the majority of owners and operators of existing facilities, (2) present additional public health problems from the excavation of waste, and (3) disrupt existing solid waste management activities.

Third, today's proposal provides a phase-in period of 18 months for all requirements not only to allow States to put in place revised regulations, but also to provide lead time for owners and operators to comply with the new requirements. Furthermore, additional phase-in time is provided for ground-water monitoring due to the resources needed by States and owners and operators to implement this provision. Detailed discussion of the ground-water monitoring provision is provided in Section IX.E of this preamble.

In today's proposal, EPA has not varied requirements for new and existing units in cases where such requirements are equally feasible, technically and economically, at both new and existing landfill units, except existing facilities would have more time to comply with certain requirements. For this universe of facilities, ground-water monitoring may not be necessary for all facilities. While ground-water monitoring could generate substantial data, EPA believes there are more cost-effective ways of establishing a data base for rulemaking. EPA believes that the risks posed by these facilities should be evaluated more closely before taking the significant step of requiring ground-water monitoring at all 28,000 industrial solid waste disposal facilities and construction/demolition waste landfills nationwide. The advantage of a strong information base is offset by the added costs and burden imposed on these facilities for monitoring and the resulting potential for exceeding the practicable capability of marginally profitable operations. Moreover, most States would have difficulty implementing the program due to the extensive resources it would require and the fact that even the basic data (e.g., location) on these facilities are very limited in many States.

Instead, EPA is contemplating a phased approach to data collection. The proposed amendment to Part 257, which is described in more detail in section VIII of this preamble, calls for a notification requirement with a limited amount of exposure information. Once these basic data are compiled and analyzed, the Agency can determine what further information requirements or regulatory controls should be pursued for industrial solid waste disposal facilities and construction/demolition waste landfills.

VIII. Amendments to Part 257

Today's proposal includes amendments to 40 CFR Part 257. These amendments include: (1) Conforming changes to Part 257 that would make it consistent with the proposed Part 258; (2) an update to the MCLs listed in Appendix I of Part 257; and (3) a notification requirement for certain types of facilities.

A. §§ 257.1–2 Conforming Changes to Part 257

Today's proposal adds municipal solid waste landfills to the list of exceptions to the Part 257 Criteria contained in § 257.1(c). Because MSWLFs would be covered by the proposed Part 258 Criteria, they would no longer be subject to the Part 257 Criteria that are generally applicable to solid waste disposal facilities and practices. The Part 257 Criteria would otherwise be unchanged with respect to their applicability, and would remain in full effect for all other facilities and practices.

Today's proposal also would add certain facility definitions to Part 257. Included are definitions of the four types of solid waste disposal facilities that would be regulated by the Part 257 Criteria: Landfills, surface impoundments, land application units, and waste piles. These new definitions would clarify that these types of solid waste disposal facilities are subject to the Part 257 Criteria.

B. §§ 257.3–4 Revisions to Ground-Water Requirements

EPA is proposing to update the MCLs, which are used as ground-water protection criteria in Part 257, to include any MCLs that have been established by EPA since the promulgation of Part 257 in 1979. Currently, Part 257 imposes basic environmental criteria for the protection of human health and the environment. At the time Part 257 was promulgated, the available interim MCLs for the protection of human drinking water were included as ground-water protection criteria. MCLs are developed by EPA under section 1412 of the Safe Drinking Water Act (SDWA), which was amended in 1986. Under the 1986 Amendments to the SDWA, EPA is mandated to promulgate drinking water regulations for a large number of constituents; these regulations generally include MCLs. Accordingly, this notice would *revise the Part 257* regulations to include any new MCLs as ground-water protection criteria (including the MCLs for eight volatile organics that were promulgated on July 8, 1987; see 52 FR 25690). Because the development of MCLs is an ongoing process, EPA is proposing to simply reference the MCL regulations (40 CFR Part 141) directly, rather than update Appendix I, which now includes only the MCLs promulgated prior to 1979. Therefore, today's action proposes to eliminate Appendix I and to incorporate the MCLs by reference to 40 CFR Part 141. Using this approach, the Agency avoids the need to update the Part 257 Criteria every time EPA issues a new MCL. The public would have the opportunity to comment on whether it would be appropriate to use each new MCL as a ground-water protection standard under Part 257.

C. § 257.5 Notification and Exposure Information Requirements

The proposed amendments to Part 257 also include a notification and exposure information requirement for certain solid waste disposal facilities (§ 257.5). As discussed above, under this requirement, EPA intends to obtain notification and exposure information from a set of solid waste disposal facilities of particular concern: Industrial landfills, surface impoundments, land application units, and waste piles, as well as construction/demolition waste land.

As explained earlier, these facilities are of concern to the Agency because they represent a large and diverse set of solid waste disposal facilities, and little information is available on these facilities at either the State or Federal level. In addition, some of these sites may be used for disposal of SQG hazardous waste and may pose unknown risks to human health and the environment. EPA plans to undertake data collection efforts on these facilities to establish the basis for future rulemaking. Today's proposed requirement for notification and exposure information from these facilities is a first major step toward revising the current regulatory program for these facilities.

The information EPA is proposing to require from these facilities consists of two parts: Basic notification information for facility identification purposes and limited exposure information to be used to estimate potential risks posed by these facilities. The notification information is necessary because neither EPA nor the State have adequate information on these facilities to support fully revised Criteria for these facilities at this time. EPA's recent survey of th States clearly indicates the scarcity oi data on industrial solid waste disposal facilities and construction/demolition waste landfills. The proposed notification requirement would provide EPA and the States the mechanism to identify the universe of facilities and, at the same time, indicate to the facilities that they are subject to Subtitle D.

The notification also would request very basic data for determining the potential risks the facilities present to human health and the environment. For example, in addition to seeking general facility information, the proposed notification includes two questions relating to the potential risks posed by the facility: The number of households within one mile of the facility, and the number of on-site monitoring wells. Information submitted in response to these risk-based questions could be used by the States in setting priorities for inspections and other activities. EPA requests comments on whether to include other risk-related questions in the proposed notification, such as questions concerning the use of local waters (ground and surface), the number of local drinking water wells, and the number of municipal water intakes downstream from the facility. In addition, EPA requests comments generally on the appropriate questions impose corrective action. Approximately half of the States and Territories require methane gas monitoring and/or surface water monitoring. While most States and Territories have general guidelines or requirements for facility closure and post-closure maintenance requirements, these requirements vary widely in stringency. Finally, some form of financial assurance for closure and post-closure care is required in about half of the States and Territories.

As can be seen from the above information, there are certain gaps in some State and Territorial regulatory programs, which may result in inadequate protection of human health and the environment in some parts of the country. In some cases, the gaps in State and Territorial programs may be linked both to the inadequate implementation of the existing Federal Criteria by certain States and Territories and to the absence of certain key regulatory provisions in the current Federal Subtitle D Criteria themselves. For example, the current Criteria do not require ground-water monitoring or monitoring for methane releases, so MSWLF owners and operators may choose not to install monitoring devices (if the State or Territory does not specifically require them) and thus may not detect problems before significant problems have occurred. The existing Criteria also do not require corrective measures in the event contamination above levels of concern occurs. Furthermore, MSWLF owners and operators are not required to provide continued protection of human health and the environment through effective closure procedures and post-closure care. Agency experience since 1979 in both the hazardous waste regulatory program and response actions under Superfund has confirmed the importance of such preventive measures for long-term protection of human health and the environment.

C. Need for Revisions to the Part 257 Criteria

The evidence briefly described above indicates that MSWLFs, when improperly designed and operated, may present threats to human health and the environment. The evidence further indicates that the Federal Criteria are missing several key regulatory provisions. These provisions include location restrictions, ground-water monitoring, and corrective action, which all are mandated by HSWA. In addition, current data point to the need for the addition of methane monitoring, closure and post-closure care, and financial assurance requirements. The Agency believes that the available data clearly indicate that the current Federal Criteria have not proved adequate to protect human health and the environment and must be revised to ensure such protection.

These revisions to the Subtitle D Criteria come at a time when heightened concern is directed at issues of solid waste management. This concern derives from State, Territorial, and local government difficulties in ensuring adequate capability for municipal solid waste management as well as public concern regarding potential hazards presented by waste disposal facilities. EPA is aware of the crisis in solid waste management and believes that these proposed Criteria revisions should be a major step toward alleviating public concern with respect to inadequate controls on solid waste disposal. In addition, EPA believes these proposed revisions provide States and Territories with the flexibility needed to address the practicable capacity of the regulated community.

IV. Public Participation in This Rulemaking

Given the number and diversity of MSWLFs and the potentially significant impacts that the revised Criteria may have on them, EPA involved the public and private sector in the rulemaking process. This effort included public meetings and outreach activities aimed at encouraging participation in the process.

Since the spring of 1985, EPA has hosted or participated in a series of public meetings, workshops, conferences, and other activities focusing on issues in the Subtitle D program. In August 1985, EPA sponsored a conference explaining the major provisions of the Hazardous and Solid Waste Amendments of 1984 that affected three key RCRA programs—Subtitle D, small quantity generators, and underground storage tanks. During the conference, EPA held workshops on the following Subtitle D issues: 1) Identification of available information and case studies, 2) ground-water monitoring and protection requirements, 3) closure and post-closure care and financial responsibility requirements, 4) waste restrictions and liquids management requirements, and 5) liner and location requirements. The workshops provided a forum for EPA and the participating State and local governments, public interest groups, industry, and trade associations to exchange information and discuss significant regulatory issues.

On June 27, 1986, EPA hosted a public meeting in Washington, DC, on the issues and options being considered for the revisions to the Subtitle D Criteria. At that time, EPA presented the Agency's initial thinking on the revised Criteria, solicited comments, and responded to questions from representatives of States, local governments, public interest groups, and private organizations.

On November 18 to 20, 1986, EPA held a three-day conference in Arlington, Virginia, on solid waste disposal facilities and HHW collection programs. At this conference, EPA presented interim results of the Subtitle D Study, reported on the status of the Subtitle D Criteria revisions, and discussed issues associated with HHW collection programs. Conference participants also made presentations on State regulatory perspectives and public- and private-sector views.

EPA also sponsored a series of policy discussion meetings in 1986 involving high-level representatives of the principal interest groups affected by the Subtitle D program, including State and local governments, citizen and environmental groups, and industry and trade associations. The broad objective of these meetings, which were coordinated for EPA by the Conservation Foundation, were to examine the effectiveness of the Subtitle D program, identify issues likely to affect implementation of the revised Criteria, and suggest innovative strategies to address problems identified.

V. Scope and Structure of Today's Proposal

The revised Criteria EPA is proposing today vary considerably in scope and content from the current Criteria in Part 257. This section explains the basis for EPA's decisions with respect to the scope and structure of today's proposal.

A. Scope of the Existing Part 257

The existing Part 257 Criteria are applicable to all solid waste disposal facilities and practices regulated under Subtitle D of RCRA. With certain exceptions listed in § 257.1(c), the Criteria apply to all types of facilities (i.e., landfills, surface impoundments, land application units, and waste piles) used for disposal of solid waste, as well as all types of solid wastes (i.e., municipal, industrial, commercial, agricultural, mining, and oil and gas waste) regulated under Subtitle D of RCRA.

Part 257 also applies to the disposal of sewage sludges from POTWs, but the Agency currently is developing specific standards for managing POTW sewage sludge under section 405(d) of the CWA.

order to meet these goals, EPA considered four options for the approach to today's proposal. First, EPA considered uniform design and operating standards for application to all MSWLFs. Second, EPA considered a performance standards approach that defines goals for the design and operation of MSWLFs. The third and fourth options are methodology-based decision frameworks for determining design and operating requirements. In the third option, facility requirements are specified for facilities in various location categories. The fourth option utilizes a risk assessment algorithm to delineate the necessary design and operating controls. These options are not necessarily mutually exclusive: given that this proposal contains many facets, different options could be employed for different parts of the rule (e.g., performance standards for location requirements and a methodological approach to design requirements). However, in general, EPA chose the performance standards approach for today's proposal.

The uniform national design and operating standards option would impose specific design standards and operating requirements on all units regardless of location and other relevant factors. The Agency believes that such an approach would not adequately account for variability across the country. For instance, this approach would require EPA to assume that all facility locations are "poor" and impose comprehensive design standards on all facilities based on what is necessary to protect human health and the environment in the "poorest" of locations. A rule that does not take into account site-specific location characteristics would likely over-regulate MSWLFs in "good" locations; however, a uniform standards approach may be easier to implement and enforce by States because of the specificity of the standard.

The Agency also considered adopting the uniform national standards option with variances, in order to account for site-specific characteristics. Under this option, variances would be granted if the owner or operator could demonstrate that equivalent protection is provided by site-specific location, design, and operating characteristics. This approach parallels the one adopted for hazardous waste facilities under Subtitle C of RCRA, which imposes virtually identical requirements (e.g., double liners and leachate collection systems) at all new hazardous waste landfills. Variances are then allowed, under Subtitle C, based on an adequate demonstration by the owner or operator that the specific standard is not necessary. While variances add some flexibility, EPA has two concerns about this approach. First, variance demonstrations often require substantial resources on the part of the owner and operator and the States. Second, EPA is concerned that public pressure would limit State or local flexibility in granting variances, even though they may be warranted for a specific site. While this option might provide a high assurance of protection of human health and the environment, it could over-regulate some facilities by requiring unnecessary controls. In addition, this approach does not fully take into account the practicable capability of the regulated community.

The second approach considered was to impose overall performance standards for each facility requirement. These performance goals or standards would require site-specific analyses to determine appropriate controls. EPA chose this approach for this rulemaking because it allows the greatest flexibility for the State to consider numerous location-specific factors in tailoring facility requirements. In addition, performance standards are less disruptive of existing State programs and give facilities some needed latitude to meet requirements within the bounds of their practicable capability. Finally, a performance standard, as opposed to a strict design standard, allows for the consideration of innovative technologies that may be developed in the future.

The third approach, a methodological one, was to impose a decision framework based on location categories to determine the applicable requirements for a specific facility. This approach would categorize all locations on the basis of certain characteristics, then set individual requirements for each category. Under this approach, appropriate requirements could be matched to specific categories of locations. Methods of establishing location categories and their corresponding requirements would be specified in the revised Criteria; then States, using information submitted by the owner or operator, could determine the category and apply the associated requirements to a given facility. A key advantage to the categorical rule approach is that it establishes uniform criteria for matching requirements to potential problems. For example, facilities in areas of the country characterized by abundant rainfall could be required to collect generated leachate. Conversely, facilities in the more arid areas of the country do not necessarily generate leachate in quantities sufficient to warrant leachate control systems, and could be regul accordingly.

The Agency believes this categorical requirements approach would provide protection without over-regulation; however, a complex, sophisticated scheme would be necessary to address every location consideration and to match appropriate requirements. Furthermore, it would be difficult to develop a technically defensible approach for all requirements for MSWLFs, particularly those requirements that necessitate site-specific analyses (e.g., ground-water monitoring). In addition, this approach would restrict State flexibility because it would specify which designs are necessary for each location.

The fourth option, also a methodological approach, is based on a risk assessment algorithm. This approach would require the use of a predictive equation to determine the necessary facility requirements. The predictive equation would include some simplifying assumptions, but would utilize site-specific values for some of the parameters. Like the categorical approach, this option has the advantages of employing a uniform national standards approach that co' be easy to implement; however, it wc be difficult to develop a technically sound risk algorithm and could restrict State flexibility.

EPA intends to provide guidance on how to design MSWLFs to meet the proposed performance standards. The agency believes the categorical approach is one viable method for determining landfill design, and is considering developing this method as guidance along with the risk algorithm method. Both of these approaches to design requirements are discussed in more detail in section IX.D of this preamble. The Agency requests comments on the approach proposed today and on the alternatives presented.

VII. Major Issues

A. Ground-Water Resource Value

Resource value refers to the current and future importance of ground water as a water supply and as an ecological resource. Highly saline ground water or ground water with very low yield may have a low resource value. Pristine ground water or ground water in high demand that cannot easily be replaced or restored similarly may have a high resource value. As EPA was developin the framework for the revised Criteria, the Agency considered at length the addition, § 257.3-6 requires pathogen reduction processes for sewage sludges and septic tank pumpings applied to land.

The air criterion in § 257.3-7 prohibits open burning of solid waste (with certain exceptions) and specifies that the applicable requirements of the State Implementation Plans developed under section 110 of the Clean Air Act must be met. Finally, the safety provisions of § 257.3-8 require control of explosive gases, fires, bird hazards to aircraft, and public access to the facility.

Currently, EPA does not have the authority to enforce these existing Part 257 Criteria directly, except in situations involving the disposal or handling of POTW sludge. Federal enforcement of POTW sludge handling facilities is authorized under the CWA. The existing Criteria, as they apply to non-sludge-handling facilities, are enforced by the States through State regulatory programs or by citizens through the citizen suit provisions of section 7002 of RCRA.

B. Hazardous and Solid Waste Amendments of 1984

In 1984, Congress made significant modifications to Subtitle D of RCRA through the Hazardous and Solid Waste Amendments. As described below, the major modifications to Subtitle D include requirements that EPA complete a Subtitle D study and revise the Part 257 Criteria, and that States implement revised permitting programs.

1. Subtitle D Study and Report to Congress

HSWA added a new section 4010 to RCRA, which requires EPA to "conduct a study of the extent to which the guidelines and Criteria under this Act (other than guidelines and Criteria for facilities to which Subtitle C applies) which are applicable to solid waste management and disposal facilities * * * are adequate to protect human health and the environment from ground water contamination." This study is to include a detailed assessment of the adequacy of the Criteria regarding monitoring, prevention of contamination, and remedial action for protecting ground water and also is to identify "recommendation with respect to any additional enforcement authorities which the Administrator, in consultation with the Attorney General, deems necessary." EPA anticipates submitting a Report to Congress on the results of the study shortly.

2. Criteria Revisions

Section 4010 also required EPA to revise the Subtitle D Criteria by March 31, 1988, for facilities that may receive household hazardous waste or hazardous waste from small quantity generators. These revisions must be those necessary to protect human health and the environment, but, at a minimum, should require ground-water monitoring as necessary to detect contamination, establish location standards for new or existing facilities, and provide for corrective action, as appropriate. Section 4010 further states that EPA may take into account the "practicable capability" of facilities to implement the Criteria. Today's proposal represents the first phase of the Agency's promulgation of these mandated revisions.

3. Implementation and Enforcement

HSWA amended section 4005 of RCRA to require States to establish by November 8, 1987, a permit program or other system of prior approval to ensure that facilities that receive HHW or SQG hazardous waste are in compliance with the existing Part 257 Criteria. Within 18 months of promulgation of revised Criteria, each State must modify its permit program to ensure compliance with the revised Criteria. If the Administrator determines that a State has not adopted an adequate permit program, EPA may enforce the revised Criteria at facilities that may receive HHW or SQG waste.

C. Current Sewage Sludge Criteria

The existing Part 257 Criteria discussed above were co-promulgated under the joint authority of RCRA and section 405(d) of the CWA. The Part 257 regulations thus apply to all sludge land disposal practices, except distributing and marketing sludge. Because these regulations apply to sewage sludge, they are directly enforceable by EPA against any person found to be in violation of them.

In February 1987, Congress enacted the Water Quality Act of 1987, which amended portions of the CWA, including section 405. First, Congress expanded section 405(d) to impose new standard-setting requirements with associated deadlines. Second, Congress established new sludge permitting requirements in section 405(f) along with State program requirements. EPA currently is developing sludge regulations to be proposed under section 405(d) and published in 40 CFR Part 503. In addition, EPA already has published a proposed regulation in 40 CFR Part 501 that would implement the requirements of section 405(f) (53 FR 7642, March 9, 1988). The comment period for these latter regulations closed on May 9, 1988.

The Part 503 regulations, when promulgated, will address the incineration, ocean disposal, land application, and distribution and marketing of sludge. Lastly, and most relevant here, they also will regulate sludge monofills, which are landfills in which only sewage sludge is disposed of (i.e., no other type of solid waste is co-disposed of with the sewage sludge). Those regulations will not, however, contain regulations for the co-disposal of sewage sludge with household wastes. Regulations for the co-disposal of sewage sludge and household wastes, rather, are part of today's proposal. By this action, the Agency seeks to achieve consistency in its regulation under two legal authorities of a single disposal practice—the co-disposal of sewage sludge and other solid wastes in municipal solid waste landfills.

III. Nature and Scope of the Problem

To fulfill its responsibilities under HSWA, EPA has conducted a series of studies and analyses of solid waste characteristics, waste disposal practices, and environmental and public health impacts resulting from solid waste disposal. Preliminary results of these studies were summarized in the "Subtitle D Study Phase I Report," issued in October 1986 (Ref. 34). Final results, which form the basis for Agency decision making for this rule, are incorporated in EPA's Subtitle D report to Congress, which is expected to be issued shortly. The key studies pertinent to today's proposal are summarized below. Copies of the reports mentioned below are available for public review in the docket for this rulemaking.

A. EPA Studies of Solid Waste Management

1. Analysis of Solid Waste Characteristics

To analyze the characteristics of solid waste, EPA conducted numerous studies to determine the volume, characteristics, and management methods of wastes regulated under Subtitle D. These studies revealed that more than 11 billion tons of solid waste are generated each year, including 7.6 billion tons of industrial nonhazardous waste (which includes about 55.8 million tons of electric utility wastes), 2 to 3 billion tons of oil and gas waste (including both drilling wastes and produced wastes), more than 1.4 billion tons of mining waste, and nearly 160 million tons of municipal solid waste.

Several Subtitle D wastes currently are being addressed under separate Agency efforts and thus were not small (less than 10 acres) and 52 percent dispose of small amounts of waste (less than 17.5 tons per day); only 15 percent are designed with liners (natural or synthetic) and only 5 percent have leachate collection systems. Current data also indicate that only 25 to 30 percent of MSWLFs have some type of ground-water monitoring system. Results from the 1986 MSWLF survey generally are consistent with these results.

3. Assessment of Impacts

Impacts associated with MSWLFs and industrial Subtitle D facilities are described below. Existing data indicate that some MSWLFs are adversely affecting the environment and could harm human health. Industrial solid waste facilities need to be examined more closely to determine [illegible] impacts.

a. Municipal Solid Waste Landfills. State inspection data, case study evidence, risk characterization studies, waste and leachate characteristics, and the current limited use of design controls indicate that some MSWLFs have degraded the environment and that this degradation could continue. Older landfills are of most concern because they may have received large volumes of hazardous waste and, in general, their use of design controls was very limited; however, existing data are not sufficient to conclusively demonstrate that MSWLFs currently are harming human health, other than data indicating acute impacts associated with methane releases. Current human health impacts from past exposure to contaminant releases from MSWLFs are difficult to isolate due to the complex interaction of factors that affect human health. However, the Agency's recently completed risk assessments indicate that MSWLFs present future potential risks to human health.

More than 500 MSWLFs, or about 25 percent of MSWLFs with ground-water monitoring systems, were reported by States to be violating a State ground-water protection standard, although the nature and extent of these violations are unknown. In some States, any detectable degradation of the ground water is considered a violation. Most facilities do not monitor for organic hazardous constituents in ground water, so these violations represent analyses for a limited set of pollutants. States also reported that 845 MSWLFs were cited for air-related violations (many of which are likely to be odor-related incidents), and 660 MSWLFs were cited for surface water contamination. Some of these violations may have been reported at sites established before existing State and Federal regulations were in place.

EPA has summarized case study information documenting ground-water and surface water contamination incidents (Ref. 7). Evaluation of 163 MSWLF case studies revealed ground-water contamination at 146 facilities and surface water contamination at 73 facilities. For most of these landfills, information on the waste received either was not available or was incomplete, although a limited number are known to have received hazardous waste before the Subtitle C regulations were issued. At about 50% of the facilities with ground-water contamination, specific contaminants were identified. The most common constituents were iron, chloride, manganese, trichloroethylene, benzene, and toluene. At several sites, drinking water sources were contaminated. Ground-water contaminant plumes characterized at three of the sites extended to (or nearly to) the base of an aquifer at depths of approximately 70 feet (at two sites) and 300 feet (at one site).

The plume from one site migrated one-half mile downgradient of the landfill, while the plume at another site migrated almost one and one-half miles downgradient.

Typically, those facilities causing ground-water contamination were more than 10 years older than facilities reporting no impacts. Ground-water impacts appeared to be more severe in locations characterized by high net infiltration rates and high ground-water flow rates. Most facilities that had contaminated ground water were located close to the ground-water table, underlain by highly permeable soils, or had no or very limited engineering controls. The case study information identifies several factors that may be related to failure at a particular facility, specifically the landfill's age, location, and engineering design; however, it is unknown whether this sample is representative of the universe of MSWLFs, and it is not possible to isolate the specific factors responsible for each failure.

Analysis of damage cases involving methane indicates that methane must be controlled to protect human health. Methane is produced in MSWLFs through anaerobic decomposition of organic waste and is explosive at sufficiently high concentrations (the lower explosive limit). Existing Federal regulations require that the concentration of explosive gases should not exceed 25 percent of the lower explosive limit in facility structures and should not exceed the lower explosive limit at the facility boundary. Methane is produced in such abundance that methane collection projects are in at approximately 100 landfills for the primary purpose of resource recovery and energy production. Where methane is not controlled, fires and explosions have occurred. In 23 of 29 damage cases studied, methane has been measured in concentrations above the lower explosive limit at distances up to 1,000 feet off site. Explosions and fires, both on site and off site, have occurred in 20 of the 29 cases, loss of life has been documented in five instances, and injuries have been reported in several others. Most of these sites where injuries or death occurred did not have a landfill gas control system.

EPA also examined the characteristics of landfills on the Superfund National Priorities List (NPL) in May 1986 (Ref. 28). Of the 850 sites listed or proposed for listing on the NPL (in May 1986), 184 sites (22 percent) were identified as MSWLFs. In addition, of the 27,000 sites in the Superfund data base, almost one fourth are MSWLFs. In general, the MSWLFs on the NPL were poorly located and designed. Because most of the NPL sites were in operation before 1980 (the effective date of EPA's hazardous waste rules) and may have *received hazardous wastes in additi[on]* to Subtitle D wastes, they are not representative of newer, better designed and operated MSWLFs; however, these sites indicate the extent to which older and poorly located, designed, and managed landfills can harm the environment. Current data indicate that 70 percent of existing MSWLFs were in operation prior to 1980.

The State data, case study information, and NPL study were supplemented by a risk assessment of MSWLFs (Ref. 10). The risk assessment was completed using the Subtitle D Risk Model, which was developed to evaluate the risks and resource damage associated with ground-water contamination at MSWLFs and to identify the factors that affect the nature, extent, and severity of environmental impacts from these facilities. The model simulates pollutant release, fate, and transport; exposure; impacts; and corrective action. The model is described in more detail in Section XI of this preamble.

Caveats to the risk and resource damage analysis results presented in the risk assessment need to be recognized. First, the risk and resource damage modeling includes considerable uncertainty. The model components that introduce the most uncertainty are those that predict leachate quality for trace

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Part III

Environmental Protection Agency

40 CFR Parts 257 and 258
Solid Waste Disposal Facility Criteria;
Proposed Rule

For information on specific aspects of this proposed rule, contact either Allen Geswein or Paul Cassidy, Office of Solid Waste (OS-323), U.S. Environmental Protection Agency, 401 M Street, SW., Washington, DC 20460, (202) 382-4659 or 382-3348.

SUPPLEMENTARY INFORMATION:

Copies of the following Subtitle D Criteria background documents are available for purchase through the National Technical Information Service (NTIS), U.S. Department of Commerce, 5285 Port Royal Road, Springfield, Virginia 22161, (703) 487-4650. EPA and NTIS numbers and NTIS prices are listed below. Documents cannot be obtained directly from EPA.

(1) U.S. EPA. Office of Solid Waste (OSW). Notification Requirements for Industrial Solid Waste Disposal Facilities—Criteria for Classification of Solid Waste Disposal Facilities and Practices (40 CFR Part 257)—Subtitle D of the Resource Conservation and Recovery Act (RCRA). August 1988 (draft). EPA/530-SW-88-044, PB88-242 508, $12.95.

(2) U.S. EPA. OSW. Location Restrictions (Subpart B)—Criteria for Municipal Solid Waste Landfills (40 CFR Part 258)—Subtitle D of the Resource Conservation and Recovery Act (RCRA). July 1988 (draft). EPA/530-SW-88-036, PB88-242 425, $19.95.

(3) U.S. EPA. OSW. Operating Criteria (Subpart C)—Criteria for Municipal Solid Waste Landfills (40 CFR Part 258)—Subtitle D of the Resource Conservation and Recovery Act (RCRA). July 1988 (draft). EPA/530-SW-88-037, PB88-242 433, $19.95.

(4) U.S. EPA. OSW. Closure/Post-Closure Care and Financial Responsibility Requirements (Subpart C, §§ 258.30-258.32)—Criteria for Municipal Solid Waste Landfills (40 CFR Part 258)—Subtitle D of the Resource Conservation and Recovery Act (RCRA). July 1988 (draft). EPA/530-SW-88-041, PB88-242 474, $19.95.

(5) U.S. EPA. OSW. Design Criteria (Subpart D)—Criteria for Municipal Solid Waste Landfills (40 CFR Part 258)—Subtitle D of the Resource Conservation and Recovery Act (RCRA). July 1988 (draft). EPA/530-SW-88-042, PB88-242 482, $19.95.

(6) U.S. EPA. OSW. Ground-Water Monitoring and Corrective Action (Subpart E)—Criteria for Municipal Solid Waste Landfills (40 CFR Part 258)—Subtitle D of the Resource Conservation and Recovery Act (RCRA). July 1988 (draft). EPA/530-SW-88-043, PB88-242 490, $19.95.

(7) U.S. EPA. OSW. Case Studies on Ground-Water and Surface Water Contamination from Municipal Solid Waste Landfills—Criteria for Municipal Solid Waste Landfills (40 CFR Part 258)—Subtitle D of the Resource Conservation and Recovery Act (RCRA). July 1988 (draft). EPA/530-SW-88-040, PB88-242 466, $14.95.

(8) U.S. EPA. OSW. Summary of Data on Municipal Solid Waste Landfill Leachate Characteristics—Criteria for Municipal Solid Waste Landfills (40 CFR Part 258)—Subtitle D of the Resource Conservation and Recovery Act (RCRA). July 1988 (draft). EPA/530-SW-88-038, PB88-242 441, $19.95.

(9) U.S. EPA. OSW. Updated Review of Selected Provisions of State Solid Waste Regulations—Criteria for Municipal Solid Waste Landfills (40 CFR Part 258)—Subtitle D of the Resource Conservation and Recovery Act (RCRA). July 1988 (draft). EPA/530-SW-88-039, PB88-242 458, $14.95.

(10) U.S. EPA. OSW. Regulatory Impact Analysis (RIA) of Proposed Revisions to Subtitle D Criteria for Municipal Solid Waste Landfills—Criteria for Municipal Solid Waste Landfills (40 CFR Part 258)—Subtitle D of the Resource Conservation and Recovery Act (RCRA). July 1988 (draft). EPA/530-SW-88-045, PB88-242 516, $25.95.

All documents can be microfiched for $6.95.

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X. Effective Date, Implementation, and Enforcement of the Revised Criteria
A. Effective Date of the Revised Criteria
1. Eighteen-month Period
2. Two-stage Approach
B. Review of State Permit Programs
C. Enforcement of the Revised Criteria
1. Citizen Suits
2. Federal Enforcement
D. Other Implementation Issues
1. Implementation Strategy
2. Co-disposal of Sewage Sludge
XI. Regulatory Requirements
A. Executive Order No. 12291
1. Purpose
2. Regulatory Alternatives
3. Cost Analysis
4. Economic Impact Analysis
5. Risk Assessment
B. Regulatory Flexibility Act
1. Methodology
2. Results

APPENDIX F

PROPOSED EPA LANDFILL REGULATIONS

(0063t)
updated: 9/90

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BACKGROUND

Existing Criteria

Congressional Mandate

EXISTING CRITERIA

Issued in September 1979

Apply to all solid waste disposal facilities

General Environmental Performance Standards

- Floodplains
- Endangered Species
- Surface Water
- Ground Water
- Land used for Food-Chain Crops Production
- Disease
- Air
- Safety

MANDATE:

iAZARDOUS AND SOLID WASTE AMENDMENTS OF 1984 (HSWA)

PA must REVISE EXISTING CRITERIA for acilities that receive household or small uantity generator hazardous waste

At minimum, revisions must include:

- Location criteria
- Ground-water monitoring
- Corrective action, as appropriate

Consider "practicable capability" of facilities

States must:

- ESTABLISH PERMIT PROGRAM for existing Criteria by November 1987
- ESTABLISH REVISED PERMIT PROGRAM within 18 months after revised Criteria are final

SCOPE OF PROPOSAL

- Establishes new Criteria (Part 258) for Municipal Solid Waste Landfills (MSWLFs)
- Establishes notification requirement for Industrial Solid Waste Disposal Facilities and Construction/Demolition Waste Landfills

CRITERIA FOR MSWLFS (PART 258)

APPLICABILITY

- Applies to new and existing MSWLFs (i.e., any landfill that receives household waste)
- Includes MSWLFs that receive sewage sludge or municipal waste combustion ash
- Does not apply to closed MSWLFs

GENERAL APPROACH

ormance Standards

- otective of HHE
- ows site-specific characteristics to be considered
- ovides flexibility to States
- ows for innovative technologies
- orporates "practicable capability"

INE OF PROPOSED RULE

ATION RESTRICTIONS
RATING CRITERIA
GN CRITERIA
UND-WATER MONITORING
RECTIVE ACTION
SURE AND POST-CLOSURE CARE
NCIAL ASSURANCE

ICATION RESTRICTIONS

imity to Airports
dplains
lands
t Areas
nic Impact Zones
able Areas

PROXIMITY TO AIRPORTS

- uires new and existing MSWLF units to ent bird hazards to aircraft
- 000 feet from airports handling turbojets d 5,000 feet from airports handling piston-e aircraft
- e as existing Part 257 Criteria

FLOODPLAINS

- and existing MSWLF units located in 100- floodplain must not:
  - strict flow of base-flood,
  - duce temporary water storage capacity of odplain, and
  - sult in washout of wastes
- e as existing Part 257 Criteria

WETLANDS

- Prohibits new MSWLF units in wetlands unless:
  - There is no practicable alternative,
  - State and Federal standards are met,
  - Endangered species are not jeopardized,
  - Marine sanctuaries are protected,
  - Significant degradation of wetlands will not occur,
  - Adverse impacts on wetlands are minimized, and
  - Information is available to make decision.
- New Requirement

FAULT AREAS

- Prohibits location of new MSWLF units within 60 meters (200 feet) of Holocene Fault
- New Requirement

CORRECTIVE ACTION PROGRAM IMPLEMENTATION

- Requires clean-up to be initiated when GWPS is exceeded
- Owner or operator must:
  - Establish corrective action ground-water monitoring program,
  - Implement selected remedy,
  - Notify affected property owners, and
  - Take interim measures specified by State
- State determines when remedy complete

CLOSURE CRITERIA

- Requires closure in a manner that:
  - Minimizes post-closure release of leachate and explosive gases
  - Minimizes need for further maintenance, and
  - Ensures protection of HHE

CLOSURE PLAN

- Closure plan must include:
  - Description of closure activities,
  - Description of final cover,
  - Schedule for completing closure, and
  - Other information needed for financial assurance

CLOSURE ACTIVITIES

- Closure must begin within 30 days of final receipt of waste; extensions may be granted
- Closure must be completed in accordance with closure plan
- A notation must be placed in the deed

POST-CLOSURE CARE REQUIREMENTS

- Requires two phase post-closure care period
- First phase must last at least 30 years and must include:
  - Maintenance of the final cover and containment systems,
  - Leachate collection,
  - Ground-water monitoring, and
  - Gas monitoring
- Second phase begins after initial 30 years
- Second phase must include ground-water monitoring and gas monitoring
- State establishes length of second phase

POST-CLOSURE CARE PLAN

- Post-closure care plan includes:
  - Description of the monitoring and maintenance activities,
  - Name of a contact person, and
  - Description of any post-closure uses of the property

FINANCIAL ASSURANCE

- Applies to all entities, except States and the Federal Government
- Requesting comment on:
  - Special tests for local governments, and
  - Approach to Indian Tribes
- Requires demonstration of financial assurance for:
  - Closure
  - Post-closure care, and
  - Corrective action for known releases
- Level of financial assurance is site-specific

FINANCIAL ASSURANCE MECHANISMS

- Mechanisms specified by State
- Mechanisms must:
  - Ensure sufficient funds are available,
  - Ensure continuous coverage, and
  - Be legally valid, binding, and enforceable
- Requesting comment on a financial test for local governments
- Financial test would consider
  - Definition of local government
  - Fiscal measures
  - Institutional factors

MAJOR CHANGES TO EXISTING CRITER (PART 257) FOR OTHER SOLID WASTE DISPOSAL FACILITIES

Notification Requirement

- Requires notification by Industrial Solid Wast Disposal Facilities including:
  - Landfills,
  - Surface Impoundments,
  - Land Application Units,
  - Waste Piles, and
  - Construction/Demolition Waste Landfills
- Form to be submitted to State and EPA within months of promulgation date of rule
- One-time requirement, not applicable to facili that open after the effective date of rule
- Required information includes:
  - Number and type of units
  - Waste types
  - Total annual amount of waste disposed
  - Number of households within one mile
  - Number of wells

GROUND-WATER STANDARDS (PART 257)

- Applies to all solid waste disposal facilities except MSWLFs
- Updates ground-water standards, i.e., Maximum Contaminant Levels (MCLs)

IMPLEMENTATION

- Revised Criteria to be implemented by State Solid Waste Programs
- EPA is developing strategy to determine actions necessary for implementing programs

ENFORCEMENT

- Revised criteria can be enforced by:
  - States that have adopted the revised Criteria,
  - Through Citizen Suits, or
  - By EPA in States that have not adopted an adequate program

SCHEDULE

- Anticipate Final Rule - Late 1989
- Anticipated Effective Date - Mid 1991 (18 mo- after promulgation date)

COMMENT PERIOD

- Comment period ends November 30, 1988
- Submit comments to:

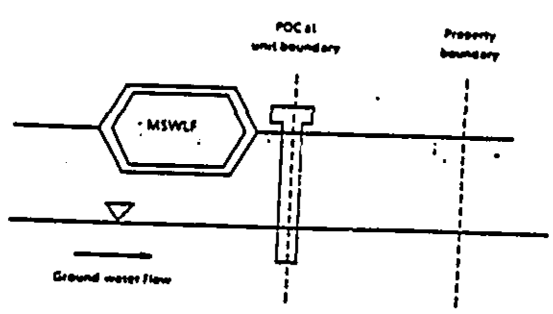
  RCRA Docket Information Center
  OS-305
  U.S. Environmental Protection Agency
  401 M. Street, S.W.
  Washington, D.C. 20460

- Reference Docket #F-88-CMLP-FFFFF

- Requires records to be kept of:
  - Ground-water monitoring,
  - Gas monitoring results,
  - Procedures for excluding hazardous waste, and
  - Closure and post-closure plans.
- State specifies reporting format
- New requirement

DESIGN CRITERIA FOR NEW MSWLF UNITS

- States establish design goal within a carcinogenic risk range of $1x10^{-4}$ to $1x10^{-7}$
- Requires liners, LCSs, and final covers as necessary to meet design goal at a specified Point of Compliance (POC)
- POC must be:
  - Waste management unit boundary, or
  - Alternative boundary not exceeding 150 meters from unit boundary and on property of owner/operator



DESIGN CRITERIA FOR EXISTING MSWLF UNITS

- Requires installation of final cover that prevents infiltration after closure
- Does not require retrofitting with liners and LCSs

GROUND-WATER MONITORING

- Requires monitoring of ground water to de· releases and to determine if corrective actio necessary
- New MSWLF units must comply prior to acce wastes
- Existing MSWLF units must comply in accord with State established schedule

GROUND-WATER MONITORING SYSTEMS

- Requires grou d-water monitoring system
  - Be approved by State,
  - Be installed at unit boundary or alternati· boundary,
  - Yield representative samples of the uppe aquifer,
  - Have well casings, and
  - Perform throughout the life of the monitc program

- Phase II is initiated when Phase I indicates possible release
- Requires monitoring for all hazardous constituents in Appendix II
- Corrective action program is initiated if Appendix II constituents exceed "trigger le

TRIGGER LEVELS

- State must establish "trigger levels" before Phase I Monitoring
- "Trigger levels" must be established for all Appendix II constituents
- "Trigger levels" are health-based levels, including:
  - MCLs
  - Where MCLs are not available; State selected health-based limits
  - Where health-based limits are not available; background levels

CORRECTIVE ACTION PROGRAI

- Assessment of corrective measures
- Selection of remedy and ground-water protection standard (GWPS)
- Implementation of corrective action pro

GROUND-WATER MONITORING PROGRAM

- Requires monitoring to be conducted in two phases:
  - Phase I: To detect changes in ground-water chemistry
  - Phase II: To identify hazardous constituents (HC) released and monitor HC detected

ASSESSMENT OF CORRECTIVE MEASURES

- Requires assessment when Appendix II constit exceed pre-established "trigger levels"
- Scope of assessment established by State

PHASE I MONITORING

- Limited number of parameters
- Minimum semiannual frequency

REMEDY SELECTION

- State must select remedy which:
  - Is protective of HHE
  - Attains GWPS
  - Controls source of release, and
  - Properly manages wastes that are generate
- State must consider:
  - Long-term and short-term effects
  - Source control
  - Ease of implementation
  - Practicable capability, and
  - Community concerns
- State must establish:
  - Schedule
  - GWPS for appropriate Appendix II constituent
  - Extent of clean-up, and
  - Compliance demonstration period

- Requires new MSWLF units located in "Seismic Impact Zones" to be designed to withstand ground motion due to earthquakes
- New requirement

UNSTABLE AREAS

- Requires new and existing MSWLF units to be designed to maintain structural stability of the unit
- Unstable areas include:
  - Subsidence-prone areas
  - Landslide susceptible areas
  - Areas of weak and unstable soils
  - Karst terrains
- Existing units must close over time
- New requirement

OPERATING CRITERIA

- Procedures for excluding hazardous waste
- Daily cover
- Disease vector control
- Explosive gases
- Air criteria
- Access control
- *Run-on and run-off control*
- Surface water requirements
- Liquids management
- Recordkeeping

PROCEDURES FOR EXCLUDING HAZARDOUS WASTE

- Requires a program to detect the receipt of regulated quantities of hazardous waste:
  - Random inspection of incoming loads,
  - Inspection of suspicious loads,
  - Recordkeeping,
  - Training, and
  - Procedures to notify authorities
- New requirement

- Requires cover at the end of each operating d or more frequently to control:
  - Disease vectors,
  - Fires,
  - Odors,
  - Blowing litter, and
  - Scavenging
- Allows temporary waivers for extreme seasor climatic conditions
- Modifies existing Part 257 Criteria

DISEASE VECTORS

- Requires other measures as necessary to contr disease vectors
- Same as existing Part 257 Criteria

EXPLOSIVE GASES

- Requires that explosive gases do not exceed 25% LEL in on-site structures or LEL at property boundary
- Requires routine monitoring
- Requires remedial measures when performance standard is exceeded

AIR CRITERIA

- Bans open burning
- Allows infrequent burning of specific wastes
- Requires compliance with State Implementatior Plans
- Same as existing Part 257 Criteria

ACCESS CONTROL

- Requires access control to:
  - Protect human health and environment,
  - Prevent unauthorized vehicular traffic, and
  - Prevent illegal dumping of waste
- New requirement

RUN-ON/RUN-OFF CONTROLS

- Requires that run-on onto active portion of uni during peak discharge from 25-year storm be prevented
- Requires collection and control of run-off from active portion of unit resulting from a 24-hour, 25-year storm
- New requirement

SURFACE WATER REQUIREMENTS

- Prohibits discharges to surface waters in violation of the CWA including:
  - Non-point sources discharges (Section 208), ar
  - Point source discharges (Section 402).
- Same as existing Part 257 Criteria

LIQUIDS RESTRICTIONS

- Prohibits disposal of:
  - Bulk or non-containerized liquids, and
  - Containerized liquids
- Allows leachate and gas condensate recirculatic if MSWLF equipped with composite liner and leachate collection system (LCS)
- New requirement