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Office of Environmental Quality Control
Office of the Governor
550 Halekauwila Street
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Honolulu, Hawaii 96813

Revised

ENVIRONMENTAL IMPACT STATEMENT
LEEWARD SANITARY LANDFILL

CITY AND COUNTY OF HONOLULU

DEPARTMENT OF PUBLIC WORKS

REVISED

ENVIRONMENTAL IMPACT STATEMENT

FOR

THE PROPOSED

LEEWARD SANITARY LANDFILL

(LEEWARD DISTRICT SANITARY LANDFILL PROJECT)

KALOI	TMK	9-02,03 & 04
MAKAIWA	TMK	9-2-03
NANAKULI	TMK	8-7-9: 1 & 3
		8-7-21: 26

OAHU, HAWAII

This environmental document is submitted pursuant to Chapter 343, HRS

Accepting Authority: Mayor
City and County of Honolulu

Responsible Official: Wallace Miyahira 4/18/78

Wallace Miyahira
Director & Chief Engineer

Date

Prepared for: Stanley S. Shimabukuro and Associates, Inc.

By: Environment Impact Study Corporation

APRIL 1978

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SUMMARY

NAME OF ACTION:	(X) ADMINISTRATIVE ( ) LEGISLATIVE
PROPOSING AGENCY:	DEPARTMENT OF PUBLIC WORKS
PROPOSED PROJECT:	LEEWARD SANITARY LANDFILL
PROJECT LOCATION:	KALOI TMK 9-02,03 & 04 MAKAIWA TMK 9-2-03 NANAKULI TMK 8-7-9: 1 & 3 8-7-21: 26 OAHU, HAWAII
ACCEPTING AUTHORITY:	MAYOR, CITY & COUNTY OF HONOLULU

1. PROPOSED ACTION

The City and County of Honolulu has a serious waste disposal problem. The Kapalama and Kewalo incinerators did not meet Federal and State air quality requirements and were permanently shut down in October, 1977. To renovate these incinerators to meet the standards would have been financially prohibitive. The City's major landfill at Kapaa will be filled up in about 4 months and the smaller existing Waianae and Kawailoa sanitary landfills will reach their capacities in less than three years at the present rates of disposal. To meet the City's needs for solid waste disposal, the City plans to implement major landfills, one each on the windward and the leeward sides of the island. The proposed action is to provide a major sanitary landfill to accommodate solid waste generated primarily in the Honolulu and leeward districts of Oahu. The three leading prospective sites which have been evaluated are at Makaiwa Gulch, Nanakuli, and Kaloi Gulch. Descriptions of the sites, the proposed action and anticipated impacts from the proposed project at each of these sites are presented.

After careful evaluation of the technical, economic and environmental data developed for the alternative sites, the Makaiwa Gulch site was selected for landfill implementation. In making the selection, consideration was also given to the public input received during the consultation and review phases in processing the environmental impact statement and at the public informational meeting conducted by the Department of Public Works on December 7, 1977.

2. SOLID WASTE MANAGEMENT PLAN

The City and County of Honolulu's Solid Waste Management Plan (1971) presented basic planning data and recommendations for solid waste management for the island of Oahu. These recommendations were adopted and are still in force today. Four basic management systems for Oahu were presented in this document:

* System A developed around incineration in the downtown area
* System B developed around incineration in outlying areas
* System C developed around maximum usage of landfills
* System D developed around complete recovery for reuse of materials

Systems A and B were not recommended because of citizen opposition to incinerators, to air pollution considerations and to the incompatibility of such systems with a resource recovery program. System D is the most desirable plan, but until recovery systems prove to be technically and economically feasible, this plan is extremely costly. Until resource recovery becomes more feasible, System C would be a logical and flexible waste management system which would accommodate existing refuse disposal needs as well as allow for future waste recovery programs. Although the City is seriously pursuing resource recovery, present estimates indicate that an island-wide resource recovery system cannot be in operation earlier than 1981. At that time, landfills will still be required for the disposal of all non-recoverable materials, which will be approximately 40-50 percent of all waste by weight.

3. ENVIRONMENTAL IMPACT

During construction and operation of the landfill dust and noise will be generated. Dust will be controlled by maintaining a water sprinkling schedule. Maintaining all proper landfill procedures, including gas venting (if required) and proper amounts of cover soil will alleviate potential fires, litter, odor and vectors.

Leachate is not expected to be a problem and, except for Kaloi Gulch, a control system will not be required. However, to confirm our expectations, a leachate monitoring program will be instituted. The Kaloi site is the only site with a potable aquifer beneath it. The development of this site will require an impermeable membrane to be laid down and the construction of a leachate collection system to assure protection of the aquifer.

Air quality at the Makaiwa site, as well as the Kaloi site, should not be a problem since the prevailing winds should sweep any dust generated or any gases produced by the landfill in a direction that should bypass Honokai Hale and Makakilo. Nanakuli is in a sheltered area so gases produced by the landfill will not dissipate quite as readily as the other two sites. With water sprinkling schedules to control dust and gas venting systems if needed, air quality should not be adversely impacted by the proposed project.

Visual impact will be lessened by the construction of a landscaped buffer zone and earth berms to screen off landfill operations. This will also aid in lessening the impact of noise.

4. ALTERNATIVES

Alternatives can be summarized as no action, alternative landfill sites and alternative methods of disposal. If the proposed project is not implemented, refuse disposal for the leeward area will be severely impacted. Refuse from the service area must be disposed of at the existing Waianae and Kawailoa Sanitary landfills, which will shorten the lives of these facilities. Also, refuse hauled over a long distance to another site will increase transport and labor costs. Portions of the solid waste collected by the City may have to be disposed of at privately owned Palailai Landfill. The City must pay tipping fees to use the Palailai Landfill.

In an inventory study of potential landfill sites conducted by a consultant (Shimabukuro and Associates, 1977), several alternative sites in the leeward area were investigated for their landfill potential according to the following: a) refuse hauling distance, b) landfill capacity, c) available utilities for the site, infrastructure and access, d) available cover material, e) compatible existing and proposed land uses of the site and surrounding areas, f) displacement of families or businesses, g) site acquisition, development and operation costs, h) environmental compatibility of site according

to climatology, geology, drainage and hydrology, i) social and cultural compatibility of site according to surrounding land uses, affect on sites of archaeological or historical significance, j) visual intrusion, and k) acceptability by landowner, adjacent landowners and the community.

The optimum landfill site would produce the least environmental and social disruption at the least economic cost. It would be located close to major refuse generation centers, remote from residential areas, schools and hospitals, have sufficient cover material (soil0 and require minimal improvements. Alternative sites, which were considered, included sites at Honouliuli, Maili, Koko Head, Mililani, Waipio, Poamoho, Keekee, Makua, Ohikilolo, and Waimanalo Gulch.

Alternative methods of disposal are: incineration, ocean disposal, baling, and waste utilization systems. Actions which would not be compatible with resource recovery or waste utilization programs such as incineration or baling were rejected as inflexible and short term. Ocean disposal is prohibitive according to EPA regulations. Waste utilization systems comprise composting, pyrolysis, recycling and steam energy generation. These alternative processes, however, cannot totally dispose of solid waste; a landfill, therefore, is required to dispose of waste that cannot be processed or to dispose of residues resulting from processing. A consultant for the City recently completed a feasibility study of resource recovery (Analysis of the Feasibility of Resource Recovery for Honolulu, MITRE 1977). This study showed that resource recovery can be economically competitive with available landfill alternatives. Because of this study, the City is now preparing a request for a proposal (RFP) package to solicit private participation on a resource recovery plan on the island. This RFP is expected to be issued at the end of June 1978.

5. IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

The resources that will be irreversibly and irretrievably committed will include funds expended for the construction of the proposed facility, raw materials, and energy, both in terms of labor and in terms of fuel and electrical power required during the construction and operation of the proposed facility. Land will be committed to the activities of the project for the duration of the project's life, but can be converted to other uses upon the expiration of this period.

SECTION 1

DESCRIPTION OF THE PROPOSED ACTION

I. BACKGROUND

The basic document for solid waste management on Oahu is the City and County of Honolulu's Solid Waste Management Plan (SWMP). The plan, which was completed in 1971 and is still in effect today, recommended a waste management system based on sanitary landfill disposal. Sanitary landfills would be the primary disposal sites until a resource recovery or waste utilization system is initiated for the island of Oahu. Although the City is seriously pursuing resource recovery, present estimates indicate that an island-wide resource recovery system will not be in operation until December 1981, at the earliest. At that time, landfills will still be required for the disposal of all non-recoverable materials and resource recovery residue, which will amount to 40-50 percent by weight of all waste.

Currently, solid waste from municipal refuse collection is incinerated at the Waipahu incinerator. Municipally collected refuse and commercially collected solid waste is directly landfilled at sites located at Kapaa, Kawailoa, Palailai (privately owned) and Waianae. The Kapaa Landfill has been serving the Koolauloa and Koolaupoko solid waste districts and portions of the Honolulu District. The Kawailoa Landfill has been serving the Waialua and Wahiawa areas. The Waianae Landfill serves the Waianae District and the Palailai Landfill has been the disposal site for a portion of the solid waste collected by private refuse hauling firms.

Solid waste disposal in the windward and leeward districts of Oahu is becoming a critical problem due to growing solid waste loads and an increasing inability of disposal facilities to accommodate solid waste loads. The solid waste disposal problem has been accelerated by the fact that: 1) the Kewalo and Kapalama incinerators were operating without effective air pollution controls to maintain ambient air quality standards and had to be closed in October 1977 to comply with an Environmental Protection Agency order and 2) all existing sanitary landfill sites are nearly full. The Kapaa Landfill is estimated to have less than 4 months of capacity left while the much smaller Waianae and Kawailoa landfills are estimated to each have less than 3 years of landfill life remaining based on current rates of disposal. New disposal sites

therefore must be found and used for waste disposal.

In order to meet the solid waste disposal problem, the City and County of Honolulu proposes to establish major landfills on the windward and leeward sides of the island. The Leeward Sanitary Landfill, together with the Waipahu Incinerator, will fulfill most of the solid waste disposal requirements of the Honolulu and the leeward solid waste districts. In 1980, these areas are expected to generate approximately 1,400 tons of refuse per day (TPD), exclusive of agricultural wastes.

The City's engineering consultant recently completed a study to identify all potential sanitary and demolition landfill sites on the island. The consultant's study identified three sites which have potential for use as the major leeward sanitary landfill (Shimabukuro and Associates, Inventory Study of Potential Sanitary and Demoltion Landfill Sites, 1977). As shown in Figure 1-1, these sites are located in the Ewa and Waianae districts: Makaiwa Gulch, Kaloi Gulch and Nanakuli (Figure 1-1). The Makaiwa and Nanakuli sites are rated approximately equally by the consultant and are leading candidates for selection as the major leeward sanitary landfill site. The Kaloi Gulch site is ranked as the third alternative site (Shimabukuro and Associates, 1977).

II. PURPOSE AND SCOPE OF EIS

The purpose of this report is to examine in detail the environmental impacts which are anticipated as a result of the proposed project.

III. SANITARY LANDFILL OPERATIONS

A sanitary landfill is a solid waste disposal facility in which refuse is placed and compacted to the greatest practical density for final deposition. A daily earth cover is placed on top of all raw refuse to minimize odor, litter and vector potential, with no open burning permitted. Refuse is deposited by haulers at a specific area called the working surface. The refuse is compacted and at the end of a day's activities covered with a minimum 6-inch soil mantle. This combination of refuse and cover is termed a cell. Cell construction can be accomplished through basically three methods of operation: trench, area, and ramp methods, the method used determined by the topography and soil characteristics of the landfill.

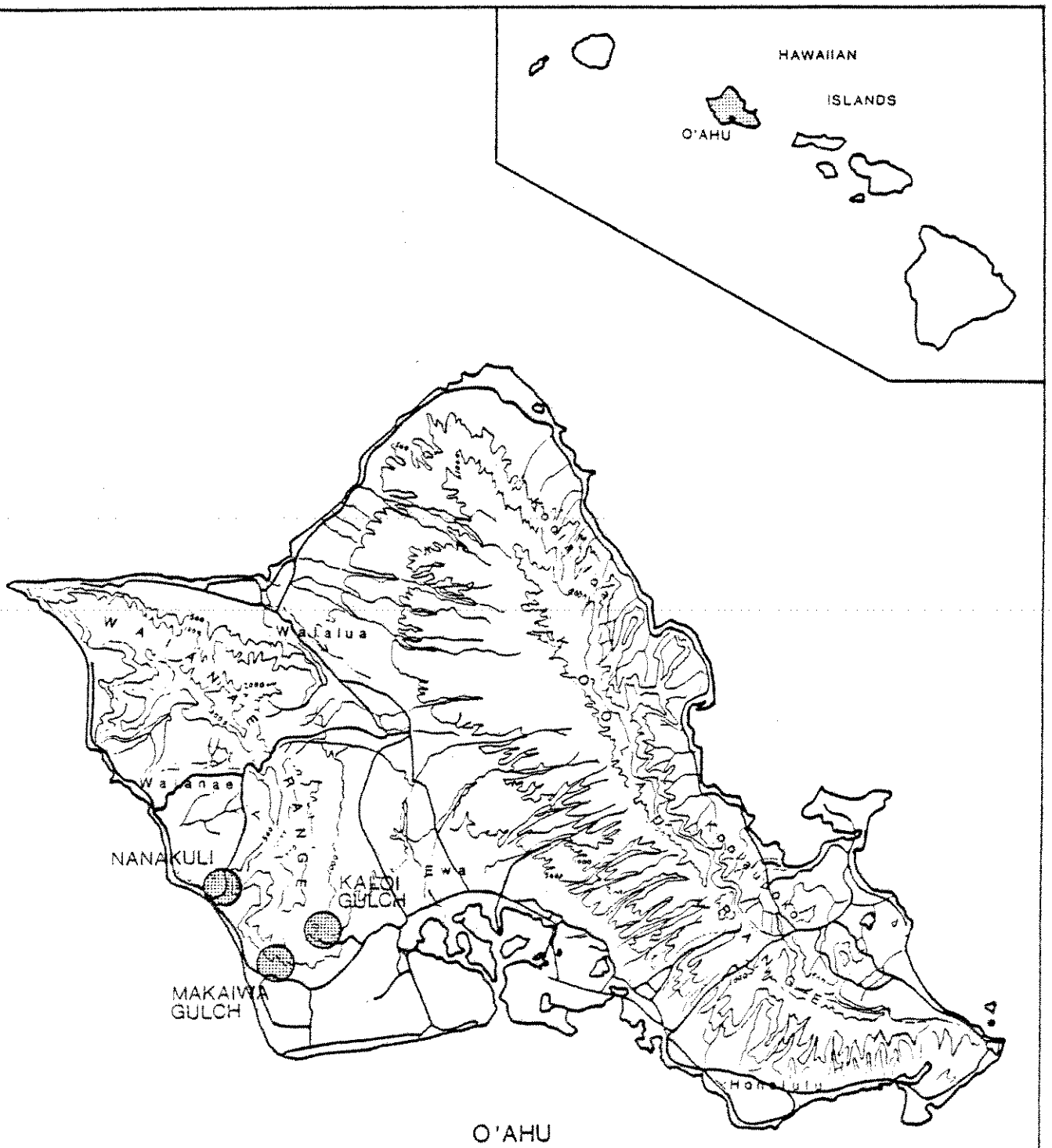

Figure 1-1

LOCATION MAP
PROPOSED SITES
Leeward Sanitary Landfill

0 5 10 miles
SCALE

NORTH

Environment Impact Study Corp.

e.i.s.c.

In the trench method (Figure 1-2), a long narrow excavation is made in the earth and the excavated soil is stockpiled. Wastes are placed at the sloped end of the excavation. The refuse is spread in a shallow inclination and compacted. At the end of the day's activity, the compacted layers of refuse are covered with a layer of soil from the stockpile.

In the area method of landfilling (Figure 1-3) refuse is placed on the ground surface. It is spread over the ground in a uniform layer, compacted and then covered with a soil mantle.

The ramp method (Figure 1-4) is a combination of the trench and the area methods and usually used in gullies or in areas with slope. The face of an existing slope, is excavated and the soil is removed and stockpiled nearby. Refuse is placed within the cut, spread, compacted and then covered with a soil mantle at the end of a day. The process is repeated at the face of newly created slopes producing a succession of slopes across the landfill site.

The completed succession of adjoining cells over the landfill is termed a lift which is usually a maximum of eight feet in depth. Additional lifts can be placed on top of the original lift. Increments will be seeded and landscaped as they are completed.

IV. SANITARY LANDFILL DESIGN AND SELECTION REQUIREMENTS

The design and selection of a sanitary landfill are dependent on several factors which must be closely evaluated in order to prevent air and water quality alterations, to promote efficient and economic use of the site and to minimize disturbance to neighboring activities. These factors include: 1) landfill capacity, 2) refuse hauling distance, 3) access to adequate roads, 4) availability of cover material, 5) acquisition, development, and operation costs, 6) compatibility of existing and proposed land uses of the site with surrounding areas, 7) final land uses of the landfill, 8) environmental compatibility of the site in terms of geology, drainage, hydrology and effects on air and water quality, noise levels and flora and fauna, 9) social and cultural compatibility of the site in terms of effect on sites of archaeological or historical significance and of visual intrusion upon surrounding areas, and 10) acceptability by landowner, adjacent landowners and the community. These criteria are further discussed in Appendix A.

The above factors will, to a large extent, determine the scope and cost of improvements that must be implemented

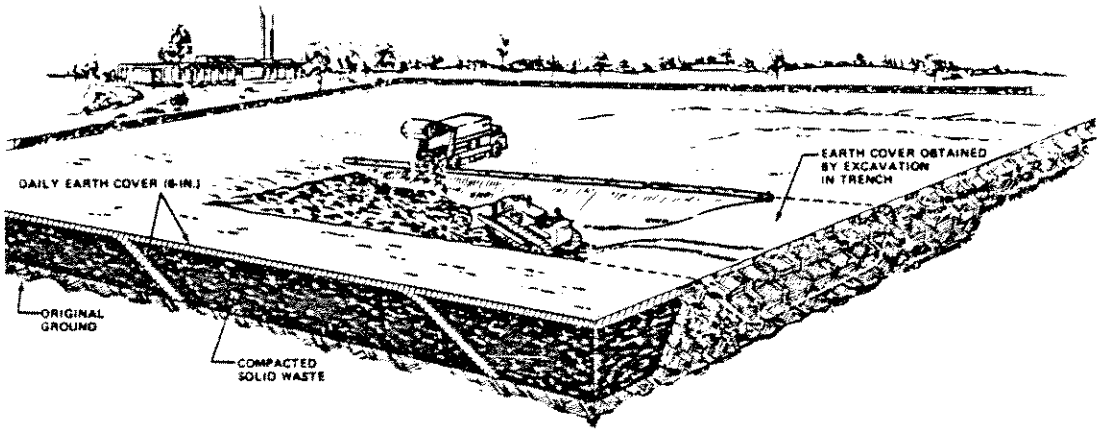

Figure 1-2 In the trench method of sanitary landfilling, the collection truck deposits its load into a trench where a bulldozer spreads and compacts it. At the end of the day, the trench is extended, and the excavated soil is used as daily cover material.

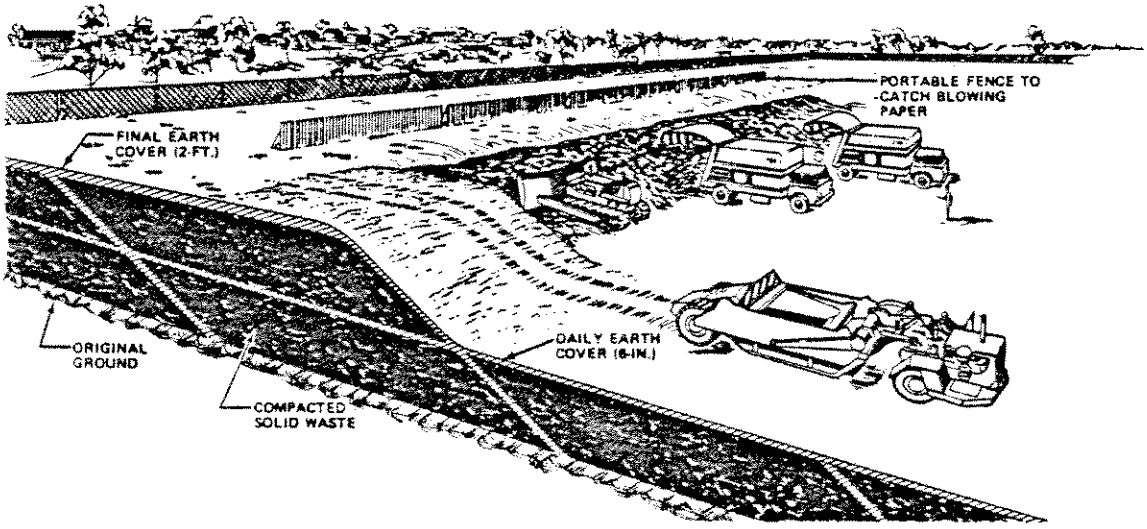

Figure 1-3 In the area method of sanitary landfilling, a bulldozer spreads and compacts the waste on the natural surface of the ground, and a scraper is used to haul the cover material at the end of the day's operations.

Source: Sanitary Landfill Design and Operation (1972)

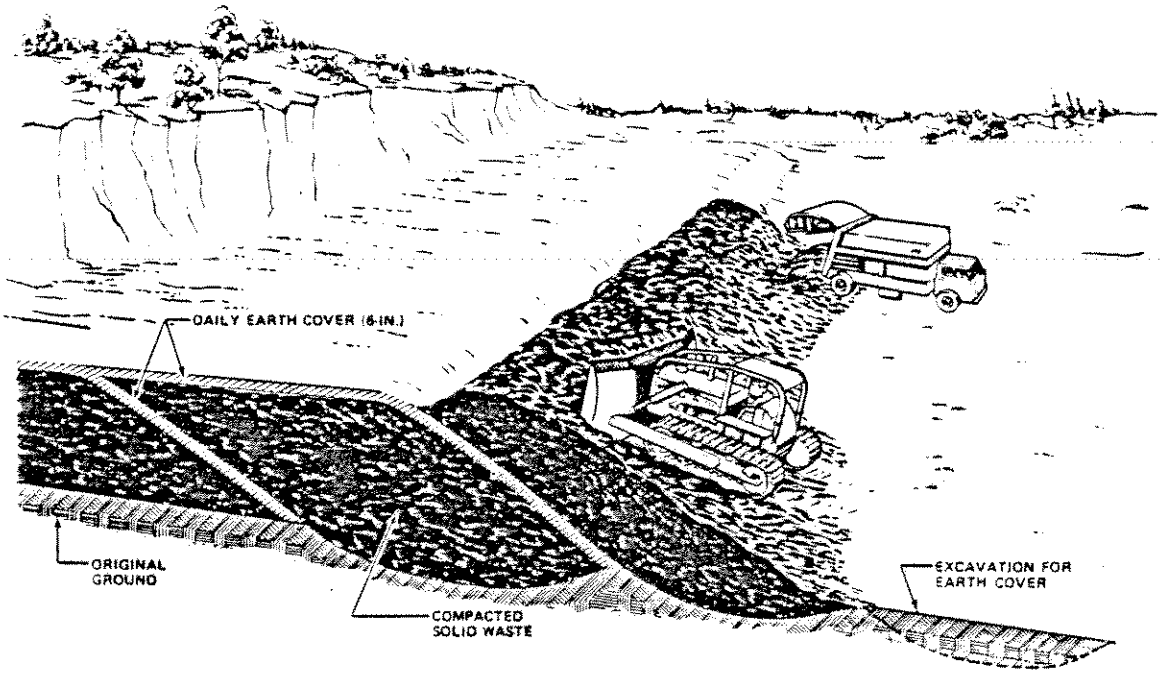

Figure 1-4 In the progressive slope or ramp method of sanitary landfilling, solid waste is spread and compacted on a slope. Cover material is obtained directly in front of the working face and compacted on the waste.

Source: Sanitary Landfill Design and Operation (1972)

to operate an efficient and environmentally compatible sanitary landfill. The most favorable landfill site should have large capacity, be close to the area of waste generation, be remote from residential and commercial centers, be near a good road and have electrical, water and telephone services readily available. Relative merits of each site are discussed in Section 2.

A sanitary landfill requires the following site improvements: 1) clearing and grubbing of the site, 2) permanent roads from the public road system to the site, 3) a scale to record the weights of refuse, 4) office building, 5) utilities (electrical, water and sanitary services), and 6) usually peripheral and litter fences (Brunner and Keller, 1972).

Less favorable sites may require more site improvements including: 1) surface drainage works to prevent contact of surface waters with deposited refuse, 2) an impervious shield over the site and leachate collection systems to prevent landfill leachate from coming into contact with groundwater supplies, 3) importing of cover material, and 4) green buffer zones landscaped to screen a visually prominent site.

With the provision of appropriate site improvements, a properly operated sanitary landfill fulfills crucial solid waste disposal needs efficiently, safely, and with minimum impact on the environment or neighboring land uses and activities. It is the most economical method of solid waste disposal and upon completion, can be used for recreational or agricultural activities for which it may formerly have been unsuited.

V. PROPOSED LANDFILL OPERATIONS

The proposed landfill will utilize all methods of landfilling described previously. Refuse collection trucks or private individuals using the facility first will be weighed. Commercial refuse brought to the facility will be charged a fee based on their load weights. Vehicles will then proceed to the landfill's area of deposition.

Vehicles will be routed to the working surface of the landfill by a signalperson (spotter), who will direct traffic according to the type of refuse load. All wastes will be directed to the working surface. There may also be a special area for waste disposal during inclement weather.

The State has contracted a consultant to survey the hazardous waste problem in Hawaii and in American Samoa. The survey is funded by an EPA grant and should be completed by May, 1978.

As required by the Resource Recovery Conservation Act of 1976 the EPA is developing a list of hazardous wastes and guidelines for their disposal. Until some guidelines are established, present methods used for hazardous waste disposal will be continued.

The Department of Health has been recommending that hazardous wastes or chemicals from large operations be sent back to the manufacturers for disposal, be used up or be stored until a disposal system has been established. The usual recommendation to a private individual for disposal of a hazardous chemical is to send it back to the manufacturer, to use it up or to greatly dilute the chemical and spread it on the ground, assuring that it is not disposed of near drains or surface waters. Some hazardous chemicals that can be incinerated according to the Air Pollution Act have been incinerated at a private incinerator owned by Pacific Marine and Supply Company.

Hawaii does not have the type of large industries that generate large amounts of hazardous wastes. The University of Hawaii, however, has significant amounts of hazardous compounds. Approximately 300 gallons of liquid solvents are burned at the Pacific Marine and Supply Company once or twice a year. This amount is about one percent of the hazardous wastes from the University that must be disposed. Radioactive substances, insecticides, chlorinated hydrocarbons, highly flammable liquids and compressed gases make up the majority of the remaining hazardous compounds which must be disposed. The radioactive substances, insecticides and chlorinated hydrocarbons are packed in approved containers and shipped to the mainland for disposal. Other hazardous compounds must be stored until a system is developed for their disposal. Biological contaminants from the University and hospitals are inactivated at their sources before disposal.

The proposed landfill will not accept highly toxic compounds. It will bury dead animals into the landfill. Sludge cakes produced by the sewage treatment plants will be accepted by the landfill provided the cakes have been dewatered and digested. The proposed landfill will not include special provisions for disposal of all types of hazardous compounds.

Refuse vehicles will unload refuse, then exit the landfill. Approximately 6 municipal collection loads, 6 municipal transfer loads, 40-50 commercial loads and 50 public self/haul loads are anticipated at the facility daily.* The peak hours for refuse traffic at the landfill are anticipated to be between 8:00 a.m. and 11:30 a.m., with refuse traffic tapering off in the afternoon.

Refuse unloaded at the working surface will be spread in layers less than two feet deep. Tracked, rubber-tired or steel-wheeled vehicles will compact the refuse by passing over the layer two to five times. This procedure will be repeated as required according to incoming refuse quantities.

At the end of a day's activities, the compacted waste will be covered by a six inch soil cover. The cover material is required by Chapter 46, Public Health Regulations of the State Department of Health, to prevent possible vector, odor, fire and litter problems.

A gas venting system will be installed if landfill gas problems occur. The system may consist of a gravel-filled interceptor trench with an impermeable membrane on the side away from the landfill or gas vents located in areas of gas production (Figure 1-5).

Production of methane is not always considered a liability. Recovering, purifying and marketing methane produced in sanitary landfills is being explored. Recovering methane offers a mutual benefit in controlling gas migration, eliminating potential hazard, and using an otherwise wasted resource. Los Angeles has been successful in recovering methane from its landfills since 1974. The extracted gas is used to run an internal combustion engine, which is used to produce 200 kilowatts of electrical power for about 350 residences. The NRG NuFuel Co., and the sanitation districts of Los Angeles County are also trying to recover methane from a landfill. The extracted methane has been cleansed and is ready for direct insertion into a natural gas pipeline. "The city of Mountain View, California, and the Pacific Gas & Electric Co., are cooperating with EPA in a pilot effort to define some of the parameters involved in gas extraction and to investigate gas marketing alternatives" (EPA, 1976).

When the landfill has reached the designed height, a final soil cover will be applied. The final cover will

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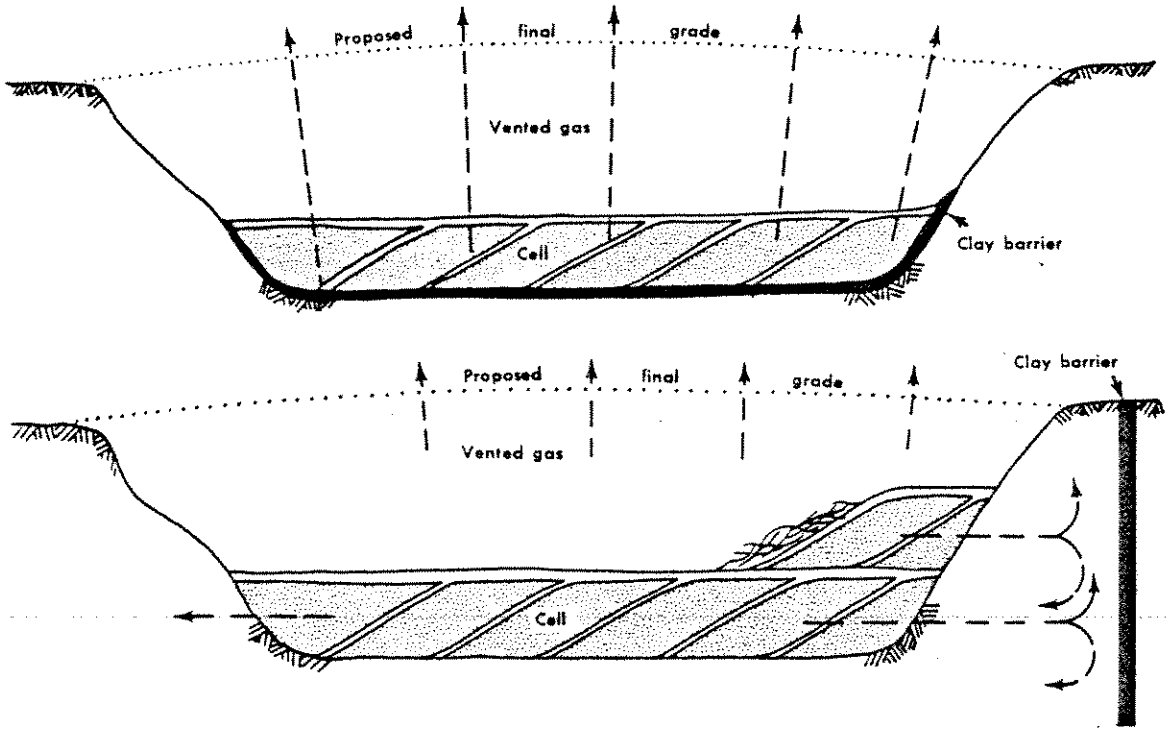
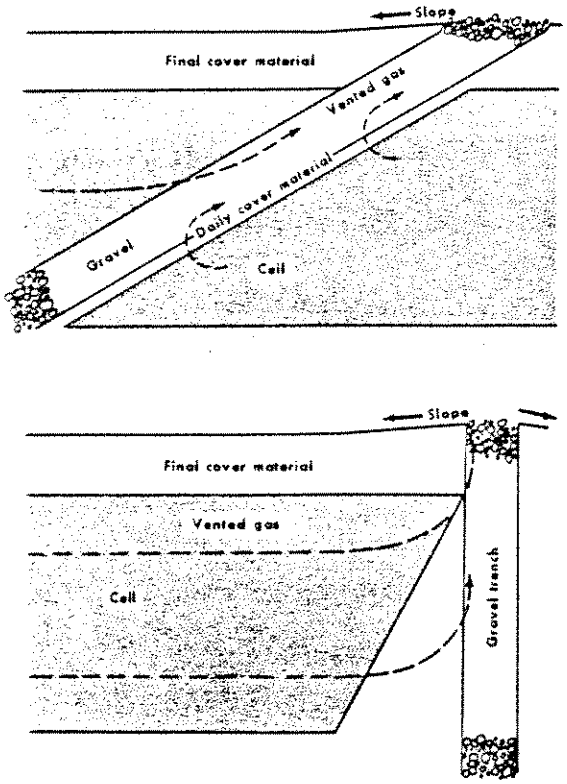
*Based on tentative information provided by the Division of Refuse.

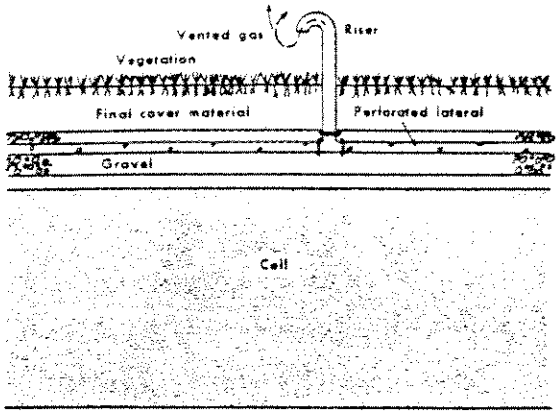
Figure 1-5



Clay can be placed as a liner in an excavation or installed as a curtain wall to block underground gas flow.



Gravel vents or gravel-filled trenches can be used to control lateral gas movement in a sanitary landfill.



Gases are sometimes vented out of a sanitary landfill via pipes that are inserted through a relatively impermeable top cover and are connected to collecting laterals placed in shallow gravel trenches within or on top of the waste.

Source: Sanitary Landfill Design and Operation (1972)

be contoured and landscaped with final depth of soil varying from 2-10 feet depending on specific use of the various portion of the site. The final cover will be graded to prevent surface ponding and infiltration of water. Grades will be limited between two and four percent in flat areas to limit cover material erosion and infiltration. The final cover and slopes then will be seeded or sodded with grass to prevent erosion. This will be accomplished as each lift is completed.

The completed landfill will be maintained and any cracks, fissures and depressions that may occur due to settling will be repaired. The landfill sites may then be used for either active or passive recreation, agriculture or other suitable purpose.

VI. DESCRIPTION OF THE SERVICE AREA

A. General

The proposed project will serve as the primary solid waste disposal site for all refuse collected by the City and County of Honolulu, Division of Refuse within the Honolulu, Ewa, Waianae, Waialua and Wahiawa districts, located on the island of Oahu, Hawaii, as shown in Figure 1-6.

The service area encompassses the island's present urban core centered around the Honolulu District. Honolulu contains high density urban uses with large concentrations of commercial, industrial, and resort activities. Future urban growth is anticipated to expand into the Ewa and Wahiawa districts which are presently low to medium density urban in character, with large areas devoted to agricultural use. Both the Ewa and Wahiawa districts contain large areas held by the military. The Waianae District is in very low-density urban use, with incidental commerce, scattered agriculture, and limited resort development.

B. Population

According to the revised General Plan (City and County of Honolulu), 1977, the estimated 1975 population for the leeward area was 588,962. This is assuming that the leeward area encompasses the areas designated 1, 2, 3, 4, 7, 8, 9, 12 and 13 (Figure 1-7 and Table 1-1). By the year 2000 the population is estimated to increase to 888,500 in the same area.

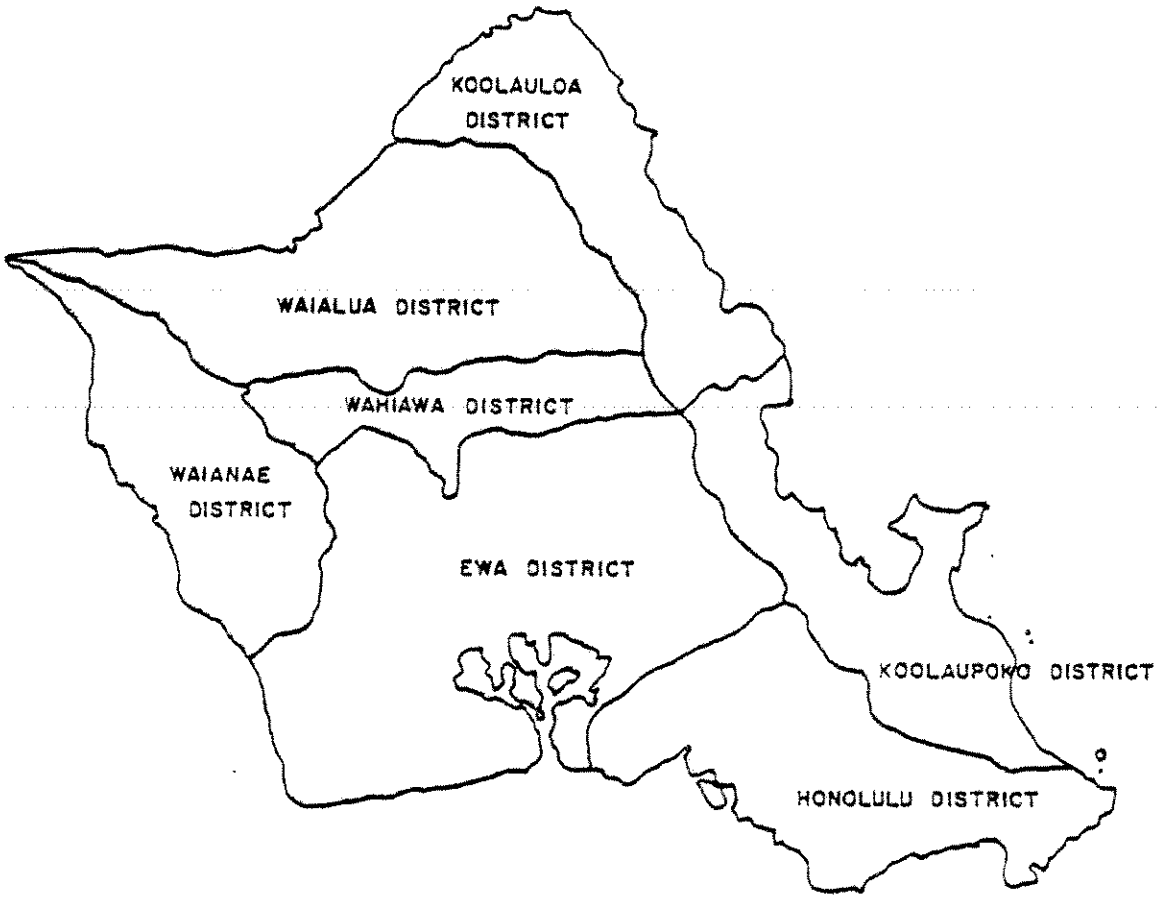
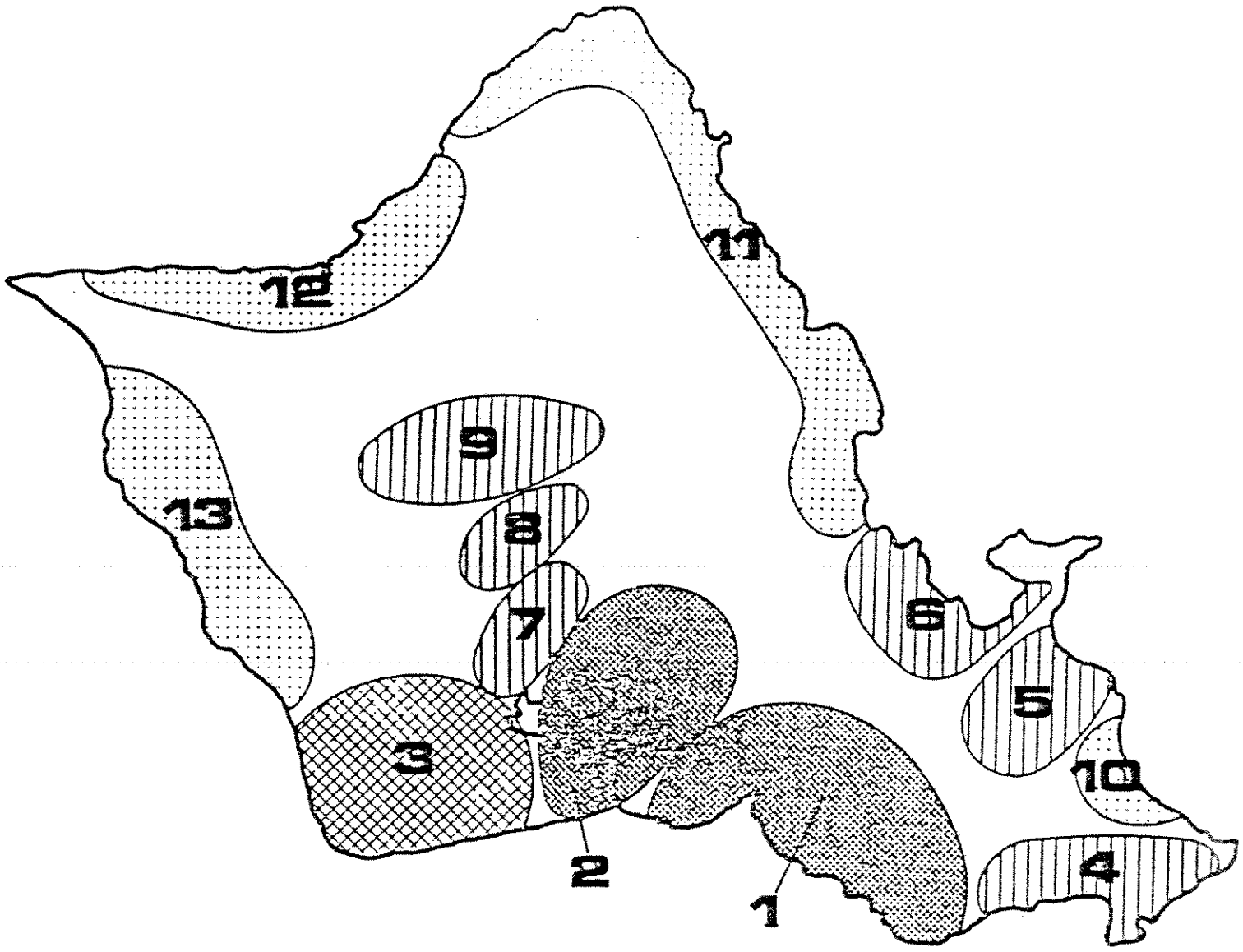


Figure 1-6 JUDICIAL DISTRICTS OF THE CITY AND COUNTY OF HONOLULU

Source: Analysis of the Feasibility of Resource Recovery for Honolulu, April 1977.



POPULATION AREAS
City and County of Honolulu

LEGEND

PRIMARY URBAN CENTER
1. Honolulu (Waialae/Kahala-Halawa)
2. Aiea-Pearl City

SECONDARY URBAN CENTER
3. Ewa - Makakilo

URBAN-FRINGE
4. Aina Koa - Hawaii Kai
5. Kailua
6. Kaneohe - Ahuimanu
7. Waipahu - Crestview
8. Mililani - Waipio
9. Wahiawa

RURAL
10. Waimanalo
11. Kahaluu - Kahuku
12. North Shore
13. Waianae Coast

Figure 1-7

Source: General Plan
City and County of Honolulu,
January 18, 1977

Table 1-1

DISTRIBUTION OF THE RESIDENTIAL POPULATION
1975 and 2000

Location	1975 Population	% of Total	2000 Population	% of Total
Oahu Total	704,403	100.0	1,039,000	100.0
Primary Urban Center	398,354	56.5	530,000	51.0
Honolulu (Waialae/ Kahala-Halawa	304,546	43.2	400,000	38.5
Aiea-Pearl City	93,806	13.3	130,000	12.5
Secondary Urban Center				
Ewa-Makakilo	21,800	3.1	104,000	10.0
Urban-Fringe	223,892	31.8	322,000	31.0
Aina Koa-Hawaii Kai	39,374	5.6	65,000	6.3
Kailua	40,722	5.8	49,000	4.7
Kaneohe-Ahuimanu	51,394	7.3	69,000	6.6
Waipahu-Crestview	26,913	3.8	48,000	4.6
Mililani-Waipio	20,302	2.9	39,000	3.8
Wahiawa	45,185	6.4	52,000	5.0
Rural	60,361	8.6	83,000	8.0
Waimanalo	8,435	1.2	12,500	1.2
Kahaluu-Kahuku	14,890	2.1	20,000	1.9
North Shore	9,540	1.4	11,500	1.1
Waianae Coast	27,496	3.9	39,000	3.8

NOTE: The "% of total" figures for the year 2000 state the policy contained in the table. The figure of 1,039,000 for the year 2000 and the corresponding distribution of the population to the various designated areas (see map on next page) will be revised as the State Department of Planning and Economic Development revises its population projections.

The "% of total" figures also indicate a mean or average percentage rather than a rigid requirement. A year 2000 percentage which falls within 5% of the indicated mean for an area would be consistent with the Plan's population-distribution policy. For example, as the mean percentage for Ewa is 10.0%, an actual population within a range of 9.5% to 10.5% of Oahu's total population at the year 2000 would be acceptable.

Population figures may be further adjusted to accommodate housing necessary to support resort industry in various areas of the island.

Source: General Plan, City and County of Honolulu, January 18, 1977

C. Solid Waste Quantities

Solid waste quantities on Oahu are anticipated to increase with the increase in population, as shown in Table 1-2 and Figure 1-8. For convenience, solid waste will be addressed by weight. Volumes of solid waste change in various stages of storage, transport and compaction.

Presently, the service area generates approximately 1300 TPD (7 days a week). This accounts for approximately 87 percent of all refuse generated on Oahu. According to Division of Refuse and Collection estimates in the service area, the City and County of Honolulu collects about 616 TPD (6 day collection week). Commercial refuse amounts to about 799 TPD (6 day collection week) although a significant portion of this tonnage is disposed of at Kapaa Landfill. Refuse generation in the service area in future years is expected to increase at rates shown in Figure 1-8.

D. Solid Waste Characteristics

The following is an excerpt from Analysis of the Feasibility of Resource Recovery for Honolulu, (MITRE 1977).

Solid waste composition is a function of the use of materials and varies widely among communities and regions throughout the United States. While a number of studies have been performed and composition estimates rendered on a national basis, specific composition for a particular locality can be determined only through separating and weighing samples of disposed wastes.

In 1964, a survey of residential waste composition was performed at the Kewalo and Kapalama incinerators on Oahu. Although the results of this survey are 13 years old, and probably somewhat out of date due to the increasing use over the past decade of materials such as plastics, they are useful in comparing the proportional amounts of constituent materials with national surveys. Shown on Table 1-3 are the results of the Honolulu survey, as well as 1975 national composition estimates, and 1990 projections. These latter estimates have been drawn from Midwest Research Institute's 1975 report for EPA, "Baseline Forecasts for Resource Recovery 1972-1990". Of particular interest is the proportionally greater amount of yard trimmings in Honolulu refuse, due to the

Table 1-2

Projections of City/County Solid Waste Quantities

Population/Projections	FY75-76	1980	1985	1990	1995	2000
Resident Population	704,500	749,500	818,700	891,000	965,000	1,039,400
Detacto Population	759,700	819,900	908,600	1,005,800	1,111,500	1,226,300
Series A: Increasing Generation Rate*						
#/c/d-MSW	3.34-3.82	3.61-4.13	3.99-4.56	4.19-4.79	4.40-5.03	4.62-5.29
TPD MSW	1270-1450	1480-1695	1810-2070	2110-2410	2445-2795	2830-3245
TPD ISW	300	300	300	300	300	300
TOTAL TPD	1570-1750	1780-1995	2110-2370	2410-2710	2745-3095	3130-3545
TPY	489,800-546,000	555,360-622,400	658,300-739,400	751,900-845,500	856,400-965,600	976,600-1,106,000
Series B: Stable Generation Rate						
#/c/d-MSW	3.34-3.82	3.34-3.82	3.34-3.82	3.34-3.82	3.34-3.82	3.34-3.82
TPD MSW	1270-1450	1370-1565	1515-1735	1680-1920	1855-2120	2045-2340
TPD ISW	300	300	300	300	300	300
TOTAL TPD**	1570-1750	1670-1865	1815-2035	1980-2220	2155-2420	2345-2640
TPY	489,800-546,000	521,000-581,900	566,300-634,900	617,800-692,600	672,400-755,000	731,600-823,700

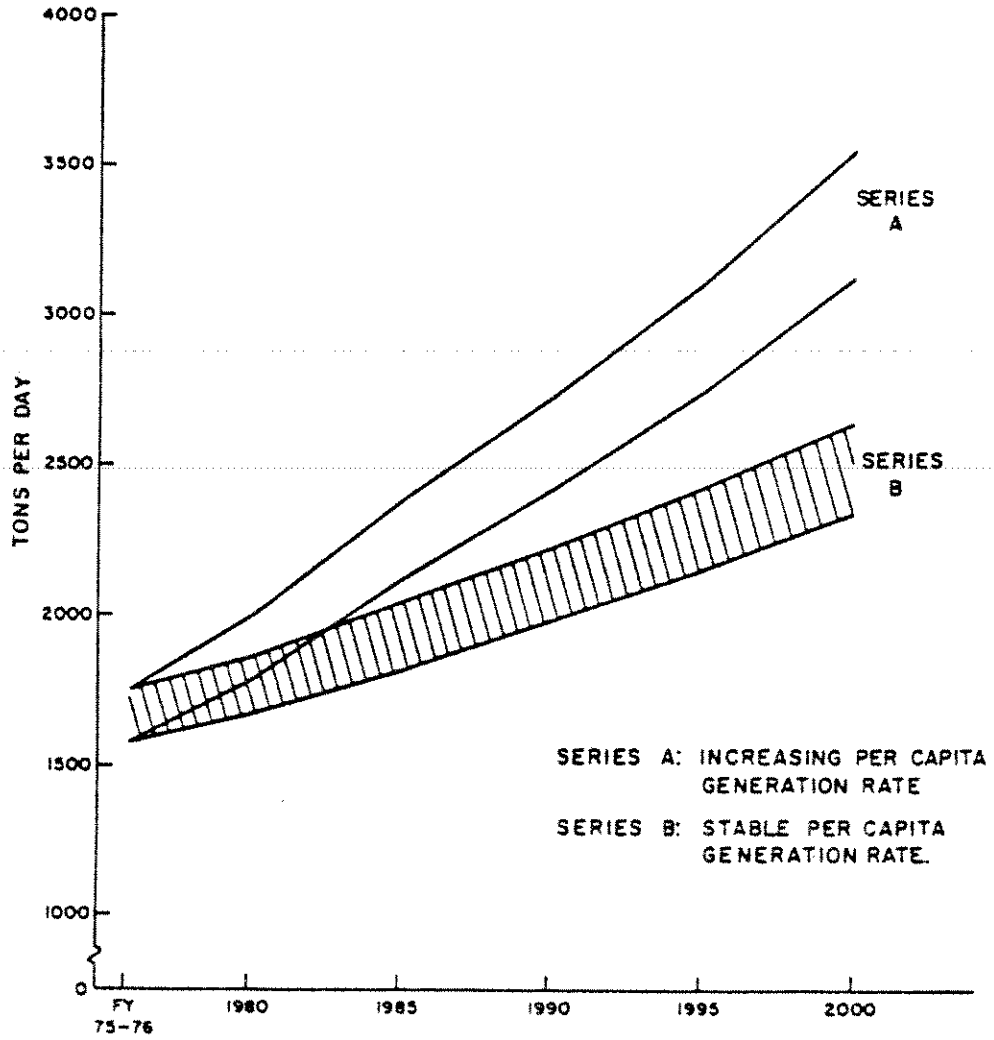
*Assuming rate increase of 2%/yr thru 1985; thereafter 1%/yr, MSW only.

**Based on a six day work week.

"Source: Analysis of the Feasibility of Resource Recovery for Honolulu, 1977"

Figure 1-8

SOLID WASTE PROJECTIONS
FOR THE
CITY & COUNTY OF HONOLULU



Source: Analysis of the Feasibility of Resource Recovery for Honolulu, April 1977

Table 1-3

Residential Solid Waste Composition

Constituent	Percent by Weight		
	Honolulu - 1964[1]	National - 1975[2]	Projected National - 1990[2]
Combustible			
Paper	39.4	30.6	33.5
Yard Trimmings	36.7	19.1	18.1
Garbage	5.8	16.7	13.8
Textiles	1.7	1.5	1.7
Wood	1.7	3.7	3.7
Miscellaneous	1.1	4.1(Plastics) 2.7(Rubber/Leather) 6.8	6.6(Plastics) 2.9(Rubber/Leather) 9.5
Total Combustible	86.4	78.4	80.3
Non Combustible			
Metals	6.3	8.5(ferrous) 1.1(nonferrous) 9.6	8.2(ferrous) 1.5(nonferrous) 9.7
Glass	5.9	10.5	8.4
Misc. Inorganics	1.4	1.5	1.6
Total Non Combustible	13.6	21.6	19.7

[1]Source: "A Study of the Composition and Character of Solid Wastes of Oahu", Nathan Burbank, University of Hawaii, June, 1964.

[2]Source: Midwest Research Institute, "Baseline Forcasts of Resource Recovery, 1972-1990", March 1975, p.47.

"Source: Analysis of the Feasibility of Resource Recovery for Honolulu, 1977"

region's uniform climate and consequently, the constant growing season. Also of interest is the comparatively lesser amount of food waste, metals and glass. Overall, the Honolulu survey indicates a greater percentage of combustible material.

National projections of 1990 composition indicate increases in paper discards, textiles, and plastic/rubber/leather, and slight increases in metals, and miscellaneous organics. In contrast, yard trimmings, garbage, and glass discards are expected to decrease. In the absence of a current refuse sampling in Honolulu, it is impossible to predict, with any certainty, future waste composition. However, with the exception of yard trimmings, which will undoubtedly increase as greater portions of the island are developed, it is expected that national trends will similarly impact Honolulu.

One factor which could have a significant impact upon composition is the effect of beverage container legislation, which is being considered by state and local legislatures throughout the United States. One of the more popular types of legislation requires a mandatory deposit for beverage containers. Passage of this legislation could impact the amount of post-consumer steel, aluminum, and glass currently disposed. It has been estimated by the U. S. Environmental Protection Agency ("Third Report to Congress: Resource Recovery and Waste Reduction," September 1975, p. 58) that reductions on the order of 15 percent for steel cans, 30 percent for aluminum, and 35 percent for glass could occur. The impact on glass discards on Oahu, as an example, could result in a decrease of some 32-36 TPD, or 10,100-11,300 TPY (assuming 1570-1750 TPD, and 5.9 percent glass composition).

Refuse quantity and composition within the service area are subject to daily and seasonal variations. Refuse collected on days following the week-end generally have a greater amount of plant trimmings due to week-end yard cleaning activities, while refuse collected during the summer months show greater amounts of organic material primarily due to disposal of mangoes in this season.

E. Solid Waste Collection

1. Collection

Refuse collection within the service area is done by the City and County of Honolulu,

private collectors, or self-hauled. The State of Hawaii collects refuse from some of its own facilities, such as State Parks and recreation areas, and hauls it to City and County disposal sites while some private institutions such as hospitals process and dispose of waste generated by their own activities. Generally, the agricultural organizations collect and dispose of their own waste. The military collects and disposes of part of its own waste and contracts with private firms for collection and disposal of the rest.

Municipal collection is provided 6 days per week, with a twice-a-week pickup from each residence. Refuse is collected by 3-man crews. Crews generally operate with a 20 cubic yard rear loading compactor truck. Residential refuse with a density of approximately 150 pounds per cubic yard is compacted within the collection truck to a density of approximately 500 pounds per cubic yard. Each truck carries 4 to 5 tons of refuse per trip and typically makes two trips per day.

Compactor trucks are stationed at the Honolulu, Pearl City, Wahiawa, Waialua, and Waianae base yards. The collection crews begin their routes as early as 6:00 a.m. and continue until they are completed, which is usually an average of 2 trips per day between the disposal sites and collection points.

Figure 1-9 shows municipal solid waste collection districts and collection yards. Table 1-4 shows quantities collected according to collection yards and Table 1-5 shows quantities deposited at municipal facilities. Disposal facilities on Oahu are shown in Figure 1-10.

Commercial haulers usually handle refuse generated by some apartment, commercial, industrial and resort activities. Private collection in the service area occurs primarily in the downtown Honolulu and Waikiki areas. Collection by private firms is on a competitive basis, with no specific area, route assignments or franchise given by the City.

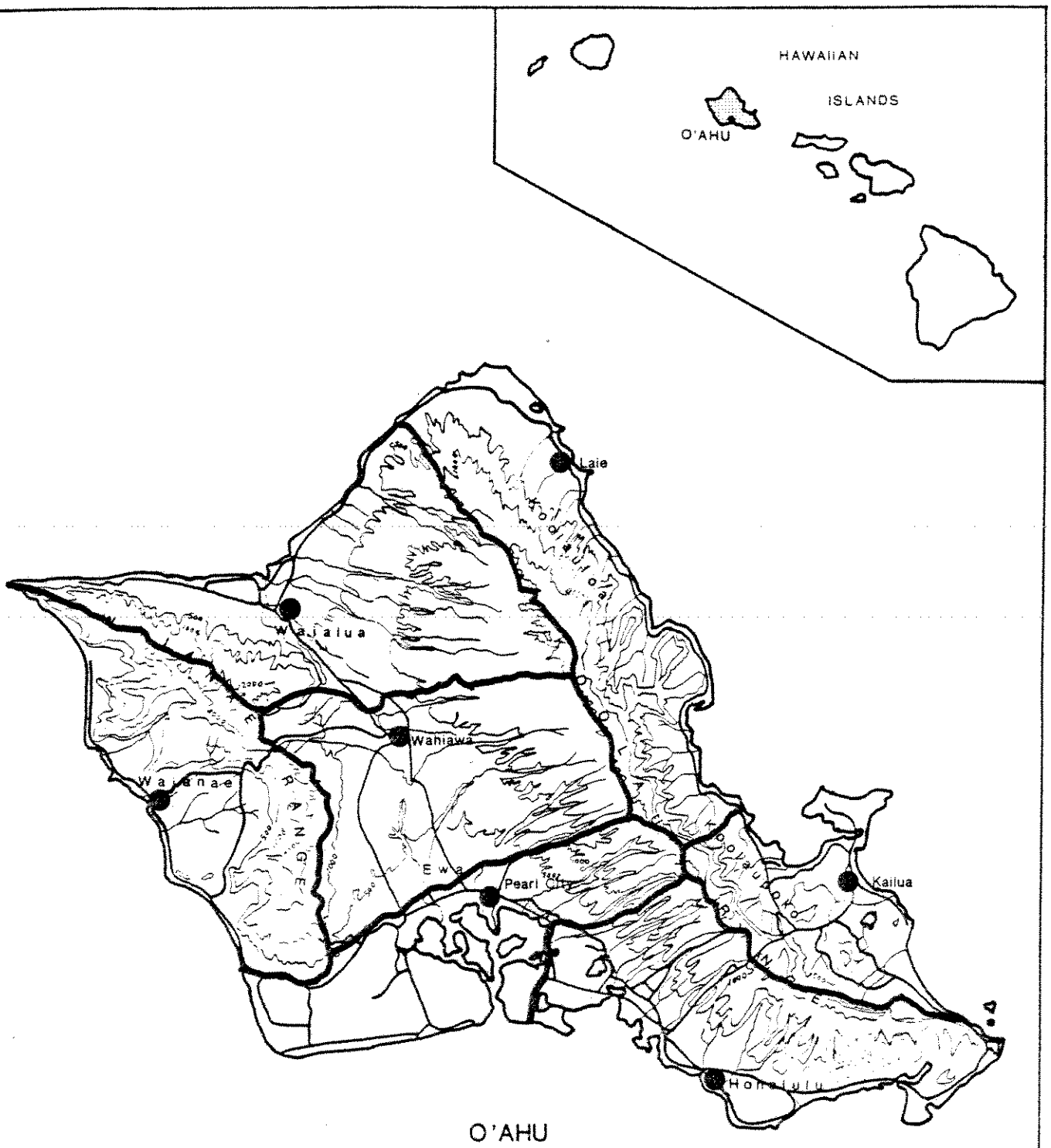


Figure 1-9

City and County
Refuse Collection
Base Yards and Service Areas

0 5 10 miles
SCALE

NORTH

Environment Impact Study Corp.

Adapted from:
Analysis of the Feasibility of Resource Recovery for Honolulu, 1977

Table 1-4

COLLECTIONS BY COLLECTION YARD

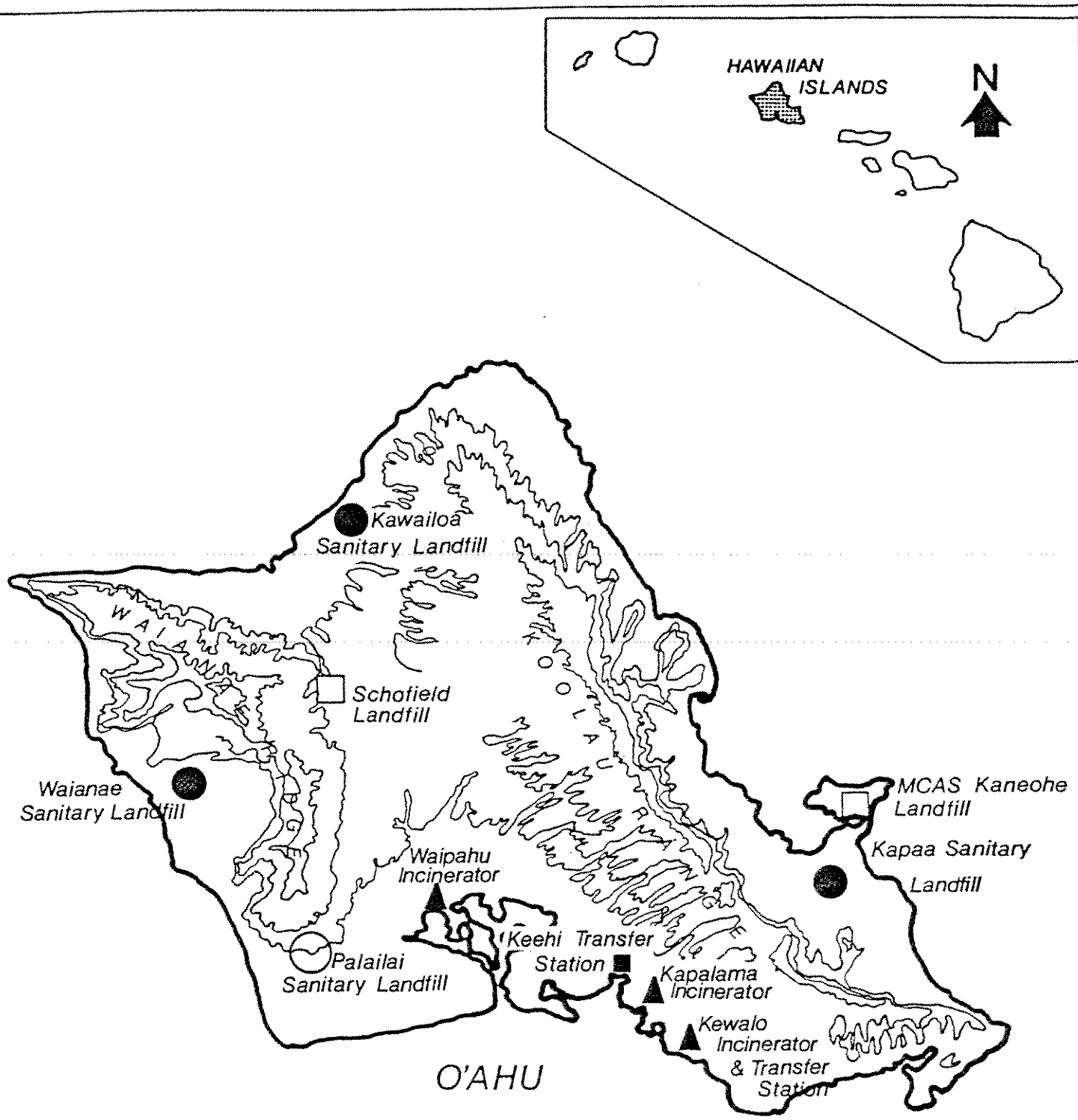
Collection Yard	1972-73 Fiscal Year		1973-74 Fiscal Year		1974-75 Fiscal Year		1975-76 Fiscal Year	
	Tons	% of Total	Tons	% of Total	Tons	% of Total	Tons	% of Total
Honolulu	118,684	47.6	131,858	52.6	123,486	51.6	121,472	51.0
Pearl City	42,185	16.9	39,335	15.7	39,873	16.7	41,235	17.3
Kailua	59,376	23.8	47,414	18.9	42,521	17.8	41,287	17.3
Wahiawa	11,564	4.6	11,799	4.7	12,150	5.1	12,220	5.1
Waianae	8,452	3.4	10,139	4.0	10,017	4.2	9,652	4.0
Waialua	4,148	1.7	4,675	1.9	5,985	2.5	6,959	2.9
Laie	4,995	2.0	5,247	2.1	5,167	2.2	5,259	2.2
Total	249,404	100%	250,467	99.9%	239,199	100.1%	238,084	99.8%

Table 1-5

DISPOSAL BY MUNICIPAL FACILITY

Facility	1972-73 Fiscal Year		1973-74 Fiscal Year		1974-75 Fiscal Year		1975-76 Fiscal Year	
	Tons	% of Total	Tons	% of Total	Tons	% of Total	Tons	% of Total
Incinerator								
Waipahu	107,302	22.0	92,727	20.8	63,005	15.3	64,181	15.3
Kewalo	58,546	12.0	51,674	11.6	46,437	11.3	43,595	10.4
Kapalama	49,161	10.0	43,905	9.9	43,958	10.7	41,147	9.8
Subtotal	215,009	44.0	188,306	42.3	153,400	37.3	148,923	35.5
Landfill								
Kapaa	177,311	36.4	224,578	50.4	211,964	51.4	219,922	52.5
Kawailoa	10,993	2.3	20,641	4.6	21,377	5.2	19,300	4.6
Waianae	83,934 (Waipahu)	17.2	12,082	2.7	25,557	6.2	31,072	7.4
Subtotal	272,238	55.9	257,301	57.7	258,898	62.8	270,294	64.5
Total	487,247	99.9%	445,607	100%	412,298	100.1%	419,217	100%

Source for both tables: Analysis of the Feasibility of Resource Recovery for Honolulu, April 1977.



Disposal Facilities on Oahu

0 5 10 miles
scale

Legend:

● ▲ Municipal

○ Private

□ Military

Figure 1-10

2. Processing

Until recently, approximately 300 tons of refuse collected by City crews in the Honolulu District were processed at the Kapalama and Kewalo incinerators. Since both incinerators, installed in 1946, with design capacities of 200 tons per day each, were old and overburdened and could handle only 300 tons total per day, the remainder of unprocessed refuse had to be transported to landfill sites. These incinerators were shut down permanently in October 1977 because they could not meet Federal and State air pollution standards.

In 1975-1976, approximately 192 tons/day collected in the Honolulu, Pearl City and Wahiawa collection districts were processed at the Waipahu incinerator. This incinerator has been undergoing renovations to meet air pollution standards and to restore lost capacity and has just been completed. The restored capacity can accommodate a major part of refuse that was disposed at the Kapalama and Kewalo incinerators.

Waste collected by commercial haulers that does not undergo processing is transported directly to a landfill (Kapaa, Kawailoa or privately-owned Palailai) for disposal.

3. Disposal

The ash and residue of incinerated waste is disposed at the Waipahu incinerator ash disposal site. Kapaa Sanitary Landfill receives unprocessed refuse. Both disposal sites are almost full and other sites are being considered for the disposal of processed and raw refuse. Wastes from private collectors are taken to the privately-operated Palailai Landfill and to the Kapaa Landfill for disposal.

unconformity at the top of the Waianae formation.

The western part of the drainage overlies a smaller basal aquifer, having a head of about 5 feet, in the Lower Member of the Waianae series. This aquifer probably extends to Nanakuli Valley. The nature of the demarcation between the two Waianae aquifers is not categorically known, but probably consists of either a buried rift zone or the weathered unconformity between the Lower and Upper Members of the Waianae series.

The aquifer to the east is heavily exploited by Oahu Sugar Company for irrigation and to a lesser extent by the U. S. Navy who withdraws water from a basal tunnel to serve some of the potable needs of Barbers Point Naval Air Station. The Navy tunnel lies 3 miles to the east and up the hydraulic gradient from Makaiwa (See Figure 2-5). An Oahu Sugar Company pumping station at Gilbert lies down gradient but groundwater in the vicinity is non-potable, containing more than 500 mg/l chloride. The abandoned Palailai Quarry, now used as a sanitary landfill, lies between Makaiwa and the Navy tunnel. Unpumped groundwater in the aquifer ultimately discharges into the sedimentary caprock of the Ewa Plain.

The small aquifer to the west of Makaiwa also contains poor quality water unsuitable for domestic use. This aquifer is not being exploited at present, although its water would be adaptable to agriculture. Pumping rates would have to be low, however, and therefore the extent of non-potable usage would be highly circumscribed.

G. Flora and Fauna

The site is located in a dry lowland vegetation zone dominated primarily by kiawe (*Prosopis pallida*) and koa haole (*Leucaena leucocephala*). Heavy undergrowth consists mainly of slender mimosa (*Desmanthus virgatus*) and fingergrass (*Chloris* sp.). Spiny amaranth (*Amaranthus spinosus*), buffelgrass (*Cenchrus ciliaris*), apple of Peru (*Nicandra physalodes*), Spanish needle (*Bidens pilosa*) and hi'aloa (*Waltheria americana*) are common along the bulldozed access road.

Avifauna seen on the project site include barred dove (*Geopelia striata*) sparrow (*Passer domesticus*), white-eye (*Zosterops japonica*) and francolin (*Francolinus* sp.). Mammalian wildlife recorded were mongoose

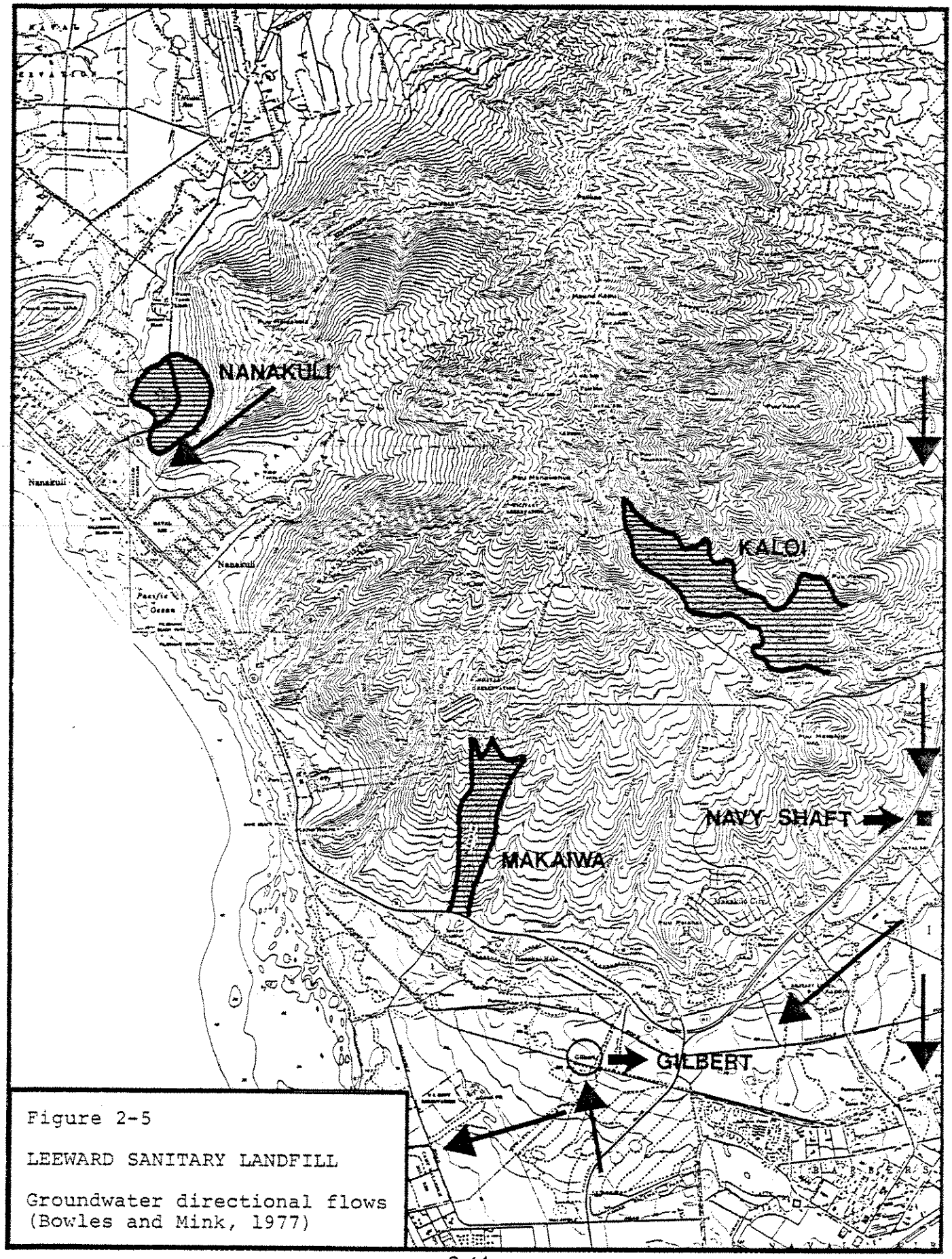


Figure 2-5

LEEWARD SANITARY LANDFILL

Groundwater directional flows
(Bowles and Mink, 1977)

(Herpestes auropunctatus) and dog (Canis familiaris). Rat (Rattus spp.), cat (Felis catus), and mouse (Mus musculus) are probably found in the project area due to its close proximity to populated areas. No rare or endangered species are believed to be in the project area and all dominant species are exotic to Hawaii.

H. Archaeological Sites

No prehistoric sites were found in the reconnaissance survey so this area is considered to have little importance for future work (Bordner, 1977).

I. Existing and Proposed Site Improvements

Tables 2-1 and 2-2 illustrate the estimated site development cost.

1. Access Road

Access to the site would be from Farrington Highway. Improvements to Farrington Highway must be made to provide safe access to and from the site. These include deceleration and acceleration lanes, storage lane for left turn movement from access road onto Farrington Highway, perhaps traffic signals, and incidental drainage and highway signing. Approximately 1,000 feet of an all-weather access road will be required. A bulldozed access road is present on the site.

2. Operation and Maintenance Facilities

Permanent facilities must be constructed, including office building, scale, maintenance yard and fences.

3. Utilities

Electric power, telephone and water connections are available on Farrington Highway. Power lines also cross the upper portion of the site. These overhead power lines at the upper portion of the site may require relocation if the entire site is fully utilized for landfilling. No sewage facilities are located on-site; a sanitary sewer line must be extended from the Honokai Hale subdivision across the highway to the landfill site.

TABLE 2-1

ESTIMATED SITE DEVELOPMENT COST*

Site	Phase	Capacity (CY)	Life (Yrs.)	Estimated Cost
Makaiwa Gulch	1st	4,580,000	9.4	$ 2,385,000
	2nd	4,484,000	9.2	1,405,000
	3rd	6,168,000	12.7	1,228,000
Total		15,232,000	31.3	$ 5,018,000
Nanakuli A	1st	5,278,000	10.8	2,589,000
Nanakuli B	2nd	3,855,000	7.9	1,204,000
	3rd	4,263,000	8.6	871,000
Total		13,396,000	27.3	$ 4,664,000
Kaloi Gulch	1st	7,631,000	15.7	$16,823,900
	2nd	6,414,000	13.2	9,483,000
	3rd	5,390,000	11.1	9,854,500
	4th	4,865,000	10.0	9,385,000
Total		24,300,000	50.0	$45,546,400

*Costs are December, 1976 prices.
Land costs not included.

Source: Shimabukuro and Associates, 1977.

TABLE 2-2

SUMMARY AND COST ANALYSIS

SITE (Yrs. of Life)	DEVELOPMENT COST	ANNUAL AMORTIZED DEVELOP. COST* (1)	ANNUAL EQUIPMENT COST (2)	ANNUAL ADMIN., OPER., MAINT. SUPPLY COST (3)	TOTAL & ANNUAL COST (1)+(2)+(3)	COST/TON**
LEEWARD						
Makaiwa (20)	$ 3,939,500	$ 343,400	$ 95,300	$ 514,100	$ 952,800	$ 5.22
Nanakuli (20)	$ 3,924,700	$ 343,200	$ 95,300	$ 377,100	$ 815,600	$ 4.47
Kaloi (20)	$19,912,000	$1,735,900	$ 95,300	$ 514,100	$2,345,300	$12.85

* Capital cost of site development is amortized at 6% with CRF - 0.08718 (20 years) and CRF - 0.12679 (11 years).

** COST/TON based on disposal rate of 500 tons/day, 365 days/year (182,500 tons/year).

Source: Shimabukuro and Associates, 1977.

4. Drainage System

A major drainage system will be constructed around the landfill to divert surface runoff around the landfill area and into existing culverts along Farrington Highway. Runoff off-site and on-site will be collected by interceptor ditches and collected in a siltation basin before discharge. The design of the drainage system will be such that the velocity of flow will be reduced to approximate the velocity of runoff under normal conditions. Debris barriers will be provided at the inlets of collection pipes. See Figure 2-6 for details.

5. Leachate Control System

A leachate control system will not be required. Leachate should not be produced due to low rainfall of 20 inches per year. Caution will be taken to utilize relatively impermeable final soil cover and to provide a final grade of at least 3 percent to enhance runoff. Vegetation should be selected which will enhance transpiration and minimize erosion. A program of continued maintenance should be provided to ensure that surface cracks created by differential settlement are sealed, thereby minimizing potential surface water infiltration (EMCON Associates, 1977). If, however, leachate were to be produced, the pulse of leachate from a landfill in Makaiwa would follow a complicated path before discharging in highly diluted form into the caprock or to an Oahu Sugar Company pumping station, which is used for irrigation purposes (Refer to Figure 2-5, page 2-14). First, it would have to traverse an 85 foot thick unsaturated zone and then travel in the saturated zone at an average particle velocity of about 8 feet per day for about three years before reaching a discharge sink. Groundwater in the aquifer along the probable path of the leachate is suitable only for agriculture. The leachate could not travel against the hydraulic gradient to the Navy tunnel (Bowles and Mink, 1977). Refer back to section on Hydrology and Drainage (page 2-12) for more information.

6. Landscaped Buffer Zone

Since the site is readily visible from

approximately 1,700 feet in width with an average slope of 13 percent. The upper portion of the site consists of three well-defined gullies totaling approximately 2,600 feet in width with an average slope of 17 percent.

D. Soils

The site consists of the following soils, according to the U.S. Department of Agriculture, Soil Conservation Service Soil Survey (1972): Stony steep land, Mahana Badland on 3 to 35 percent slopes, Lualualei extremely stony clay on 30 to 90 percent slopes and Helemano silty clay (Appendix B).

1. Stony steep land consists of a mass of boulders and stones deposited by water and gravity on side slopes of drainageways. The slopes range from gradients of 40 to 70 percent. Stones and boulders cover 59 to 90 percent of the surface with a small amount of soil among the stones. This land type is used for wildlife habitat and recreation. Its cultivatable land productivity rate is classified as "E", or poor, on a scale of A to E (Sahara, et al., 1971).

2. Mahana Badland complex consists of Mahana soils and Badland. Mahana soils make up 40 to 70 percent of the surface with Badland 30 to 60 percent. The Mahana soils are moderately steep to very steep. Runoff is medium to very rapid and the erosion hazard is moderate to very severe. This complex is used for pasture and its cultivatable land productivity rate is "E."

3. Helemano silty clay occurs on the sides of V-shaped gulches on 30 to 90 percent slopes. Permeability is moderately rapid, runoff is medium to very rapid and erosion hazard is severe to very severe. This land type is used for pasture, woodland and wildlife habitat. Its cultivatable land productivity rating is "E."

4. Lualualei extremely stony clay occurs on talus slopes. The slope range is 3 to 35 percent but in most places the soil is moderately sloping to steep. There are many stones on the surface and within the soil profile making it impractical for cultivation unless the stones are removed. Runoff is medium to rapid and the erosion hazard is moderate to severe. This soil is used for

pasture and its cultivatable land productivity rating is "E."

E. Geology

At the proposed landfill site above the highway (ground elevation greater than 100 feet) the gulch is relatively shallow and has a moderately steep gradient of about 10 percent. The gulch is cut into bedrock of the upper member of the Waianae volcanic series but is covered by a thin layer of coarse, bouldery alluvium (Bowles and Mink, 1977).

The ground surface of all of Makaiwa basin, except for a small patch at the highway boundary, consists of basaltic andesite that typically occurs in thick layers and is much more massive and dense than the thin bedded olivine basalts of the lower and middle members of the Waianae series. The basaltic andesite does not weather as easily or as deeply as the more primitive basalt, and as a result its surface layer of residium-saprolite is considerably thinner. Absorption of rainfall and vertical percolation are poorer, and runoff is higher than in the older basalts. The rock is hard and would likely be difficult to work. The exhausted Palailai Quarry and the new quarry at Makakilo were located to exploit the massiveness, denseness and hardness of the Waianae basaltic andesite.

F. Hydrology and Drainage

The following discussion is from a hydrogeologic and soils study conducted by Stephen P. Bowles and John F. Mink (1977).

Makaiwa Stream is non-perennial and runoff occurs infrequently. Although floods have a low probability of happening, high rates of runoff could be expected at least once every several years. Runoff from the gulch rarely reaches the ocean, dispersing instead into the sediments of the Ewa Plain below the highway.

Makaiwa straddles two separate groundwater bodies. Underlying the eastern part of the basin is the Waianae basalt aquifer, which has hydraulic continuity with the great Koolau basalt aquifer of southern Oahu. These aquifers carry basal lenses, with heads of approximately 12 and 15 feet, respectively. The lower head in the Waianae aquifer is caused by the loss in potential as water flows from the permeable Koolau aquifer through the poorly permeable weathered

SECTION 2

DESCRIPTION OF THE PROPOSED SITES AND REQUIRED IMPROVEMENTS

I. BACKGROUND PHYSICAL DESCRIPTION OF SITES

A. Rainfall

The following discussion comprises excerpts from a hydrogeological and soils study by Bowles and Mink (1977).

The proposed sanitary landfills lying on the slopes of the Waianae Mountains fall in the Leeward Lowlands, a climatic classification marked by dry weather except during infrequent storm periods in the winter months of October through April. The leeward sites have an annual average precipitation of 20 to 25 inches.

At the leeward sites, the normal rainfall from May through September is less than one inch in each month; in the winter months the average is between 2 and 4.5 inches per month. These figures, however, are mass averages and say nothing about rainfall intensities in real time. At the leeward sites most of the winter rain falls during storms, of which an average of about five strike Oahu each year. During summer months leeward rain showers are light and generally ineffective in penetrating deep into the soil.

Except in unusually wet years when winter storms are common, rainfall at the leeward sites is insufficient to saturate the soil and thereby to continuously infiltrate to the underlying bedrock. Some probabilities of annual rainfall quantities based on the normal distribution, which is generally applicable to Hawaii, at these sites are approximately as follows:

ANNUAL RAINFALL, EQUAL TO OR GREATER THAN	PROBABILITY
40 inches	.05 (1 year in 20 years)
35 inches	.10 (1 year in 10 years)
30 inches	.20 (1 year in 5 years)
20 inches	.50

The higher than average annual rainfalls given result from either more than the usual number of winter storms or great rainfall amounts from individual storms. Although the data and the nature of statistical inference does not permit statements of precision to be made about the frequency of rainfalls that are voluminous enough to saturate the soil, it is likely that such occurrences could be expected at least once in 5 to 10 years.

For engineering purposes, the intensity and return period of individual storms for the various regions of Oahu as computed by the U.S. Weather Service and the Army Corps of Engineers are given by Wu (1967) and summarized as follows:

Storm Type	Leeward Sites	Explanation
100 year storm; rainfall per 24 hours	14 in.	U.S. Weather Service: Probability of occurrence one in 100 years
Probable maximum 24 hour rainfall	40 in.	U.S. Weather Service: Maximum rainfall that could conceivably occur. Probability much less than .01
Standard Project Storm	26 in.	U.S. Army Engineers: The hypothetical storm that might be expected from the most severe flood producing rainfall, depth-area-duration relationship, an isohyetal pattern considered characteristic of area involved
Historical 24 hour rainfall	less than 12 in.	Actual storm rainfall experienced in region

Except for historical rainfall, the above values are hypothetical, but statistically expectable. In Honolulu, for which the hypothetical values are at least as high as they are for the leeward sites, the maximum 24 hour rainfall on record is 17.4 inches. A storm capable of yielding at least 10 inches of rain in 24 hours could be expected during the lifetime of a sanitary landfill in the Leeward Lowlands.

B. Surface Runoff and Floods

The following discussion comprises excerpts from a hydrogeological and soils study by Bowles and Mink (1977).

At the leeward sites surface runoff is sporadic and normally small when it does take place, but large storms cause substantial overland flow. Specific runoff and flood data is not available for any of the sites being considered, but maximum instantaneous peak flow data for drainage basins relatively nearby are given by Wu (1967). For the leeward locations the average of the peak flows at Honouliuli (.27 cfs/acre), which drains the southeast slope of the Waianae Range near Kaloi, and Awanui (.90 cfs/acre), draining the southern slopes between Makaiwa and Kaloi, is 384 cfs/square mile (.6 cfs/acre).

The nearest drainage in the leeward region for which peak flow return periods have been calculated (Wu, 1967) is Waikele, where the maximum peak flow is .45 cfs/acre, not greatly different from the computed peak flow for the leeward sites. Using the Waikele return periods normalized on an areal basis to these sites, the following peak flows can be expected:

Peak Flows, cfs

Return Period, Years	Runoff Inches	Makaiwa, at Hwy.	Kaloi, at foot of range	Nanakuli Sites A&B at road
2	4.4	106	281	12
3	5.5	132	351	15
5	8.7	210	560	24
10	11.7	283	752	32
Max historical (derived)	14.3	346	922	38

The potential destructiveness of these peak flows to structures and terrraces associated with sanitary landfills will have to be determined by consideration of channel environment, slope, and cross sectional area. The above calculations seem to reinforce the suggestion that a severe storm could be expected at least once in every 5 to 10 years.

The proposed sanitary landfill sites at Nanakuli, Makaiwa and Kaloi fall within the semi-arid Leeward Lowlands where the average annual rainfall is less than 25 inches per year. Much of the total annual rainfall, however, may accumulate from several storms during the winter months. Although in a normal year rainfall is not sufficient to saturate the soil layer, the probability of a storm which would provide sufficient rainfall to cause saturation and infiltration and to result in flood flows is approximately .10 to .20.

At the leeward sites, infiltration from the saturated surface to an aquifer would be impulsive rather than continuous. In addition, unsaturated flow through the soil layer could occur, probably as erratic impulses also. Most of the time significant volumes of leachate from landfills would not trickle to the groundwater zone, but an occasional slug of leachate will percolate below the soil-saprolite into the permeable basalt.

Of the leeward sites, Nanakuli A and B are the least likely to be potentially destructible by flooding. Also, at these sites the aquifers are small, have poor characteristics, and are not reasonably exploitable. The aquifer underlying Makaiwa, though poor in quality and characteristics, is better than the Nanakuli aquifers. An exploitable aquifer, from which wells presently pump water, underlies Kaloi.

C. Temperature

The temperature climate at the Nanakuli, Makaiwa and Kaloi sites are largely affected by the semi-arid conditions and clear skies that are usually prevalent at the sites. No temperature data is available for the immediate vicinity of the sites. However, the temperature data for Waianae, another valley on the leeward coast of Oahu gives a fairly accurate description of the temperature climate throughout the area, including the three project sites.

The temperature climate for Waianae is depicted in Figure 2-1. Winter temperatures usually range from the low 60°'s to the low 80°'s and summer temperatures from the lower 70°'s to the upper 80°'s. All time temperature extremes range from 96° to 50°F. The coldest month is January with a mean maximum temperature of 81.1° F and a mean minimum of 62.5°F. The warmest month is August with a mean maximum temperature of 89.5°F and a mean minimum temperature of 71.1°F.

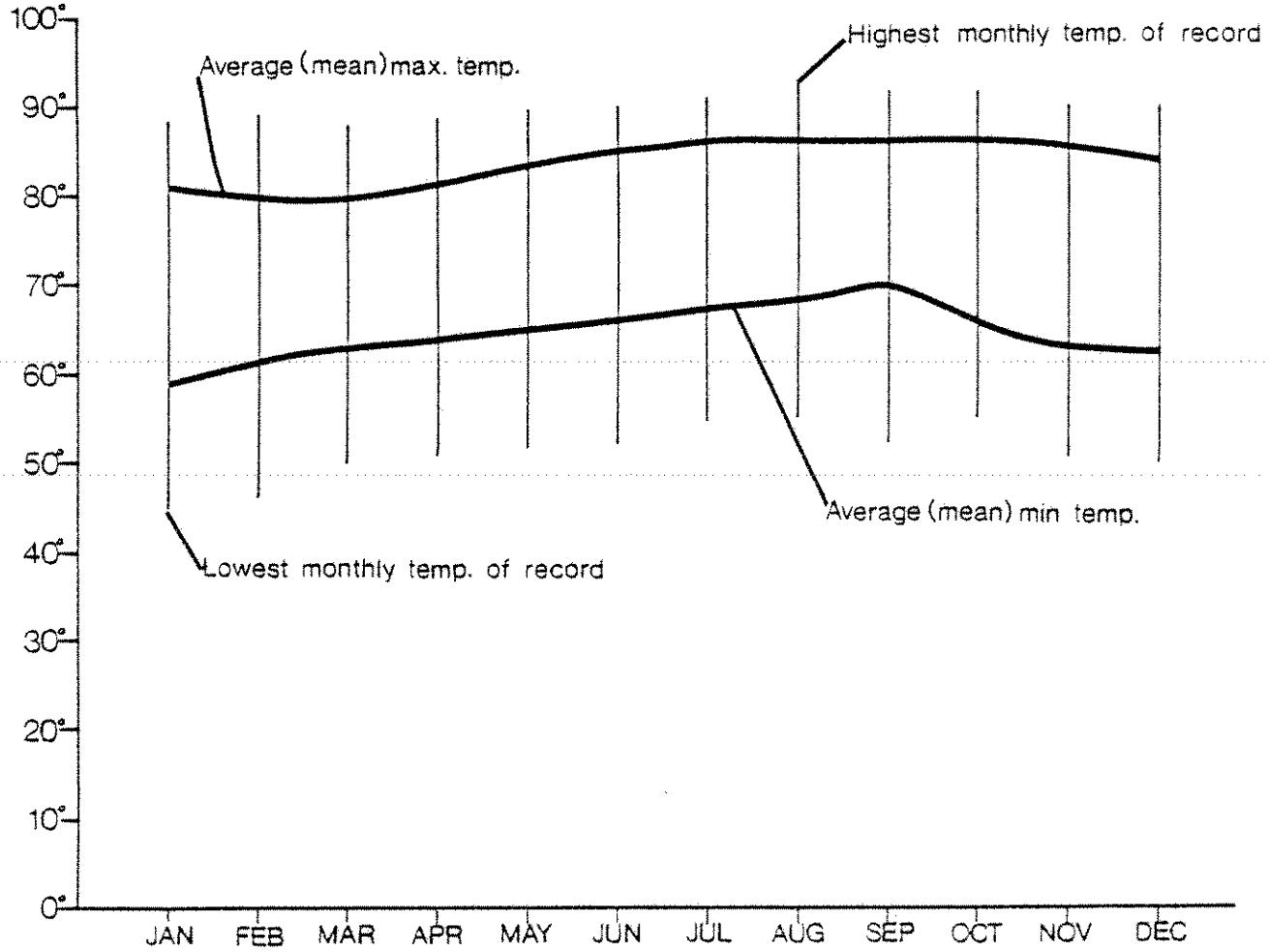


Figure 2-1

LEEWARD SANITARY LANDFILL

Temperature climate

Source: Atlas of Hawaii

D. Wind

The Nanakuli, Makaiwa and Kaloi sites are located around the southern end of the Waianae Range (Figure 1-1, page 1-3). The presence of this range modifies the local wind, affecting both its direction and its speed. Generally, a mountain range such as the Waianaes, exposed to the stream of air in the trade winds, will have several aerodynamic effects on the air flow:

1. The streamlines of flow will tend to "wrap around" the mountain barrier.

2. The airflow will be accelerated around the corners of the mountain range and over mountain passes.

3. The wind speed on the lee side of the range will be reduced.

Unfortunately, regular long-term wind observations are taken at only a few locations on Oahu, mainly at airports. Nevertheless, some local wind data is available. A preliminary report (Ramage, et al., 1977) estimates the mean long-term windspeed at Makakilo, located between the Kaloi and Makaiwa sites to be 9.5 knots.

In a recent study (Naguchi, 1977) streamlines of air flow over Oahu were mapped using data based on the tree growth deformations observed at several hundred locations throughout the island. The streamlines for the area of the Leeward Sanitary Landfill sites under consideration are shown in Figure 2-2.

The wind rose for the nearby Barbers Point NAS is shown in Figure 2-3. The most typical wind direction is NE, with windspeeds of 7-16 knots. Winds from the westerly direction only occur on rare instances.

II. MAKAIWA GULCH SITE

A. General

The Makaiwa Gulch site is recommended by the City's engineering consultant as one of the sites that should be evaluated as the major sanitary landfill site for the leeward Oahu area.

The site is located in the Ewa District, directly mauka of Farrington Highway and between Waimanalo

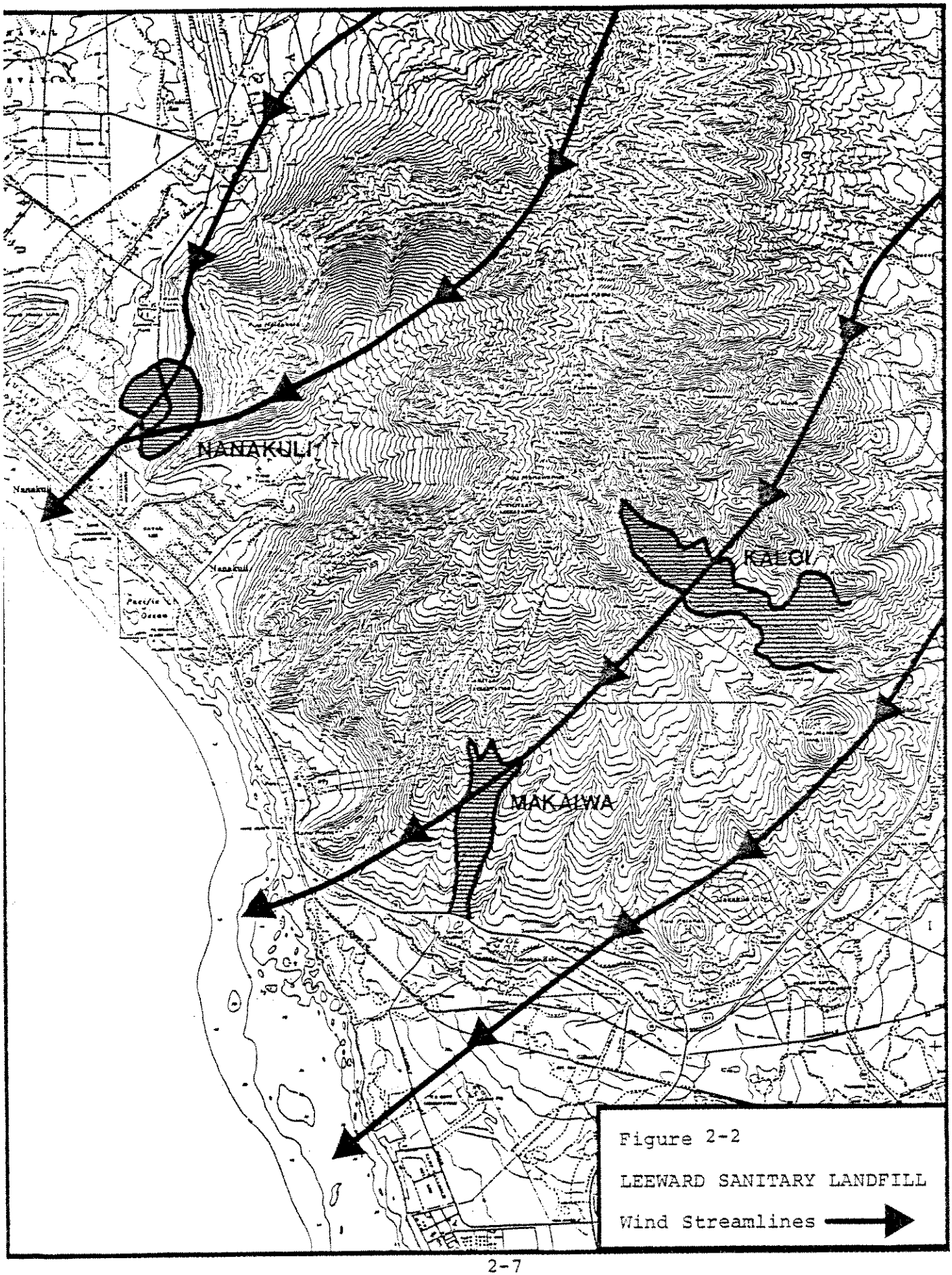


Figure 2-2

LEEWARD SANITARY LANDFILL

Wind Streamlines →

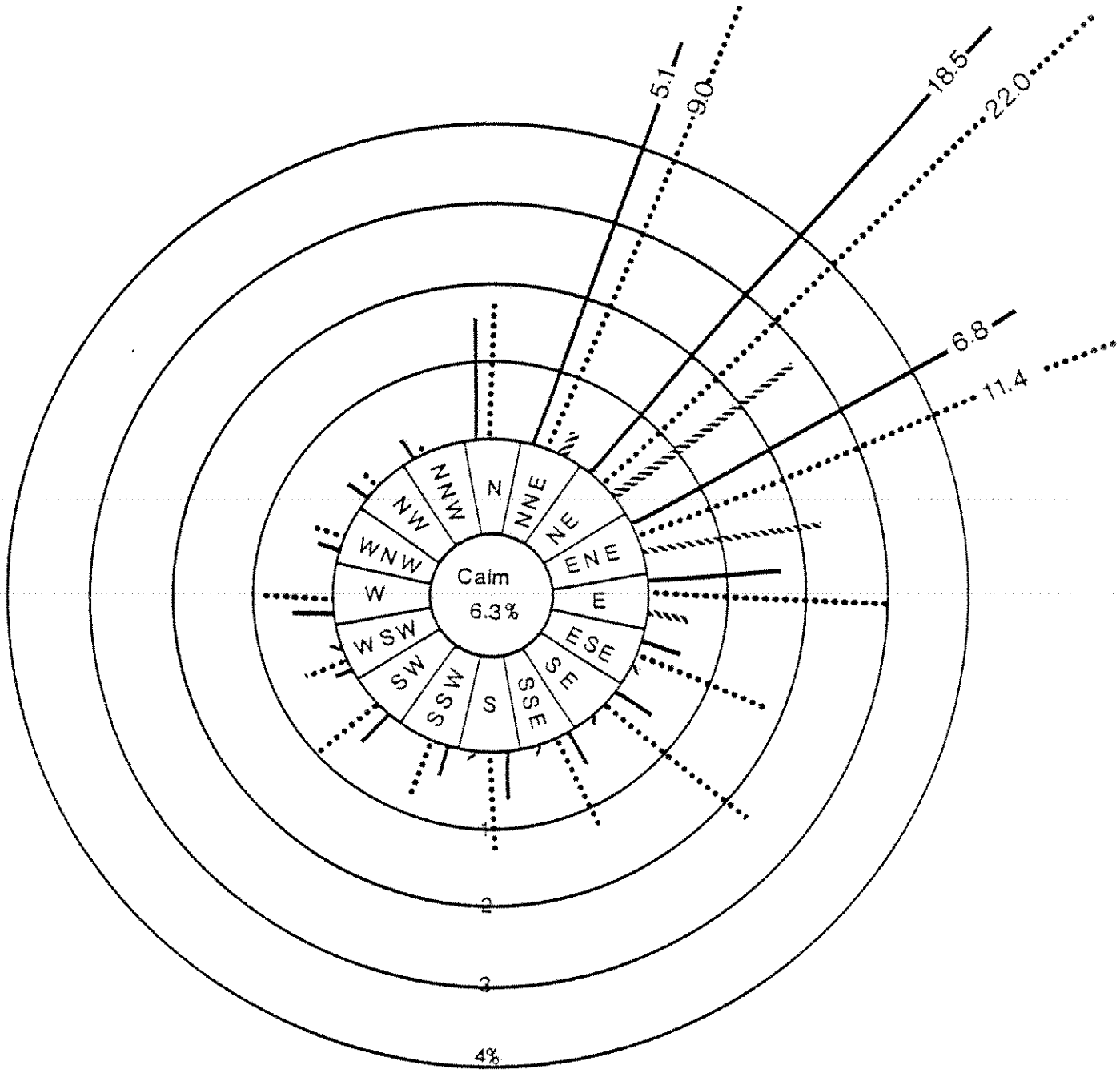


Figure 2-3

LEEWARD SANITARY LANDFILL
WIND ROSE - Wind speed in knots

Legend: ——— 1-6 knots
····· 7-16 knots
\\\\\\\\ more than 16 knots

Source of data: Chief of Naval Operations
Naval Weather Service

Data collected: April 1945 thru April 1949
and July 1952 thru March 1959

Gulch on the west and Palailai Gulch on the east as shown in Figure 2-4.

The site has a capacity of approximately 16,625,000 cubic yards with an approximate life of 31± years based on a disposal rate of 500 tons per day (TPD)*. The site is leased from Campbell Estate by Hawaii Meat Co. and subleased to Tongg Ranch. The present lease extends to 1987. Tongg Ranch has applied to extend their lease in this area to 1996. This particular site is not included in their lease extension plans. The estimated cost to purchase the land is $1,690,000. The site is approximately 18 miles from Keehi Transfer Station (formerly known as Shafter Flats Transfer Station), which will receive and transfer a significant portion of Honolulu District's solid waste. Most of the travel from the transfer station to the landfill site is on a modern, high-speed highway.

B. Land Use

Refer to Section 3 for more information on land use. The site is presently an open area used for pasture. The site is zoned Agriculture (Ag-1), general planned Agriculture and the State Land Use designation is Agriculture. It is unsuitable for crop cultivation. Adjacent land uses mauka of Farrington Highway are in open space, with former Army Nike Sites 5 and 6 located to the northwest of the site. Surrounding land use designations mauka of the highway are Agriculture and Military. The nearest residential areas consist of Honokai Hale, makai of Farrington Highway and at the lower portion of the site, and Makakilo City, approximately 2.8 miles east of the site. Nanakuli town is approximately 4.2 miles northwest of the site, and Waipahu town is approximately 8.3 miles east of the site.

C. Topography

The site is located to the south of Puu Manawahua and to the northwest of Puu Palailai. The overall length of the site is approximately 7,600 feet and average width approximately 2,000 feet. The lower portion of the site consists of a well-defined gully

* calculations are based on wastes being compacted to 1000 pounds per cubic yard and include cover material in the amount of 1/3 of the waste deposited.

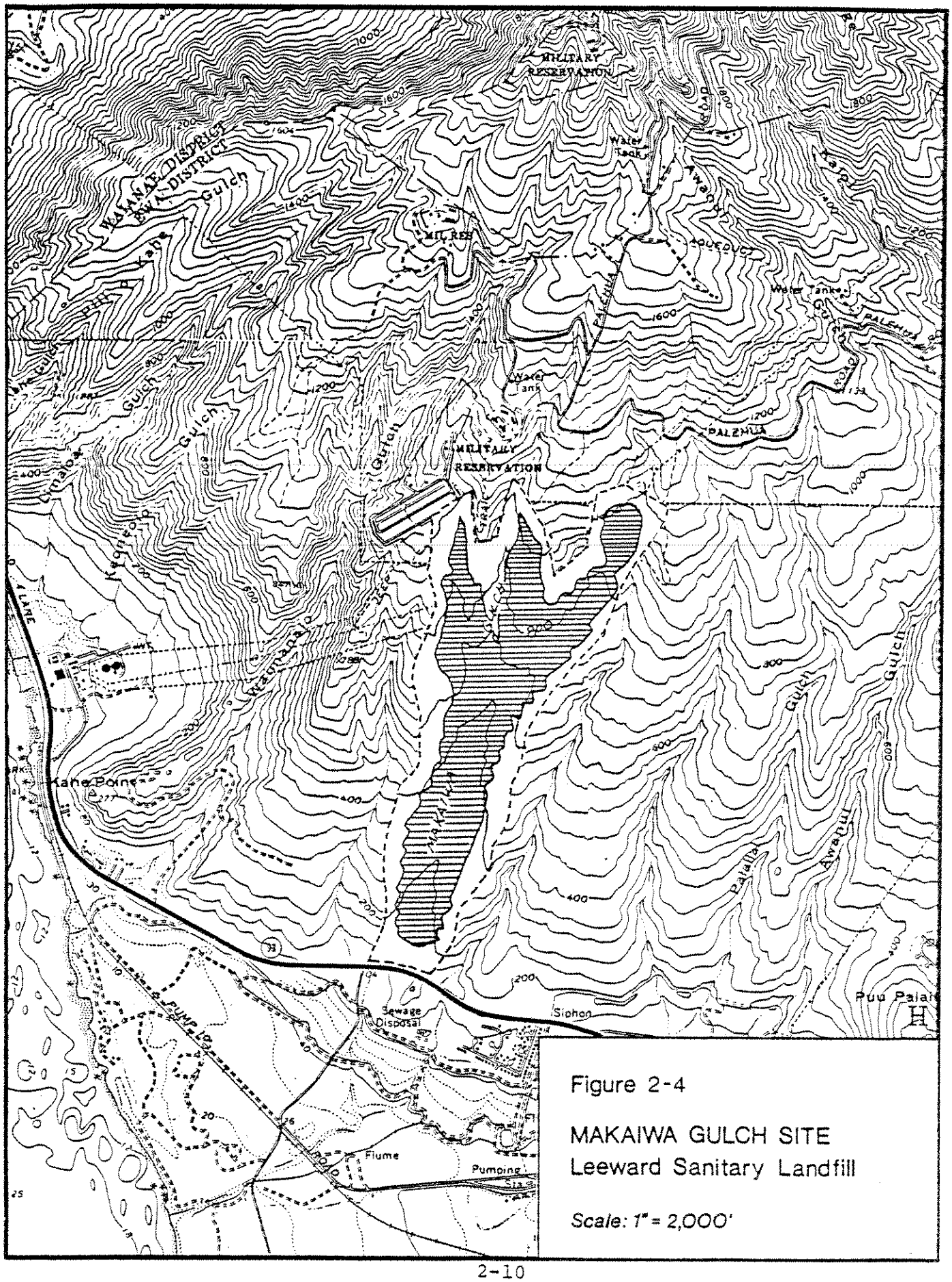


Figure 2-4

MAKAIWA GULCH SITE
Leeward Sanitary Landfill

Scale: 1" = 2,000'

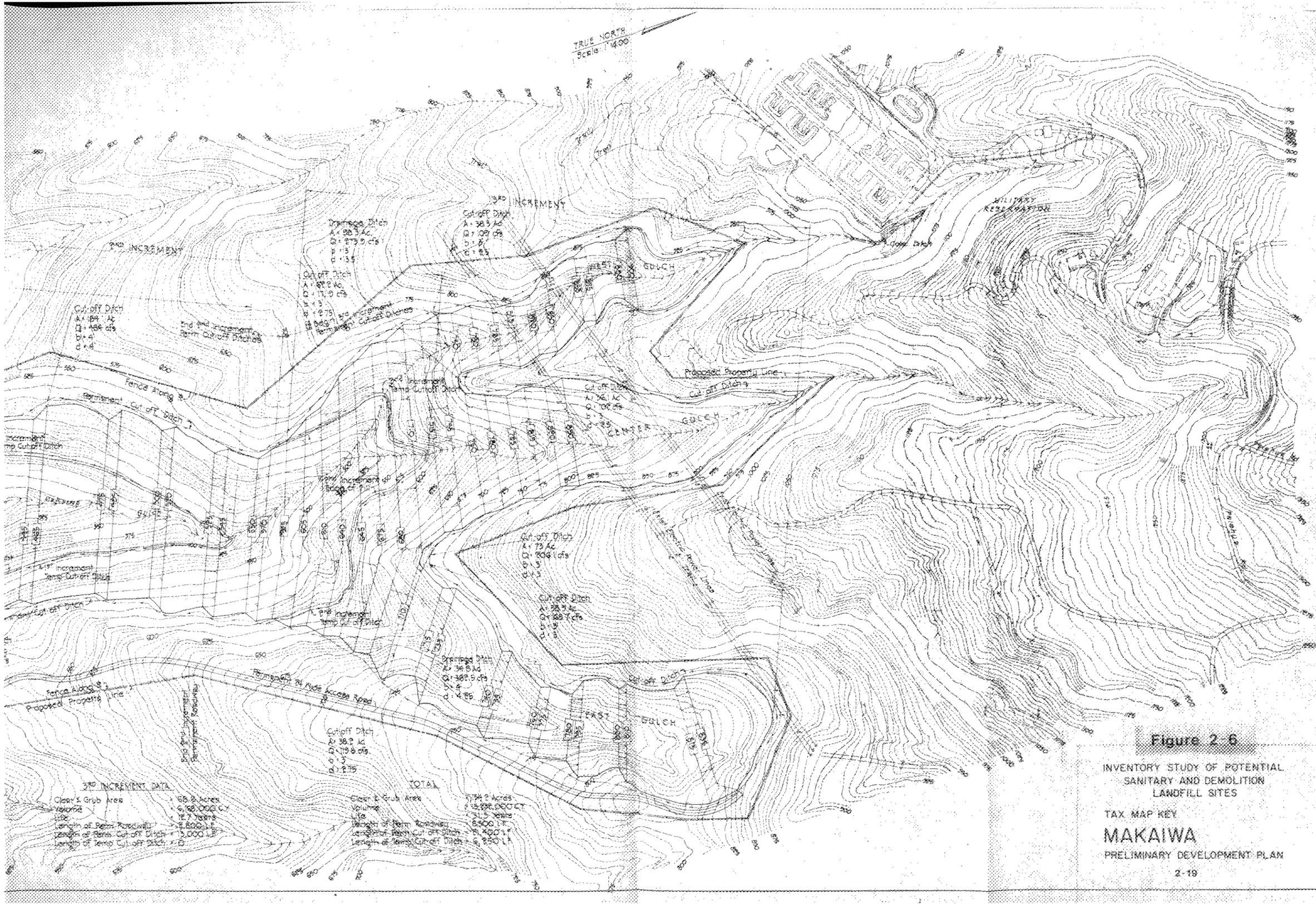


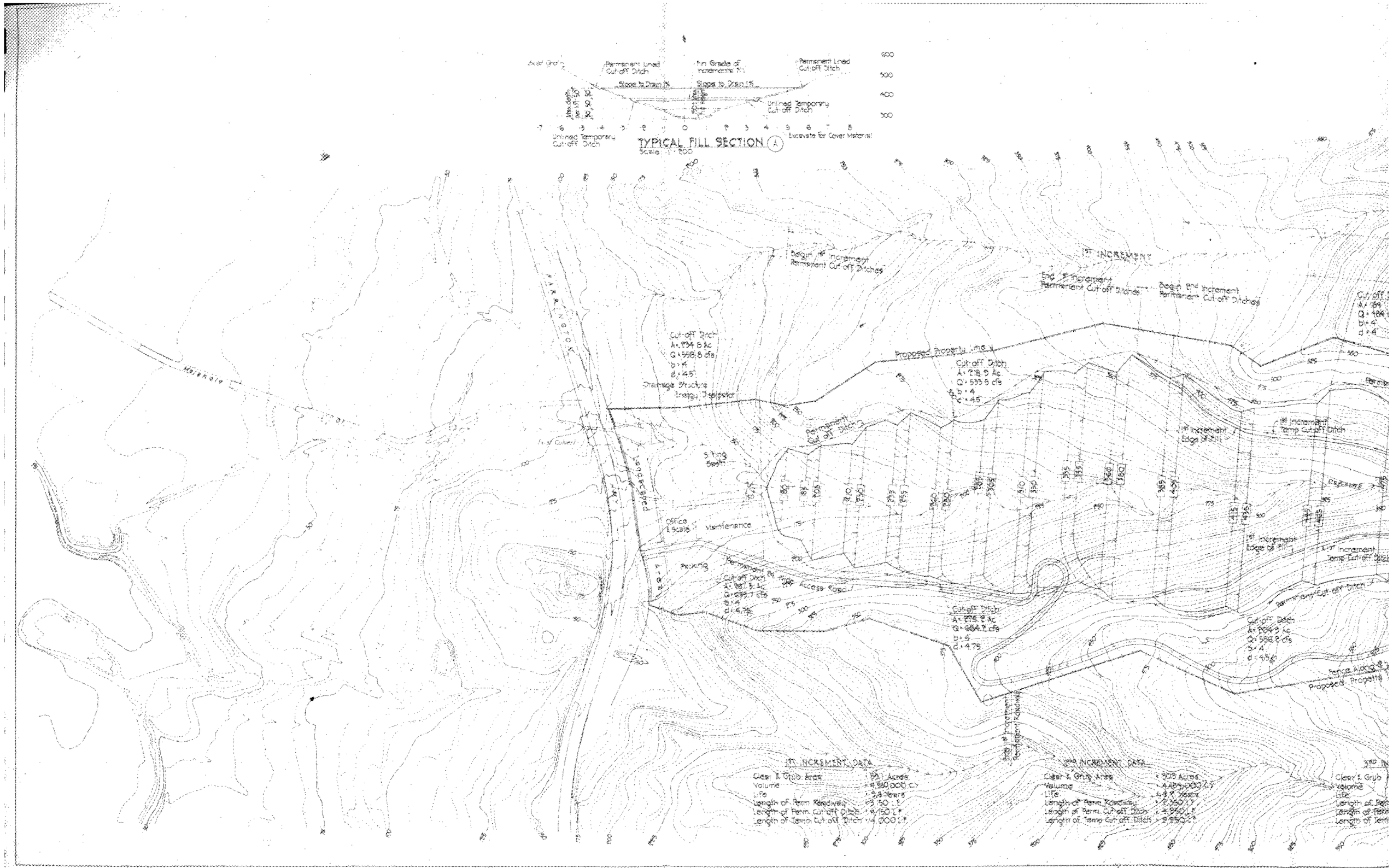
Figure 2-6

INVENTORY STUDY OF POTENTIAL SANITARY AND DEMOLITION LANDFILL SITES

TAX MAP KEY

MAKAIWA

PRELIMINARY DEVELOPMENT PLAN


Existing Grade
Permanent Lined Cut-off Ditch
Fin Grade of Increment No. 1
Permanent Lined Cut-off Ditch
Slope to Drain 1%
Slope to Drain 1%
Unlined Temporary Cut-off Ditch
Unlined Temporary Cut-off Ditch
Excavate for Cover Material
TYPICAL FILL SECTION (A)
Scale: 1" = 200'
Begin 1st Increment Permanent Cut off Ditches
1st INCREMENT
End 1st Increment Permanent Cut off Ditches
Begin 2nd Increment Permanent Cut-off Ditches
Cut-off Ditch
A = 234.8 Ac
Q = 556.8 cfs
b = 4
d = 4.5'
Drainage Structure Energy Dissipator
Proposed Property Line
Cut-off Ditch
A = 218.9 Ac
Q = 593.5 cfs
b = 4
d = 4.5'
Permanent Cut off Ditch
1st Increment Edge of Fill
1st Increment Temp Cut off Ditch
Sling Depth
Office & Scale
Maintenance
Parking
Access Road
Cut-off Ditch
A = 887.5 Ac
Q = 2397.7 cfs
b = 4
d = 6.75'
Cut-off Ditch
A = 776.2 Ac
Q = 2064.2 cfs
b = 4
d = 4.75'
Cut-off Ditch
A = 204.9 Ac
Q = 556.2 cfs
b = 4
d = 4.5'
Fence along Proposed Property
1st INCREMENT DATA
Clear & Grub Area : 52.1 Acres
Volume : 1,580,000 C.Y.
Life : 3.8 Years
Length of Perm. Roadway : 3,150 L.F.
Length of Perm. Cut off Ditch : 4,150 L.F.
Length of Temp. Cut off Ditch : 4,000 L.F.
2nd INCREMENT DATA
Clear & Grub Area : 30.5 Acres
Volume : 1,180,000 C.Y.
Life : 3.9 Years
Length of Perm. Roadway : 2,350 L.F.
Length of Perm. Cut off Ditch : 4,250 L.F.
Length of Temp. Cut off Ditch : 3,250 L.F.

Farrington Highway and from Honokai Hale a landscaped buffer zone, approximately 200 feet in width, will be provided to minimize visual obtrusiveness. The vegetation will be selected to visually minimize the impact of operations from the residents.

7. Cover Material

Within the Makaiwa basin above the highway the soil saprolite cover is thin and discontinuous. Below elevation 100 feet, which lies seaward of the highway, heavy hydromorphic soils occur but are planted in sugar cane. The bedrock above the highway would be difficult to work and adequacy of cover material might be a problem. For details about the amount of cover material required and possible areas from where cover material can be imported, see Appendix C (Bowles and Mink, 1977). The amounts of cover material may be reduced if refuse is shredded. Proponents of shredding indicate the shredded waste can be used as the daily cover material for refuse not processed through the shredder. Shredding would serve to minimize cover requirements from daily to possibly weekly or longer intervals, decreasing the need for cover material. If all refuse is shredded, the compactability of the refuse will be increased, thereby increasing the life of the landfill.

J. Summary

Advantages

1. Long (31± years) landfill life expectancy
2. Easily accessible
3. 18 miles from Keehi Transfer Station
4. Utilities available
5. Minimum measures required for groundwater protection
6. No surface water located on or near site
7. Good topographical conditions

Disadvantages

1. Near existing residential area (Honokai Hale)

2. Visually prominent if not screened or prominant from a distance

3. Lacks sufficient fill material

4. Requires major drainage improvement system

III. NANAKULI SITE

A. General

The project site is located in Nanakuli approximately 2,000 feet mauka of Nanaikapono Beach Park as shown in Figure 2-7. The site, divided by the Lualualei Naval Road, is approximately 611 acres in area and is owned by Shigeru Horita, et al., The Hawaii Corp., U.S. Financial Inc., and Security Mortgage Corp. The estimated purchase cost for this land is $4,866,000. Its capacity is estimated at 13,050,000 cubic yards with an approximate life of 27 years based on a disposal rate of 500 TPD.

This site was also recommended by the City's consultant as one of the sites that should be evaluated for use as the major leeward landfill site. The site is considered feasible for proposed landfill use, because the existing terrain precludes economical development for other uses. To convert the site to residential or urban use, extensive grading and imported fill would be required for the western portion. This makes site development extremely costly. The eastern portion of the site would require a new access road and major drainage improvements.

B. Land Use

Portions of the western half of the site formerly were used for quarry activities and presently sections of this portion are victimized by unauthorized dumping and littering. Charred areas indicate that fires have been common occurrences in recent times. Refer to Section 3 for more information on land use. The western half of the site is zoned Agriculture (Ag-1), and general planned Agriculture, Residential, Apartment and School and Park. State Land Use designation is Urban. The eastern portion of the site is zoned

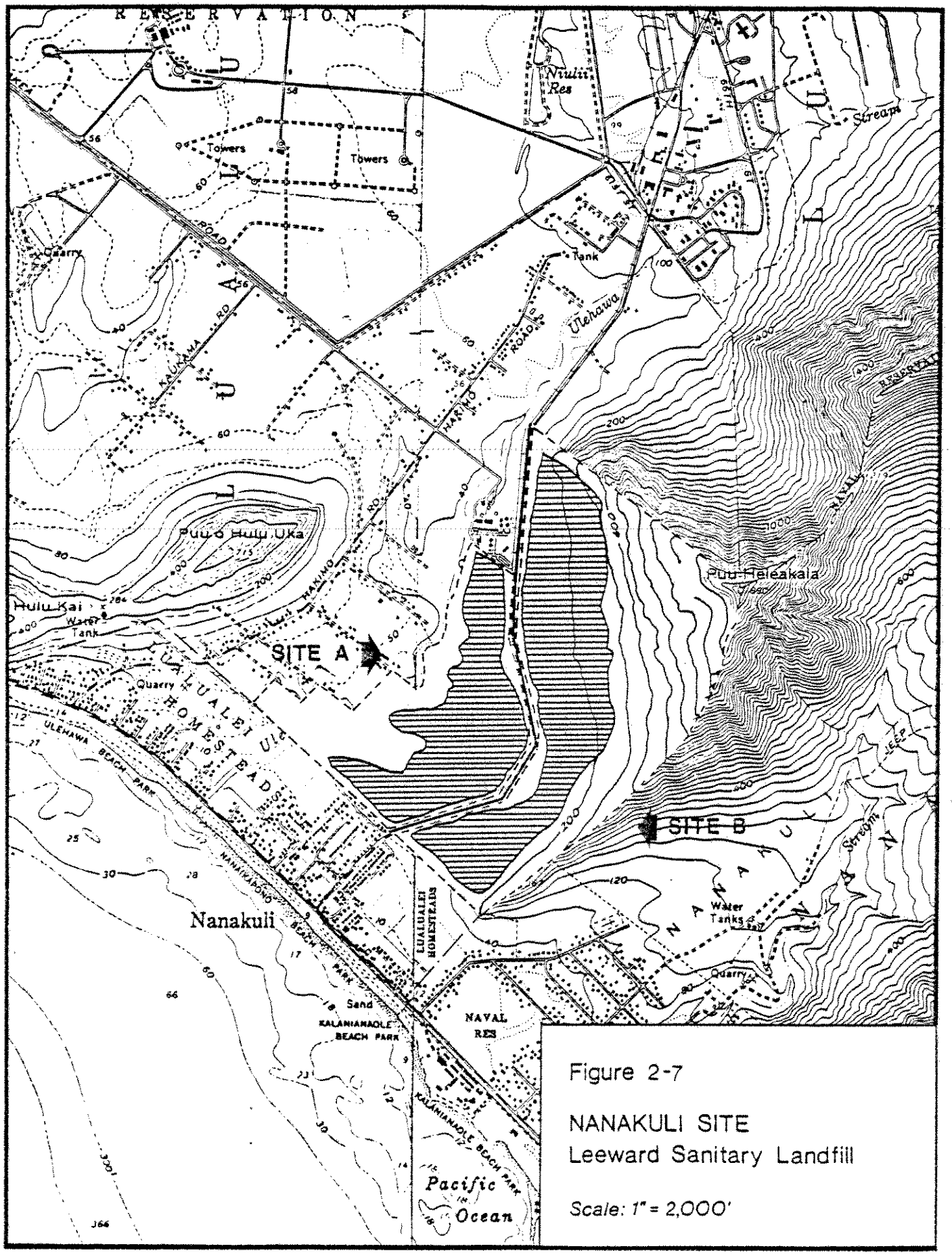


Figure 2-7

NANAKULI SITE
Leeward Sanitary Landfill

Scale: 1" = 2,000'

Planned Development Housing (PDH), Agriculture (Ag-1) and Preservation (P-1). This section is general planned Agriculture, Park and Open Space. The State Land Use designation is Conservation and Agriculture. The land is suitable for pasture but not for crop cultivation. Surrounding land uses consist of residential developments to the west and south, vacant lands to the east, a cement plant to the north and residences to the northwest. The distances of urban areas other than Nanakuli are: Maile, 3 miles, Waianae, 4.7 miles, Makaha, 7 miles, and Waipahu, 12 miles.

C. Topography

The site is located between Puu Heleakala on the east and Puu o Hulu Oka on the west. The land west of Lualualei Naval Road contains depressions of approximately 40 feet with mounds of 30 feet existing on the southern 60 percent of the site. These mounds and depressions are the result of abandoned quarry activities. The northern 40 percent of the site is in its natural state with two defined shallow gullies meeting Ulehawa Stream. The slope in this area varies from 2 percent to 10 percent. The land east of Lualualei Naval Road is relatively flat in the lower reaches along the road, gradually sloping upward toward the ridge line of Puu Heleakala.

D. Soils

Soils of the site, according to the Soil Conservation Service, consist of the following: Lualualei extremely stony clay on 3 to 35 percent slopes, Mamala stony silty clay loam on 0 to 12 percent slopes, Pulehu very stony clay loam on 0 to 12 percent slopes, and rock land (Appendix B).

1. Lualualei extremely stony clay occurs on talus slopes. The slope range is 3 to 35 percent but in most places the soil is moderately sloping to steep. There are many stones on the surface and within the soil profile making it impractical to cultivate this soil unless the stones are removed. Runoff is medium to rapid and the erosion hazard is moderate to severe. This soil is used for pasture and its cultivatable land productivity rating is "E" (Sahara, et al., 1971).

2. Mamala stony silty clay loam has a slope range of 0 to 12 percent but in most places, the

slope does not exceed 6 percent. Stones, mostly coral rock fragments are common on the surface and in the profile. Permeability is moderate, runoff is very slow to medium and the erosion hazard is slight to moderate. The cultivatable land productivity rating is "E".

3. Pulehu very stony clay loam occurs on 0 to 12 percent slopes with as much as 3 percent of the surface covered with stones. Runoff is slow to medium and the erosion hazard is slight to medium. Its cultivatable land productivity rating is "E." This soil is used for pasture and wildlife habitat.

4. Rock land is comprised of areas where exposed rock occurs on 25 to 90 percent of the surface. The rock outcrops and very shallow soils are the main characteristics of this land type. Rock land is used for pasture, wildlife habitat, water supply and urban development. It has high shrink-swell potential. Its cultivatable land productivity rating is "E".

E. Geology

1. Site A (Figure 2-7)

The abandoned quarry was dug in agrillaceous limestone lying near the lateral limit of valley fill sediments. The limestone is heterogeneous, containing corals, shells and sand, and apparently was laid down under lagoonal conditions. Its thickness is not determinable from field observations. Boreholes will be needed to establish the vertical and horizontal boundaries of the formation. The probable geologic sequence of the site, starting at the surface, is limestone above and mixed with non-calcareous valley fill to a thickness of several hundred feet, overlying basement rock consisting of basaltic lava of the Lower member of the Waianae volcanic series. The surface limestone is very porous and permeable (Bowles and Mink, 1977).

2. Site B (Figure 2-7)

The talus embankment consists of recently deposited non-calcareous bouldery alluvium overlying older material of the same sort. Although borings will be necessary to accurately establish

the thickness of the sediments, the slope wash is not likely to extend downward more than 100 feet. Below the talus a thin zone of older, more compacted alluvium may directly overlie the basement rock of basalt of the lower member of the Waianae volcanic series. Where the ground elevation is less than 100 feet, layers of calcareous sediments may occur along with the older alluvium (Bowles and Mink, 1977).

F. Hydrology/Drainage

The discussion is from a hydrogeologic and soils study conducted by Stephen H. Bowles and John F. Mink (1977).

1. Site A (Figure 2-7)

Normal rainfall at the site is less than 25 inches per year, most of which falls during winter storms. In the immediate vicinity surface runoff is negligible because of the small drainage area and the high infiltrability of the limestone. Nevertheless, on rare occasions concentrated runoff from Heleakala Ridge could wash over Lualualei Naval road onto the site.

A sedimentary aquifer containing very poor quality water underlies the site. Groundwater occurs as a basal lens in limestone and valley fill alluvium and discharges to the Ulehawa drainage canal and at the coast. The aquifer is moderately permeable but the volume flow of water through it is relatively small. The head of the lens is about two feet and therefore between the ground surface at 50 feet and the water table lies an unsaturated zone nearly 50 feet thick. The hydraulic gradient in the aquifer is about 2 feet per 2500 feet, and if a moderate hydraulic conductivity of 500 feet per day and a porosity of .20 is assumed, the particle velocity of the groundwater is 2 feet per day (Refer to Figure 2-5, page 2-14).

The quality of the water in the sedimentary aquifer is very poor. The static, unpumped water at the top of the lens has a chloride content exceeding 500 mg/l; pumped water would exceed 1000 mg/l, and its quality would progressively worsen with magnitude and time of pumping. The natural groundwater is neither potable nor acceptable for most agriculture.

2. Site B (Figure 2-7)

The sediments of the talus slope at the base of Heleakala Ridge are very heterogeneous in size and shape, ranging from clay particles to boulders. They are highly permeable to vertical infiltration and thus only a rudimentary drainage pattern has evolved on the slope. Storm runoff from the steep basalt palis that form the Heleakala Ridge disperses over many small drainage pathways.

Percolating water in the talus moves both downward into the basalt aquifer and laterally into the valley fill sedimentary aquifer. Both aquifers are intimately connected and carry similar poor quality groundwater. Heads are less than 5 feet and therefore the minimum unsaturated section between the lowest part of the talus slope and the water table is greater than 50 feet. Infrequent impulse leaching of a landfill would behave in the same manner as at Site A except that solutes that reached the basalt aquifer would not be intercepted by the Ulehawa drain. As in the case of Site A, travel time to the coast would be in the neighborhood of 3 years, and dispersion of a pulse would greatly dilute its concentration.

Groundwater at Site B is poor in both quality and exploitability and is not likely to be worth considering either for domestic or agricultural usage. Flow volume in the aquifer is low, and under pumping stress the chloride content of the water would exceed 1000 mg/l.

G. Flora and Fauna

The coastal location of the site is evidenced by the dominance of coral where the surface soil has been removed for quarrying in the western portion of the site. Vegetation in this portion includes kiawe (*Prosopis pallida*), koa haole (*Leucaena leucocephala*), slender mimosa (*Desmanthus virgatus*) and fingergrass (*Chloris* sp.). Additional common species include Australian salt bush (*Atriplex semibaccata*), hi'aloa (*Waltheria americana*), tree tobacco (*Nicotiana glauca*), scarlet-fruited passion flower (*Passiflora foetida*), golden crown-beard (*Verbesina encelioides*), castor bean (*Ricinus communis*) and pluchea (*Pluchea odorata*). The eastern portion of the site is relatively undisturbed

and dominant vegetation includes kiawe, koa haole and fingergrass.

Avifauna recorded during the site survey include sparrow (Passer domesticus), barred dove (Geopelia striata), lace-necked dove (Streptopelia chinesis), white-eye (Zosterops japonica), cardinal (Richmondena cardinalis) and common mynah (Acridotheres tristis). The presence of refuse on portions of the site accounted for the large number of birds on the site. Mammalian wildlife surveyed include dog (Canis familiaris), mongoose (Herpestes auropunctatus) and cat (Felis catus). The presence of refuse and birds indicates the presence of mouse (Mus musculus) and rat (Rattus spp.).

H. Archaeology

The area of the proposed landfill showed no visible signs of any cultural remains (Bordner, 1977).

The area enclosed in landfill Site "A" has been modified through quarrying activities, which have greatly disturbed the surrounding area. Areas not directly involved in quarry operations had been bulldozed several times.

Landfill Site "B" has only been bulldozed in the lower sections, the upper portions being unmodified. However, no area showed any signs of archaeological remains (Bordner, 1977).

I. Existing and Proposed Site Improvements

Tables 2-1 and 2-2, pp.2-16 and 2-17 illustrate the estimated site development cost.

1. Access

Access to the project site is from Lualualei Naval Road. The Navy, which controls the road, has been receptive to transferring the roadway over to the City if this site is selected for landfilling activities. The road will require widening and portions may require realignment. Safe and unlimited access to Naval facilities and cement plant mauka of the landfill will be required.

2. Operation and Maintenance Facilities

Permanent facilities must be constructed,

including office building, scales, maintenance yard and fence.

3. Utilities

Electric power, telephone and water connections are available at the adjacent Lualualei Homestead Lots. A cesspool must be constructed for sewage disposal.

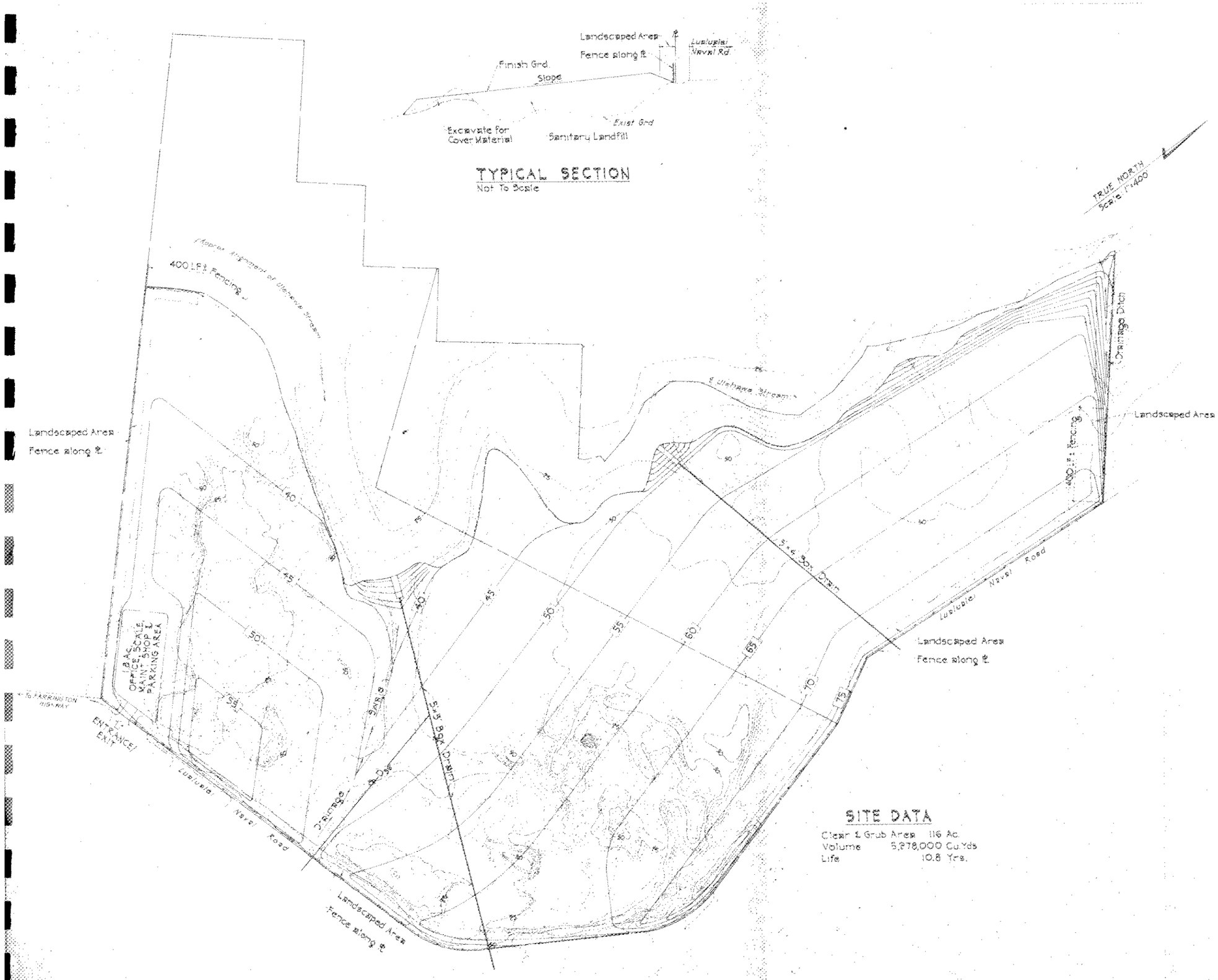
4. Drainage System

A drainage system will be constructed around the landfill to divert surface runoff around the landfill area. Runoff off-site and on-site will be collected by interceptor ditches and collected in siltation basins before discharge. The design of the drainage system will reduce the velocity of flow to approximate the velocity of runoff under normal conditions. Debris barriers will be provided at the inlets of collection pipes. (See Figures 2-8 and 2-9 details).

5. Leachate Control System

A leachate control system is not required. Leachate will probably not be produced at the Nanakuli Landfill because the rainfall is not sufficient to generate net infiltration and, hence, leachate. Nevertheless, caution should be taken to utilize relatively impermeable soil cover to provide a final grade of at least 3 percent to enhance runoff during periods of major storms. Vegetation should be selected to enhance transpiration and minimize erosion. A program of continuing maintenance should be provided to ensure that surface cracks created by differential settlement are sealed, thereby minimizing the potential of surface water infiltration (EMCON and Associates, 1977).

The particle velocity of the groundwater is 2 feet per day. If leachate were produced it would be two years before reaching Ulehawa canal and three years before discharging into coastal waters (Refer to Figure 2-5, p. 2-14). In the meantime dispersion would greatly reduce the concentration of the pulse (Bowles and Mink, 1977).



INVENTORY STUDY OF POTENTIAL SANITARY AND DEMOLITION LANDFILL SITES

TAX MAP KEY

NANAKULI "A"

PRELIMINARY DEVELOPMENT PLAN

Figure 2-8

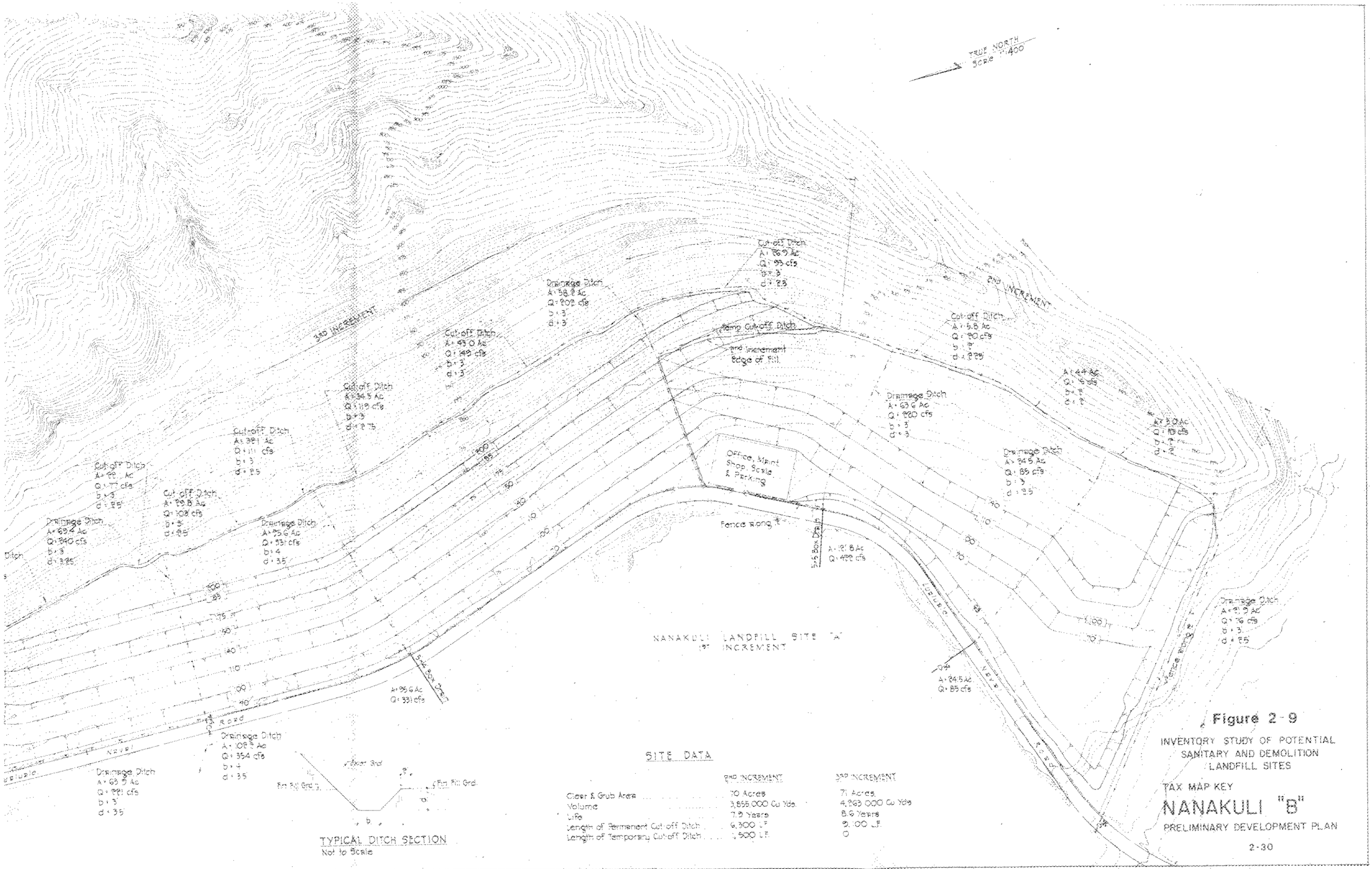


Figure 2-9

INVENTORY STUDY OF POTENTIAL SANITARY AND DEMOLITION LANDFILL SITES

TAX MAP KEY

NANAKULI "B"

PRELIMINARY DEVELOPMENT PLAN

6. Cover Material

At site A, soil cover that may have been naturally formed has been scraped away. Cover material for the landfill would have to be brought in from outside the immediate area. The nearest source is the talus slope at the foot of Puu Heleakala, where the proposed Nanakuli B site is located. Excavation for cover material at the B site would enhance its potential for landfill operations. See Appendix C for details about how much cover material is required and possible areas from where such material can be imported (Bowles and Mink, 1977).

The surface at Site B is rough and bouldery but could be excavated and shaped with moderate effort. The excavated sediments could be used as cover material at both sites A and B, although boulders would present a handling and perhaps disposal problem.

7. Landscaping

A landscaped buffer area, approximately 200 feet in width, will be provided around the makai and Puu o Hulu Uka sides of the site and along both sides of Lualualei Naval Road to minimize visual obtrusiveness. The vegetation will be selected to visually minimize operations from the residences.

J. Summary

Advantages

1. Long (27 years) landfill life expectancy

2. Utilities available

3. Minimum measures required for groundwater protection

4. Good topographical conditions as portions of the site are abandoned quarry areas

Disadvantages

1. Surrounded by existing and proposed residential developments

2. Access road must be improved

3. Moderate drainage improvement system required

4. Furthest distance from Keehi Transfer Station

5. Lacks sufficient fill material

6. May be visually obtrusive

IV. KALOI GULCH SITE

A. General

The project site is located in the foothills of the Waianae Mountain Range. Access to the site is from Farrington Highway and Palehua Road, approximately 2,500 feet northwest of the H-1 highway (Figure 2-10). The site, approximately 400 acres, is owned by the James Campbell Trust Estate. The cost of this parcel is estimated at $2,000,000. The site has an estimated landfill capacity of 24,300,000 cubic yards or 50 years based on a disposal rate of 500 TPD. The site is considered desirable for landfill use because of its large landfill capacity and because it is remote from residential centers and is not easily visible. However, site development costs may be prohibitive.

B. Land Use

Lands surrounding the project site are predominantly in sugarcane production. A residential community, Makakilo City, is located approximately 1.5 miles south of the project site. No other residential areas are located nearby.

Refer to Section 3 for more information on land use. The project site is currently open space with a portion of the site leased to the Tongg Ranch for grazing. The site is designated as Agriculture by the State Land Use Commission. Portions of the project site are general planned Agriculture and Residential, but the entire site is zoned Agriculture (Ag-1). It is not suitable for cultivation or crop production because of its uneven terrain features.

C. Topography

The site is located between two mountain peaks,

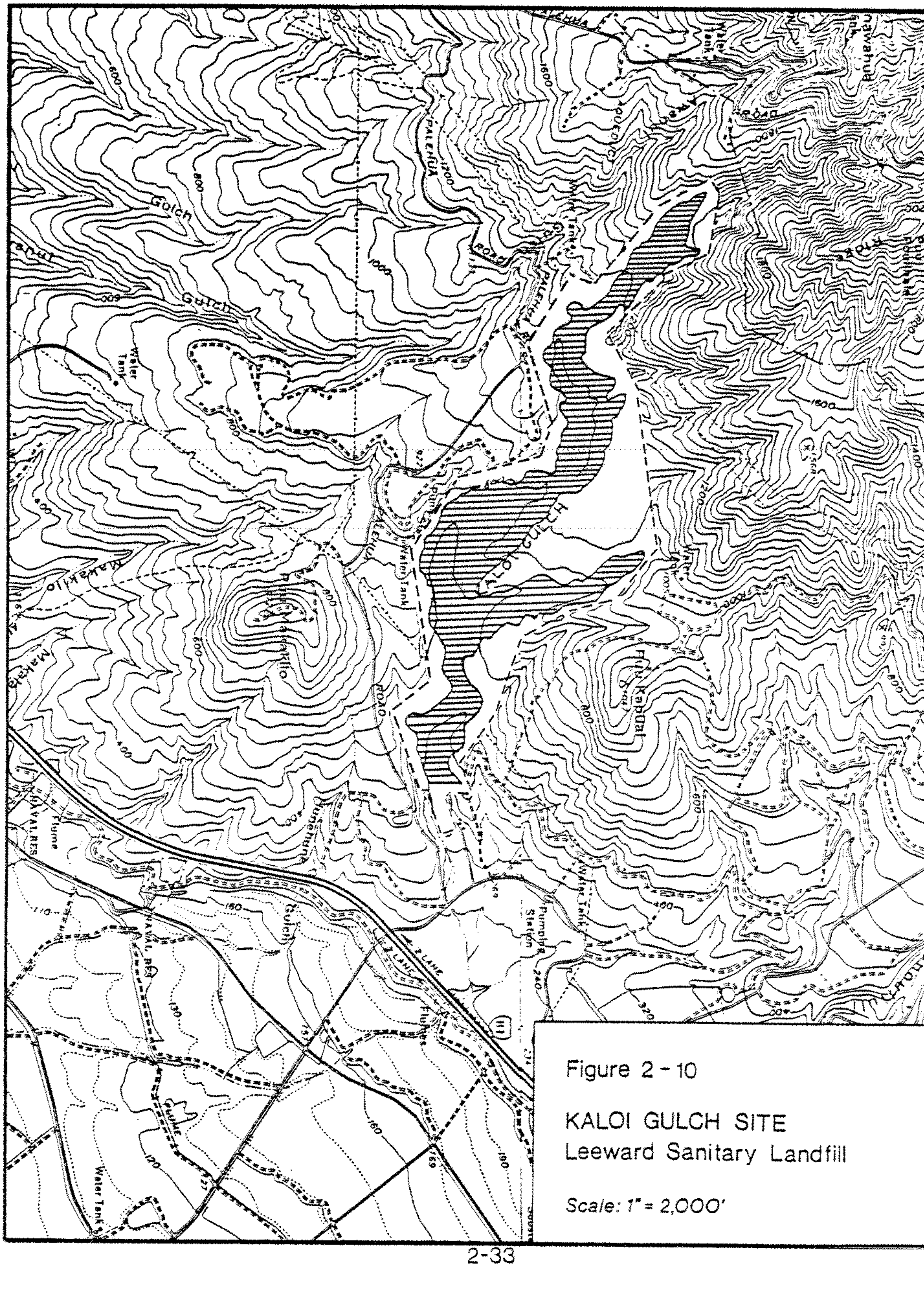


Figure 2 - 10

KALOI GULCH SITE
Leeward Sanitary Landfill

Scale: 1" = 2,000'

Puu Makakilo and Puu Kapuai. Longitudinal slopes within the gulch vary from 5 percent at the entrance to 13 percent at the western boundary of the project site. The floor of the gulch is characterized by flatlands and hilly terrain which give way to steep slopes further into the gulch. The typical depth of the gulch is approximately 175 feet.

D. Soils

The project area generally consists of the following soil series according to the Soil Conservation Service Soil Survey: Rock Land, Kawaihapai stony clay loam on 2 to 6 percent slopes, Molokai silty clay loam on 15 to 25 percent slopes, Mahana-Badland complex and Helemano silty clay on 30 to 90 percent slopes (Appendix B).

1. Rock land is made of areas where exposed rock occurs on 25 to 90 percent of the surface. The rock outcrops and very shallow soils are the main characteristics of this land type. Rock land is used for pasture, wildlife habitat, water supply and urban development. It has high shrink-swell potential. Its cultivatable land productivity rating is "E".

2. Kawaihapai stony clay loam, 2 to 6 percent slopes, has stones on the surface and in the profile. Runoff is slow and erosion hazard is slight. This soil is used for sugarcane, truck crops and pasture.

3. Molokai silty clay loam, 15 to 25 percent slopes, has medium runoff and severe erosion hazards. This soil is used for sugarcane and pineapple.

4. Helemano silty clay occurs on the sides of V-shaped gulches on 30 to 90 percent slopes. Permeability is moderately rapid, runoff is medium to very rapid and erosion hazard is severe. This land type is used for pasture, woodland and wildlife habitat. Its cultivatable land productivity rating is "E".

E. Geology

Kaloi Gulch rests on the southern slope of the Waianae Range and empties onto the sediments of the Ewa Plain. At the proposed landfill site above

the highway, the stream channel at a gradient of 5 percent is gentle over the first mile, then steepens. Ground elevation where the gulch meets the highway is greater than 200 feet (Bowles and Mink, 1977).

The upper member of the Waianae volcanic series covers the entire drainage basin above the highway except for a tongue of alluvium that reaches a short distance up the gulch. Two cinder cones, Puu Makakilo and Puu Kapuai, lie in the basin but are composed principally of lava. As in Makaiwa, the basaltic andesite of the upper member is dense and massive; its weathered horizon of residium and saprolite is thinner than in the olivine basalt of the Koolau series that lies a short distance east of the gulch. The stream channel is covered with shallow bouldery alluvium. Marine sediments and compacted older alluvium are absent because the elevation of the basin is considerably above 100 feet, the highest recognizable fossil sea level (Bowles and Mink, 1977).

F. Hydrology/Drainage

The following discussion is from a hydrogeologic and soils study conducted by Stephen P. Bowles and John F. Mink (1977).

Kaloi Stream is not perennial and only infrequently carries measurable flow. Floods are even less frequent but may occur during the 5 to 10 year storms. Runoff dissipates on the permeable sediments of the Ewa Plain. The gulch overlies the same large Waianae aquifer as does Makaiwa but is separated from it by an unsaturated zone more than 200 feet thick. The Navy water development tunnel and pumping stations of Oahu Sugar Company lie down gradient of the proposed landfill, and the Honolulu Board of Water Supply is debating the placement of a major water supply station upgradient. The quality of the groundwater near the gulch is marginally potable (Refer to Figure 2-5, p. 2-14).

The groundwater underlying the lower Kaloi drainage and in the vicinity of the Navy Shaft contains between 200 and 300 mg/l chloride, substantially more saline than the groundwater served to the public elsewhere on Oahu.

As at Makaiwa, groundwater particle velocity in the aquifer is about 8 feet per day, and therefore a pulse of leachate would reach the Navy Tunnel in

about 2 years, though in highly diluted form. Undeveloped groundwater seeps into the Ewa Plain sediments. This undeveloped groundwater, however, is exploitable for both domestic and agricultural needs. Consequently, a landfill in Kaloi would have to be carefully designed, constructed, and managed in order to prevent groundwater pollution.

G. Flora and Fauna

The project site consists of dry shrubland and a mixed shrub/forest. The predominant shrub found at the project site is koa haole (*Leucaena leucocephala* which often reaches tree size, particularly along Kaloi Stream. Kiawe (*Prosopis pallida*) is the most common tree and is scattered throughout the area. Endemic species include wiliwili (*Erythrina sandwicensis*), hi'aloa (*Waltheria americana*) and 'ilima (*Sida fallax*).

Wildlife in the project area includes dog (*Canis familiaris*), cat (*Felis catus*) and mongoose (*Herpestes auropunctatus*). Rat (*Rattus* spp.), mouse (*Mus musculus*) and pig (*Sus scrofa*) are also probably found here. Two reptiles, the fox gecko (*Hemidactylus garnottii*) and the snake-eyed skink (*Ablepharus boutoni*) are found here with the mourning gecko (*Lepidodactylus lugubris*) probably present also. Avifauna consists of lacenecked dove (*Streptopelia chinesis*), barred dove (*Geopelia striata*), Japanese white-eye (*Zosterops japonica*), American cardinal (*Richmondena cardinalis*), house finch (*Carpodacus mexicanus frontalis*) and ricebird (*Lonchura punctulata*). Brazilian cardinal (*Paroaria coronata*), black-headed mannikin (*Lonchura mallacca*), cattle egret (*Bubulcus ibis*) and mocking bird (*Mimus polyglottos*) are also prevalent in the area.

H. Archaeological Sites

An archaeological reconnaissance survey of Kaloi Gulch revealed that the only sites of possible prehistoric nature were located in the upper reaches of the study area. The lower section of the gulch has been cleared for quarry operations and further damaged by cattle-grazing and erosion. As such, it showed no visible signs of cultural activity other than the remains of the quarry operation (Bordner, 1977).

The upper section of the gulch, above the quarry, has only been damaged by the passage of cattle. However, the limited area of the gulch floor and the lack of available water year-round greatly hampered utilization of the gulch. The sites found in the upper reaches were either of recent origin or anonymous in terms of dating or classifying by purpose (Bordner, 1977).

None of the sites found in Kaloi Gulch during the reconnaissance were thought to be of major significance. As such, all were recommended for a MARGINAL status in the State Register of Historic Places (Bordner, 1977).

On the basis of this reconnaissance, no further archaeological work is needed in the section of Kalo'i Gulch covered in this survey (Bordner, 1977).

I. Existing and Proposed Site Improvements

Refer to Tables 2-1 and 2-2 (pp. 2-16 and 2-17) for estimated site development cost.

1. Access

Access to the project area is via Palehua Road, a black-topped cane-haul roadway used by Oahu Sugar Company. Portions of Palehua Road must be upgraded and realigned for increased traffic, and a new bridge and approximately 2,200 feet of new access road into the site must be constructed. Approximately one acre of cane must be removed for road realignment.

A traffic light will be installed and devices provided to the cane-haul truck drivers so that they can change the light to give them the right-of-way as they approach the intersection. The cane-haul vehicles will have the right-of-way at all times.

2. Operation and Maintenance Facilities

Permanent facilities must be constructed, including office building, scale, maintenance yard and fence.

3. Utilities

A 4-inch waterline owned by Oahu Sugar Company, an inverted water siphon and an irriga-

tion ditch are located within the project site. Existing water, irrigation and power lines crossing the site must be relocated. Power is available. Water and telephone service must be brought to the site and sanitary waste facilities must be installed.

4. Drainage System

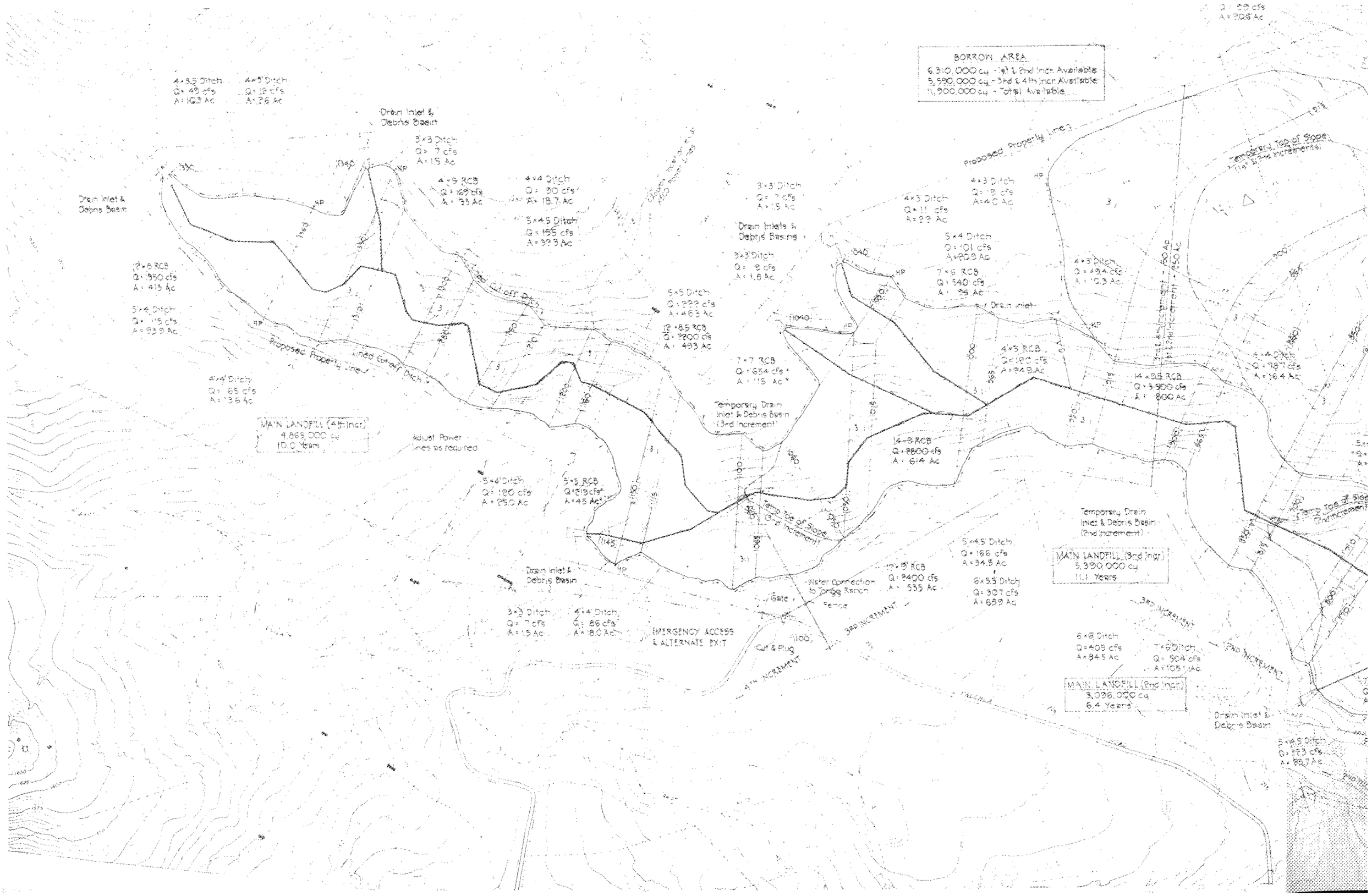
A drainage system will be constructed around and under the landfill to divert surface runoff around and through the landfill area. Runoff off-site and on-site will be collected by interceptor ditches and collected in siltation basins before discharge. The design of the drainage system will be such that the velocity of flow will be reduced to approximate the velocity of runoff under normal conditions. Debris barriers will be provided at the inlets of collection pipes. (See Figure 2-11 for details).

5. Leachate Control System

An impervious shield and a leachate collection and treatment system should be provided to protect groundwater resources. Although leachate probably would not be produced at the Kaloi Landfill because the rainfall is 25 inches or less, caution will be taken to utilize a relatively impermeable final soil cover and to provide a final grade of at least 3 percent to enhance runoff. Vegetation should be selected which will enhance transpiration and minimize erosion. A program of continued maintenance should be provided to ensure that surface cracks created by differential settlement are sealed, thereby minimizing potential surface water infiltration (EMCON and Associates, 1977).

If leachate were to be produced, there are some factors that should be considered. The following is from a report by Bowles and Mink (1977).

In the Pearl Harbor basal aquifer, which underlies Kaloi, experience has shown that infiltrate such as return irrigation water tends to remain near the top of the fresh water lens. Leachate reaching the water table would also likely follow a flow path along the upper part of the lens, which would minimize the opportunities for complete mixing and therefore thorough


BORROW AREA
6,310,000 cu - 1st & 2nd Inch Available
5,590,000 cu - 3rd & 4th Inch Available
11,900,000 cu - Total Available
Q = 58 cfs
A = 20.8 Ac
4×3.5 Ditch
Q = 49 cfs
A = 10.3 Ac
4×3 Ditch
Q = 12 cfs
A = 3.6 Ac
Drain Inlet & Debris Basin
3×3 Ditch
Q = 7 cfs
A = 1.5 Ac
4×3 RCB
Q = 169 cfs
A = 33 Ac
4×4 Ditch
Q = 90 cfs
A = 18.7 Ac
5×4.5 Ditch
Q = 155 cfs
A = 32.3 Ac
Drain Inlet & Debris Basin
12×6 RCB
Q = 1350 cfs
A = 41.5 Ac
5×4 Ditch
Q = 115 cfs
A = 23.9 Ac
Lined Cut-off Ditch
Proposed Property Line
4×4 Ditch
Q = 65 cfs
A = 13.6 Ac
MAIN LANDFILL (4th Incr.)
9,869,000 cu
10.0 Years
Adjust Power Lines as required
5×4 Ditch
Q = 180 cfs
A = 35.0 Ac
5×5 RCB
Q = 219 cfs
A = 45 Ac
Temp. Toe of Slope (3rd Increment)
Drain Inlet & Debris Basin
3×3 Ditch
Q = 7 cfs
A = 1.5 Ac
4×4 Ditch
Q = 86 cfs
A = 18.0 Ac
EMERGENCY ACCESS & ALTERNATE EXIT
Gate
Cut & Plug
4TH INCREMENT
3RD INCREMENT
Water Connection to Jones Ranch
Fence
5×5 Ditch
Q = 223 cfs
A = 46.3 Ac
12×8.5 RCB
Q = 2200 cfs
A = 49.3 Ac
7×7 RCB
Q = 654 cfs
A = 11.5 Ac
Temporary Drain Inlet & Debris Basin (3rd Increment)
14×8 RCB
Q = 2800 cfs
A = 61.4 Ac
12×8 RCB
Q = 2400 cfs
A = 53.5 Ac
3×3 Ditch
Q = 7 cfs
A = 1.5 Ac
Drain Inlets & Debris Basins
3×3 Ditch
Q = 9 cfs
A = 1.8 Ac
4×3 Ditch
Q = 11 cfs
A = 2.2 Ac
5×4 Ditch
Q = 101 cfs
A = 20.8 Ac
7×6 RCB
Q = 540 cfs
A = 9.9 Ac
Drain Inlet
4×5 RCB
Q = 120 cfs
A = 24.9 Ac
5×4.5 Ditch
Q = 166 cfs
A = 34.5 Ac
6×5.5 Ditch
Q = 307 cfs
A = 63.9 Ac
Temporary Drain Inlet & Debris Basin (2nd Increment)
MAIN LANDFILL (3rd Incr.)
5,390,000 cu
11.1 Years
4×3 Ditch
Q = 18 cfs
A = 4.0 Ac
4×3 Ditch
Q = 49.4 cfs
A = 10.3 Ac
3rd Increment - 1.0 Ac
4th Increment - 9.50 Ac
14×9.5 RCB
Q = 3,900 cfs
A = 80.0 Ac
4×4 Ditch
Q = 78.7 cfs
A = 16.4 Ac
Temporary Top of Slope (1st & 2nd Increments)
Temp. Toe of Slope (1st Increment)
3RD INCREMENT
2ND INCREMENT
6×6 Ditch
Q = 405 cfs
A = 84.5 Ac
7×6 Ditch
Q = 504 cfs
A = 105.1 Ac
MAIN LANDFILL (2nd Incr.)
3,036,000 cu
6.4 Years
Drain Inlet & Debris Basin
5×4.5 Ditch
Q = 123 cfs
A = 25.7 Ac
Proposed Property Line

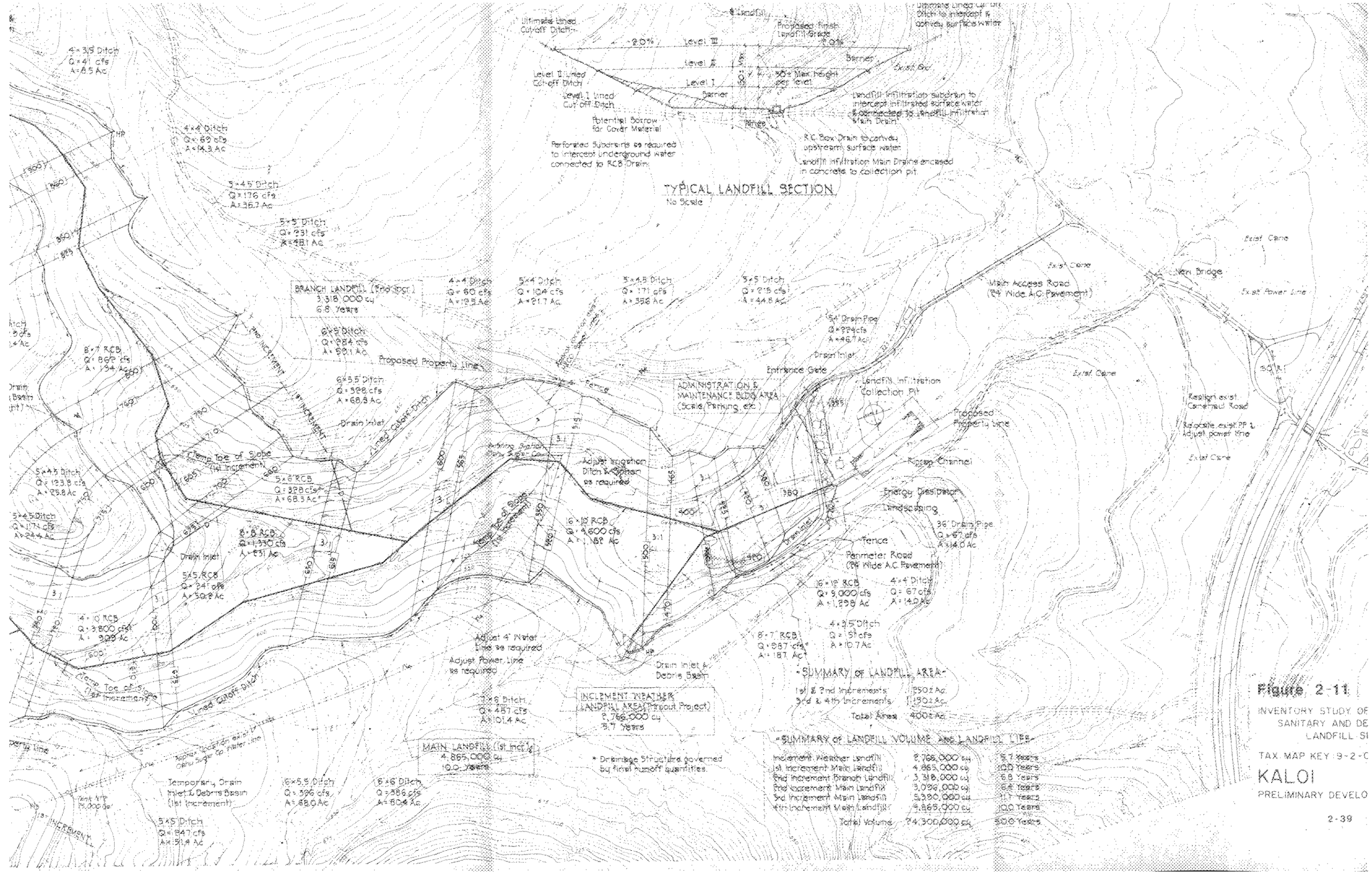


Figure 2-11

INVENTORY STUDY OF
SANITARY AND DE
LANDFILL SI

TAX MAP KEY 9-2-C

KALOI

PRELIMINARY DEVELO

dilution (Refer to Figure 2-5, p. 2-14). Nevertheless, the flux of groundwater in the aquifer is very great, amounting to approximately 5 gallons per square foot per day. Even if the leachate stayed on the top of the lens, substantial mixing and dilution would take place (Bowles and Mink, 1977).

6. Cover Material

Some potential cover material occurs in the basin but insufficient to satisfy landfill requirements. An abundant supply of soil could be obtained from the alluvial sediments that cover much of southern Oahu below elevation 100 feet but which are, for the most part, planted in sugar cane. Appendix C contains information concerning the amount of cover material required and from which possible areas such material can be imported (Bowles and Mink, 1977).

J. Summary

Advantages

1. Largest landfill capacity and longest landfill life expectancy (50 years)

2. Minimum impact on surrounding land uses as surrounded by vacant lands in agricultural use

3. Not visually obtrusive

4. Low anticipated cost

5. Excellent topographical conditions for landfill

6. Nearest distance (15 miles) to Keehi Transfer Station

Disadvantages

1. Poor access to adequate roads and major access improvement required

2. Lack of utility facilities

3. Maximum measures required for protection of groundwater

4. Lack of sufficient cover material

5. Maximum measures required for on and off-site drainage improvement

6. Traffic conflict with cane haul trucks

SECTION 3

RELATIONSHIP OF THE PROPOSED ACTION TO LAND USE PLANS, POLICIES AND CONTROLS FOR THE AREA

I. MAKAIWA GULCH SITE

The land use controls for the project site and surrounding area are shown in Figures 3-1 to 3-3. They are as follows:

Site Land Use

State Land Use Classification: Agriculture.

General Plan: Agriculture.

Zoning: Agriculture (Ag-1).

Surrounding Land Use

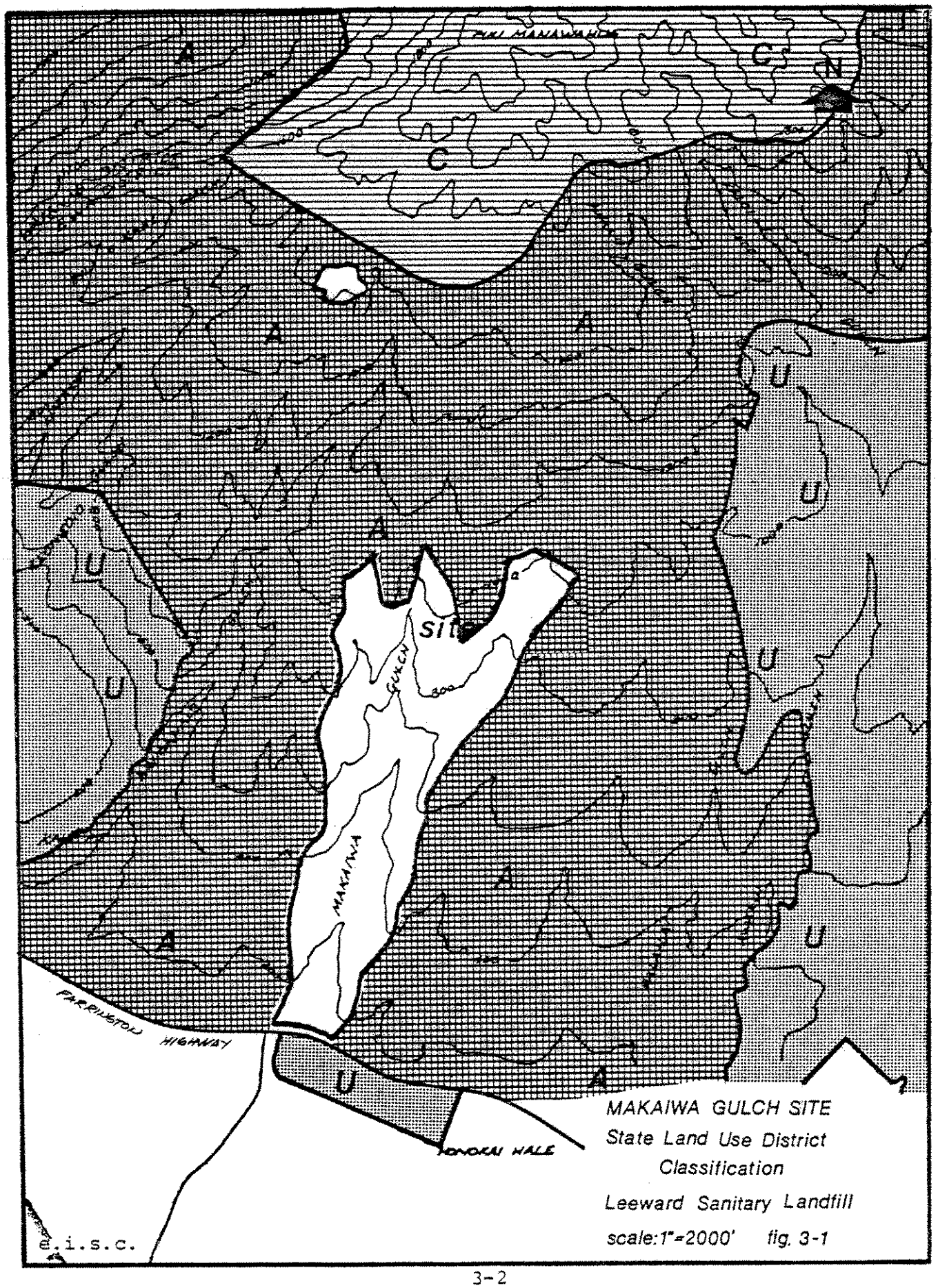
State Land Use Classification: Agriculture to the west, north, east; Urban to the south (Honokai Hale).

General Plan: Agriculture to the west, north and east; Residential to the south (Honokai Hale).

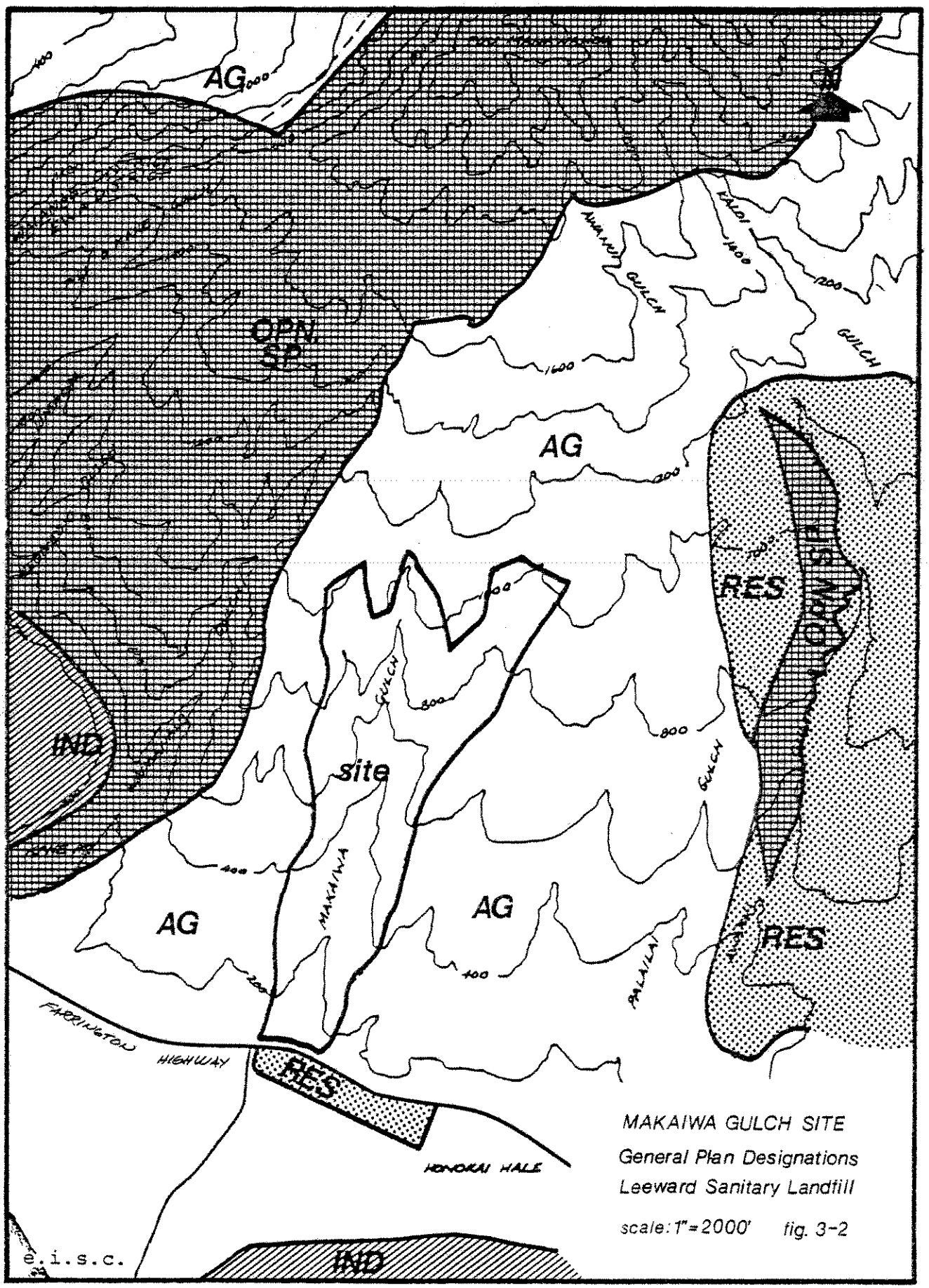
Zoning: Agriculture (Ag-1) to the west, north, and east; Residential (R-6) to the south (Honokai Hale).

The proposed project is a permitted use according to County Zoning Controls. However, a State Special Use Permit must be obtained through the Department of Land Utilization. The County Planning Commission will hold the required public hearing and has the final decision in case of a denial. If approved by the Planning Commission, the petition for the permit and the Planning Commission's decision will be forwarded to the State Land Use Commission for its review and final action. The Planning Commission must receive concurrence of the State Land Use Commission in case of an approval.

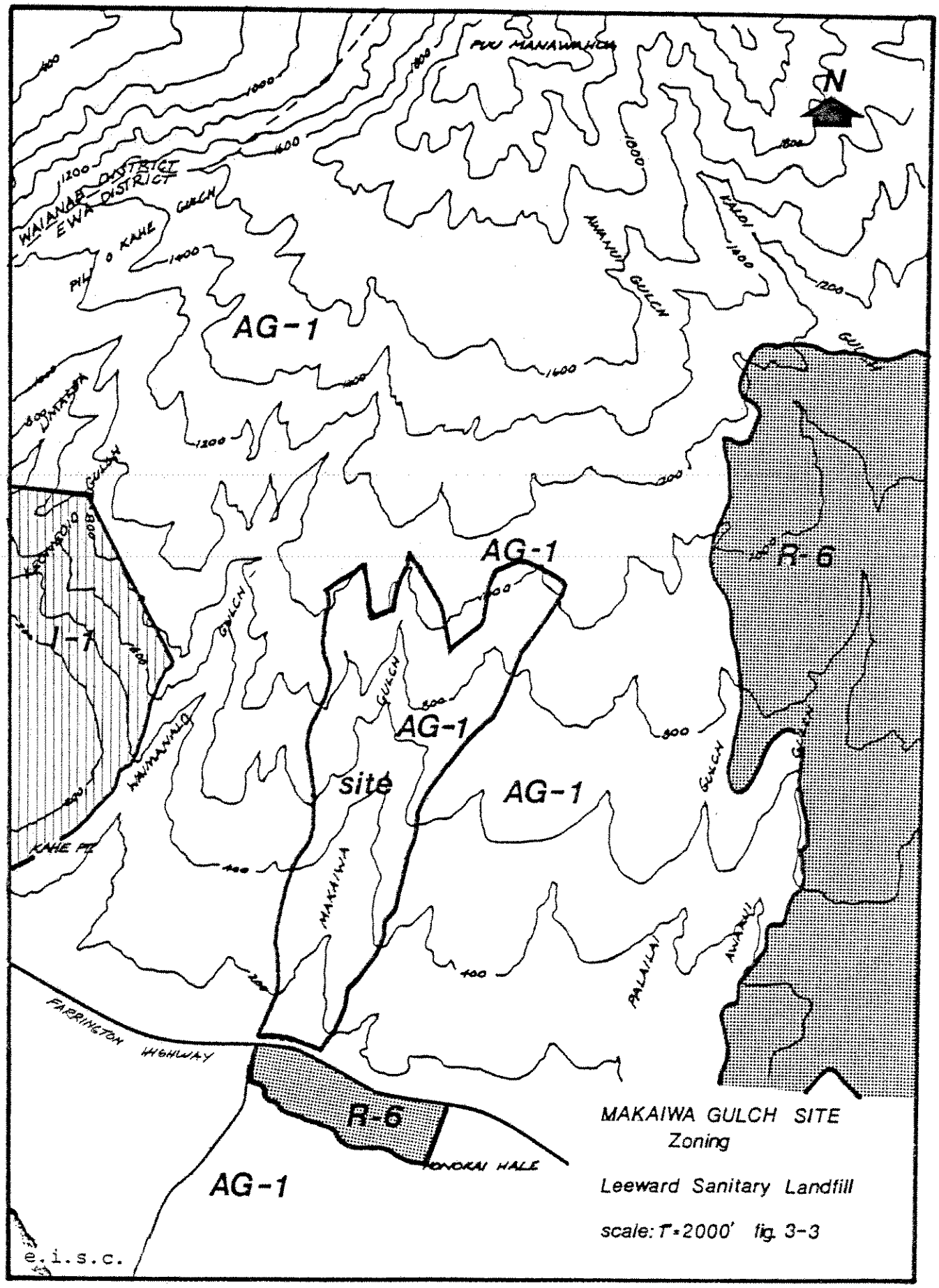
The project is compatible with surrounding land uses which are anticipated to remain open space or as agricultural. There are no plans for future use of Army Nike Sites 5 and 6 by the Army. The nearest residential development is Honokai Hale, which is located across Farrington Highway at the lower portion of the site.



MAKAIWA GULCH SITE
State Land Use District
Classification
Leeward Sanitary Landfill
scale:1"=2000' fig. 3-1



MAKAIWA GULCH SITE
General Plan Designations
Leeward Sanitary Landfill
scale: 1" = 2000' fig. 3-2



MAKAIWA GULCH SITE
Zoning

Leeward Sanitary Landfill

scale: 1" = 2000' fig. 3-3

e.i.s.c.

II. NANAKULI SITE

The land use controls for the project site and surrounding areas are shown in Figures 3-4 to 3-6. They are as follows:

Site Land Use

State Land Use Classification: The western portion of the site is classified as Urban. The eastern portion as Agriculture to the 200 foot contour and Conservation above.

General Plan: The western portion of the site is designated as Agriculture, School and Park, Residential, and Apartment. The eastern portion is designated as Agriculture, Residential, Park and Open Space.

Zoning: Agriculture (Ag-1); Preservation (P-1); Planned Development Housing (PDH)

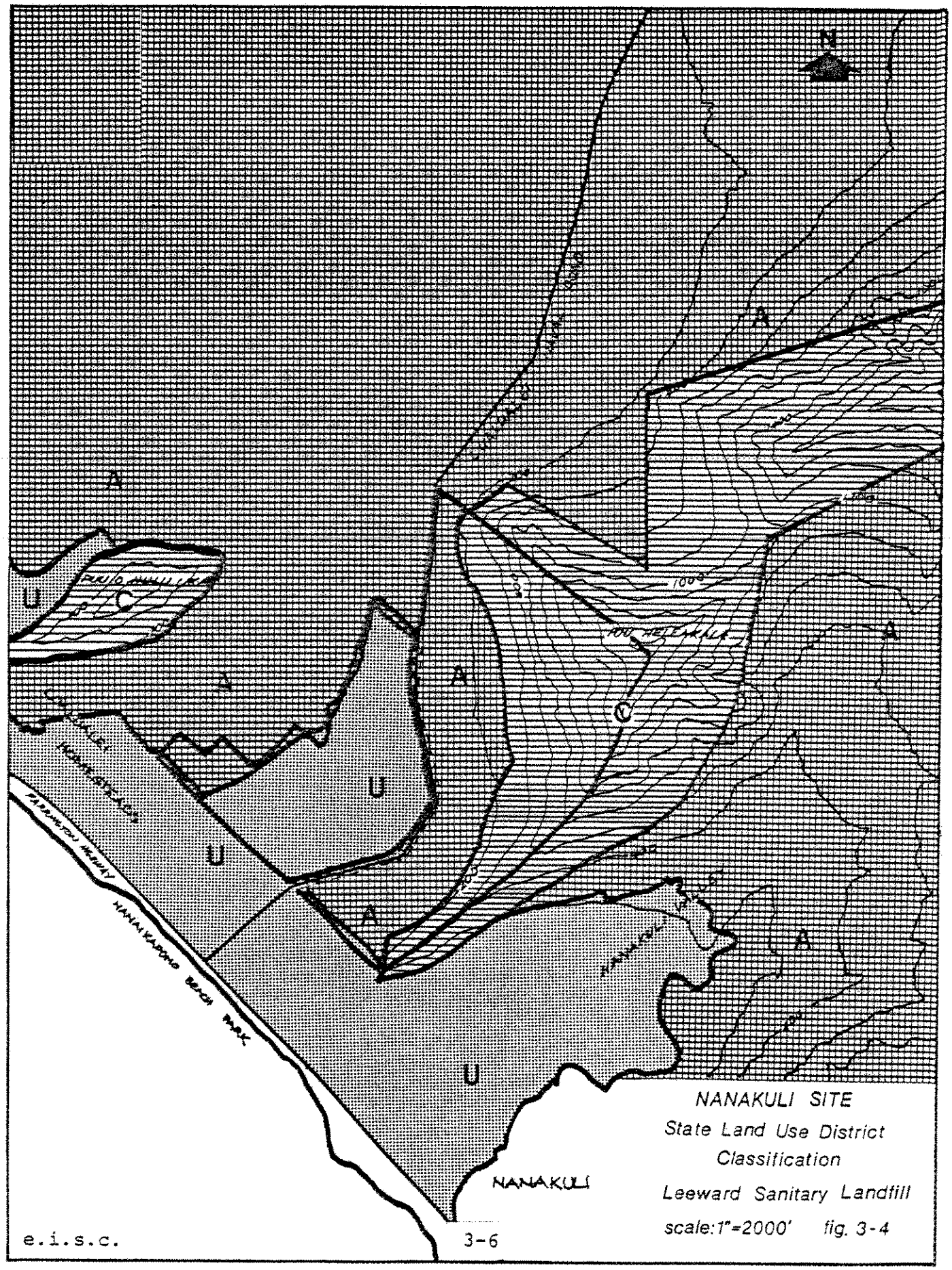
Surrounding Land Use

State Land Use Classification: Urban to the south, west, southeast; Agriculture to the north; Conservation to the east.

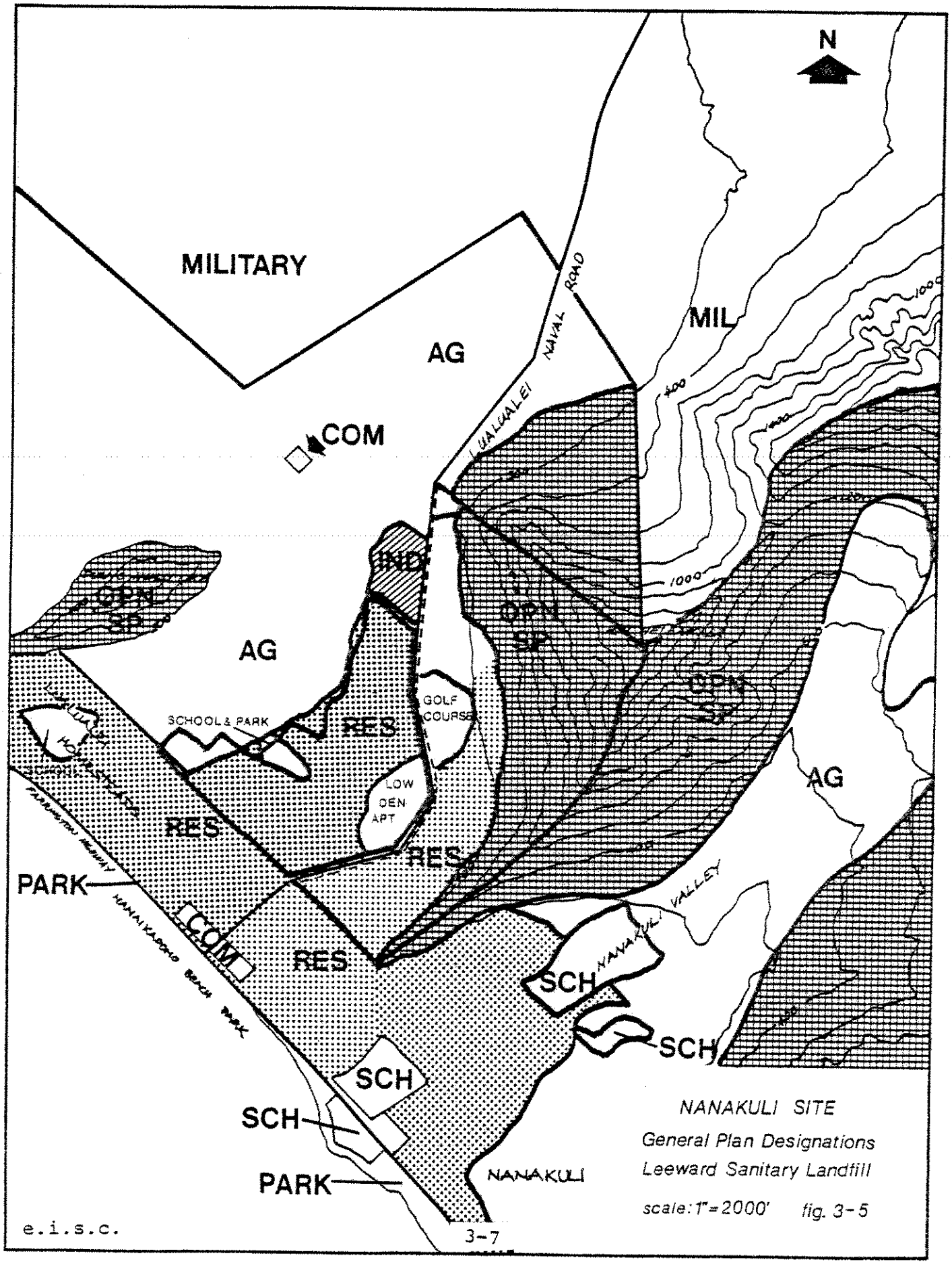
General Plan: Agriculture to the west, north, open space to the east, and Residential to the south.

Zoning: PDH, R-6 and B-2 to the south, Ag-2, PDH, and D-1 to the west, Ag-1 and I-2 to the north, and P-1 and Ag-1 to the east.

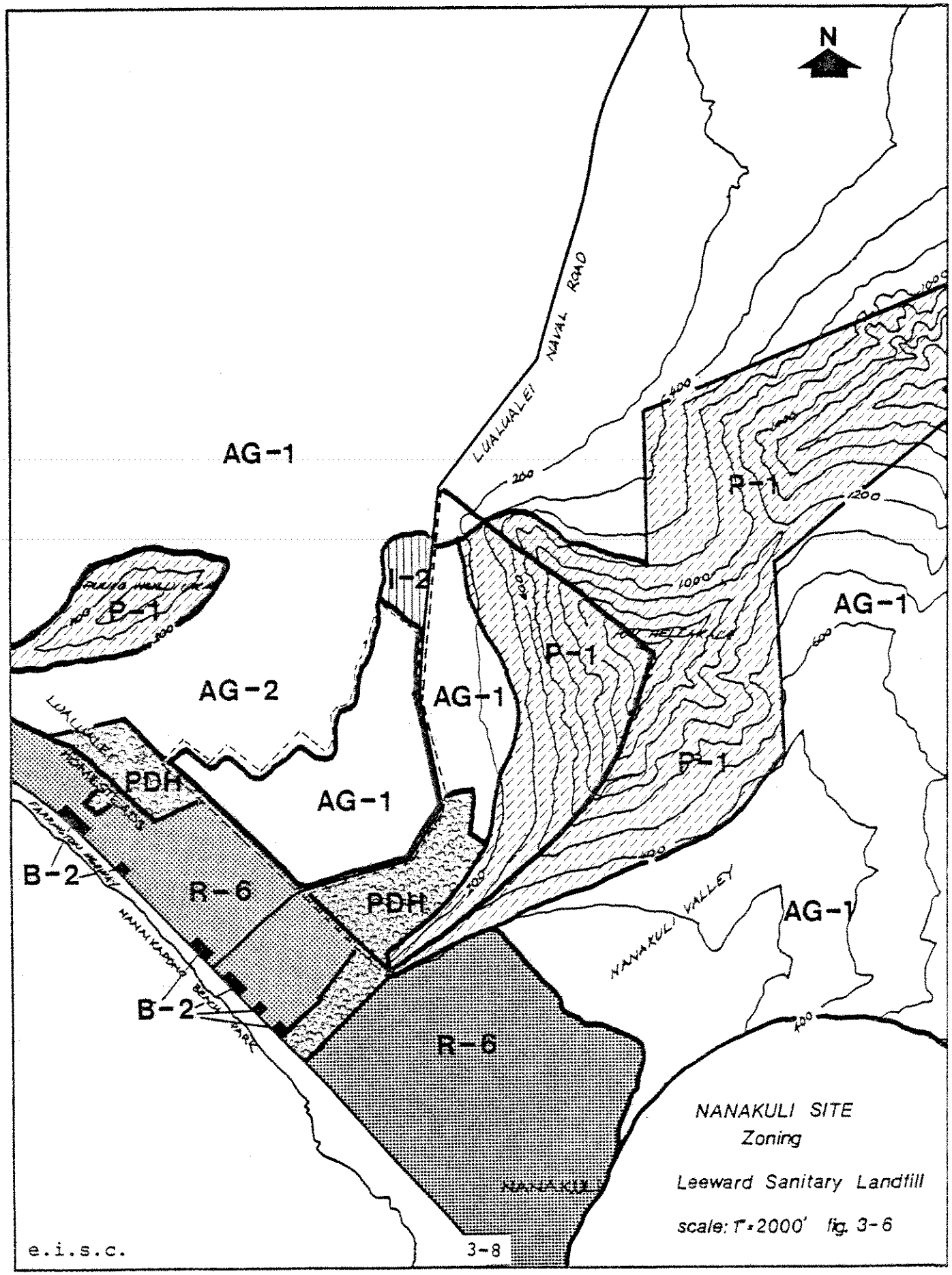
The proposed landfill is permitted according to County zoning controls if necessary approvals are obtained. A State Special Use Permit must be obtained through the Department of Land Utilization. The County Planning Commission will hold the required public hearing and has the final decision in case of denial. If approved by the Planning Commission, the petition and the Planning Commission's decision will be sent to the State Land Use Commission for its review and final action. A Conservation District Use Application (CDUA) must be approved by the Department of Land and Natural Resources (DLNR) if landfill activity will encroach into State Land Use Conservation District areas.



NANAKULI SITE
State Land Use District
Classification
Leeward Sanitary Landfill
scale:1"=2000' fig. 3-4


N
MILITARY
AG
COM
MIL
NAVAL ROAD
LUALUALEI
IND
OPN SP
AG
SCHOOL & PARK
RES
GOLF COURSE
LOW DEN APT
RES
RES
PARK
COM
RES
SCH
SCH
SCH
PARK
NANAKULI
NANAKULI VALLEY
AG
1000
400
NANAKULI SITE
General Plan Designations
Leeward Sanitary Landfill
scale: 1"=2000'
fig. 3-5

e.i.s.c.



NANAKULI SITE
Zoning

Leeward Sanitary Landfill

scale: 1" = 2000' fig. 3-6

The project is not in total conformance with existing General Plan designations which propose higher density urban uses for the western two-thirds of the site. Most of the site is designated for residential development, with small portions classified for agricultural use at the northwestern and the southwestern tips of the site. Apartment use is designated in a small parcel of land to the west of Lualualei Naval Road, and a golf course to the east of the road in the middle of the site.

The eastern portion of the site will require major drainage improvements and the western portion of the site requires extensive fill to convert the site for urban use. Considering these extensive site preparations, it is anticipated that this area will remain in its present state, vacant and unused, until development becomes feasible.

III. KALOI GULCH SITE

The land use controls for the project site and surrounding areas are shown in Figures 3-7 to 3-9. They are as follows:

Site Land Use

State Land Use District: Agriculture.

General Plan: Agricultural and Residential.

Zoning: Agriculture (Ag-1).

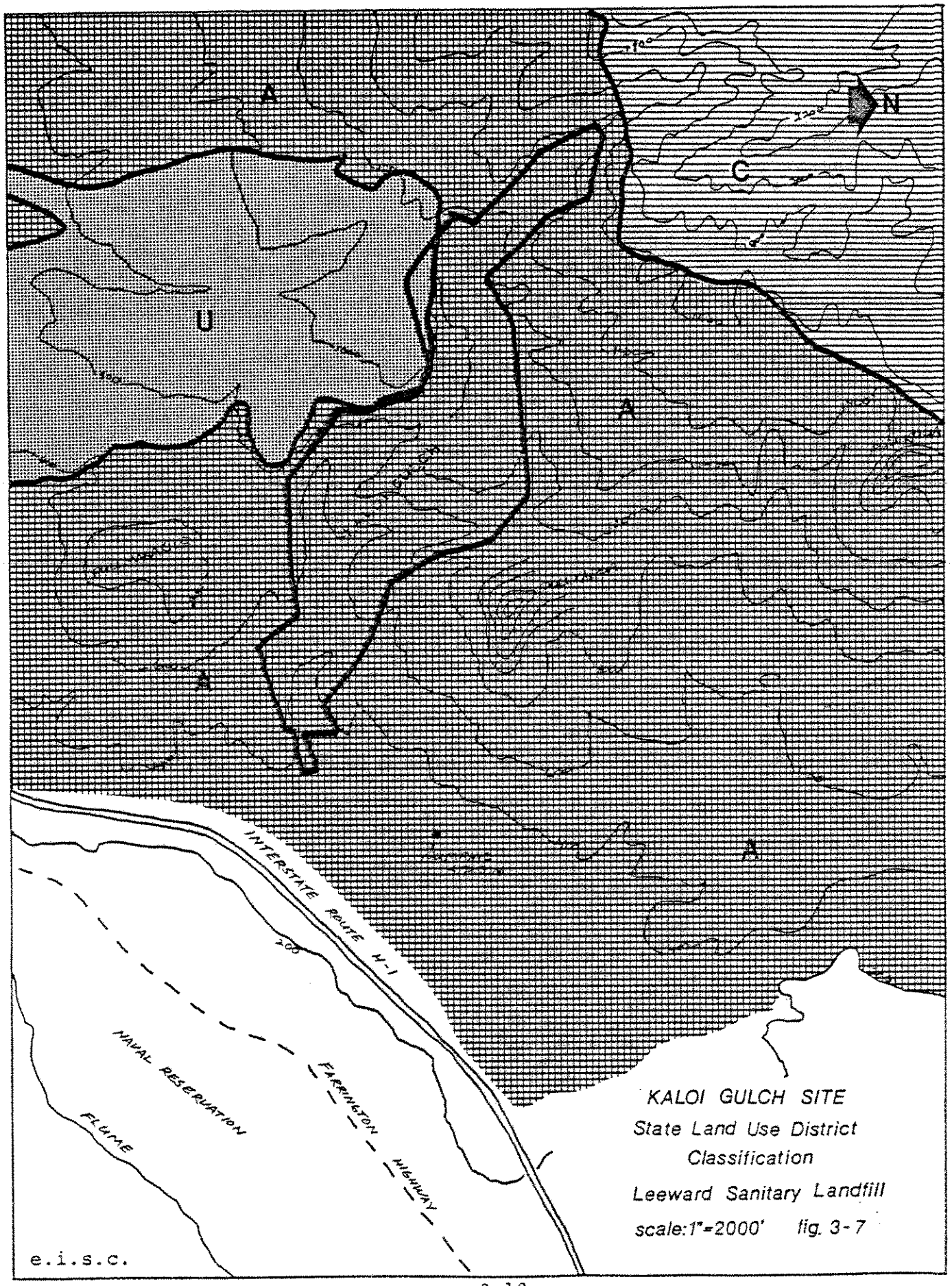
Surrounding Land Use District

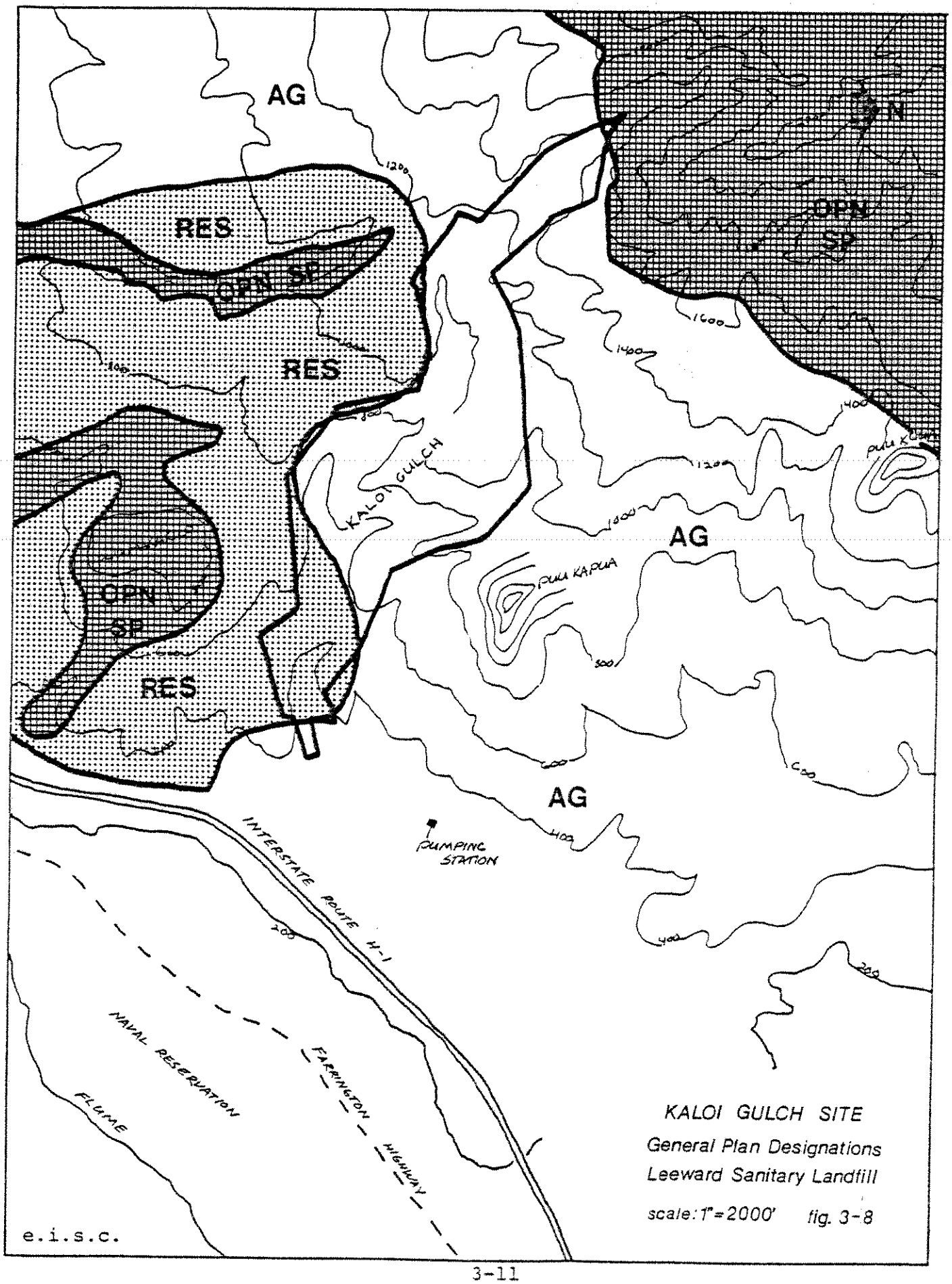
State Land Use District: Agriculture to the north, west, east; Urban to the south.

General Plan: Agriculture to the north, west, east; Residential and open space to the south.

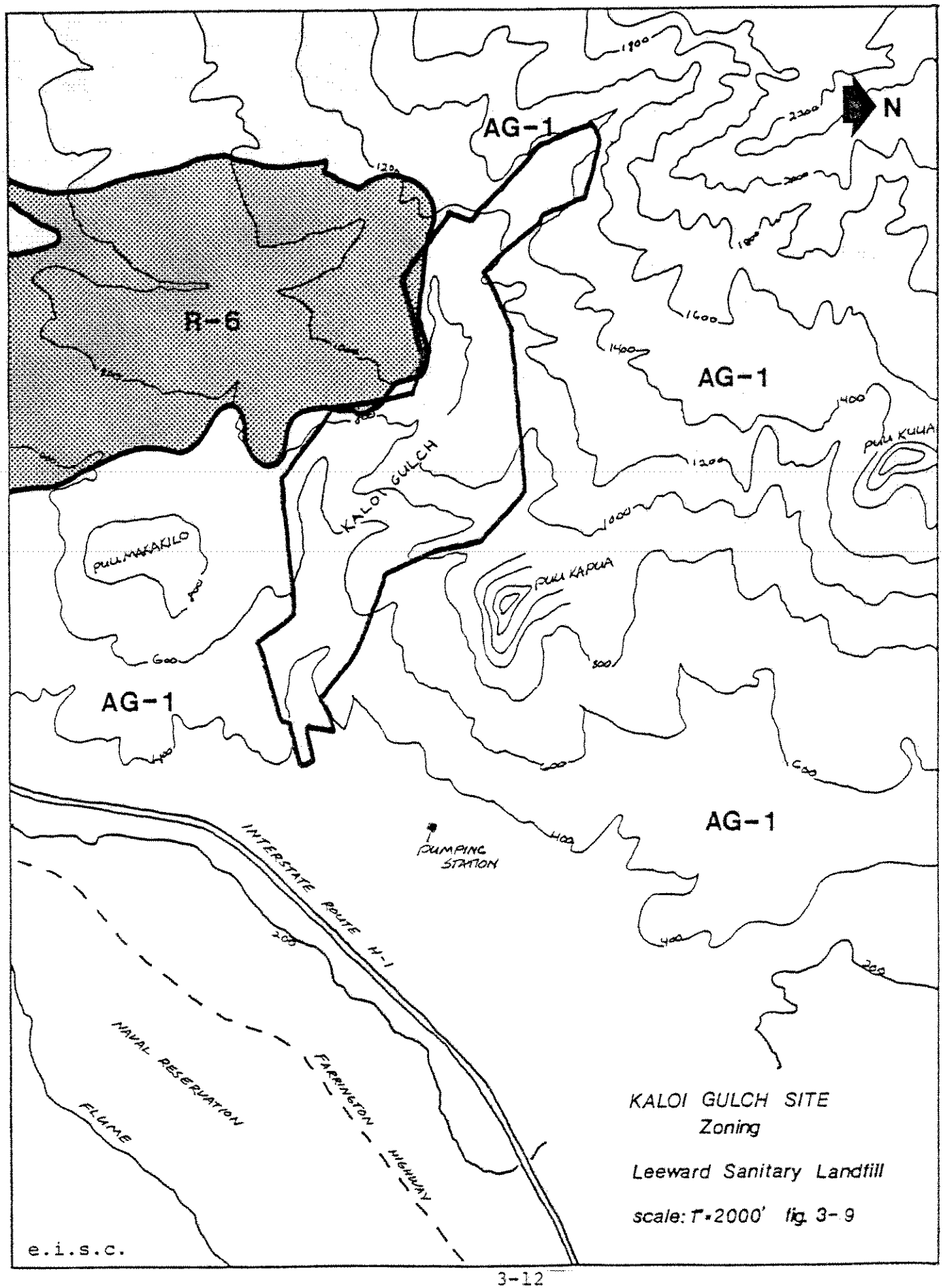
Zoning: Agriculture (Ag-1) to the north, west, east, southeast; Residential (R-6) to the southwest.

In order to develop the proposed project on land designated and zoned as Agriculture, a State Special Use Permit must be obtained. The County Planning Commission has the final decision in case of denial, but upon approval at the County level the petition and the Planning Commission's decision will be sent to the State Land Use Commission for its review and final action.


A
U
C
A
A
A
N
INTERSTATE ROUTE H-1
NAVAL RESERVATION
FARRINGTON HIGHWAY
FLUME
KALOI GULCH SITE
State Land Use District
Classification
Leeward Sanitary Landfill
scale:1"=2000' fig. 3-7
e.i.s.c.



KALOI GULCH SITE
General Plan Designations
Leeward Sanitary Landfill
scale: 1" = 2000' fig. 3-8


N
AG-1
R-6
AG-1
AG-1
AG-1
KALOI GULCH
PULI KULUA
PULI MAKAKILO
PULI KAPUA
PUMPING STATION
INTERSTATE ROUTE H-1
NAVAL RESERVATION
FARRINGTON HIGHWAY
FLUME
KALOI GULCH SITE
Zoning
Leeward Sanitary Landfill
scale: 1" = 2000' fig. 3-9
e.i.s.c.

The proposed project is compatible with all existing and proposed land uses to the north, west and east of the site. Areas to the south and southwest of the site, however, may be developed for residential use if the Makakilo community, located approximately 1.5 miles to the south of the site, continues to expand. Residential development, if it occurs, may be located on the border of the proposed landfill.

SECTION 4

ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATIVE MEASURES TAKEN TO MINIMIZE ADVERSE IMPACTS

I. IMPACTS DURING CONSTRUCTION

A. Landform Alteration

Portions of land to be landfilled initially will be cleared and grubbed of vegetation. The site will then be excavated, filled and graded. These activities will comply with the County Grading Ordinance relating to grubbing, grading and dirt stockpiling. The extent of such activities within the landfill area are shown in Figures 2-4 (pg.2-10), 2-7 (pg. 2-22), and 2-10 (pg.2-33).

1. Makaiwa Gulch Site

Landform alteration will not be extensive during site development activities.

2. Nanakuli Site

Site development alterations will not be extensive; however, the access road will require improvements and portions may be realigned and drainage works must be constructed.

3. Kaloi Gulch Site

It is expected that extensive site development activities may be required at this site including the installation of: 1) an impervious barrier over the areas to be landfilled, 2) leachate control system, 3) surface drainage works, 4) access road and bridge and 5) relocation of existing improvements. Approximately one acre of sugarcane will be removed from production on the project site for the life of the project.

B. Air Quality

Dust will be raised during site excavating, filling, grading and general construction activities. Dust levels will be controlled by using sprinkling and/or waterwagon systems during all activities that generate dust.

Exhaust emissions from construction equipment will be discharged into the atmosphere but the amounts generated are not expected to cause a significant adverse impact.

All activities will be conducted to minimize dust and will comply with the Air Pollution Control Regulations (Chapter 43) of the State Department of Health.

1. Makaiwa Gulch Site

Air quality impacts are not anticipated to affect adjacent lands as they are open space. However, dust levels in the Honokai Hale residential development may increase, depending upon wind and weather conditions. Water-sprinkling during site development activities will alleviate potential dust problems that may be experienced by Honokai Hale residents. Data on prevailing wind conditions indicate that dust generated during construction probably will bypass Honokai Hale most of the time (Figure 4-1).

2. Nanakuli Site

Residential areas border the site on two sides. Impacts to these areas during site development activities will be mitigated by the use of extensive water sprinkling to control dust levels.

3. Kaloi Gulch Site

Air quality impacts are not anticipated to seriously affect surrounding areas as they are in agricultural or open space use. Figure 4-1 illustrates the direction of the prevailing winds in the area. However, water sprinkling will be utilized to control dust levels.

C. Water Quality

The first phase for site development will be to construct drainage channels, interceptor ditches, siltation basins and debris racks. This should alleviate drainage and erosion problems as the site is developed.

The siltation basins are designed to remove most of the suspended particles from the drainage

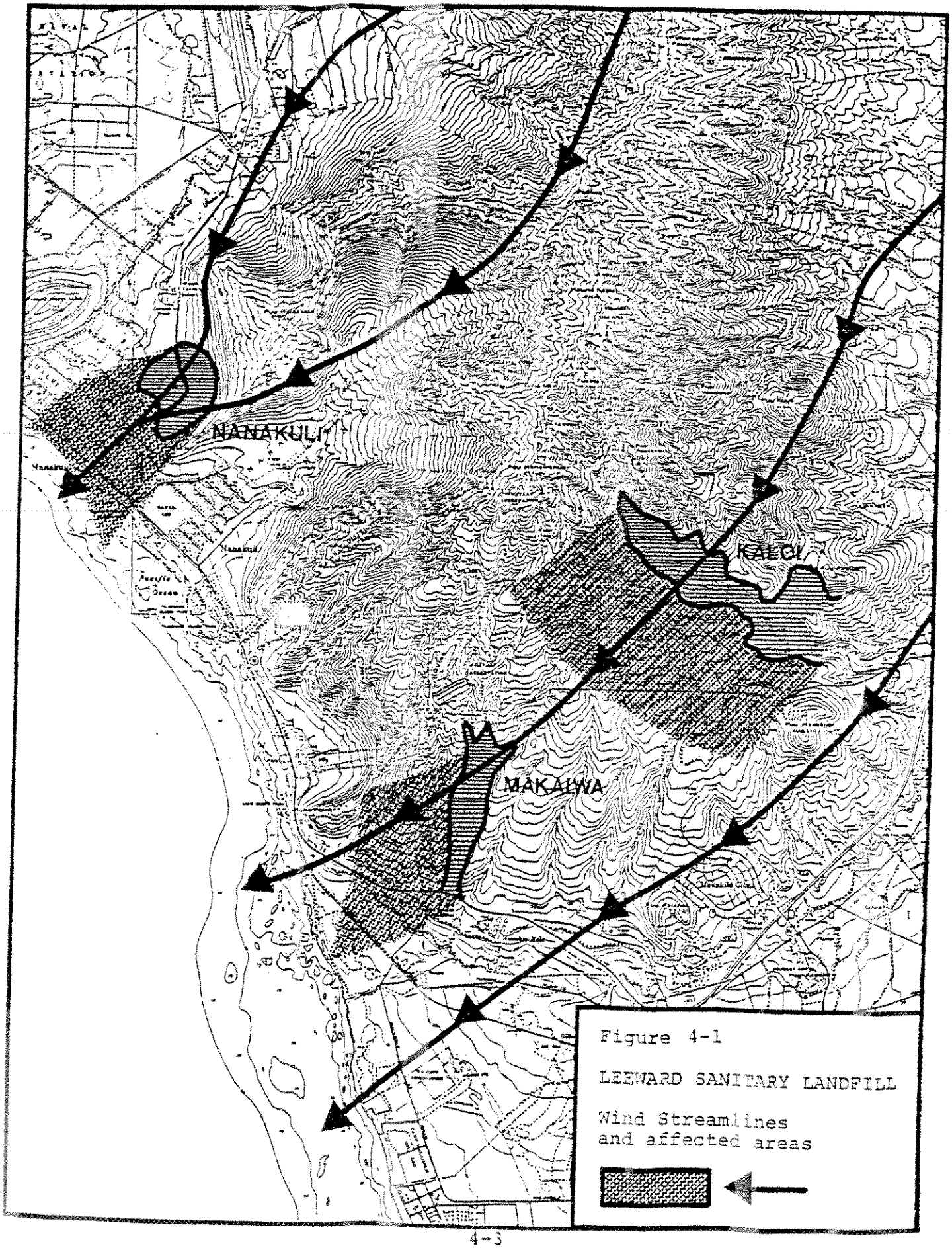


Figure 4-1

LEEWARD SANITARY LANDFILL

Wind Streamlines
and affected areas

water before it is released into the surface water. The debris racks should retain most of the debris in the drainage water.

D. Noise Levels

Noise will be generated by construction equipment and vehicles during site development. Conventional construction equipment will be used and the noise levels generated by such equipment are shown in Figure 4-2. No piledriving will be conducted and no blasting is anticipated.

General construction noise can be better mitigated by limiting the hours of construction. In addition, the contractor will ensure that all mufflers on construction equipment are functional and properly maintained.

As sound waves move uniformly in all directions, the amplitude decreases as they move from the source of the sound. In air when the distance doubles the amplitude drops by half, which is a drop of 6 dB. Therefore, if one moves one meter from the source to two meters from the source the sound pressure level will drop by 6 dB. If you move to four meters it will drop by 12 dB, eight meters by 18 dB, etc. (B&K Instruments, Inc. Handbook).

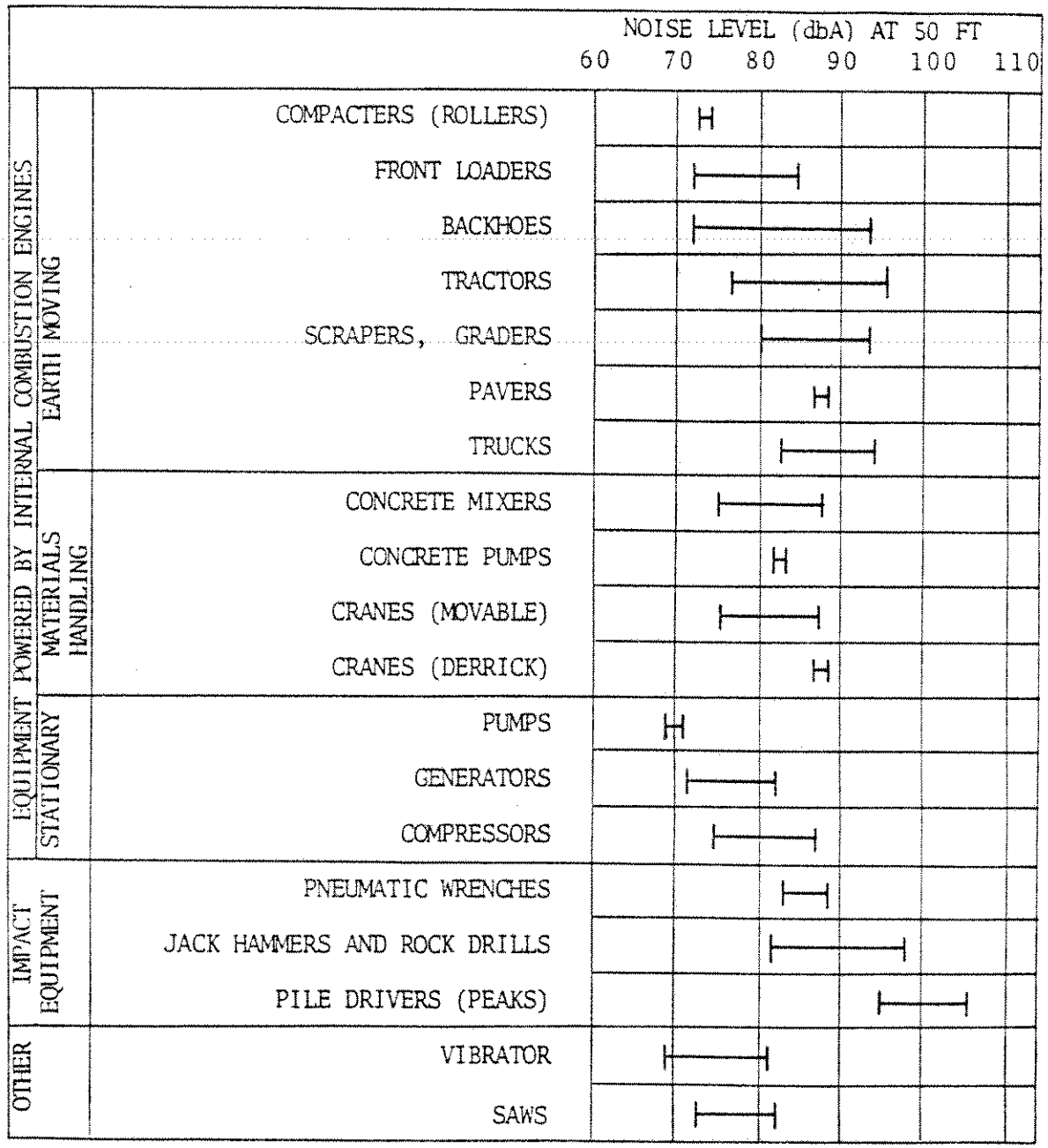
Given the noise levels presented in Figure 4-2 and assuming that piledriving will not be used during construction of the sites, the theoretical level of noise created by the next loudest equipment (jackhammer) that would exist at a given distance from the source is provided in the following table:

Distance (feet)	dB
50	98
100	92
200	86
400	80
800	72
1600	66

It should be noted that these particular estimates only would be true when there are no reflecting or blocking objects in the sound path. These ideal conditions would be termed free-field conditions. With an obstacle in the path, part of the sound will

Figure 4-2

CONSTRUCTION EQUIPMENT NOISE RANGES



Note: Based on Limited Available Data Samples

Source: Noise From Construction Equipment and Operations Building Equipment, and Home Appliances, EPA, 1971

be reflected, part absorbed and the remainder transmitted through the obstacle. The amount or degree of sound that is reflected, absorbed or transmitted depends upon the absorbing properties of the obstacle, its size and the wave length of the sound (B&K Instruments, Inc. Handbook).

During construction, noise may have an impact on wildlife. Studies reported by the Environmental Protection Agency are discussed later in this section under Noise Levels (page 4-18).

1. Makaiwa Gulch Site

Existing noise levels were taken at the project site and from Honokai Hale, across from the site (See Appendix D for recording stations and results). Station 1 is at the project site at Farrington Highway. Readings ranged between 58 dBA with no traffic to 82 dBA with a passing truck. Stations 2 and 3 are within the proposed site, Station 3 being the furthest away from the highway. At Station 2 the ambient level ranged between 42 - 46 dBA and about 45 - 46 dBA with a bird call. Station 3 read 35 dBA with a bird in the far background.

Station 4 was at Honokai Hale and the readings ranged from 52 - 58 dBA with heavy equipment noise in the background.

Noise levels generated by landfill construction activities are not anticipated to be a problem for adjacent lands as they are open space or in agricultural use. The closest working face of the landfill to Honokai Hale would be approximately 750 feet away. Assuming site development to commence in this general area the loudest equipment that could possibly be used would be a jackhammer. At that distance the theoretical dB reading would probably be less than 80 dB. This would represent the extreme and the overall construction noise heard at Honokai Hale should be lower than the theoretical figures represented (Refer to Figure 4-2).

2. Nanakuli Site

Noise levels were taken at the proposed site. The locations and results of the readings are contained in Appendix D. Both stations A1 and B1 read the same so their readings are combined. Readings ranged from 44 dBA with birds in the background to 70 dBA with a passing truck. Station B2 ranged from 34 - 40 dBA with wind blowing through trees and with birds to 65 - 76 dBA with a passing car.

Noise levels generated by landfill construction would be audible above the low ambient sound level from adjacent residences. There will also be additional noise from increased truck traffic on Lualualei Naval Road.

3. Kaloi Gulch Site

Noise readings were taken at four different stations at the proposed site (See Appendix D for station locations and reading results). Levels ranged from 41 dBA with ambient noise to 64 dBA with a plane flying overhead.

Continuous traffic noise is audible from Interstate Highway H-1, about one mile away. Wind rustling leaves and grass was the predominant natural sound with occasional bird calls.

Noise levels generated by landfill construction will increase appreciably over the existing ambient conditions. Because of the extent of site preparation required this increase will probably be of longer duration than at the other two sites. However, noise impacts are anticipated to be negligible as surrounding areas are open space or in agricultural use and the nearest residential area, Makakilo, is about 1 mile away.

E. Flora and Fauna

During site development, vegetation will be removed on the proposed landfill site. The biota of all the considered landfill sites are composed of plant and animal species found elsewhere on Oahu and throughout the State. Few native species occur and those that do are relatively common. Flora and fauna are most abundant at the Kaloi Gulch and the Makaiwa Gulch

sites, which have been relatively undisturbed. It is anticipated that wildlife inhabiting the proposed project site will relocate to open space areas surrounding the site during site development activities if carrying capacity for the species has not yet been reached. If it has, there may be attrition of any over-crowded species.

1. Makaiwa Gulch Site

The vegetation that will be removed consists primarily of scrub brush and kiawe. No native, rare or endangered species will be affected.

2. Nanakuli Site

There are no native, rare or endangered species.

3. Kaloi Gulch Site

There are three native species present on the site that will be affected during clearing and grubbing activities. These species, the wiliwili, uhaloa and ilima, however, are common to other areas of the island.

F. Archaeological-Historical Sites

Though a literature search found no archaeological sites on the three sites, reconnaissance by an archaeologist revealed some sites. The remaining discussion contains excerpts from results of the archaeological reconnaissance conducted by Richard Bordner (1977).

1. Makaiwa Gulch Site

The absence of sites precludes any adverse impacts.

2. Nanakuli Site

At the upper end of Lualualei Valley is Nioliula Heiau, Site 149. This heiau is reputed to be very ancient, originally belonging to the chief Kaku'ihewa, a ruling chief of O'ahu.

There are also units of house sites and possible terraces located in the upper reaches of the valleys. However, there remains no indication of the earlier uses of the lower portion of the valley.

No archaeological sites were found in the study area.

Although most of the study area was located on a portion of the valley floor that has been extensively modified through bulldozing and quarry operations, the paucity of sites found does not indicate a lack of possible prehistoric habitation.

The early historic accounts describe an area lacking in intensive utilization at least near the shoreline. This lack of utilization, in general due to the dry nature of the area and the poor soil helps to explain the lack of activity in the period of initial European contacts.

The areas not affected by the bulldozing and quarrying operations within the study area were found to show no signs of cultural activity. This supports the supposition that the area was not considered suitable for frequent human utilization.

As no archaeological remains were found at this site, it is considered to have little archaeological value.

On the basis of these findings, it is felt that, at present, no further archaeological work is needed in this area.

3. Kaloi Gulch

The only archaeological remains found in the lower part of the study area were the remains of historic structures. The first of these consisted of the remains of the old quarry at the 225.55 meter elevation.

Above the quarry, at approximately 152.00 m, the valley narrows considerably, forming a gorge for almost 16.00 meters. On a natural shelf against the north side of the gorge, a pathway retained by a wall has been built to extend and reinforce the ledge. This pathway is at present being used by cattle to gain access to the upper sections of the gulch. As portions of this feature show stone set in mortar, this feature is considered of recent construction. There is a possibility, however, that the recent modifications were constructed on an older trail.

The other sites located during the reconnaissance survey of Kaloi Gulch were in the upper reaches of the gulch, above the 365.76 m elevation.

The first of the upper sites was a wall of poorly stacked pahoehoe, approximately 7.62 m long. The wall was low, only .61 m high. This wall had been set on top of a small knoll jutting out from the slope. The wall extended for 6.10 m along the knoll before turning towards the slope for 1.50 m, abutting against a boulder. The presence of a small cairn containing tin cans below the wall indicates that it was built recently.

The second site was located 24.40 m upstream of Site 2600 on the same side of the stream bed. This site is a wall built on the stream terrace cut by the present channel. This wall follows the course of the stream, and is constructed of stacked pahoehoe. It has a total length of 67.70 m, and incorporates existing boulders where possible into the wall. The wall has an average height of .91 m.

The wall appears to be placed so as to protect the stream terrace from possible erosion. This terrace contained no visible midden or other cultural remains.

The last site was 25.60 m to the north of the end of Site 2601. This site was a wall of stacked pahoehoe, free-standing, that has the appearance of being a boundary wall.

None of the sites found in Kaloi Gulch during this reconnaissance were thought to be of major significance. As such, all were recommended for a marginal status in the State Register of Historic Places.

On the basis of this reconnaissance, it is felt that no further archaeological work is needed in the section covered in this survey. This finding has been reaffirmed by the State Historic Preservation Officer.

G. Economic

The estimated cost for site development of Makaiwa

is $3,939,500, of Nanakuli is $3,924,700, and of Kaloi is $19,912,000 (based on 20 years of life). Details on cost are presented in Section 2 Tables 2-1 and 2-2 (pages 2-16 and 2-17), and considerations on the economics of operation of the landfill are presented later in this section under Economic (page 4-30).

II. IMPACTS DURING OPERATION

A. Air Quality

Data on mean local wind direction help identify areas downwind of the landfill site whose air quality might be adversely affected. The strength of local wind speeds can give an idea of the rate of air pollutant dispersal that can be expected. With the help of these streamlines (shown in Figure 4-1, page 4-3) the areas directly downwind (for the prevailing winds) of the three sites within one mile of the landfill boundaries have been indicated. These areas would be more likely to experience any adverse impact on air quality that might result from landfill activities.

Air quality may be altered by dust raised during landfilling activities and the escape of gases from refuse decomposition within the landfill. A water wagon will be provided at the site to control dust as it is generated from landfill operations. Once the dust problem is assessed, a schedule for sprinkling will be developed to best minimize the amount of dust produced so that it will comply with the Air Pollution Control Regulations (Chapter 43) of the State Department of Health.

During operation of the landfill the anticipated daily traffic associated with the landfill will be about 12 municipal vehicle trips, about 50 commercial vehicle trips, and 60 homeowner vehicle trips. Equipment associated with the landfill will be approximately two landfill dozers, one compactor, one water truck, one pick-up and one scraper.

The amount of emissions that will be generated by vehicles should be insignificant and should not increase over what is being generated now.

The following discussion on landfill gases are excerpts from a report by EMCON Associates, 1977.

The major constituents of landfill decomposition gas are carbon dioxide and methane; lesser amounts

of nitrogen, and occasionally a trace of hydrogen sulfide. Composition of some typical landfill gas samples is shown in Table 4-1.

The composition of landfill gas evolves as the waste goes through aerobic and then anaerobic conditions. This evolution develops in four phases (Figure 4-3).

The first phase lasts from several days to weeks. Oxygen present at the time of waste placement aides decomposition. Carbon dioxide is produced during this stage. During the second phase, anaerobic conditions occur since free oxygen has been depleted. At the onset of anaerobic decomposition, significant amounts of carbon dioxide and some nitrogen and hydrogen are produced. The third phase is characterized by the first formation of methane, a reduction in carbon dioxide production, and the depletion of hydrogen. The fourth phase differs from the third in that gas production and composition approach steady state conditions. At this stage the percentage of methane in the gas may range from 50 to 70 percent; carbon dioxide, from 30 to 50 percent.

Carbon dioxide is a colorless, odorless, noncombustible gas and is highly soluble in water at atmospheric pressures. At one atmosphere of partial pressure, pure water will absorb 1688 mg/l of CO_2. This can increase the acidity, corrosivity, and hardness of the water. Carbon dioxide in excess of 20 ppm attacks iron, steel, and concrete.

Relatively little concern is addressed to the adverse impact of CO_2 on groundwater or surface water. This lack of concern is undoubtedly due to the almost total lack of water quality degradation attributable to CO_2 gas.

Methane is generated by the action of methane-producing bacteria on the organic components of refuse. Methane, an odorless hydrocarbon, is the principal constituent of natural gas, with an average heat content of 1000 Btu's per standard cubic foot. Since only about 50 percent of the landfill gas compositions is methane, the heat content produced by a landfill is about 500 Btu's per scf of landfill gas.

Methane is highly combustible in concentrations between 5 and 15 percent by volume in air, a characteristic which can be an asset or a liability. As an

TABLE 4-1

TYPICAL LANDFILL GAS COMPOSITION

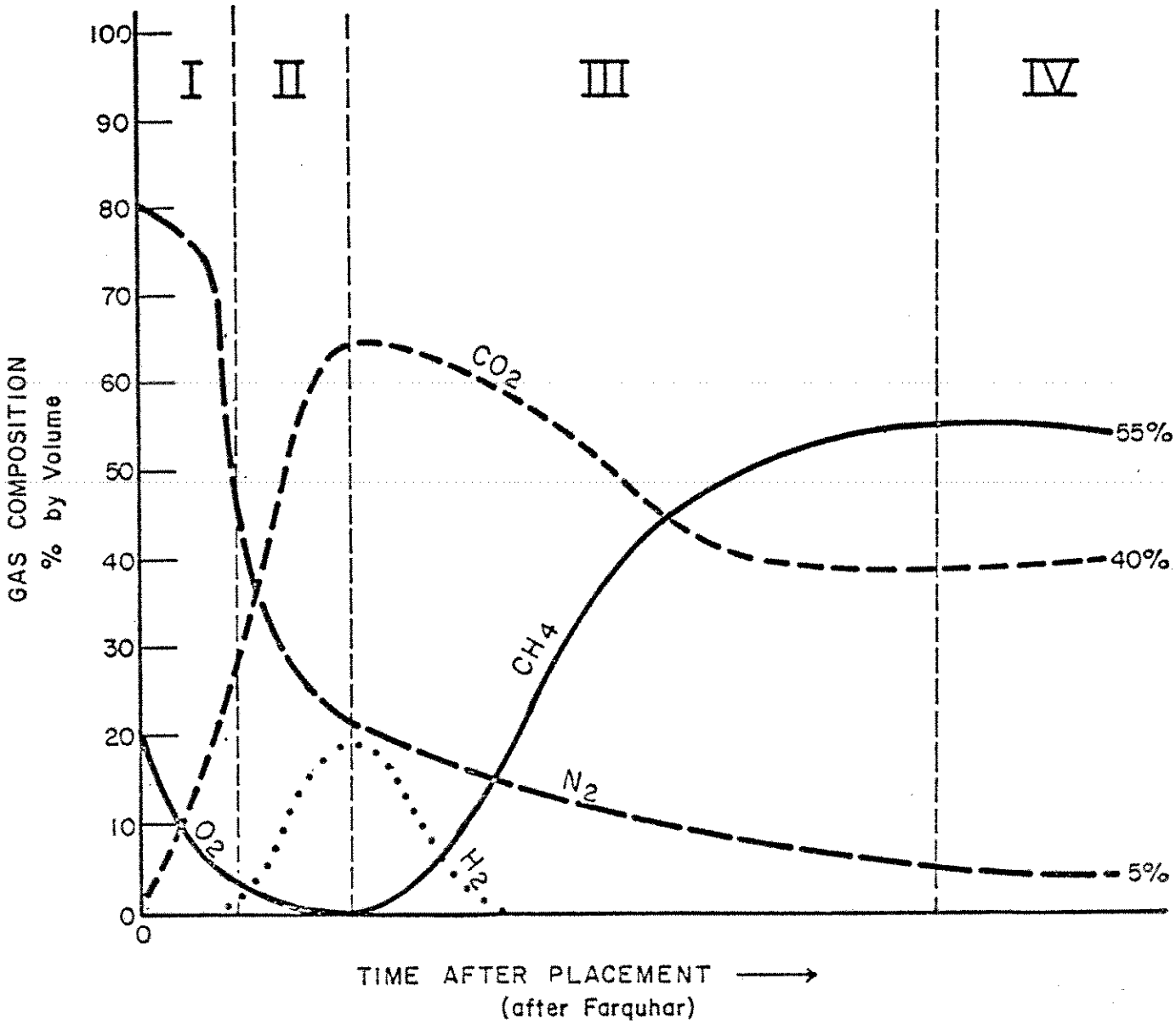
LANDFILL	Methane %	Carbon Dioxide %	Nitrogen %	Oxygen %	Other %
Azusa Western Azusa, CA	50.0	50.0	-	-	-
Bradley Los Angeles, CA	50.0	50.0	-	-	-
Branford Los Angeles, CA	46.0	40.0	?	?	?
Hewitt Los Angeles, CA	45.0	55.0	-	-	-
Mountain View Mountain View, CA	44.0	34.2	20.8	1.0	-
Palos Verdes Rolling Hills, CA	52.6	43.5	2.9	0.3	0.7
Scholl Canyon Glendale, CA	40.5	50.8	7.0	1.7	-
Sheldon Arleta Los Angeles, CA	55.0	45.0	T	T	-
P.I.I Denver, CO	45.0	55.0	-	-	-
G.R.O.W.S. Morristown, PA	46.0	53.0	0.5	0.1	0.4

T - Trace

Source: Leachate Study, Landfill Inventory Study, EMCON Associates, 1977

Figure 4-3

EVOLUTION OF TYPICAL LANDFILL GAS COMPOSITION



I. Aerobic

II. Anaerobic, Non-Methanogenic

III. Anaerobic, Methanogenic, Unsteady

IV. Anaerobic, Methanogenic, Steady

Source: Leachate Study, Landfill Inventory Study, EMCON Associates, 1977

asset, methane can, in certain situations, be an economically recoverable energy resource. As a liability, uncontrolled release of methane may produce such hazards as fire or explosions in confined areas.

The migration of gas to the landfill edge and into surrounding soils, or overlying structures, occurs by two basic processes: convection (movement in response to pressure gradients) and diffusion (movement from area of high gas concentration to areas of lower gas concentration). Gas flow is greater in materials with large pore spaces and high permeability (i.e., sands, gravels) and lower in materials of lower permeability (i.e., clays). Generally, therefore, there is greater vertical and lateral movement of gases in a sand-gravel environment than in a clay environment. Gas movement is limited by methane's insolubility in water, so the presence of groundwater may limit migration of methane.

Methane is lighter than air so it tends to rise and to exit through landfill cover which is sufficiently permeable. A cover of clay is relatively impermeable and will restrict gas loss.

Sufficient rain can render any type of soil less permeable, encouraging lateral migration of gas. The precipitation can also infiltrate the refuse, increase its moisture and stimulate the rate of waste decomposition and gas production. Decreased permeability of the cover and increased gas production may cause a significant increase in lateral gas migration during the rainy season. Typically most of the gas ($\pm$ 80%) will exit through the soil cover.

Methods to control landfill gas migration include one or a combination of the following:

1. Placement of impervious liner materials to block the flow of gas.

2. Selective placement of granular materials for gas venting and/or collection.

3. Evacuation and venting of gas from the landfill itself.

The necessity for a gas control system and the design of the system will be determined during the design phase of the landfill. Specific considerations

of the gas situation for each site are as follows:

1. Makaiwa Gulch Site

Carbon dioxide and methane gas will undoubtedly be generated within the landfill. Moreover, because of the moderately permeable nature of the underlying bedrock materials there is a high probability of migration of these gases from the landfill. However, since the landfill is in a relatively isolated canyon area, it may not be necessary to provide lateral control of migration, except at the canyon mouth.

If lateral gas control is required, then it will be necessary to install a migration control barrier. The barrier may consist of imported relatively impervious clay or synthetic membrane material. This barrier should be installed beneath the 500 foot strip of the perimeter of the landfill.

Gas monitoring probes should be installed at the canyon mouth and adjacent to the perimeter of the landfill to monitor the effectiveness of the gas control system. The canyon mouth is not believed to be a hazardous area since relatively impervious clay soils cover the valley floor.

Gas vents in the landfill should not be required, as the site should vent naturally. If any structures are to be placed above refuse, they should be designed for safety from migrating gas.

The prevailing winds should promptly dilute all gases emitted by the landfill. The area one mile downwind from the landfill is mostly open. Dust levels will be controlled by water sprinkling so no significant impact on air quality is anticipated.

2. Nanakuli Site

Carbon dioxide and methane gases will be generated within the landfill; furthermore, because of the moderately permeable nature of the surrounding subsoils there is a high probability of lateral migration of these gases. To contain lateral migration, a barrier of clay or syn-

thetic liners should be used around the perimeter where migration control is required. This barrier should underlie the perimeter strip of the landfill. The barrier system is preferred to vertical wells with induced vacuum exhaust because the former is permanent and does not require continued maintenance or operational costs.

Gas vents in the landfill should not be required, as the site should vent naturally. If any structures are to be placed above refuse, they should be designed for safety from migrating gas. Gas probes should be installed just beyond the perimeter boundaries of the landfill to monitor the effectiveness of the gas control system.

The residential area of Nanakuli is located downwind of the proposed project. This community is sheltered from the prevailing winds by the surrounding mountains, resulting in lowered average windspeeds which directly affect the overall dispersal rates. Atmospheric dispersal, therefore, cannot be relied on to dilute and disperse air pollutants constantly. Thus it will be imperative to minimize the production of air pollutants.

The low rainfall and lowered average windspeed of the site will help to prevent major air quality problems. The low rainfall will minimize the generation of carbon dioxide, methane and odoriferous compounds during refuse decomposition. The low average windspeed should curtail the migration of the dust generated during normal activities into the residential area.

Furthermore, a properly operated sanitary landfill should not produce undesirable odors nor should it produce excessive dust during normal activities.

3. Kaloi Site

Gas vents in the landfill should not be required, as the site should vent naturally. If any structures are to be placed above refuse, they should be designed for safety from migrating gas. Gas probes should be installed just beyond the perimeter boundaries of the landfill to monitor the effectiveness of the gas control

system, if such a system is determined necessary during the design phase of the proposed project.

Carbon dioxide and methane gas will be generated within the landfill. Moreover, because of the moderately permeable nature of the underlying bedrock materials, there is a high probability of migration of these gases from the landfill. However, since the landfill is in a relatively isolated canyon area, it may not be necessary to provide lateral control of migration, except at the canyon mouth.

If lateral gas control is required, then it will be necessary to install a migration control barrier. The barrier should consist of imported relatively impervious clay or synthetic membrane material. This barrier should be installed beneath the 500 foot strip of the perimeter landfill.

Prevailing winds should rapidly dilute gases emitted by the landfill. The closest residential area to this site is Makakilo, which is over one mile away. Dust levels will be controlled by water sprinkling.

B. Noise Levels

Noise readings were taken at the Kapaa Sanitary Landfill at various distances from the working surface. These indicate the noise levels that can be expected at the proposed Leeward Sanitary Landfill. They are as follows:

Distance from the Working Surface in Feet	Average Noise Level (dBA)
50	74 - 83
100	72 - 78
200	64 - 70
300	60 - 66
400	58 - 64
500	54 - 60
600	52 - 58
700	52 - 58
800	51 - 56

The loudest equipment in use at the Landfill are three steel-tracked bulldozer spreaders which operate at least 50 percent of the time. The loudest sound

is their back-up alert signals. Comparative noise levels of different activities and locations are presented in Figure 4-4 and Table 4-2.

The number of vehicles going to the landfill can affect the level of noise that will be generated during landfill operations. Initial municipal collection traffic is anticipated to average 6 visits by collection trucks and 6 visits by transfer trucks per day. Homeowner traffic should be less than 60 vehicles per day. The City will encourage homeowners to use the facility to cut down illegal dumping of refuse in leeward areas.

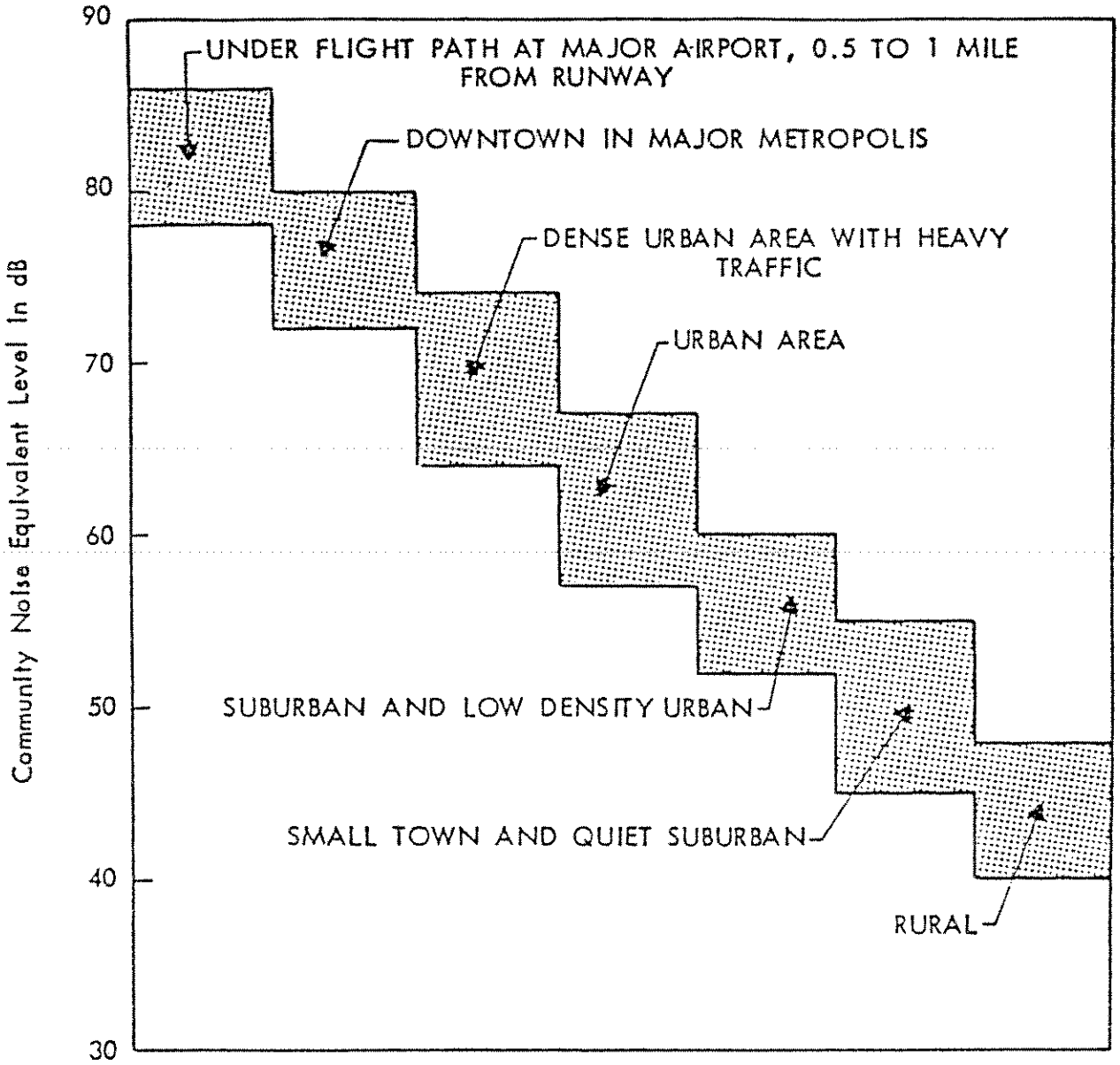
The Waianae Landfill traffic is approximately 44 vehicles per day. These vehicles comprise City and homeowner types since commercial refuse is not accepted at the Waianae Landfill. Once the Waianae Landfill has reached its capacity (less than 3 years), this amount of traffic can be expected at the proposed landfill.

Along the roadside a refuse truck generates a noise level of about 80 dB (A) at a distance of 10 feet. The theoretical noise levels at given distances would be:

Distance (feet)	db (A)
10	80
20	74
40	72
80	66
160	62
320	56
640	50
1280	44

These particular estimates, however, would only be true when there are no reflecting or blocking objects in the sound path. With an obstacle in the sound path part of the sound will be reflected, part absorbed and the remainder transmitted through the object. The degree to which it is reflected, absorbed or tansmitted depends upon the absorbing properties of the object, its size and the wave length of the sound. Frequency of occurrence will be low because of the small amount of refuse bearing traffic.

Figure 4-4



GRAPH 1 TYPICAL RANGE OF OUTDOOR COMMUNITY NOISE EXPOSURE LEVELS

Source: Bolt, Beranek, and Newman, Inc., 1974.

Table 4-2

SOUND LEVELS OF COMMON SOUNDS

Sound	Sound Level dB(A)	Relative Loudness (Approximate)
Jet Plane, 100 Feet	130	128
Rock Music with Amplifier	120	64
Thunder, Danger of Permanent Hearing Loss	110	32
Boiler Shop, Power Mower	100	16
Orchestral Crescendo at 25 Feet, Noisy Kitchen	90	8
Busy Street	80	4
Interior of Department Store	70	2
Ordinary Conversation, 3 Feet away	60	1
Quiet Automobile at Low Speed	50	1/2
Average Office	40	1/4
City Residence	30	1/8
Quiet Country Residence	20	1/16
Rustle of Leaves	10	1/32
Threshold of Hearing	0	1/64

Source: Bolt, Beranek and Newman, Inc., 1974

1. Makaiwa Gulch Site

Since the working surface would be about 750 feet from Honokai Hale, incremental noise increase to the 58 to 82 dBA average noise of Farrington Highway traffic will be insignificant. Provision of a 200 foot landscaped buffer zone between the working face of the landfill and the residential area will also contribute to some attenuation of the noise produced by the operations. Landscaping completed increments will add buffer to alleviate effects by noise as well as alleviate visual impact.

2. Nanakuli Site

Because of the low 44 to 46 dBA ambient level, noise will be audible but should not be obtrusive at a distance of 800 feet from the working surface. The nearest residential area to the working face will be from 200 to 300 feet away because of a proposed buffer zone.

By providing this landscaped buffer area, some of the noise generated by landfilling operations should be attenuated. A noise barrier wall may be provided along the makai perimeter of the landfill between the working face of the landfill and the residential area should noise problems persist. Development of a park and landscaping completed increments will add buffer to alleviate effects by noise as well as alleviate visual impact.

3. Kaloi Gulch Site

The ambient level is 44 to 52 dBA; therefore, noise will be audible but not obtrusive at a distance of 800 feet from the working surface.

Due to the geographical location of Kaloi Gulch, somewhat removed from residential areas, noise is not anticipated to have significant impact.

As background, a brief discussion of studies done on the effects of noise on wildlife will be presented, but much of what has been done lacks specific information on noise intensity, spectrum, and duration of exposure (EPA, 1971b). However, possible effects can be inferred from information dealing with:

(1) direct effects of noise that have been demonstrated in laboratory or domestic animals and (2) incidental observations of responses to noise in wild animals (EPA, 1971b).

It is unlikely that wild animals will be subjected to noises intense enough or of sufficient duration to produce hearing losses. It is possible, however, that moderate noise levels could produce some hearing loss or influence hormonally regulated processes because of noise-induced stress. But until studies are done to separate these stresses from stresses resulting from capture, handling, or other kinds of interference, these answers will be unknown (EPA, 1971b).

Some studies on birds indicate that birds can adapt to certain sounds. Birds were most effectively repelled by high-intensity (not defined) recordings of the species' own distress calls (Lanowski, Wight, and Jacobson, 1969; Messersmith, 1970; Wight, 1971). The same investigators reported that if the specific distress calls were presented continuously, rapid adaptation ocurred (EPA, 1971b). Block (1966) used tape-recorded distress calls to disperse roosting starlings. The number of starlings were reduced but the roosts were subsequently reinfested by a majority of the former resident population (EPA, 1971b).

The final report of a committee on the Problem of Noise (1963) reported that to scare birds a noise level of about 85 dB at the bird's ear was required. The noise consisted of loud bangs and birds' distress calls. Birds adapted quickly to the noise (EPA, 1971b).

A U. S. Department of Interior report on Environmental Impact of the Big Cypress Swamp Jetport (1969) discussed the effects of B-720s flying over two sites in a park. Observers reported that no birds were flushed and no disturbances were seen. Noise levels ranged from 75 dB (plane at 3,000 ft.) to 96.5 dB (plane at 500 ft.) (EPA, 1971b).

Bird calls convey many types of information such as distress, danger or alarm, warnings about territorial boundaries, recognition of mate or of young, and presence of food. If background noises mask these signals, then they can potentially influence such processes as spacing to obtain optimum

population densities in an area, nesting and care of young, and detection of prey or of a predator [(Thorpe, 1969), EPA, 1971b].

Potash (in press) reported that male Japanese quail, isolated from their mates, increased the frequency of their "separation calls" when ambient noise levels increased from 30 dBA to 63 dBA. This increase in frequency of calls can make detection and recognition of the call and localization of the caller more likely. The ultimate significance of this is whether the mate or a predator finds the caller first (EPA, 1971b).

Shaw (1970) reported that adult condors were very sensitive to noise and abandoned their nest when disturbed by blasting, sonic booms or traffic noise. Bell (1970) described only minimal reactions to sonic booms among domestic animals, ranch mink, and wild animals. The typical reaction he reported was a startle response. The only clearly detrimental effect he discussed was the Dry Tortugas sooty terns' hatching failure (EPA, 1971b).

The direct effects of noise on laboratory animals is of lesser concern here, since it is unlikely that wild animals will ever be subjected to the intensity or duration of noises imposed on laboratory animals.

Studies evaluating the effects of noise on laboratory animals generally exposed the subjects to sound pressure levels ranging from 100 to 106 dB, with a duration ranging from a few seconds to continuous 24 hour exposure over a period of several months. These studies have produced results suggestive of significant effects of noise on sexual function, auditory function and blood chemistry, among others (EPA, 1971b).

A biological reconnaissance of all the proposed sites did not reveal the presence of any endangered species. It is quite probable that animal species will displace into adjacent areas, away from the sound source.

C. Traffic

Landfilling activities are anticipated to generate daily traffic in the following amounts: 6 municipal transfer trailer trips, 6 municipal collector truck trips, approximately 50 commercial refuse vehicle

trips, and 60 homeowner vehicle trips. The extent of impact of refuse vehicle traffic on the access roads to the proposed landfill sites will be dependent upon existing traffic conditions and the conditions of the access roads.

Most of the refuse traffic that will be going to the landfill is anticipated to occur after the morning peak hour traffic and will taper off before the afternoon peak hour traffic. Since refuse traffic to the landfill will generally be going in the opposite direction of the peak hour traffic, impact on existing traffic patterns at either of the proposed sites is expected to be insignificant.

1. Makaiwa Gulch Site

The site is accessible from Farrington Highway. Existing traffic counts in the vicinity of the site, along Farrington Highway, between Nanakuli Bridge and Palailai Interchange of H-1 are as follows:

Average Daily Traffic	(1973)	18,505
Peak Hour (two way)	A.M.	1,591
Peak Hour (two way)	P.M.	1,925

Vehicle traffic associated with landfill operation will not substantially increase existing traffic counts.

2. Nanakuli Site

The site is easily accessible from Farrington Highway by way of Lualualei Naval Road. Traffic counts have been estimated as follows for these thoroughfares:

	Farrington Highway (between Lualualei Naval Road and Nanakuli Bridge)	Lualualei Naval Road
ADT (1973)	20,320	5,892
Peak Hour A.M.	1,748	737
Peak Hour P.M.	2,113	860

Refuse vehicle traffic should not substantially increase vehicular traffic on either of the above routes.

3. Kaloi Gulch Site

The site is accessible from the Interstate Highway H-1 via Ewa Exit, old two-lane Farrington Highway and Palehua Road. Traffic counts on the highways have been estimated as follows:

Interstate Highway H-1, between Kunia Road and Makakilo Drive		Farrington Highway Ewa of Ft. Weaver Road (June 1976) 24 hour count	
ADT (1973)	22,002	Honolulu Bound	2,015
Peak Hour A.M.	1,848	Ewa Bound	2,669
Peak Hour P.M.	2,200		

Refuse vehicle traffic will not substantially increase traffic on any of the above routes. A traffic light or other traffic arrangement will be provided on Palehua Road to give cane-haul trucks the right-of-way at all times. It is therefore not anticipated that refuse traffic will significatly impact cane-haul traffic. The drivers of the cane-haul vehicles will be allowed to change the light or given priority as they approach the intersection to give them the right-of-way.

D. Fire

Fires are a potential hazard within the proposed landfill if proper sanitary landfilling procedures are not followed. Burning of wastes is not permitted at a sanitary landfill but fires occasionally occur due to (1) careless handling of open flames, (2) handling of hot wastes or (3) spontaneous combustion of materials in the presence of appropriate gases. To reduce fire hazard, smoking materials or use of open flames will not be permitted within the area of refuse deposition and hot wastes will not be accepted for disposal. It is, however, difficult to segregate volatile or combustible materials from other wastes within a landfill. Fires may still occur despite

the precautions listed above but proper amounts of daily cover should prevent fire in a refuse cell from spreading laterally into other cells. Proper cell construction would limit the extent of burning until the fire has burned itself out. In shallow cells fire can be controlled by removing burning refuse or by adding more cover. The gas venting system, if installed, will allow venting of decomposition gases, reducing explosive or fire potential within the landfill. Because of the nature of the vegetation surrounding the sites, the potential for brush fires exists. However, as explained above, with proper landfill practices, including proper cover and cell construction, it is not anticipated that the landfill will be a contributing source to brush fires.

All landfill compacting equipment will be equipped with fire extinguishers and a water sprinkling truck will be on-site during all hours of landfill operation.

1. Makaiwa Gulch Site

The site is isolated on all sides and the only road access to the site is from Farrington Highway. The entrance to the landfill will be secured to prevent vandalism or other illegal activities which may lead to fire hazard.

2. Nanakuli Site

Fire hazard will be more significant here as the site is easily accessible and residential developments are located nearby. Children from nearby residences may gain access to the site if the site is not surrounded by protective fences.

3. Kaloi Gulch Site

The site is isolated from residential developments and is easily accessible from only one point, which will be the entrance to the landfill. The entrance will be secured to prevent unauthorized entering, thereby reducing fire hazard. Security or protective fencing will be provided at all sites.

E. Litter

Proposed landfill activities may generate litter around the area of landfill deposition. However, careful maintenance operations and the use of a daily 6 inch soil cover will minimize blowing litter. Portable litter fences will be installed to confine windblown litter around the working face of the landfill. The entrance to the landfill will be secured to prevent unauthorized dumping after hours.

F. Odor

Odor will be generated in various levels according to refuse composition, moisture content and the length of time refuse remains uncovered prior to final compaction and cover. Odors from existing landfills on the island are not detectable past the sites' borders, and generally are not strong within the sites themselves. Proper amounts of daily cover over refuse will reduce odors. If odor becomes severe at any time, more cover material will be added, refuse will be covered faster, or chemical masking agents, if available, will be used to alleviate the problem.

1. Makaiwa Gulch Site

Odor may present a short-term nuisance to residents of Honokai Hale during landfill activities if a combination of highly organic refuse, warm weather and wind conditions occurs. Prevailing winds tend to by-pass the Honokai Hale development. Proper landfill procedures should minimize the odor problem. If odor levels are still discernible at the residential development, chemical masking agents can be used, as required, to mitigate odor nuisance.

2. Nanakuli Site

Odor may present a short-term nuisance to residents of surrounding developments if a combination of highly organic refuse and warm weather occurs. Under such conditions prevailing winds would carry odor into residential areas. Proper landfill procedures will minimize odors. Odor nuisance can be mitigated by the use of chemical masking agents, if available, as required.

3. Kaloi Gulch Site

Odor is not anticipated to be a problem as surrounding areas are used for agriculture and open space. Nevertheless, proper landfill procedures will minimize odors and, if necessary, chemical masking agents will be used.

G. Vectors

Landfills may attract rats, flies, birds, and other disease vectors if not properly operated. Disease vectors can be successfully controlled by daily cover on the refuse and proper landfill procedures. If rats become a nuisance at the landfill, a pest control program consisting of a baiting program to control the rats will be implemented and supervised by an experienced exterminator. Signs to indicate baiting stations will inform the public of the program. Generally, such programs last two to three weeks and are an effective short-term control in reducing numbers of rats. However, rats have not been a problem at the existing landfill and are not expected to be a problem at the proposed landfill. Proper daily soil cover reduces fly contact with refuse.

If refuse is shredded it may be left uncovered. The Department of Health will determine the need for daily cover. Rodents are not attracted to nor can they survive on a diet of shredded refuse. Studies of flies have indicated that 1) shredding kills nearly 100 percent of maggots present in incoming refuse; 2) the necessary conditions for freshly shredded refuse to support the fly reproduction cycle are rarely obtained in a landfill; 3) after shredded refuse is aged several months, the ability to support the fly cycle is destroyed; 4) flies are more attracted to uncovered shredded refuse than covered non-shredded refuse (Pavoni and Heer, 1975).

1. Makaiwa Gulch Site

Vectors are not anticipated to be a problem with the implementation of the above control measures. Vector control measures will be implemented, if necessary.

2. Nanakuli Site

Vectors are not anticipated to be a problem but vector control measures will be implemented, if required.

3. Kaloi Gulch Site

Vectors should not be a problem but vector control measures will be implemented, if necessary.

H. Economic

The proposed landfill will be the most cost-effective method for refuse disposal until a resource recovery system is initiated for the Island of Oahu. The City may utilize Federal funds (e.g. Community Development Block Grants) to construct this landfill. Disposal costs are estimated to be $5.22/ton for Makaiwa, $4.47/ton for Nanakuli and $12.85/ton for Kaloi, based on a rate of 500 tons/day, 365 day/year.* These cost figures include cost of development, equipment and maintenance (Refer to Table 2-1 and 2-2, pp. 2-16 and 2-17). Using Kaloi as the base, it costs $.06/ton more to haul to Makaiwa and $.50/ton more to haul to Nanakuli. Difference in hauling cost between Makaiwa and Nanakuli is $.44/ton. Presently, the cost for incineration is approximately $16.00/ton. The Kewalo and Kapalama incinerators were closed in October, 1977, because they did not meet the Environmental Protection Agency's air quality standards. Renovations of these incinerators to meet EPA specifications was not economically feasible.

Although the volume of waste will be reduced once a recovery system is implemented, a landfill will still be required to dispose of non-recoverable waste and resource recovery residues including sewage sludge.

*Shimabukuro and Associates, 1977.

I. Water Quality

Possible adverse impacts on the water quality of the groundwater and surface waters below and surrounding the proposed landfill would be due to the presence of leachate in those waters. "The production of leachate from refuse is dependent upon the presence of excess water. Water can be introduced into a landfill by infiltration through the soil cover or through subsurface seepage. When the net water infiltration into a landfill exceeds the absorptive and/or retention ability of the refuse, leachate will be produced." (EMCON Associates, 1977).

Leachate is made up of both organic and inorganic matter, suspended and dissolved. Table 4-3 illustrates typical ranges of leachate one can expect from a sanitary landfill. Studies for the basis of this table are contained in Appendix E. (EMCON Associates, 1977).

The following discussion is an excerpt from a leachate study done by EMCON Associates, 1977:

The operating phase of most landfills may be a period of non-steady state leachate production if there is a high rainfall (30 inches or more) and the soil cover and grades are insufficient to shed surface water. The refuse, on initial placement, has a tremendous capacity to absorb moisture before leachate is produced. If the refuse lifts are covered daily with moderately impermeable soil and interim drainage provisions protect against heavy infiltration, then leachate should not be produced during the operational phase. If, however, the cover soil is pervious, the lifts are not sloped to drain, or heavy infiltration of surface or groundwater is permitted, significant leachate generation can occur during the operational phase. Because the rainfall at Oahu occurs predominantly during major storms, there is every reason to believe the landfills can shed the bulk of this water by runoff, thereby virtually eliminating leachate production. The landfills of this project can be filled in a manner that prevents heavy infiltration and assures that the absorptive capacity is not exceeded during construction.

Post-construction leachate generation is dependent upon infiltration of rainfall through the final soil cover and/or groundwater infiltration. Groundwater infiltration at the landfills should be non-existent as

Table 4-3

SUMMARY OF TYPICAL RANGES FOR VARIOUS LEACHATE PARAMETERS

PARAMETER (mg/l unless otherwise noted)	LABORATORY STUDIES				FIELD STUDIES			THIS STUDY		
	California	W. Virginia	Drexel	Georgia Tech.	California	S. Dakota	Illinois	Cell A	Cell C	Cell D
Acetic Acid				4,000-8,000						
Acidity		500-3,000		1,500-3,300						
Alkalinity	730-9,500	8,000-18,000		2,000-2,500	255-1,125	243	100-10,000	1,000-8,500	2,000-2,500	2,000-8,000
Aluminum							0.05-2.2			
Arsenic							0.1-6.9			
Barium							0.15-8.5			
Berylium							0.1			
BOD	81-33,000	9,000-30,000		40-130	0.6-59		50-50,000	12,000-31,000	4,000-28,000	400-33,000
Bromide							0.1-12			
Butyric Acid				500-2,500						
Cadmium							0.05			
Calcium	115-2,570	500-3,000			68-355		100-300	500-2,500	400-1,600	500-1,600
Chloride	96-2,350	500-2,000	200-2,000	100-350	72-865	5.94	25-1,500	500-2,000	200-2,000	1,000-2,000
Chromium							0.05-0.2			
COD			1,000-40,000	6,000-18,000			10-50,000	15,000-55,000	4,000-40,000	1,000-38,000
Copper			1-4.5				0.05	0.15-0.7	0.02-0.6	0.04-0.35
Cyanide							0.005-0.024			
Flouride							0.05-0.89			
Hardness, Total (as $CaCO_3$)	650-8,120	5,000-12,000	1,000-5,000	1,000-5,000	305-1,175	302	100-10,000			
HBAS							0.02-0.5			
Hexane Solubles							0-350			
Iron, Ferrous	2.0-93				0-4.0					
Iron, Total	6.5-305	100-800	100-1,400	0.02-24.0	0.07		0.2-5,000	700-1,100	200-300	62-300
Lead							0.5-1.3	0.1-1.8	0.1-0.8	0.01-2.0
Magnesium	64-410	100-400			13-110		25-300	600-1,100	100-1,000	300-700
Manganese	0.05-1.66									
Nickel			0.01-0.9							
Nitrogen, Total		400-2,000	30-400				2.4-6.5			
Nitrogen, Ammonia	0.22-890	300-1,000		20-250	0.12-8.5			40-700	100-800	200-900
Nitrogen, Nitrate						9.8	0.1-1.5	0.1-1	0.1-9	0.1-9
Nitrogen, Organic	2.4-550	200-1,000	8-480	50-150	0-2.3			5-100	10-900	10-900
Pesticides (ppb)				100-800			5			
pH	5.6-7.6	5.3-6.3	5.0-3.0	7.0	6.85-7.78	7.31	6.5-8.5	4.5-5.2	4.4-5.3	4.5-6.6
Phosphate	0.16-29	20-120	1-130	1.0-7.0	0.01-1.6		0.5-7.0	1-15	1-40	1-40
Potassium	28-1,860	700-3,500			4.4-190	0.16	2-790	200-900	70-800	300-800
Propionic Acid				2,000-5,000						
Selenium							0.1-2.7			
Sodium	65-1,805	300-1,200	200-3,800		67-710	10.2	50-1,200	80-900	100-950	600-1,000
Solids, Total		18,000-50,000	5,000-40,000							
Solids, Dissolved							200-13,000	12,000-26,000	3,000-20,000	4,000-22,000
Solids, Suspended			5,000-25,000							
Solids, Volatile		10,000-28,000								
Sulphate	39-730	200-800	50-400		25-700		25-800	150-800	100-800	100-900
Tannin and Lignin		300-1,000								
TOC				3,000-5,000						
Veleric Acid				30-1,800						
Volatile Acids, Total								10,000-19,000	3,000-12,000	1,000-14,000
Zinc			1-120				0.05-40	0.2-60	0.6-42	1.12-95

Source: EMCON Associates, 1977.

Notes: 1. Refer to Tables in Appendix B for identification of laboratory and field studies.
2. BOD and volatile acids and suspended and total solids should be at high end of spectrum in the fresh leachate due to high percentage of readily decomposible organics in refuse.

refuse will be placed well above groundwater levels, and no groundwater seeps are reported at any of the landfills. If seeps are found during construction, however, they can be intercepted and isolated from the refuse.

Infiltration of rainfall through the soil cover is the principal potential mode of leachate generation after the landfill has been constructed. The majority of this precipitation will be shed from a relatively impervious soil cover as surface water runoff. The precipitation that does not exit the site as surface runoff will be partially removed by the processes of evaporation transpiration, and soil absorption. Any amount in excess of that accounted for in the above processes would enter the refuse as "net" infiltration. The "net" infiltration rate will estabish the maximum post-construction rate of leachate production. Areas receiving 20 to 30 inches or less of annual precipitation generate little or no leachate if operated as true sanitary landfills. Where precipitation approaches 50 inches per year on Oahu, however, a percentage of the annual precipitation in excess of 30 inches may infiltrate the cover. The percentage figure will vary depending on final cover soil, final slope, vegetative growth, etc. We estimate that the percentage figure will range from 10 percent for relatively steep slopes, to 20 percent for slopes flatter than 10 percent.

We estimate the design magnitude of post-construction leachate generation for the landfills of this project, based on the above discussion, as follows:

Site	Annual Site Rainfall in/yr.	Leachate Generation, per acre In./Yr.
Nanakuli, A&B	25	0
Makaiwa	20	0
Kaloi	25	0

Leachate should not be produced at any of the proposed landfill sites due to low rainfall of less than 30 inches per year. Nevertheless, caution will be taken to utilize relatively impermeable soil cover and to provide a final grade of at least 3 percent to enhance runoff. Vegetation should be selected which will enhance transpiration and minimize erosion.

A program of continued maintenance will be provided to ensure that surface cracks created by differential settlement are sealed, thereby minimizing potential surface water infiltration (EMCON and Associates, 1977). The drainage system to be constructed around the landfill also will prevent surface runoff from contacting refuse.

The following discussion includes excerpts from a hydrogeologic and soils study conducted by Stephen P. Bowles and John F. Mink (1977). This discussion is offered to add information about what can be expected should leachate be produced.

1. Makaiwa Gulch Site

A pulse of leachate from a landfill in Makaiwa would follow a complicated path before discharging in highly diluted form into the caprock or to an Oahu Sugar Company pumping station, which is used for irrigation purposes. First it would have to traverse an 85 foot thick unsaturated zone and then travel in the saturated zone at an average particle velocity of about 8 feet per day for about three years before reaching a discharge sink. Groundwater in the aquifer along the probable path of the leachate is suitable only for agriculture. The leachate could not travel against the hydraulic gradient to the Navy tunnel (Bowles and Mink, 1977).

2. Nanakuli Site

The following are excerpts from Bowles and Mink (1977).

The hydraulic gradient in the aquifer is about 2 feet per 2500 feet. The particle velocity of the groundwater is 2 feet per day. If a pulse of leachate were to reach the water table, approximately 3 years would pass before it discharged at the coast and about 2 years before it discharged at Ulehawa canal. Meanwhile, dispersion would greatly reduce the concentration of the pulse.

The quality of the water in the sedimentary aquifer under Site A is very poor. The static, unpumped water at the top of the lens has a chloride content exceeding 500 mg/l; pumped water would exceed 1000 mg/l, and its quality

would progressively worsen with magnitude and time of pumping. The natural groundwater is neither potable nor acceptable for most agriculture.

Groundwater at Site B is poor in both quality and exploitability and is not likely to be worth considering either for domestic or agricultural usage. Flow volume in the aquifer is low, and under pumping stress the chloride content of the water would exceed 1000 mg/l.

3. Kaloi Site

The gulch overlies the same large Waianae aquifer as does Makaiwa but is separated from it by an unsaturated zone more than 200 feet thick. The Navy water development tunnel and pumping stations of Oahu Sugar Company lie down-gradient of this site, and the Honolulu Board of Water Supply is considering the placement of a major water supply station upgradient. The quality of the groundwater near the gulch is marginally potable (Bowles and Mink, 1977).

As at Makaiwa, groundwater particle velocity in the aquifer is about 8 feet per day, and therefore a pulse of leachate would reach the Navy Tunnel in about 2 years, though in highly diluted form. Undeveloped groundwater seeps into the Ewa Plain sediments. This undeveloped groundwater, however, is exploitable for both domestic and agricultural needs. According to the Board of Water Supply a landfill at Kaloi would have to be carefully designed, constructed and adequate measures taken to protect against groundwater pollution. To accomplish this a major drainage system would have to be installed and a lining and leachate collection system installed to prevent any possible leachate from entering the groundwater. A discussion on some of the types of linings available is provided in Appendix F (Bowles and Mink, 1977).

J. Drainage

The construction of a drainage system around the landfill will alter the existing drainage patterns of the proposed site areas. The system will be designed, however, to minimize the amount of debris and sediment that flows out of the drainage system by use of debris

racks and basins. The velocity of the outflow will approximate that of normal surface runoff velocity for that particular site.

K. Visual

The Kaloi Gulch Site will be the least visible, while Makaiwa Gulch Site will be readily visible from Farrington Highway. The Nanakuli Site will not be visible to most motorists but will be surrounded and visible to existing and proposed residential areas.

In order to mitigate visual impact, the Makaiwa Gulch Site will be heavily landscaped at its entrance and a green buffer zone of approximately 6 acres is proposed.

The Nanakuli Site will be extensively landscaped in a buffer area bordering residential areas to screen landfilling activities from them. The Kaloi Gulch Site is remote and located in an agricultural area and should not be visually obtrusive.

The extensive landscaping will also help screen the fugitive dust that may occur.

The landfilled portions of the proposed site will be landscaped in increments as each landfill area is completed. This will create green open spaces that can be used for either active or passive recreational purposes or agriculture.

Figures 4-5, 4-6 and 4-7 illustrate the existing appearance of the proposed sites. Figure 4-8, 4-9 and 4-10 show the location of the "view stations" for figures 4-5 thru 4-7 (aerial views). Figures 4-11, 4-12 and 4-13 illustrate how the landfill will appear during operation and Figures 4-14, 4-15 and 4-16 after completion.

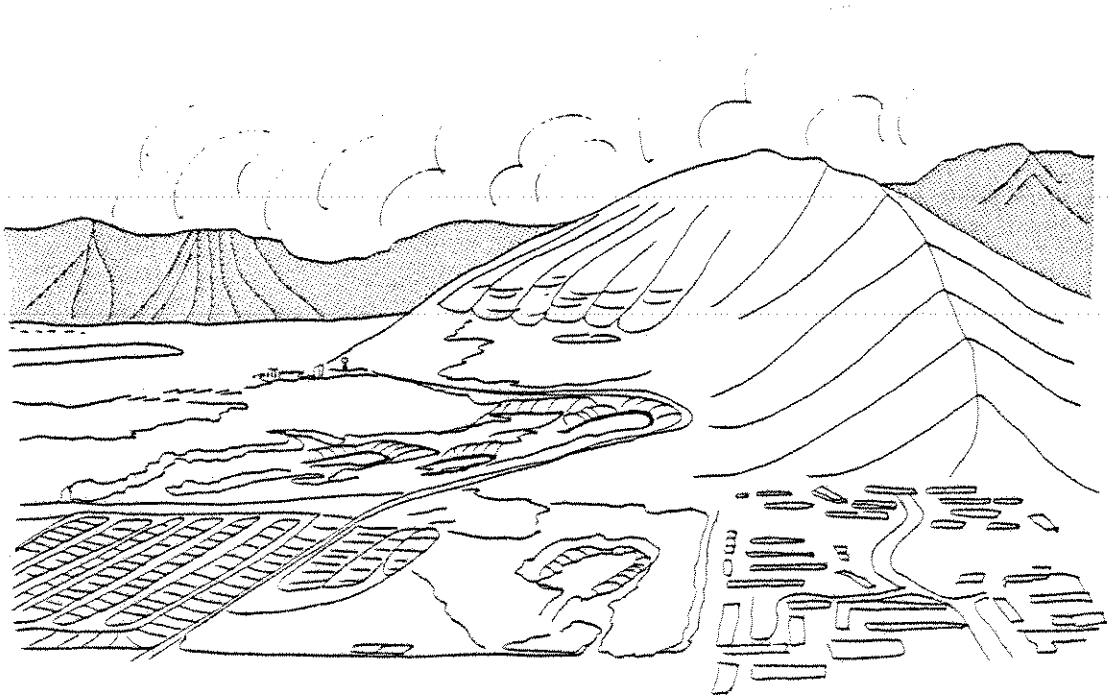
During landfilling the exposed soil will contrast with the surrounding vegetation. To reduce this visual impact increments will be grassed as they are completed so that completed sections will blend with the surrounding environment.

The original landforms will be altered during landfilling. During landfilling a series of terraces will be formed, a method used to control erosion. After the landfill is completed, soil will be added

Figure 4-5

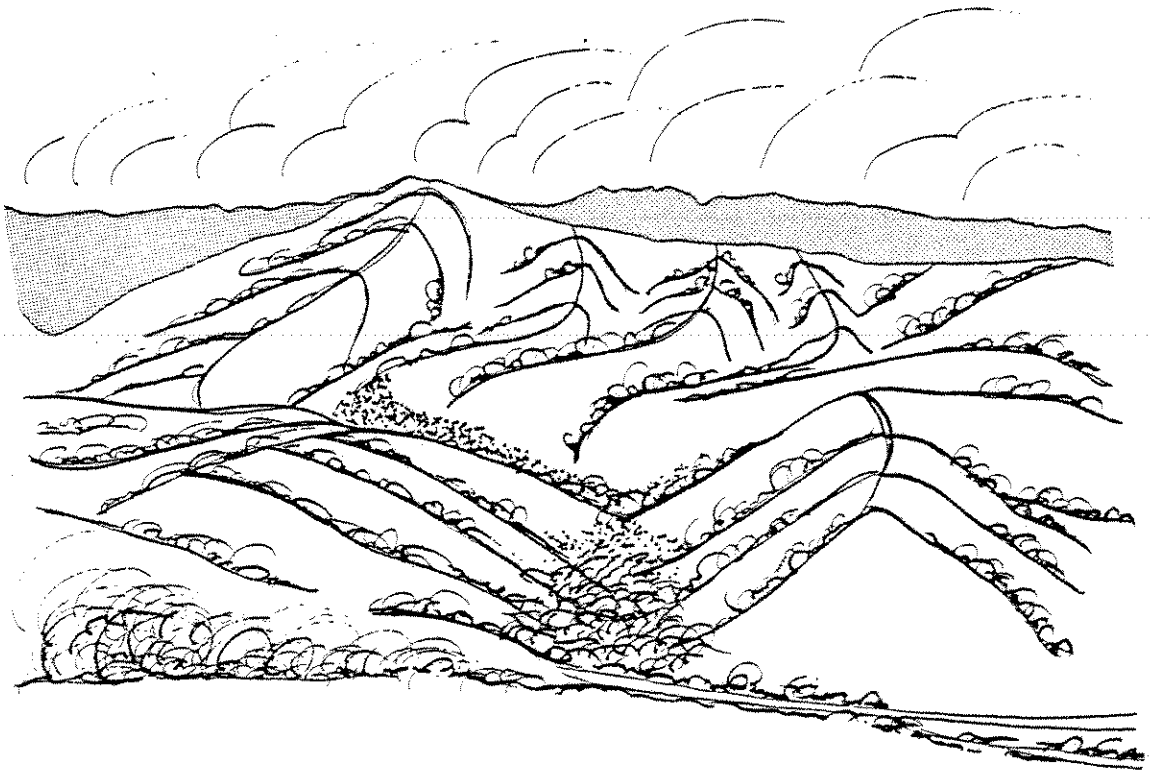
Makaiwa Existing Condition

Figure 4-6



Nanakuli Existing Condition

Figure 4-7



Kaloi Existing Condition

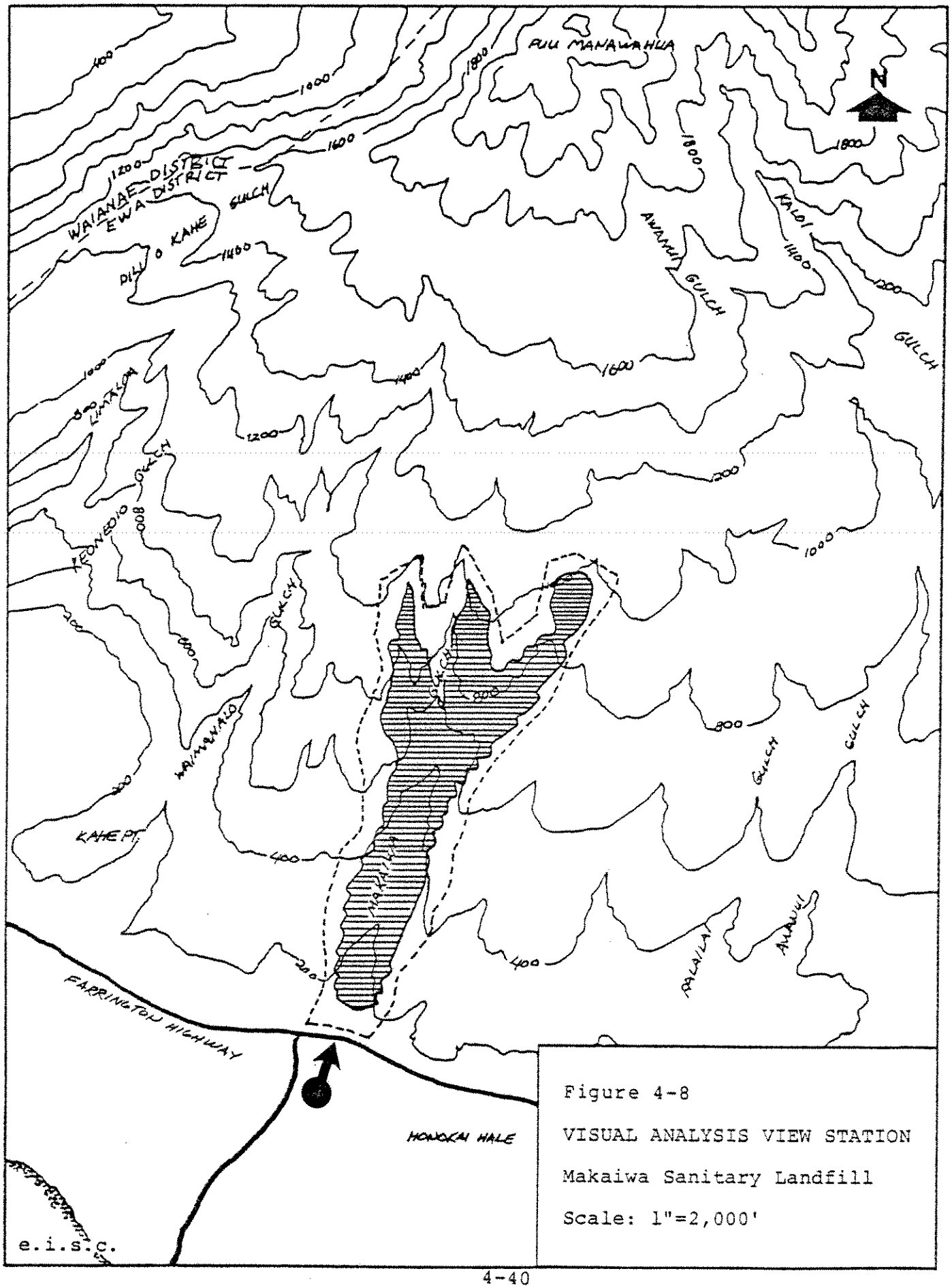


Figure 4-8

VISUAL ANALYSIS VIEW STATION

Makaiwa Sanitary Landfill

Scale: 1"=2,000'

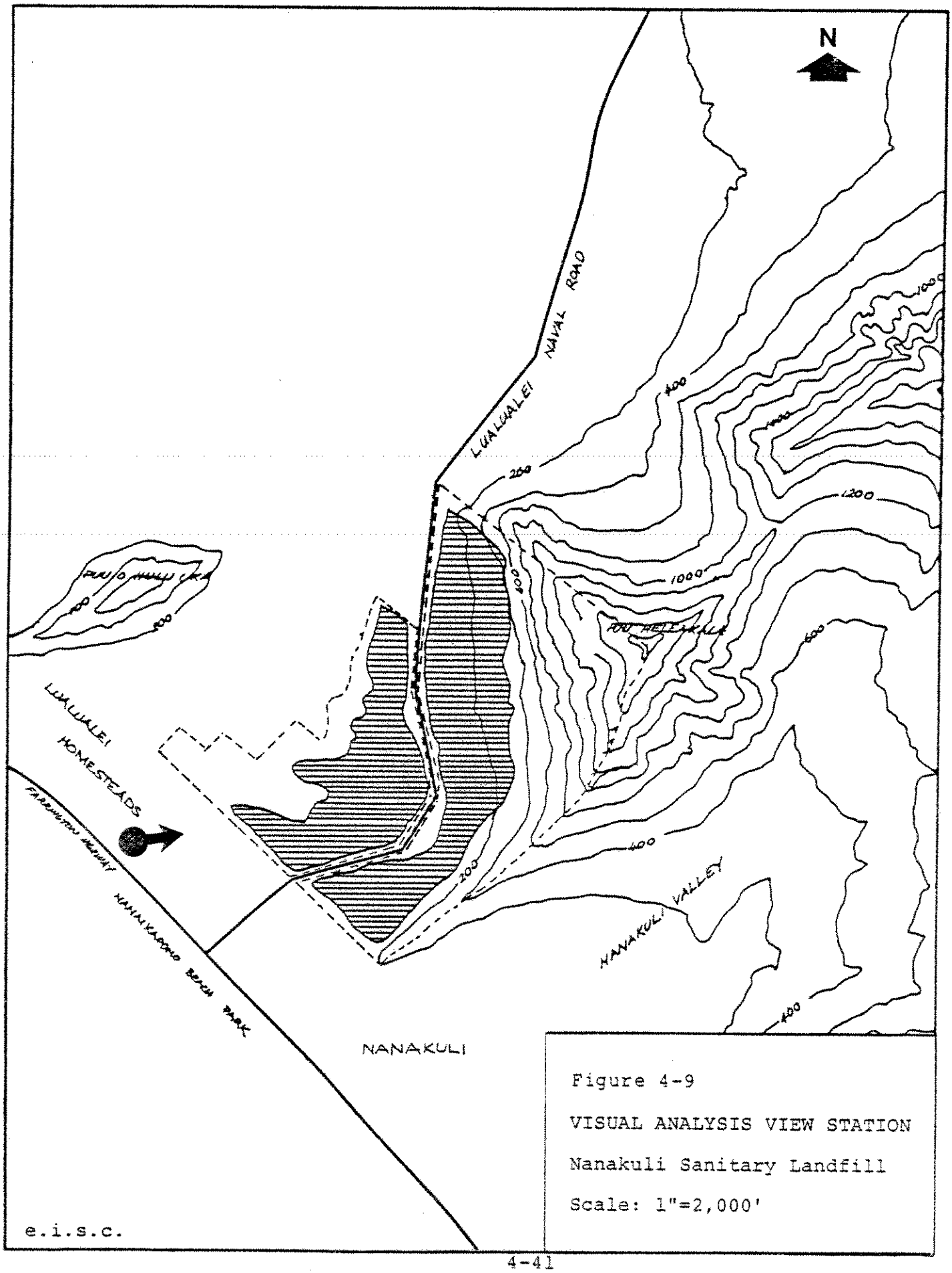


Figure 4-9

VISUAL ANALYSIS VIEW STATION

Nanakuli Sanitary Landfill

Scale: 1"=2,000'

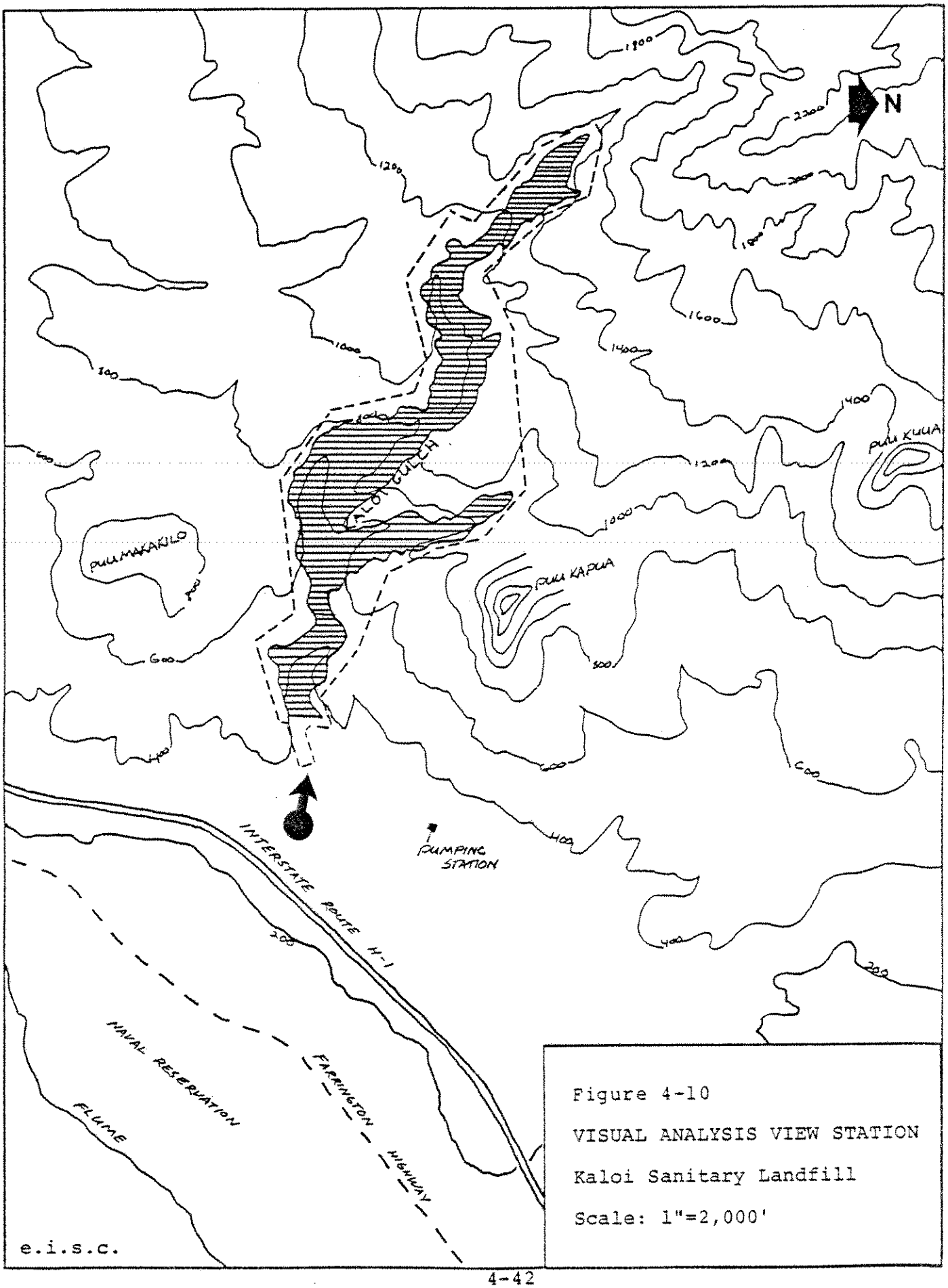


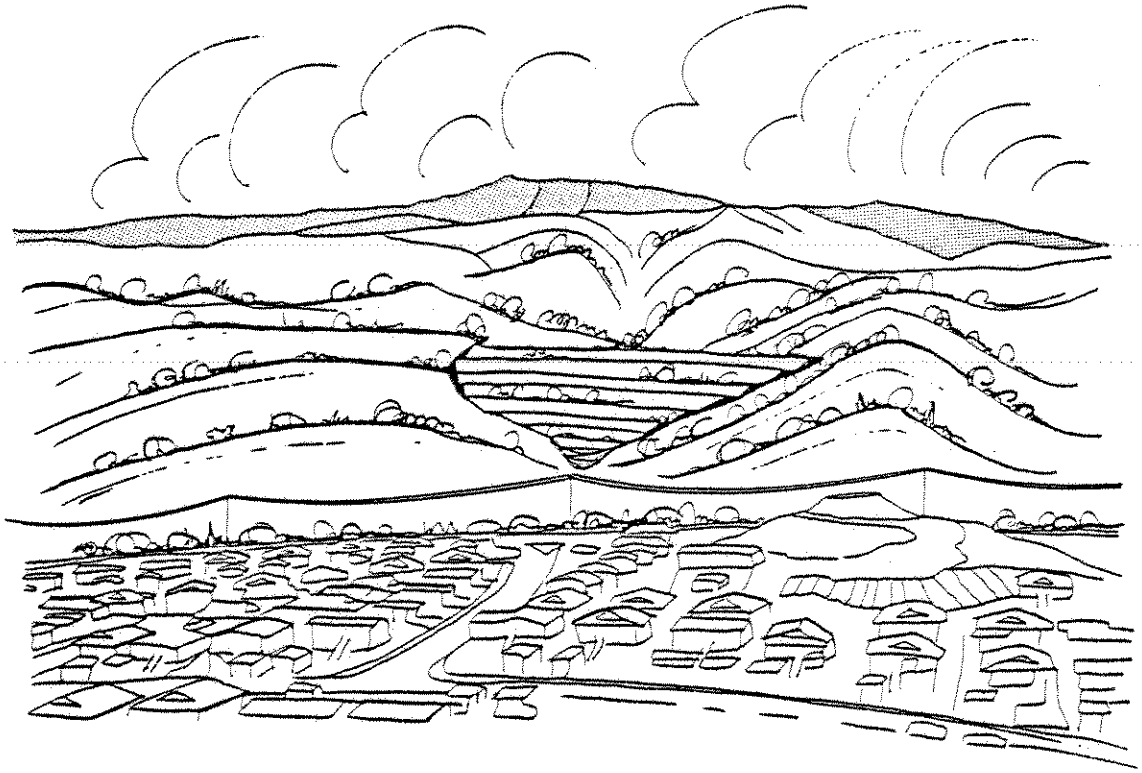
Figure 4-10

VISUAL ANALYSIS VIEW STATION

Kaloi Sanitary Landfill

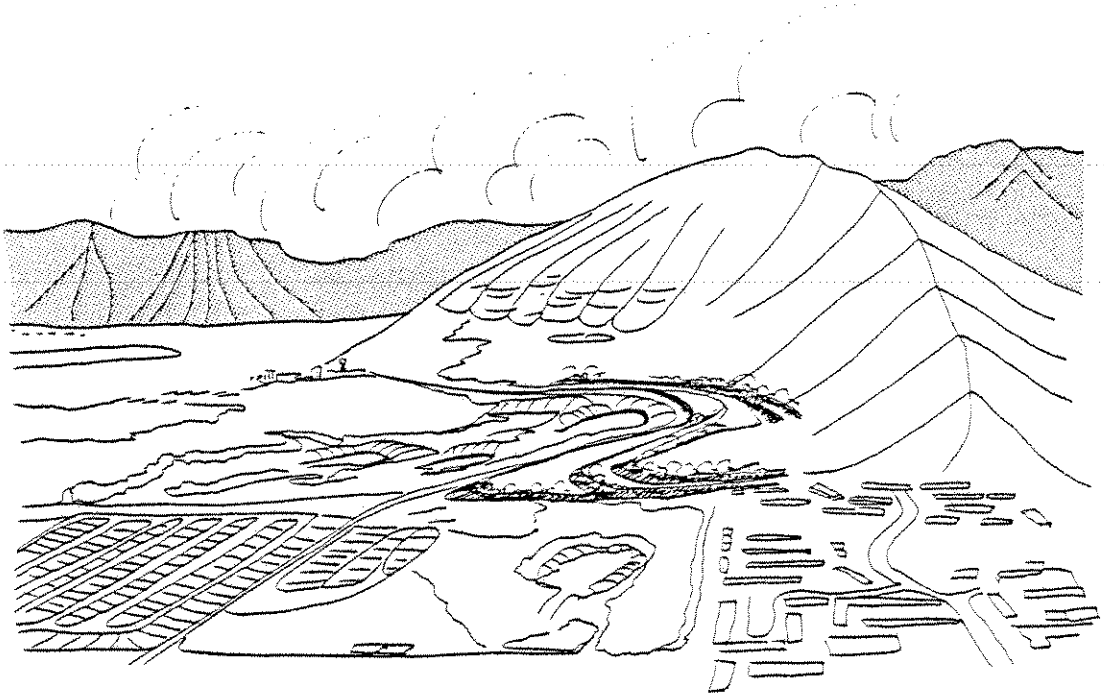
Scale: 1"=2,000'

Figure 4-11



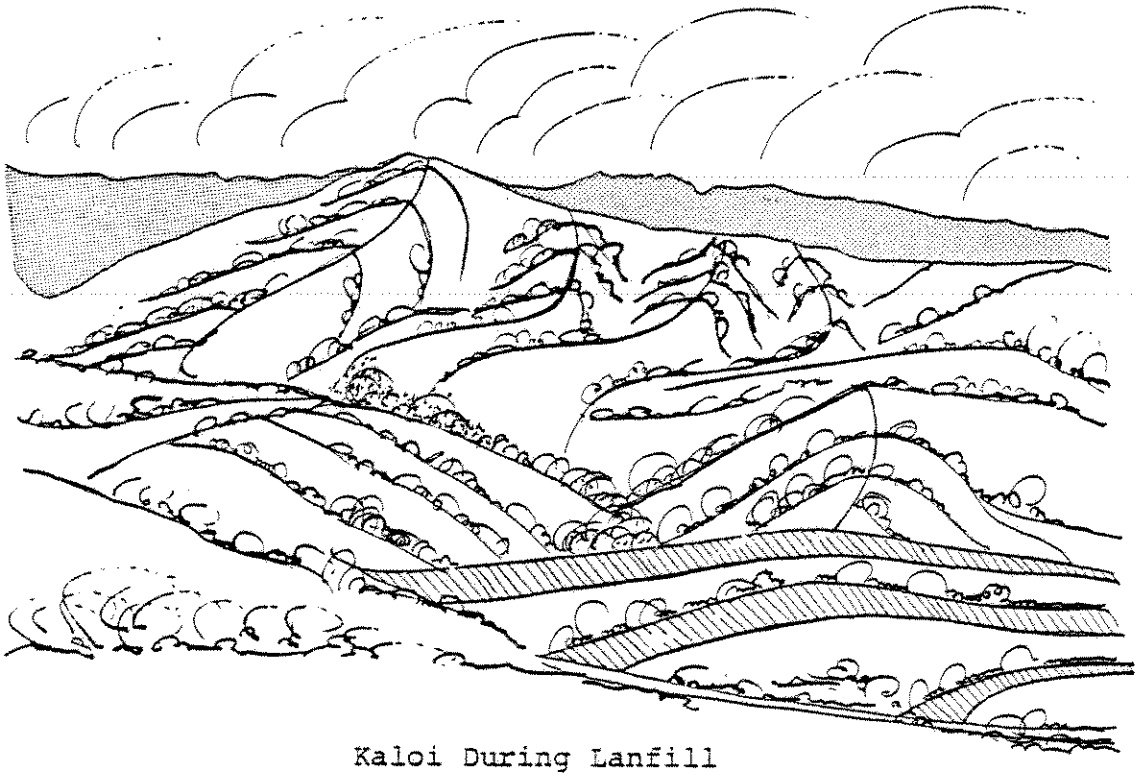
Makaiwa During Landfill

Figure 4-12



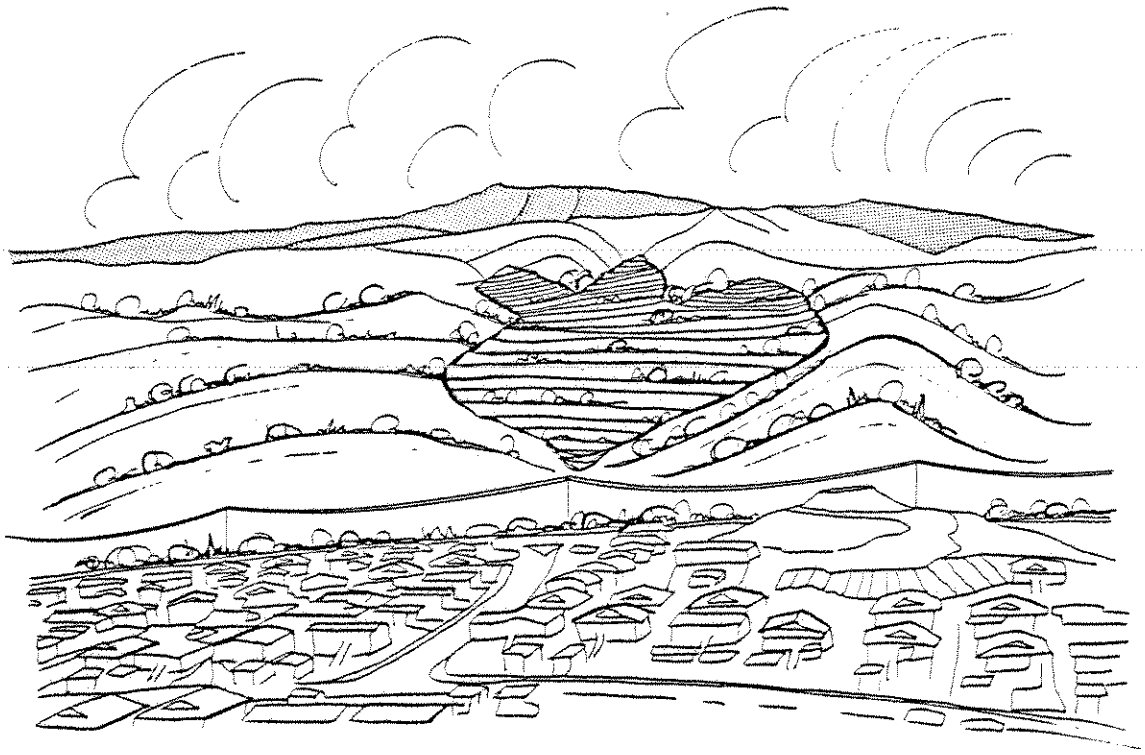
Nanakuli During Landfill

Figure 4-13



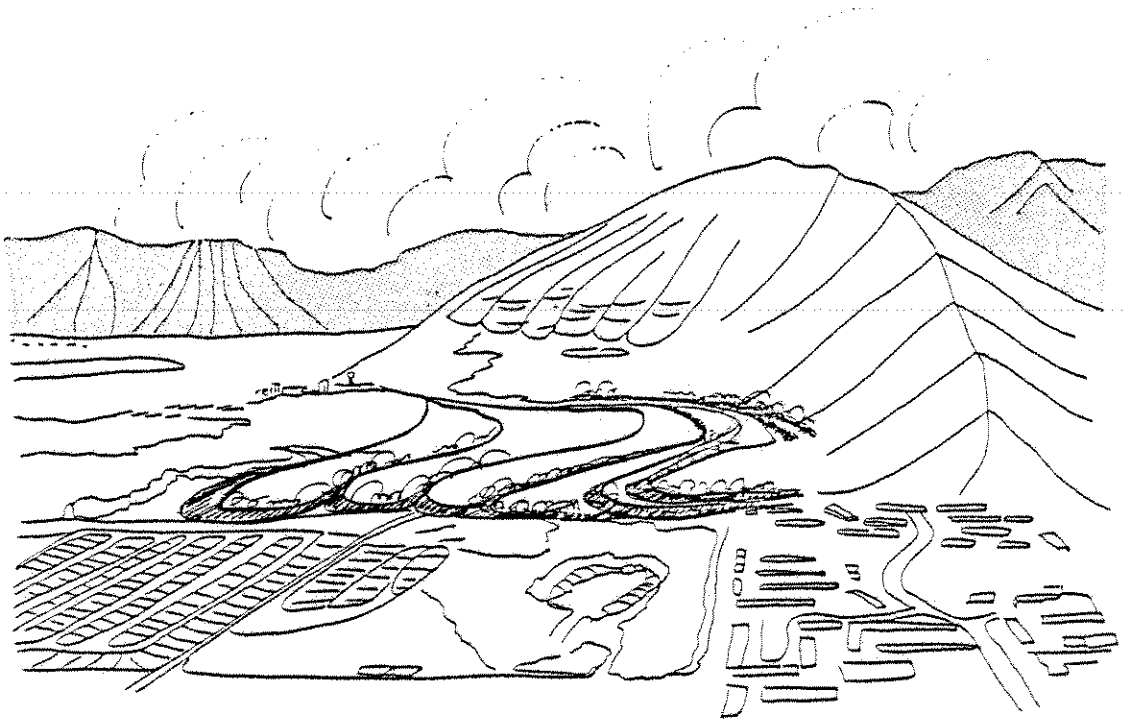
Kaloi During Lanfill

Figure 4-14



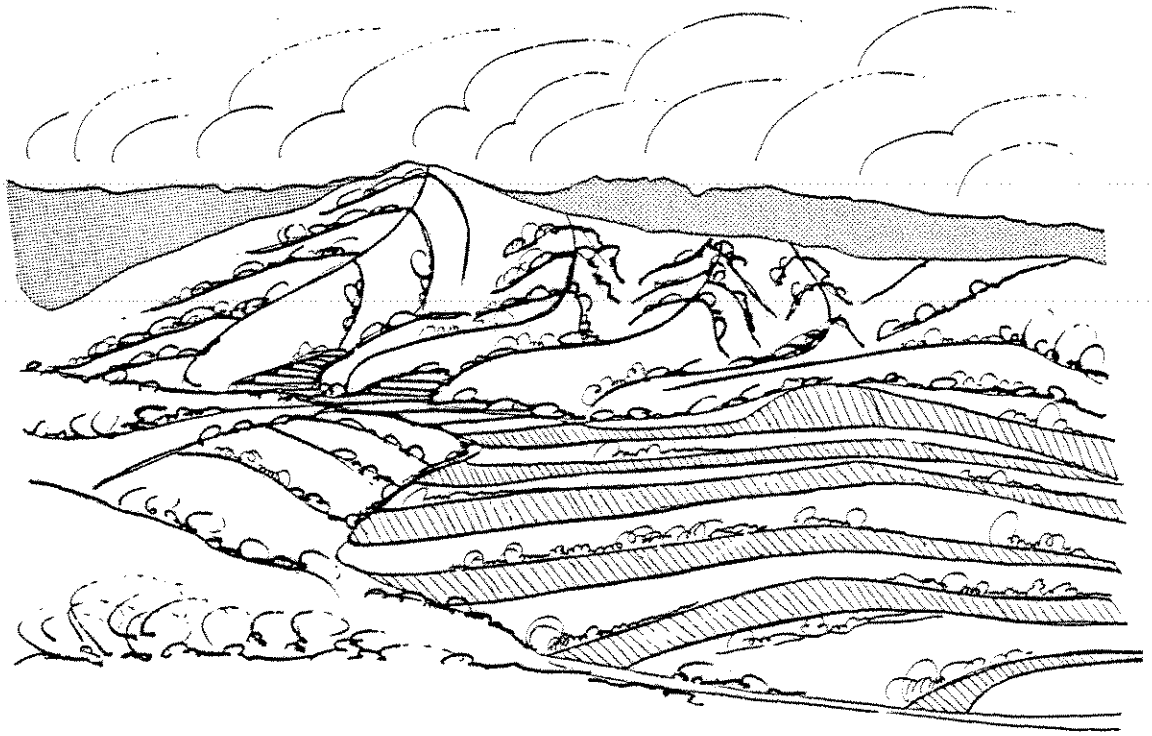
Makaiwa Completed Landfill

Figure 4-15



Nanakuli Completed Landfill

Figure 4-16



Kaloi Completed Landfill

to the terraces so that the area can be contoured to a more natural appearance and can be better suited for recreational activities. Figure 4-17, 4-18 and 4-19 show schematic land use plans for the proposed park which can be established at the site.

III. IMPACTS AFTER COMPLETION

If structures are to be built on the landfill, they should be designed for safety from migrating gas. Heavy structures should not be built because of possible uneven settling of the landfill. The future use of the site will be restricted to recreation, agriculture or open space. The City and County plans to purchase the land in fee (lease is possible if the City does not have adequate funds to purchase the site).

The City and County will maintain the landfill after its completion. Any cracks caused by settlement or erosion will be repaired.

The drainage system during operation will be kept functioning to mitigate water quality impacts. The completed landfill will be graded, seeded or sodded and landscaped to blend with the natural environment. This open area will have the potential of being developed as a park, either for passive or for active recreation.

Agricultural potential of the sites will be limited. Deep tilling and crops with extensive root systems will not be feasible unless a deep final cover is provided to avoid the risk of opening up waste cells. Grazing will be an acceptable agricultural use for the sites.

A. Makaiwa Gulch Site

A water supply will be provided to the site during project construction so the site can be developed as a park or used for crop cultivation. It can revert to use for grazing and open space and will probably be recolonized by the same species of flora and fauna as will have been displaced.

B. Nanakuli Site

Department of Parks and Recreation plans envision a regional park in Nanakuli. The completed landfill would be an appropriate location for it. Facilities for active recreation such as baseball, tennis, basketball and golf could be accommodated. The Nanakuli community will have these facilities, which residents

must now travel to, close at hand. Increased community involvement and increased property values may be a result.

C. Kaloi Gulch Site

The completed site would be a good site for a park because of its attractive view across the Central Plain and Pearl Harbor to the Koolau Range, Honolulu and the ocean. Figure 4-19 shows a conceptual schematic layout for a park. This site would be an ideal site for a passive mountain recreation park. A well can tap groundwater supplies for water.

SECTION 5

PROBABLE ADVERSE ENVIRONMENTAL EFFECTS WHICH CANNOT BE AVOIDED

Leachate

Since rainfall is insufficient to generate net infiltration, leachate should not be a problem at either the Nanakuli, Makaiwa or Kaloi sites. However, if the Kaloi site is used as a landfill, maximum measures including a lining and a leachate collection system would have to be employed. In any case, caution will be taken to use a relatively impermeable final soil cover and to provide a final grade of at least 3 percent to enhance runoff during periods of major storms. A leachate monitoring program will be implemented as a safety measure.

Visual

Removing vegetation during construction and operation of the landfill will expose soil which will be contrasting to the surrounding area. Proceeding in increments, only the amount of land needed for a particular phase of landfilling will be disturbed. As each increment is completed, it will be contoured and grassed to reduce the visual impact of the soil against the surrounding background of vegetation.

The landfill operations will be buffered from residential areas by providing a landscaped screen along borders adjacent to housing areas at the Nanakuli site and along the landfill entrance at the Makaiwa site to screen visual impact to Honokai Hale residents. In addition, earth berms may be provided to hide landfill operations.

Filling the existing gulches and area with refuse will alter the existing landforms. The new landforms created by landfilling, however, can be more usable for some type of recreation or agriculture.

Erosion

The drainage system will be built to minimize the effects of erosion during initial construction of the sites. During construction of the drainage system, however, soil may wash off the site into the surrounding areas, but the amount of erosion during this phase of construction is not anticipated to be significant.

Noise

Noise created during construction and during operation of a landfill is unavoidable. At the Nanakuli site the ambient noise ranges between 35 dBA and 46 dBA. Passing vehicles range up to 70 dBA to 76 dBA. From noise readings at the existing Kapaa Sanitary Landfill it is anticipated that the level of noise heard at the residential area nearest the working face of the landfill, about 200 feet away, would be approximately 60-70 dBA. To minimize any impact a landscaped buffer zone and possibly a noise barrier fence are proposed along the perimeter of the landfill site between the working areas of the landfill and the residential area. The number of municipal collection and transfer loads expected at the landfill will be about 12 per day. Approximately 50 commercial loads and about 60 homeowner loads are anticipated per day. This will be additional traffic to existing patterns.

The closest working face of the Makaiwa landfill will be approximately 750 feet away from Honokai Hale. At this distance and from data taken at the existing Kapaa Sanitary Landfill, it is estimated that the noise will be about 52-58 dBA. Providing earth berms and a landscaped buffer area of 200 feet in width should result in levels lower than the anticipated 52-58 dBA. Passing traffic along Farrington Highway registers about 72 dBA. The highway is already heavily traveled so the addition of refuse collection and transfer trucks should not significantly add to noise in the area.

Since the Kaloi site is not in close proximity to residential areas, it is not anticipated that landfill operation noise will have an impact. Noise and activity of the landfill will displace wildlife from the immediate site and may displace wildlife from areas directly adjacent to landfill activity. Since it is not known exactly what type of effect noise may have on wildlife, it is not possible at this time to speculate what effects noise will have.

Air Quality

Periodically, when climatic conditions are warm and moist, odors may be generated. Odors can be controlled by adherence to proper landfill procedures and the use of chemical masking agents, if necessary.

SECTION 6

ALTERNATIVES TO THE PROPOSED ACTION

I. NO ACTION

If the proposed project is not implemented, the City faces serious refuse disposal problems. The Kapaa Sanitary Landfill will soon be filled to capacity. The Kewalo and Kapalama incinerators were permanently closed in October, 1977. This, combined with the increase in future refuse quantities, drastically shortens the lives of the smaller Waianae and Kawailoa landfills which have remaining lives of less than three years, based on existing rates of disposal.

This will result in the City having to dispose of more refuse at Palailai, a private landfill. The result will be added expenses for municipal refuse disposal as disposal fees will be charged to the City. In addition, Palailai has a limited capacity and its landfill life will also be used up quickly. It is estimated that Palailai Landfill will be filled in 1980 if no new disposal facilities are implemented.

The City may have to limit refuse disposal at existing City disposal sites to municipally collected refuse only. Private haulers may be required to use private landfills, an action which will result in increased costs and charges to their customers.

II. ALTERNATIVE SITES

There are several difficulties in selecting and developing landfill sites on Oahu (Shimabukuro and Associates, 1977):

1. A small island having limited land space.
2. Restrictions imposed by the Board of Water Supply in the groundwater supply areas.
3. Low cost, undeveloped suitable lands are scarce.
4. Large volumes of solid waste generated.
5. Community objections to landfill.

Potential landfill sites are located in inland areas, away from population centers, but these sites are often

situated over the groundwater aquifers which supply potable water to the population or are potential sources of water supply.

In Shimabukuro and Associates' recently completed inventory study of potential landfills on Oahu, several other alternative sites in the leeward area were investigated for their landfill potential. These include sites in Honouliuli, Maili, Koko Crater, Mililani, Waipio, Poamoho, Keekee, Makua, Ohikilolo, and Waimanalo Gulch (see Figure 6-1). These sites were evaluated according to specific environmental, social and/or economic criteria.

The most desirable landfill site would produce the least environmental and social disruption at the least cost. It would be located close to major refuse generation centers, remote from residential areas, schools and hospitals, have sufficient cover material (soil) and require minimal improvements.

All sites selected for potential sanitary landfills were evaluated according to criteria listed in Appendix D. Some evaluations were made subjectively. With these evaluations a ranking was established and the results are shown in Table 6-1 (Shimabukuro and Associates). The Makaiwa and Nanakuli sites were rated the most desirable sites for selection as the major sanitary landfill site for the Leeward Oahu area. The Kaloi site was ranked next because of its exceptionally large capacity.

The Honouliuli site could be added to the already planned Kaukonahua site as a demolition landfill site, and may be used in conjunction with the Leeward District Sanitary Landfill site. The Waipahu site is planned as an extension of the ash disposal site for the Waipahu incinerator.

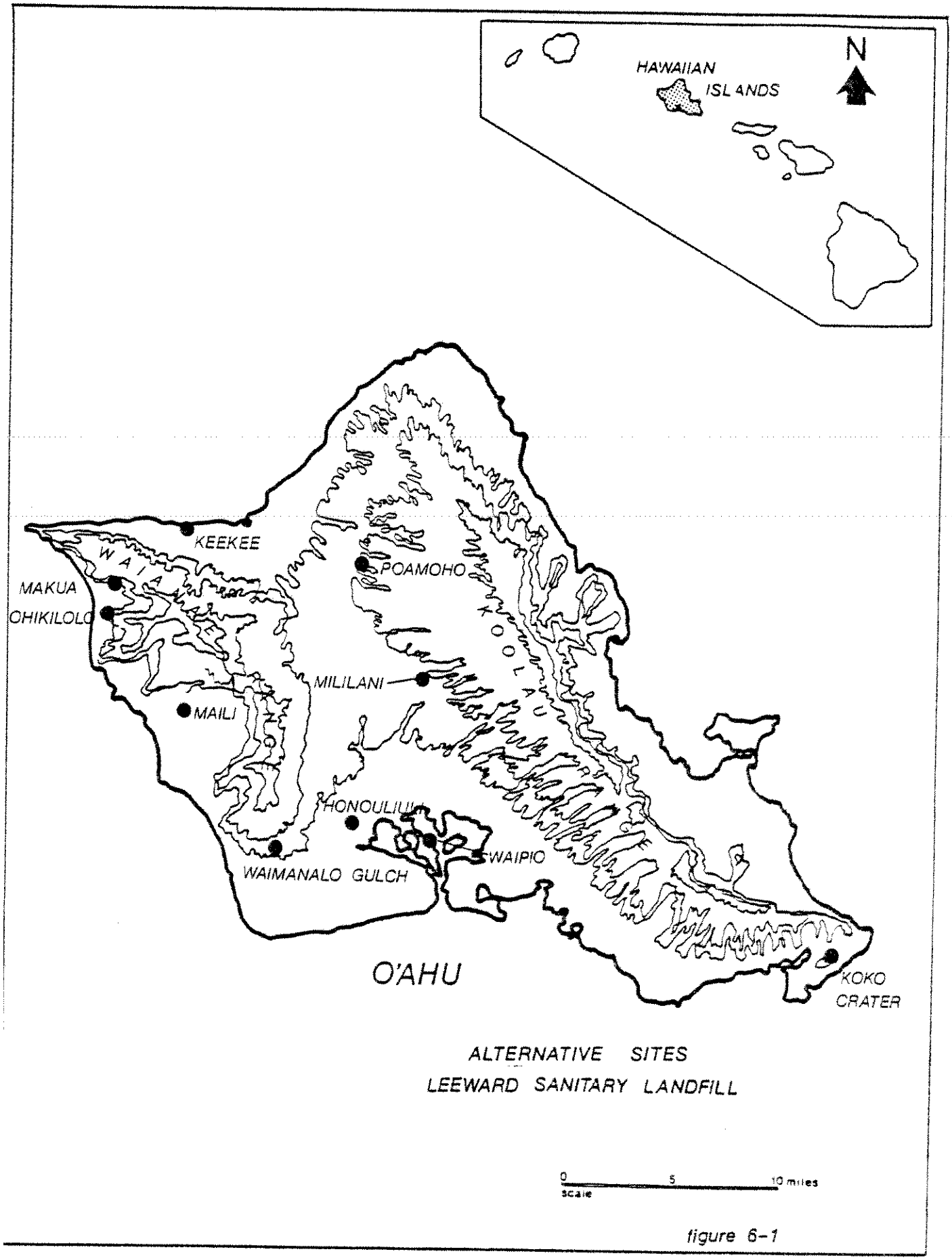
The Makaiwa site has a capacity of approximately 15,232,000 cubic yards and 31± years of life at 500 Tons/Day.

The Nanakui site was also considered a good potential site. It offers almost the same major features as the Makaiwa site except:

a. Capacity is approximately 27 years.

b. Approximately 4 miles farther from the proposed Keehi Transfer Station.

c. Immediately adjacent to a residential area.



ALTERNATIVE SITES
LEEWARD SANITARY LANDFILL

figure 6-1

Table 6-1

SUMMARY OF EVALUATIONS AND RANKING OF SITES
LEEWARD OAHU

RATING
E = Excellent
G = Good
F = Fair
P = Poor

Max = Maximum
Mod = Moderate
Min = Minimum

POTENTIAL SITE	RANKING	1. Approximate Capacity, in million cu. yd.	2. Approximate life as Sanitary Landfill, in yrs.**	3. Access to Adequate Roads	4. Availability of Utilities	5. Measures Required for Protection of Ground Water	6. Objection by Public, Community Groups, etc.***	7. Objection by Landowner and Adjacent Landowners	8. Impact on Nearby Land Uses	9. Site Location	10. Measures Required for Protection of Surface Water	11. Availability of Cover Material	12. General Nuisance (Litter, Dust, Noise, Odor, Traffic, etc.)	13. Land Cost	14. Drainage Improvements On and Off Site	15. Topography	16. Hazard to Public Health and Safety	REMARKS
Makaiwa	1	15.2	31 (E)	E	G	Min	Mod	Min	Mod	G	Min	P	Mod	Mod	Min	G	Mod	Sanitary Landfill Site
Nanakuli	1	13.4	27 (E)	E	G	Min	Max	Mod	Mod	F	Min	G	Mod	Mod	Mod	E	Mod	" " "
Kaloi	3	24.3	50 (E)	P	P	Max	Min	Min	Min	F	Mod	P	Min	Low	Max	G	Mod	" " "
Honouliuli	4	1.7	34 (P)	G	G	Mod	Mod	Min	Min	G	Mod	G	Min	Low	Min	G	Mod	Demolition Landfill Site
Kaukonahua																		
Waipahu																		
Malli																		
Koko Crater																		
Waipio																		
Mililani	UNRANKED -- SEE TEXT FOR COMMENTS ON THESE SITES																	
Poamoho																		
Keekee																		
Kaena Quarry																		
Makua																		
Ohikilolo																		
Waimanalo Gulch																		

References: Appendix A Site Selection and Evaluation Criteria
Appendix C Site Maps
Appendix D Detailed Site Data and Descriptions
Plate II-A-1 Key Map

* Some of the evaluation criteria from Appendix "A" have been modified, revised or deleted from this tabulation.
** If demolition material is disposed of at another site, Sanitary Landfill life can be increased by approximately 10% to 20%. If site is used exclusively for Demolition Landfill, life can be increased approximately 5 to 10 times.
*** Anticipated reaction.

SOURCE: Chimborkuma and Associates (1977)

This site has the potential of generating its own daily cover material.

The Nanakuli site has great potential for use as an active type park or golf course after its life as a landfill.

The Kaloi Gulch site offers great capacity, but this alternative has three major drawbacks:

a. Need for cover material even with shredding.

b. Requirements for lining to protect the groundwater supply.

c. Poor access.

The Kaloi Gulch site is ranked as the third alternative site for Leeward Oahu. It offers a landfill capacity of approximately 50 years and is removed from residential areas. The James Campbell Trust Estate has reacted favorably to discussions about the City's possible use of this gulch for landfilling.

The following alternative landfill sites were determined to have far less potential than the Makaiwa, Kaloi and Nanakuli sites.

Honouliuli Site

The site is a relatively small gully surrounded by sugar cane fields and located in Honouliuli, approximately 1,200 feet off Ft. Weaver Road and 3,000 feet from Farrington Highway. About four acres of sugar cane are under cultivation in the bottom of the gully. The site is about 22 acres in area with a landfill capacity of approximately 1,650,000 cubic yards and an estimated life of 3.4 years based on 500 TPD disposal rate. It is owned by the James Campbell Trust Estate. Immediately below the site is a plantation-owned domestic water well.

The nearest urban centers to the site are the Honouliuli residential and commercial area located approximately 1,700 feet to the southeast, the Waipahu business district 2.3 miles to the northeast, Fernandez Village 1.4 miles to the south and Makakilo City 2.7 miles to the west-southwest.

Advantages

1. Cover material available on site

2. Not situated over a potable groundwater supply

3. Moderate site preparation costs

Disadvantages

1. Limited capacity (3.4 years) -- too small for sanitary landfill use but adequate as demolition disposal site

2. No utilities available on site; connections must be made at Ft. Weaver Road

3. 1,200 feet of access road must be constructed

4. Visually prominent site

5. Near residential and commercial area

6. Drainage system required

Maili Site

The site is located in Maili, approximately 1,200 feet from Farrington Highway. It is owned by the Permanente Cement Company. It contains approximately 200 acres and is presently being used as a quarry with an expected quarry life of 25 years remaining.

The site has an approximate landfill capacity of 9,200,000 cubic yards and life of 18.9 years. This site has potential as a future sanitary landfill. It is not recommended for development at this time because there are more desirable sites.

Advantages

1. Located outside of Board of Water Supply Ground Water Zone

2. Long landfill life

3. Located in light industrial use zone

4. Moderate site development costs including landscaping, operation and maintenance facilities, drainage system, upgrading of access road and utilities

Disadvantages

1. Long distance (approximately 25 miles) from Keehi (formerly known as Shafter Flats) Transfer Station

2. Quarry still in use and not presently available for landfill purposes

Koko Head Crater Site

The site is located in the southeast portion of Oahu, contains about 75 acres of usable landfill area and is an open area owned by the City and County of Honolulu. Access is available through an existing paved road from both the windward and leeward sides of the island.

The capacity is approximately 4,537,500 cubic yards and estimated life is 12.4 years. This site should be considered as a future sanitary landfill only after depletion of other sites since it is removed from refuse generation centers and hauling costs would be high. This site was deeded over to the City on condition that the City use it as a park.

Advantages

1. Located outside Board of Water Supply Ground Water Zone

2. Nominal site preparation costs

3. No land acquisition required

4. Well buffered from urbanized areas on all sides except at entrance

5. Moderate (12.4 years) landfill life

6. No displacement by project

Disadvantages

1. Main route to site is on heavily traveled and congested traffic corridor (Kalanianaole Highway)

2. Located in area that is proposed for future urbanization

3. Utilities not available on site

4. Land deeded to City with restrictions to park use only

Mililani Site

The site is one of the major gullies connected to Panakauahi Gulch. It is adjacent to Mililani Memorial Park and pineapple fields, 1.5 miles from Kamehameha Highway, 4.6 miles from Waipahu, 3.2 miles from Pearl City and 2.0 miles from Mililani Town. The total and usable area of the site is 34 acres, with a capacity of approximately 2,200,000 cubic yards and with an estimated life of 4.5 years. It is owned by Castle & Cooke, Inc. (85±%) and B.P. Bishop Estate (15±%). This site is not recommended for a demolition or a sanitary landfill site.

Advantages

1. Site not currently in use

2. Remote from residential areas

Disadvantages

1. Groundwater supply present; impermeable lining and leachate collection, treatment and/or disposal system required

2. Substantial site development costs, including groundwater protection system, drainage system, upgrading of access road, and utilities

3. Short landfill life

Waipio Site

The entire lower Waipio Peninsula is a U. S. Naval Reservation, leased to Oahu Sugar Company for agricultural purposes. The site is being used by Oahu Sugar Company as their disposal site for cane wash water and bagasse. As long as cultivation of sugar cane and operation of sugar mills continue, an area for mill waste disposal is necessary. Should the City decide to acquire this land for demolition and/or sanitary landfill, the sugar company must find another area for mill waste disposal. Therefore, the consultant has recommended that the existing Oahu Sugar Company bagasse and wash water disposal site remain as is and that the City and County of Honolulu consider other alternative sites for landfill use.

Poamoho Landfill Site

The site is located off Kamehameha Highway, adjacent to cane and pineapple fields, 2.6 miles north of Wahiawa.

Characteristics of this site are: short landfill life of about 1.5 years, upgrading required for existing 1,200 feet of cane haul dirt road, leachate control system must be provided, telephone and water service not available nearby, a 1,500 foot drainage channel must be built to accommodate a 5 x 20 foot box culvert crossing under Kamehameha Highway and a cesspool must be constructed. This site, therefore, is not recommended for landfill development.

Keekee Landfill Site

The site is located in the western end of Oahu between Kaena Point and Waialua, adjacent to the west of Dillingham Air Force Base and east of Camps Erdman and Kaena.

The site is outside the Board of Water Supply ground water zone. The land is stony and most of the cover material must be imported. Refuse generation centers of Waialua and Haleiwa urban areas are 6.7 miles away. Site can be used for local landfill areas. This site is not recommended for landfill development.

Makua Landfill Site

Makua Valley is a Military Reservation used for military exercises. This site is a practice range for military weapons and the possibility of existing duds makes this site very dangerous and undesirable. This site is not recommended for landfill development.

Ohikilolo Landfill Site

The site is located north of Makaha Valley. It is remote from refuse generation centers which would result in high haul costs. It is not recommended for landfill development.

Waimanalo Gulch Site

The site is located between the Hawaiian Electric Company Kahe Power Plant and the Makaiwa Landfill Site. Presently this site is being planned as a Disneyland-type park so land acquisition costs would be high. This site is not recommended for landfill development.

III. PURCHASE OF PRIVATELY OWNED PALAILAI LANDFILL

The Palailai Landfill is currently privately operated and accommodates refuse collected by private operators.

This facility is comparatively small in size and is estimated to have a remaining capacity of less than 2.7 million cubic yards. At a 500 ton per day disposal rate this facility will be filled up in less than six years. It will be very costly to acquire this privately owned facility. Since this site is already in landfill use and is contributing to the refuse disposal needs for the island, there is no special need for the City to purchase this facility.

IV. ALTERNATIVE DISPOSAL/PROCESSING METHODS

Disposal of refuse can occur either on land or at sea. However, ocean disposal of solid waste is currently prohibitive according to the U. S. Environmental Protection Agency.

Methods to process waste include: 1) shredding, 2) incineration, 3) baling and 4) waste utilization, including composting, pyrolysis, recycling and steam and energy generation. These alternative processes, however, cannot totally dispose of solid waste; a landfill, therefore, is still required to dispose of waste that cannot be processed or to dispose of residues resulting from processing. Of the alternatives, incineration is the only method with extensive data on operation, efficiency and cost.

The newest concept of solid waste management is resource recovery. Although it is attractive from an environmental viewpoint, the economics of resource recovery depend on many factors, among which are alternative disposal costs, markets for energy products, financing, climate, availability and control of wastes, and citizen acceptance. In other parts of the country pilot programs are currently being studied and will provide much information necessary to completely evaluate these recovery processes.

Since success of any resource recovery program is dependent on market demand for products generated, the feasibility of these programs on Oahu is evaluated in this section in terms of existing or potential markets for recovered materials, soil conditioner and energy, as well as in terms of environmental impact.

A. Shredding

The source for the following discussion is from Decision-Makers Guide in Solid Waste Management (U. S. EPA, 1976).

Shredding reduces the volume of solid waste and turns it into a relatively homogeneous material.

There are many basic types of size reduction equipment commercially available. The most common kind of size reduction used is the hammermill.

The size of the particles produced is quite important to the effectiveness of the steps following shredding, whether it is energy recovery, disposal, or a combination. The shredding system must be capable of meeting the particular size requirements. Until recently, shredding was used to prepare solid waste for immediate disposal, but it is now considered a beneficial first step to other processing methods.

Advantages of Shredding:

- Reduces the volume of solid wastes significantly, with bulky waste being reduced around 90%

- Shredded waste does not attract vectors, support combustion, have an objectionable odor, or lead to littering

- When compacted in a landfill, shredded waste has fewer voids than unprocessed waste; the density is 25% to 60% greater depending on whether daily coverage required

- Produces a more uniform fuel for incineration; the problem of agitation of the fuel to prevent uneven firebeds is minimized

- Essential to process solid wastes for efficient mechanical separation

- Produces uniform material so it is a common prerequisite for composting

- Shredded waste is easily compacted and can extend the life of the landfill

- Because shredding reduces the volume of bulky waste, it provides an advantage in hauling, handling during any process, and landfilling

- Public acceptance to shredding facilities has been relatively good compared to acceptance of more conventional solid waste processing or disposal facilities

- Compared to other reduction processes, cost for the initial investment and operation for shredding is relatively low

- A large portion of the total solid waste load can be shredded

Disadvantages of Shredding:

- Some waste cannot be put through a shredder because of size or density or because it is hazardous, has a high moisture content, or has other qualities that normally call for specialized handling in any system

- Jamming of the shredder and uneven feeding can significantly reduce the output of the mill

- Municipal solid waste has a high percentage of flammable materials which have caused fires in the shredder

- There is a potential for explosion within a shredder due to explosive materials that may enter the facility

- Shredders are noisy and produce dust so the entire operation must be enclosed and dust collectors must be installed

The decisions to be made as to whether a shredding operation should be installed need to consider the total benefits of shredding versus the cost of the operation. For projects in which EPA has been involved, cost per ton range from $8.60 up to $10.60. One operation in Madison, Wisconsin (1974) reported $8.60 TPD, based on a processing rate of 180 TPD, including hauling and disposal cost. Another operation in New York indicated a cost of $10.60 per ton including disposal with an average annual output of 284 TPD. One county in Georgia has been shredding waste since 1973. Their two installations have shown lower operating costs. One installation showed a cost of $4.80 per ton at a 534 TPD facility and $4.35 per ton for their 400 TPD facility. In 1974 a recent operation in South Carolina estimated a $4.10 per ton cost including hauling and disposal. This facility processes 1,000 TPD. The City has deferred any plans for shredding until the need for shredding is established in the resource recovery program. If resource recovery is

not feasible, shredding will be considered again if proven economical.

B. Incineration

Incineration is defined as controlled combustion that reduces solid, liquid, or gaseous combustible wastes primarily to carbon dioxide, other gases, and to a relatively noncombustible residue. The gases are released into the atmosphere and the residue is usually deposited in a landfill (Pavoni, et al., 1975). Reductions of 80 to 90 percent of the total volume of municipal solid waste and 98 to 99 percent by weight of the combustible portion are possible through incineration (EPA, 1976).

Although incineration reduces refuse quickly and efficiently, it is one of the most costly methods of refuse processing. On Oahu there is one incinerator functioning at the present time at Waipahu. The incinerators at Kapalama and Kewalo were outdated and had to be closed in October of 1977 to comply with air pollution standards. Costs to modify the incinerators were prohibitive. The incinerator at Waipahu has been undergoing renovation to meet air pollution standards and these renovations have just been completed. The incinerator will continue in operation unntil such time when a resource recovery facility is built which is of sufficient capacity to handle all of the island's existing and near-term projected tonnages. With the renovations that are to be made it has been estimated that the unit cost of operation for the Waipahu incinerator, with renovations, will be $12.85 per ton.

Advantages of Incineration: (EPA, 1976)

- Solid waste is reduced in weight and volume, and this extends the useful life of the available land disposal facilities

- Where waste must be hauled long distances to a landfill, incineration may be economically advantageous if closed-in locations can be found for the incinerator

- Incineration is adaptable to energy recovery processes such as steam generation and to recovery of minerals from the residue

Disadvantages of Incineration: (EPA, 1976)

- The process requires large capital expenditures and high operating costs
- Skilled labor is required to properly operate and maintain the facility
- Improper operations can result in air, water and land pollution
- Residents may object to having an incinerator built in their neighborhood

C. Baling

Baling is a method used to reduce the volume of refuse. It potentially can achieve cost savings if transfer and long haul are necessary prior to disposal, and when land disposal space is at a premium. It also can potentially make waste easier to handle and transport. The decision as to whether baling should be implemented would have to take into consideration the economic and environmental basis for that particular community (EPA, 1976).

The cost for establishing baling operations can range anywhere from about two-million dollars to four-million dollars. Baling projects which the EPA has been involved range from $6.38 per ton for a 425 TPD processing facility to $9.20 per ton for a 78 TPD processing facility.

Advantages of Baling:
(EPA, 1976)

- Baling nearly doubles the life of the land disposal site and reduces the number of times a city government must go through the difficult process of acquiring a new disposal site. Densities vary from 1,000 to more than 1,700 pounds of cubic yards, depending on the type of baler used
- Balers can handle most types of wastes
- Cost is comparable to cost of other forms of solid waste processing; bulk reduction makes long hauls more economical
- Bales are easier to handle and transport than unprocessed waste; they are therefore

more convenient for operation such as rail hauling

- Baling should permit more immediate use of the disposal site upon completion since minimal settling is anticipated

- In shredding/baling operations, ferrous metal can be recovered from recycling via magnetic separation of the shredding. Also corrugated containers and white goods can be hand-picked and baled separately and sold.

Disadvantages of Baling:

- Baling involves a greater initial investment than a conventional transfer station handling the same tonnage

- Baling precludes resource recovery once the bale is formed

- There is incomplete knowledge about the economics of baling and effects of baling on decomposition in landfills, gas and leachate formation, and settling

- Baling is not a final disposal process; bales must be disposed of in a landfill situation

D. Waste Utilization

1. Composting

Composting is a volume-reducing process in which organic solid wastes, after separation from inorganic fraction, are biologically decomposed at a rapid rate (15-21 days) in open windrows or within confined tanks. The end product is a humus-like substance that primarily is used to condition soil (Pavoni, et al., 1975).

In the United States, composting has been extremely costly, cost limiting the number of markets for the compost materials. Consequently, composting as a process is slowly being phased out.

Advantages of Composting:

- Reduces volume and weight of refuse
- Can be used as soil conditioner to improve soil characteristics, thereby recycling solid wastes back to the soil
- Can prolong use of sanitary landfill

Disadvantages of Composting:

- Municipal refuse does not contain sufficient nitrogen to ensure proper digestion so most compost media must be supplemented with additional nitrogen
- Requires large land areas for process
- Attracts flies and rodents
- Generates odor
- Requires separation of non-compostable material so does not account for total waste disposal
- High cost of application to land has made it uneconomical for large-scale use
- Dependent on market conditions

The following is an excerpt from Handbook of Solid Waste Disposal (Pavoni, et al., 1975)

> Despite considerable investment and technical know-how, not one large-scale composting plant has operated economically long enough in the United States to indicate that the process is feasible. As of 1972, there had been 18 attempts at composting in the United States and of those 18 only one or two were operating, and they existed under special circumstances. Composting has failed in the United States for four main reasons: (1) no steady market for the end product has been found, (2) initial investment and operating costs are generally high compared to other disposal methods, (3) a high quality end product usually cannot be derived from refuse in the United States without excessive expense, and (4) the separation of

noncompostables requires a secondary method of disposal.

Many composting plants have been operated by private contractors who in turn charge the city an amount that defrays operating costs. Profits for the contractor are helped to be realized from the sale of the end product. Operators usually charge the city from $1.00 to $5.00 (1967) per ton, while the costs for composting refuse usually range from $5.00 to $10.00 per ton. The operators must make up the balance of the costs and any profits from the sale of the compost. To date this has not been possible.

2. Resource Recovery by Pyrolysis

"Pyrolysis is the thermal decomposition of materials in the absence and near absence of oxygen. The high temperature and the 'starved-air' situation causes a breakdown of the materials into three parts: (1) a gas consisting primarily of hydrogen, methane, and carbon monoxide; (2) a liquid fuel that includes organic chemicals such as acetic acid, acetone and methanol; (3) a char consisting of almost pure carbon, plus any glass, metal, or rock that may have been processed." Pyrolysis is under development by many private and public organizations. The ultimate goal of this system is to convert solid waste into a storable, transportable fuel, either liquid or gas (EPA, 1976).

There are basically two types of pyrolysis processes, one is a gas pyrolysis process and the other oil pyrolysis. There are different types of gas pyrolysis but the principle is essentially the same: as refuse moves through the pyrolysis reactor, it is exposed to successively higher temperatures and is destructively distilled. In some processes, the amount of recovered fuels is sufficient to be used as auxiliary fuels in fossil fuel boilers (medium Btu gas systems). In other systems the gas is of low Btu value and cannot be transported off site; thus, it must be used as a fuel in a waste heat boiler to produce steam or electric power (MITRE, 1977). Oil pyrolysis differs from gas pyrolysis by the temperatures to which the refuse is disposed.

According to a study by MITRE (1977) cost estimates for a gas pyrolysis system range from $33.90 per ton for a thousand TPD facility to $25.44 per ton for a 2,000 TPD facility. MITRE's cost estimates for an oil pyrolysis system range from $30.64 per ton for a 500 TPD facility to $23.16 per ton for a 2,000 TPD facility.

Advantages of Pyrolysis:

- Reduces refuse volume and weight to facilitate solid waste handling
- Prolongs life of landfill site
- Processing is not affected by weather conditions
- Processing can produce fuel in the form of gas and oil

Disadvantages of Pyrolysis:

- Requires skilled operators
- Requires prior shredding and separating if fuels are to be produced efficiently
- Can produce operational impacts of noise, dust, thermal discharge into the atmosphere and contaminated wastewater
- Cost for the process is high

3. Recycling

The following discussion of recycling was obtained from Decision-Makers Guide in Solid Waste Management (EPA, 1976).

Certain types of materials can be recovered from solid waste. These materials can be recovered in one of two phases. The first phase is when materials can be recovered before it is placed in a collection vehicle. The second type of recovery is the recovery of marketable materials from mixed municipal refuse.

Examples of materials that can be recovered from refuse through "source separation" are paper, glass and metal containers. These can

be separated at their point of generation, be it at the home office or other place of business. This separation is made prior to collection by collection vehicles. Once these materials have been separated out they can be transported to a secondary materials dealer or directly to a manufacturer.

This type of source separation has been used widely for recovery of waste paper. Recovery of glass and cans by this method has been used only in a few communities; the economic balance of these systems have been poor to date. The following table (Table 6-2) gives a breakdown of the estimated percentage that paper, glass, ferrous metals, etc., make up of the total municipal solid refuse.

Recovery of materials by source separation on a regular basis has been practiced only in a few instances until 1970. Since then this method has grown rapidly as a means of recovering paper, primarily newsprint, from municipal refuse.

Recovery of marketable materials from mixed municipal refuse fall into three basic approaches for implementation. The first approach is to add shredding and ferrous metal recovery systems to landfill operations. Shredding can improve landfill operations and reduce requirements for landfill volume. Shredding can also be an important first step in liberating various components from each other, such that ferrous metals can then be magnetically extracted. The second approach would be to recover non-combustible materials either before or after energy recovery takes place and the third approach would be to recover as many of the components of the waste as are economically feasible.

The advantage for recovering material would be: (1) conservation of resources; (2) reducing the quantity of refuse to be disposed, thus lengthening the life of a landfill; (3) lower disposal cost for the sale of recovered material; and (4) with the citizen concern about resources of the environment, siting for resource recovery facilities would be less of a problem than for conventional disposal facilities.

Table 6-2

COMPOSITION OF MUNICIPAL SOLID WASTE, AS DISCARDED, UNITED STATES, 1973[1,2]

Component	Amount (millions of tons)		Percent of total	
Paper		44.2		32.8
Newspaper	8.0		6.0	
Corrugated	11.8		9.0	
Office paper	5.4		4.0	
Other	19.0		14.1	
Glass		13.2		9.9
Ferrous metals		11.0		8.2
Nonferrous metals		1.4		1.0
Food waste		22.4		16.6
Yard waste		25.0		18.5
Other		17.2		12.8
Total		134.8		100.0

[1]SMITH, F.A., U.S. Environmental Protection Agency. Unpublished data.

[2]Includes wastes generated in households, commercial and business establishments, and institutions (schools, hospitals, etc.); excluded are industrial process wastes, agricultural and animal wastes, construction and demolition wastes, mining wastes, abandoned automobiles, ashes, street sweepings, and sewage sludge. Wastes now being recycled are also excluded.

Source: EPA, 1976

There are still disadvantages and risks associated with recycling of materials. The degree of risk varies with the complexity of the system, but in general the methods used to recover marketable materials are still in stages of development. Because of the newness of the field, cost and performance information on commercially available equipment is not well documented. Estimates on the economic feasibility are primarily based on projected maintenance costs, the separation systems of recovery rate and an assumed value for the product. There are also marketing problems since the feasibility of a recovery system would depend upon the sale, at a reasonable price, of the extracted materials.

Even with full use of mechanical separating equipment and with full reuse of all separated materials, recycling can never remove 100 percent of solid wastes. There will always be materials lost to the recycling system which must be disposed of through other means because of contamination of some materials and because of inefficiencies in the separation of others. For example, paper contaminated with grease or oil cannot be reprocessed into a new paper product and must be disposed of by incineration, landfill or composting.

Market Conditions in Hawaii. Hawaii is not a major manufacturing center so little local demand for secondary materials has occurred. Markets in the Orient and on the Mainland for recycled materials exist but the cost of shipping added to the cost of separation has not made the recycling of most waste materials economically feasible. Market potential appears to be greatest at this time for the following materials:

Ferrous Metals: The recovery of metal cans from solid waste appears to be promising as there is a Mainland market for steel. Before metal cans can be used for their steel content, however, the tin in the metal must be removed. Detinning of cans from Hawaii presently occurs in Seattle. No detinning operations are planned for Oahu and it is uncertain whether such an operation would be economically feasible here. The two major operators of detinning plants for the recovery of tin and ferrous metals in the United States are M & T Chemicals and Vulcan Materials

Company. Both firms have expressed an interest in securing ferrous materials recovered from solid waste. There are, however, a number of restrictions imposed by both Vulcan Materials Company and M & T Chemicals which must be considered prior to entering an agreement with either of these firms. Each of the firms requires the following:

a. Metal shall be relatively free of trash, paper, plastics and other foreign contaminants.

b. Iron content of the material is to be approximately 95 percent.

c. Cans cannot be balled or nuggetized but must be shredded in a manner to provide maximum surface area.

d. A price penalty will apply to scrap that has not been subject to air cleanup operation for removal of loose materials.

Locally, recycling of ferrous metals is accomplished by Flynn-Learner and Hawaiian Western Steel. Both of these firms do not accept metal cans due to the tin content.

The Dole Company bales old defective cans and sells them to mainland concerns as scrap. Any cans to be recycled are sent locally to the Recycling Group.

Aluminum: Recycling Group, Inc. receives aluminum and pays $0.17/pound. They take in about 60,000-70,000 pounds per month and send the aluminum to Reynolds Aluminum. There are also branches on Maui and on Kauai that ship aluminum to the Oahu office. This particular group also accepts metal cans ($0.01/ pound), compacts them and ships them to M and T Chemicals (Division of American Can Company). Primo and Schlitz bottles are accepted ($0.60/case) and returned to the brewery. Newspaper ($0.01/ pound) is shipped to the Far East at an average rate of 60-70 tons/week.

"Castle & Cooke, Inc. plans to build Hawaii's first aluminum can manufacturing plant on part of the company's Dole cannery property in Iwilei.

The facility will be operated by a new company known as Hawaiian Container Corporation which will be 50 percent owned by Castle & Cooke and 50 percent owned by Ball Corporation of Muncie, Indiana." (Bank of Hawaii, 1977).

Rags: The demand for cotton rags on Oahu is substantial. The largest Hawaii distributor sells more than 16,000 pounds of rags a week, most of which are used for wiping purposes in various island industries. Cloth rags must be salvaged at the point of refuse generation (home) since there is no way of salvaging cloth after it has entered the waste stream.

4. STEAM AND POWER GENERATION

Steam and power generation from solid waste can be achieved by the use of a waterwall incinerator. Waste heat from the burning of solid waste is captured by boiler systems incorporated as waterfilled tubes in the lining of the furnaces. Steam is generated and piped to users and sold or converted to electrical energy by steam turbines.

Waste may be burnt in bulk or processed before firing. Refuse processing would consist of shredding, drying and air separation to remove the combustible fraction of refuse, with possible metals recovery. The combustible fraction would then be incinerated and the thermal energy so produced used to generate steam which would then be converted to electrical power.

Costs for such a system are high and must include a refuse processing plant to prepare the refuse as an acceptable fuel and a power generation plant. Initial capital costs for waterwall incineration plants are estimated at $100 million for a 2000 ton per day plant.

Advantages of Steam and Power Generation:

- Reduces refuse volume and weight
- Prolongs use of landfill site
- Provides energy alternative and reduces dependency on conventional fuel while simultaneously disposing of large quantities of solid waste

- Can incorporate resource recovery system

Disadvantages of Steam and Power Generation:

- Requires skilled operators
- Requires large amount of land and access to large quantities of water for processing
- Requires prior shredding, drying and separation - cannot utilize all waste, so other forms of refuse disposal necessary
- Dependent on large quantities of combustible refuse and may require conventionally fired support systems as back-up facilities when refuse quantities are insufficient
- Adverse operational impacts include possible air pollution by thermal, gas and particulate matter discharges, water pollution from contaminated waste water discharges, noise, dust and traffic generation

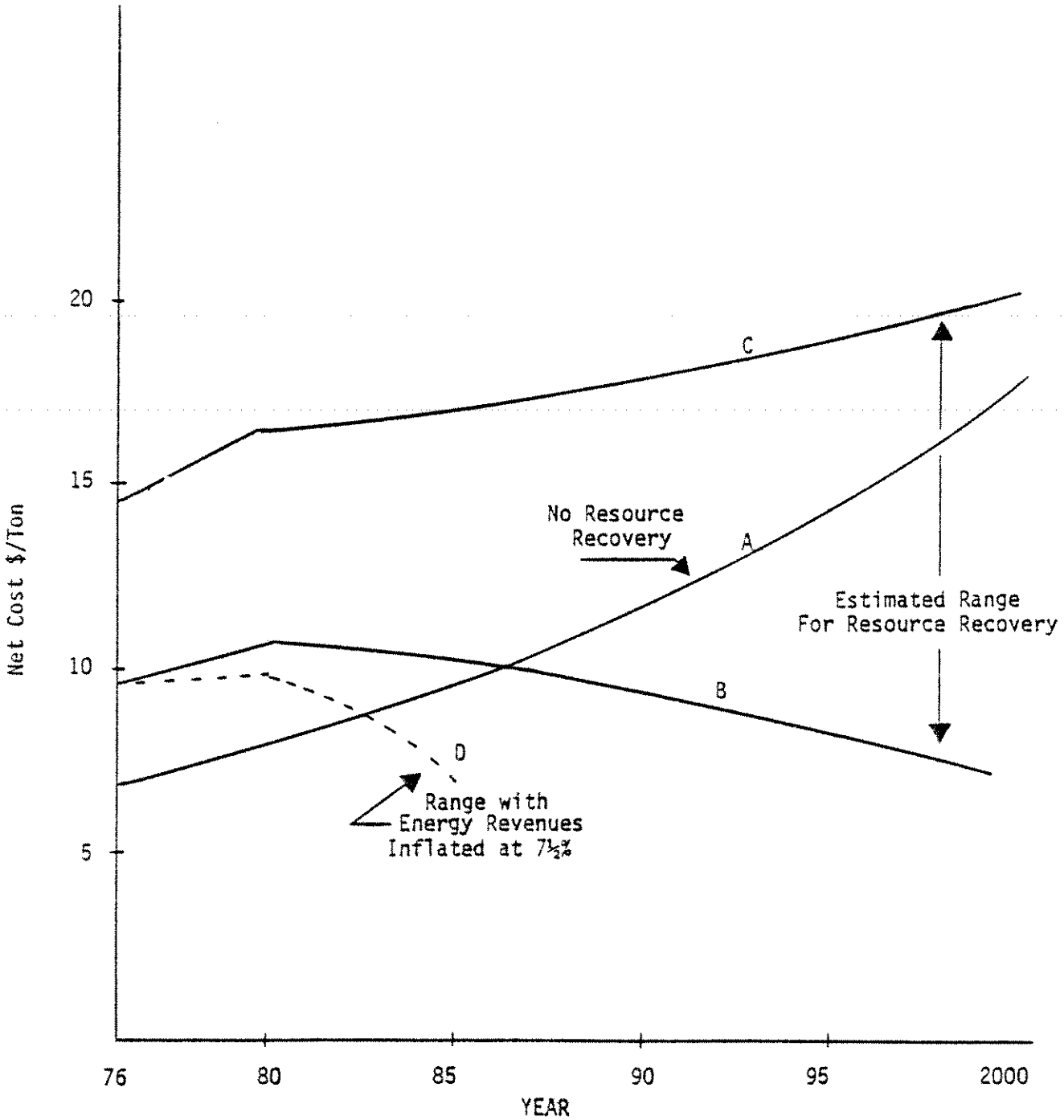
Summary

MITRE Corp., technical consultants to the City and County have recently completed a study on the feasibility of constructing a resource recovery facility on the island. This report, published in April, 1977, concluded that all the ingredients necessary for a sucessful resource recovery project were available on Oahu. This included adequate amounts of waste, existing markets for recovered energy and their willingness to enter into long term contracts for the purchase of such energy. Representatives from private industry were anxious to bid on Honolulu's project. More important, the consultant concluded that the cost of resource recovery can be competitive with the cost of available landfill alternatives.

For Oahu, resource recovery alternatives, when compared with available processing methods are shown in Figure 6-2. Commercially available resource recovery technologies include incineration with steam/electric power generation, pyrolysis to produce either a synthetic fuel gas or oil, and preparation of shredded solid fuel for use as supplemental fuel in boilers. Incineration for steam or electric

Figure 6-2

SANITARY LANDFILL & WAIPAHU INCINERATOR VS. RESOURCE RECOVERY (O&M COST AND ENERGY REVENUES INFLATED @ 5%/YEAR)



Solid Waste Disposal Cost Projections

Source: Analysis of the Feasibility of Resource Recovery for Honolulu, MITRE Corporation, Bedford, Massachusetts April 1977

power production and gas pyrolysis has been recommended for Oahu, given the market situation (MITRE, 1977). Hawaiian Electric Company, Inc., is a potential market of steam, pyrolytic gas and electric power, Amfac, Inc., for electric power, and Pacific Resource Inc., for pyrolytic gas. Of various sites evaluated, ones at Pearl City Peninsula and at Campbell Industrial Park are the most promising as potential processing sites (MITRE, 1977).

The City is now pursuing resource recovery seriously and is preparing a request for proposal (RFP) package to solicit private industry participation in constructing a resource recovery plant on the island. It is estimated that the RFP will be issued at the end of June 1978. If viable proposals are received by the City, it is conceivable that a resource recovery plant will be constructed and operating by December of 1981.

SECTION 7

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

City and County funds, construction and operating equipment, human labor and materials (building materials, fuel and soil for cover) will be committed to the construction and operation of the Leeward Sanitary Landfill. However, sanitary landfilling of refuse is less expensive than other processing methods. Therefore, until an economical resource recovery system is implemented, less net capital will be used for refuse processing and disposal.

Using the land as a landfill will make it unavailable for other uses during the life of the landfill and temporarily will remove its present use as wildlife habitat and as open space; however, the proposed sites do not represent critical wildlife habitats. Uneven settlement and gas generation by the landfill may preclude developing some of the land for uses other than recreation, open space, or agriculture. Upon completion of the landfill, the land can return to use as a wildlife habitat, open space, recreational area, or for restricted agriculture and grazing. The following is a comparison of funds which is estimated would be necessary to develop the three sites (a cost breakdown for each site is provided in Section 4).

Site	Development Cost
Makaiwa Gulch	$ 3,939,500
Nanakuli	3,924,700
Kaloi Gulch	19,912,000

The high cost for the Kaloi site, is due to site development measures necessary to protect groundwater from possible leachate contamination. Distance to haul refuse from Keehi Transfer Station to the proposed sanitary landfill is also a factor. The distance from Keehi Transfer Station to the three sites is: Makaiwa Gulch - 18 miles, Nanakuli - 22, Kaloi Gulch - 15. From Kaloi it costs $0.06/ton more to haul to Makaiwa and $0.50 more to haul to Nanakuli. The difference in hauling cost between Makaiwa and Nanakuli is $.44/ton (Shimabukuro & Associates, 1977).

Makaiwa Gulch

The existing gulch will be partially filled with refuse and will, therefore, alter the existing land form. Upon completion of the landfill, soil will be added and the terrain contoured to form a more natural appearing slope.

Nanakuli

There is considerable difference in the present state of Sites A and B. Site B has been relatively undisturbed, apparently formerly used as pasture. Site A has been quarried and the part adjacent to Lualualei Naval Road is being victimized by unauthorized dumping by the public. Both sites could be used for residential and other urban development although extensive grading of Site B would be required. They are general planned for such development but use for a sanitary landfill would preclude such development.

Kaloi Gulch

Underlying the site is a potable groundwater resource which supplies water to the Barbers Point Naval installation and water for irrigating the surrounding sugar cane fields. An impervious shield to contain leachate may be required to protect this aquifer. This largely accounts for the high development cost for this site.

Part of the site, perhaps 20 percent has been quarried, altering the natural appearance of its landform. The landfill would cover up these scars. The view from the site takes in all of Honolulu, Diamond Head, the Koolau Range, Pearl Harbor and the Central Plain covered with sugar cane, making it a good site for a park upon completion of the landfill operation.

Synopsis

1. Land area to be committed for landfill at each site:

   a. Makaiwa Gulch Site - 338± acres, of which approximately 254± acres will be used for fill

   b. Nanakuli Site - 611± acres, of which 288± acres will be used for fill

   c. Kaloi Gulch Site - 400± acres, of which 265± acres will be used for fill

2. Estimated life of each site in years, based on 500 TPD disposal rate:

   a. Makaiwa Gulch Site - 31± years

   b. Nanakuli Site - 27.3± years

   c. Kaloi Gulch Site - 50± years

3. Estimated percent of fill area filled per year compared against life of site, and how this might be altered by resource recovery (based on 500 TPD):

	% Area Per Year	Resource Recovery by Waterwall Incineration
a. Makaiwa Gulch Site	3.2	.64
b. Nanakuli Site	3.7	.74
c. Kaloi Gulch Site	2	.4

4. Site ownership and estimated land value:

   a. Makaiwa Gulch Site:

      (1) Owner: J. Campbell Trust Estate, Hawaii Meat Co. lessee, Tongg Ranch, sublessee

      (2) Estimated land cost: $1,690,000

b Nanakuli Site:

(1) Owner: Shigeru Horita, et al; The Hawaii Corp.; U.S. Financial, Inc.; Security Pacific Mortgage Corporation

(2) Estimated land cost: Site A - $2,660,000
Site B - $2,200,000

c. Kaloi Gulch Site:

(1) Owner: James Campbell Trust Estate (Oahu Sugar Co. and Hawaii Meat Co. lessee, Tongg Ranch, sublessee)

(2) Estimated land cost: $2,000,000

5. Need for cover material:

a. Makaiwa Gulch Site - very limited amount available on site; cover material to be purchased

b. Nanakuli Site A - on site cover material available
Nanakuli Site B - on site cover material available

c. Kaloi Gulch Site - some cover material available on site, must purchase remainder

SECTION 8

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

Man will continually produce solid waste and the quantities produced will increase as the population increases. A safe and efficient means to dispose of waste products must be developed. A properly operated landfill is a safe method for waste disposal. It can be odorless, free of vector problems and the dust problem can be minimized. Presently, sanitary landfills are the most efficient and economic means for solid waste disposal until resource recovery is implemented.

Although the landfill will be committed to only that purpose during the life of the landfill, once completed the landfill can be compatible for outdoor recreation or limited agricultural uses, such as grazing. There is a compatibility between its short-term use as a sanitary landfill and its long-term use, after completion of the sanitary landfill, for active recreation, grazing and some types of crop cultivation. A sanitary landfill can convert land which is unsuitable for these uses into land suitable for such purposes. It also secures land for open space.

SECTION 9

AN INDICATION OF WHAT OTHER INTERESTS AND CONSIDERATIONS OF GOVERNMENTAL POLICIES ARE THOUGHT TO OFFSET THE ADVERSE ENVIRONMENTAL EFFECTS OF THE PROPOSED ACTION

Since solid waste will continue to be generated, a place is essential to dispose and to maintain operations for solid waste disposal. Increased urbanization and development on the island of Oahu has resulted in limited areas being remote from urbanized cores. Consequently, it is difficult to find an area for solid waste disposal that is remote from urban cores yet close enough to make the economic factors for transfer and hauling of disposal to these areas reasonable. A site is needed to dispose of solid waste and to operate proper sanitary landfill procedures.

Ecological considerations make ocean disposal undesirable. Since ocean disposal is prohibitive according to EPA regulations, discussion of this possibility is precluded. Shredding and baling extends landfill life but it does not eliminate the need for a landfill. Incineration is more costly than landfilling and in the end result a landfill would be required for the residue of incineration. Resource recovery is currently being investigated. Until recently, resource recovery has been uneconomical, but if deemed feasible, resource recovery could not be implemented for this island until December 1981, at the earliest. Until that time, landfill disposal would still be the most economical means for waste disposal. At such time when resource recovery is implemented approximately 50 percent of all waste by weight would be non-recoverable materials and residue from resource recovery and would still have to be landfilled.

A landfill does not eliminate the possibility of other uses for that area. Plans have been initiated with the Department of Parks and Recreation to develop a park as increments of the landfill are completed.

There will be landform alterations. Depressions in the existing landform will be partially filled by refuse and soil. This altertion of landform, however, can be more conducive to the aforementioned park concept.

SECTION 10

LIST OF NECESSARY APPROVALS

STATE

1. Special Use Permit from the State Land Use Commission and the Honolulu Planning Commission (Kaloi, Makaiwa and Nanakuli sites).

2. Conservation District Use Permit for required sites will be requested from the Department of Land and Natural Resources, under Regulation 4 after the completion of the EIS.

3. Certificate of Compliance and Solid Waste Management Permit from the Department of Health.

4. An application for a Conditional Use Permit for Construction Activities under Chapter 44B, Community Noise Control for Oahu of the Public Health Regulations. The contractor will obtain said permit from the Department of Health.

CITY AND COUNTY

1. A permit for grading, excavation and fill will be required pursuant to ordinance No. 3968 (1972). The contractor will obtain said permit from the Department of Public Works, Division of Engineering.

SECTION 11

ORGANIZATIONS AND PERSONS CONSULTED

The following list includes those agencies and organizations who commented on the Preparation Notice. Their comments and the corresponding response follow the list in the order presented in the list.

Federal Government

Kisuk Cheung, Chief, Engineering Division, Department of the Army

Colonel Carl P. Rodolph, Director of Facilities Engineering, Department of the Army

Jack P. Kanalz, State Conservationist, U. S. Department of Agriculture

Captain R. P. Nystedt, District Civil Engineer, U. S. Navy

State of Hawaii

John Farias, Jr., Chairman, Board of Agriculture, Department of Agriculture

Hideto Kono, Director, Department of Planning and Economic Development

Dr. James S. Kumagai, Deputy Director for Environmental Health, Department of Health

Gordon Soh, Program Planning Coordinator, Department of Land and Natural Resources

E. Alvey Wright, Director, Department of Transportation

Mrs. Billie Beamer, Chairman, Department of Hawaiian Home Lands

Ms. Jane L. Silverman, Historic Preservation Officer, Department of Land and Natural Resources

City and County of Honolulu

Edward Y. Hirata, Manager and Chief Engineer, Board of Water Supply

Young Suk Ko, Director, Department of Parks and Recreation

George S. Moriguchi, Director, Department of Land Utilization

Robert R. Way, Chief Planning Officer, Department of General Planning

Kazu Hayashida, Director, Department of Transportation Services

Other

D. W. Ballie, President, Oahu Sugar Company, Ltd.

David A. Ferguson, President, Ferguson Management Corporation

Diane M. Akau, President, Waipahu Community Association

Wally Inouye, President, Makakilo Community Association

7708906

DEPARTMENT OF THE ARMY
HONOLULU DISTRICT, CORPS OF ENGINEERS
BLDG 230, FT. SHAFTER
APO SAN FRANCISCO 96558

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Div. Chief
Asst. Chief
Chief Engr.
Admin.
Engineer

RECEIVED FEB 14 10 3 AM '77 DIVISION OF REFUSE COLLECTION & DISPOSAL

TO ENV 4 Refuse

February 1977

Mr. Wallace S. Miyahara
Director and Chief Engineer
Department of Public Works
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Miyahara:

As requested in your letter of 14 January 1977, we have reviewed the Environmental Impact Statement Preparation Notice for Leeward Sanitary Landfill. We have no comments to offer at this time, but thank you for the opportunity to be included in preparation phase of this document.

Sincerely yours,

KISUK CHEUNG
Chief, Engineering Division

BICENTENNIAL 1776-1976 AMERICAN REVOLUTION

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

WALLACE MIYAHIRA
DIRECTOR AND CHIEF ENGINEER

R 77-282

April 25, 1977

Mr. Kisuk Cheung
Chief, Engineering Division
Department of the Army,
Honolulu District,
Corps of Engineers
Bldg. 230, Ft. Shafter
APO San Francisco 96558

Dear Mr. Cheung:

SUBJECT: LEEWARD SANITARY LANDFILL
ENVIRONMENTAL IMPACT STATEMENT
PREPARATION NOTICE

Thank you for your response to the subject Notice.

Very truly yours,

WALLACE MIYAHIRA
Director and Chief Engineer

DEPARTMENT OF THE ARMY
HEADQUARTERS UNITED STATES ARMY SUPPORT COMMAND, HAWAII
APO SAN FRANCISCO 96558

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DIVISION OF REFUSE COLLECTION & DISPOSAL

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Dept of Public Works
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Gentlemen:

Reference is made to Environmental Impact Statement Preparation Notice for Leeward Sanitary Landfill dated 29 December 1976.

The proposed Makaiwa Landfill Site adjoins former Army Nike Sites 5 and 6 which are presently inactive. There are no plans for future use of these sites for Army activities and we have no objection to the proposed landfill operations.

Thank you for the opportunity to review the document.

Sincerely yours,

CARL P. RODOLPH
Colonel, CE
Director of Facilities Engineering

CF:
Dept of General Planning (for)
Mayor, City and County of Honolulu

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

WALLACE MIYAHIRA
DIRECTOR AND CHIEF ENGINEER

R 77-289

April 25, 1977

Colonel Carl P. Rodolph
Director of Facilities Engineering
Department of the Army
Headquarters United States Army
Support Command, Hawaii
APO San Francisco 96558

Dear Colonel Rodolph:

SUBJECT: LEEWARD SANITARY LANDFILL
ENVIRONMENTAL IMPACT STATEMENT
PREPARATION NOTICE

Thank you for your response to the subject Notice. Your information that there are no plans for future use of former Army Nike Sites 5 and 6 adjoining the Makaiwa site will be included in the Environmental Impact Statement.

Very truly yours,

WALLACE MIYAHIRA
Director and Chief Engineer

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

440 Alexander Young Building, Honolulu, HI 96813

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TO EA/UU February 14, 1977

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Div. Chief
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Dep. Engr.
Sec. Engr.
Dep. Supt.
Supt.
Planner

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DIVISION OF REFUSE
COLLECTION & DISPOSAL

Mr. Wallace S. Miyahira
Director and Chief Engineer
Department of Public Works
City and County of Honolulu
650 South King Street
Honolulu, HI 96813

Dear Mr. Miyahira:

Subject: Environmental Impact Statement for Leeward Sanitary Landfill

We have reviewed the above-mentioned EIS preparation notice and have no comments to offer.

Thank you for the opportunity to review this document.

Sincerely,

Donald A. Moss, Acting

Jack P. Kanalz
State Conservationist

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

WALLACE MIYAHIRA
DIRECTOR AND CHIEF ENGINEER

R 77-285

April 25, 1977

Mr. Jack P. Kanalz
U. S. Department of Agriculture
440 Alexander Young Building
Honolulu, Hawaii 96813

Dear Mr. Kanalz:

SUBJECT: LEEWARD SANITARY LANDFILL
ENVIRONMENTAL IMPACT STATEMENT
PREPARATION NOTICE

Thank you for your response to the subject Notice.

Very truly yours,

Wallace Miyahira

WALLACE MIYAHIRA
Director and Chief Engineer

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HEADQUARTERS
FOURTEENTH NAVAL DISTRICT
BOX 110
FPO SAN FRANCISCO 96610

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COLLECTION & DISPOSAL

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IN REPLY REFER TO:
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Div. Chief
Asst. Chief
Dep. Dep
P.O. Supt.
Ins. Supt.
Salary
Planner

Mr. Wallace S. Miyahira
Director and Chief Engineer
Department of Public Works
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Miyahira:

The Environmental Impact Statement Preparation Notice for the Leeward Sanitary Landfill forwarded by your letter R 77-30 of January 14, 1977 has been reviewed and the following comments are submitted for consideration in the evaluation of the Nanakuli and Kaloi Gulch landfill sites:

1. Nanakuli Site. Improvements to the Lualualei Naval Access Road will need to be made to assure safety and unlimited access to the Naval facilities mauka of the Nanakuli landfill site. The Navy is receptive to transferring the roadway (from the Naval Magazine, Lualualei main entrance to Farrington Highway) over to the City, with the City accepting responsibility for improvements and continued maintenance of the roadway.

2. Kaloi Gulch. The Navy objects to a sanitary landfill operation in Kaloi Gulch as the danger of contamination of the basal groundwater which supplies Naval Air Station, Barbers Point would be great. It is felt that whatever state-of-the-art leachate control measures are proposed, no guarantee can be given that the basal groundwater would not be contaminated by the landfill operations. The damage that can be done to the basal groundwater should contamination occur is irreversible and could mean mass evacuation of the residents and operational personnel from NAS Barbers Point. Therefore, it is recommended that Kaloi Gulch not be considered for sanitary landfill purposes.

It is requested that when the EIS is prepared, this Command be consulted concerning the above comments and that a copy of the final EIS be submitted to this Command for review and comment.

Sincerely,

R. P. NYSTEDT
CAPTAIN, CEC, USN
DISTRICT CIVIL ENGINEER
BY DIRECTION OF THE COMMANDANT

Copy to:
Environmental Quality
Commission
550 Halekauwila St.,
Rm. 301
Honolulu, HI 96813

Mr. George Yuen
Director of Health
State of Hawaii
Department of Health
P. O. Box 3378
Honolulu, HI 96801

Mr. Edward Hirata
Manager and Chief Engineer
Board of Water Supply
P. O. Box 3410
Honolulu, HI 96843

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

WALLACE MIYAHIRA
DIRECTOR AND CHIEF ENGINEER

R 77-275

April 25, 1977

Captain R. P. Nysted
District Civil Engineer
Headquarters Fourteenth Naval District
Box 110
FPO San Francisco 96610

Dear Captain Nystedt:

SUBJECT: LEEWARD SANITARY LANDFILL
ENVIRONMENTAL IMPACT STATEMENT
PREPARATION NOTICE

Thank you for your response to the subject Notice. Your comments on Lualualei Naval Access Road at Nanakuli will be discussed in the Environmental Impact Statement (EIS).

Your objection to use of the Kaloi Gulch site because of possible groundwater contamination effecting water supplies to the Naval Air Station, Barbers Point, will be considered in detail. An ongoing geohydrology and leachate study of all the sites is being undertaken and our consultants will contact you about the Kaloi Gulch site.

We will be pleased to send you a copy of the draft EIS for your review and comment as requested.

Very truly yours,

Wallace Miyahira

WALLACE MIYAHIRA
Director and Chief Engineer

GEORGE R. ARIYOSHI
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF AGRICULTURE
1428 SO. KING STREET
HONOLULU, HAWAII 96814

JOHN FARIAS, JR.
CHAIRMAN, BOARD OF AGRICULTURE

YORIN FAGAWA
DEPUTY TO THE CHAIRMAN

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DIVISION OF REFUSE COLLECTION & DISPOSAL

February 2, 1977

MEMORANDUM

To: Mr. Wallace S. Miyahira, Director and Chief Engineer
Department of Public Works, City and County of Honolulu

Subject: EIS for Leeward Sanitary Landfill

The report identifies three major sites which have potential for use as the major leeward sanitary landfill. Sites are located in Ewa and Waianae districts: Makaiwa gulch, Kaloi, and Nanakuli.

1. The Makaiwa site has been recommended by the City as the most promising of the sites under evaluation for landfill purposes. The land is used for pasture and is not suitable for crop cultivation. State Land Use designation is agriculture and is zoned agriculture 1. Soil type is rSY - Stony steep land of mass boulders and stones. Slope range 40 to 70 percent. There is a small amount of soil; stones and boulders cover 50 to 90 percent of the surface.

2. Nanakuli Site - vicinity of abandoned limestone quarry. Land site is divided into two sections - A and B. The western site (A) is vacant and a portion zoned Ag 1, general planned agriculture, residential, apartment and school and park. State Land Use designation is Urban.

The eastern portion (B) is zoned Planned Development Housing (PDH), agriculture (Ag 1) and Preservation (P-1). This section is general planned agriculture, park, and open space. The State Land Use designation is Conservation and Agriculture. This area would be suitable for pasture but not for crop cultivation due to its very stony surface profile. Soil type is LPE - Slope range is 3 to 35 percent; in most places soil is moderately sloping to steep. Runoff is medium to rapid, and erosion hazard is moderate to severe. Selection of this site (A and B) will create an excellent buffer zone between the farms and urban zone of the area.

3. Kaloi Gulch - The site is designated agriculture by the State Land Use Commission. Portion of the project site is general planned agriculture and residential, but the entire area is zoned agriculture (Ag 1). Present use of the parcel is in pasture. The area is not suitable for cultivation or crop production due to its uneven terrain features.

We appreciate the opportunity to comment.

JOHN FARIAS, JR.
Chairman, Board of Agriculture

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

WALLACE MIYAHIRA
DIRECTOR AND CHIEF ENGINEER

R 77-304

May 5, 1977

RECEIVED
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EISC

Mr. John Farias, Jr.
Chairman, Board of Agriculture
Department of Agriculture
1428 S. King Street
Honolulu, Hawaii 96814

Dear Mr. Farias:

SUBJECT: LEEWARD SANITARY LANDFILL
ENVIRONMENTAL IMPACT STATEMENT
PREPARATION NOTICE

Thank you for your response to the subject Notice. Your information about the suitability of the three sites for agriculture will be included in the forthcoming Environmental Impact Statement.

Very truly yours,

for WALLACE MIYAHIRA
Director and Chief Engineer

7700688

GEORGE R. ARIYOSHI
Governor

HIDETO KONO
Director

FRANK SKRIVANEK
Deputy Director

DEPARTMENT OF PLANNING AND ECONOMIC DEVELOPMENT

Kamamalu Building, 250 South King St. Honolulu, Hawaii Mailing Address: P.O. Box 2359, Honolulu, Hawaii 96804

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TO ENVCL

Div. Chief
Asst. Chief

January 31, 1977

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DIVISION OF REFUSE
COLLECTION & DISPOSAL

Ref. No. 2887

Mr. Wallace S. Miyahira
Director and Chief Engineer
Department of Public Works
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Miyahira:

Subject: Environmental Impact Statement Preparation Notice for Leeward Sanitary Landfill

We have reviewed the subject EIS Preparation Notice and wish to offer the following comments at this time.

1. The proposed action should be fully evaluated according to all of the specific criteria presented in Section D of the document entitled "Sanitary Landfill Design and Selection." Specifically, we could find no evaluation in relation to the following factors: (i) "social and cultural compatibility of the site in terms of effects on surrounding land use...", and (j) "acceptability by the community." Since the communities of Honokai Hale and Makakilo City are in the vicinity of the proposed action, we feel that evaluations should be made in accordance with these criteria may be important.

2. The area of visual impact warrants thorough evaluation due to the proximity of the proposed action to the Honokai Hale residential community and Farrington Highway. It would be appropriate to discuss the extent to which the landfilling activities will be visible from the highway and residential area, in spite of the proposed landscaping. Also, the extent of the buffer area should be specified. This is especially important in relation to activities which may be conducted on the higher elevations of the site where visibility would be greater.

3. The long-term commitments which the proposed action will involve should be discussed.

We appreciate the opportunity to review and comment on this EIS Preparation Notice.

Sincerely,

HIDETO KONO

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

WALLACE MIYAHIRA
DIRECTOR AND CHIEF ENGINEER

R 77-281

April 25, 1977

Mr. Hideto Kono, Director
Department of Planning and
Economic Development
State of Hawaii
P. O. Box 2359
Honolulu, Hawaii 96804

Dear Mr. Kono:

SUBJECT: LEEWARD SANITARY LANDFILL
ENVIRONMENTAL IMPACT STATEMENT
PREPARATION NOTICE

Thank you for your response to the subject Notice. The concerns you expressed for more thorough evaluation and discussion in the forthcoming Environmental Impact Statement have been noted.

A visual impact analysis will be undertaken describing the appearance of the project site as is, during operation and after completion. The effectiveness of mitigative landscaping will also be described.

Community involvement is planned to explain the proposed project to effected communities and get input from them.

Very truly yours,

WALLACE MIYAHIRA
Director and Chief Engineer

770129

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF HEALTH
P.O. Box 3378
HONOLULU, HAWAII 96801

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DIVISION OF REFUSE
COLLECTION & DISPOSAL

GEORGE A. L. YUEN
DIRECTOR OF HEALTH

Audrey W. Mertz, M.D., M.P.H.
Deputy Director of Health

Henry N. Thompson, M.A.
Deputy Director of Health

James S. Kumagai, Ph.D., P.E.
Deputy Director of Health

In reply, please refer to
File: EHS — SS

Div. Chief
Asst. Chief
Div. Engr.
Adm. Supt.
Safety
Planner

February 10, 1977

Mr. Wallace S. Miyahira
Director and Chief Engineer
Department of Public Works
City & County of Honolulu
650 S. King St.
Honolulu, Hawaii 96813

Dear Mr. Miyahira:

Subject: Request for Comments on Proposed Environmental Impact Statement (EIS) for Leeward Sanitary Landfill

Thank you for allowing us to review and comment on the subject proposed EIS. We submit the following comments for your consideration:

1. The report does not address the management of hazardous waste. How will these types of wastes be handled?

2. A scale for quality control will have to be required to insure proper compactive density and efficient use of cover material.

3. It seems that all the selected sites lack sufficient cover material. Where are the prospective burrow areas with respect to each landfill site? The distances of the burrow areas will have impact on delivery charges for imported fill materials.

4. How will the proposed landfill impact the existing operation of PC&R at Palailai? Can the area accommodate two landfills? Will the public be allowed to enter the City & County landfill?

5. The possibility of shredding at Shafter Flats is rather remote at this time since it is desirable that shredding take place at the proposed resource recovery plant. Why is shredding at Shafter even mentioned in the report in light of this recent development?

6. Will fences be provided to prevent illegal scavenging and dumping? Fences also serve to retain litter on-site.

7. The purchase of Palailai for operation by the City & County of Honolulu should be given more detailed study. This seems to be the more reasonable decision at present since all facilities are in place. It would be interesting to see the cost comparisons of all alternatives.

We realize that the statements are general in nature due to preliminary plans being the sole source of discussion. We, therefore, reserve the right to impose future environmental restrictions on the project at the time final plans are submitted to this office for review.

Sincerely,

JAMES S. KUMAGAI, PH.D.
Deputy Director for
Environmental Health

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

WALLACE MIYAHIRA
DIRECTOR AND CHIEF ENGINEER

R 77-290

April 25, 1977

Dr. James S. Kumagai
Deputy Director for
Environmental Health
Department of Health
State of Hawaii
P. O. Box 3378
Honolulu, HI 96801

Dear Dr. Kumagai:

SUBJECT: LEEWARD SANITARY LANDFILL
ENVIRONMENTAL IMPACT STATEMENT
PREPARATION NOTICE

Thank you for your response to the subject Notice. Your concerns about hazardous waste, insuring proper compactive density, borrow areas for cover material, impacts on adjacent uses (including PC&R) and public use of the landfill, security fencing and purchase of Palailai Landfill will be discussed in the Environmental Impact Statement.

Regarding your comments on shredding at the Keehi (originally referred to as Shafter Flats) site, shredding could aid landfill disposal by lengthening landfill life. However, as suggested, we have decided to omit the subject of shredding operations at the Keehi site in the Environmental Impact Statement.

Very truly yours,

Wallace Miyahira

WALLACE MIYAHIRA
Director and Chief Engineer

770841

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII

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CHRISTOPHER COBB, CHAIRMAN
BOARD OF LAND & NATURAL RESOURCES

EDGAR A. HAMASU
DEPUTY TO THE CHAIRMAN

TO ENVUU

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

DIVISIONS:
CONVEYANCES
FISH AND GAME
FORESTRY
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

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February 8, 1977

Your: R77-30

DIVISION OF REFUSE
COLLECTION & DISPOSAL

WES
Div. Chief
Asst. Chief
Disp. Engr.
C.C. Supt.
Ins. Supt.
Safety
Planner

Honorable Wallace S. Miyahira
Dept. of Public Works
650 So. King St.
Honolulu, HI 96813

Dear Sir:

We have reviewed the EIS preparation notice for the Leeward Sanitary Landfill.

Statements regarding fish and wildlife are both accurate and adequate.

However, statements dealing with surface drainage and groundwater protection need additional work. We would like to see more details for accomplishing these protective measures.

Very truly yours,

GORDON SOH
Program Planning Coordinator

cc: DOWALD
Fish & Game
Historic Sites

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

WALLACE MIYAHIRA
DIRECTOR AND CHIEF ENGINEER

R 77-287

April 25, 1977

Mr. Gordon Soh
Program Planning Coordinator
Department of Land and Natural Resources
State of Hawaii
P. O. Box 621
Honolulu, Hawaii 96809

Dear Mr. Soh:

SUBJECT: LEEWARD SANITARY LANDFILL
ENVIRONMENTAL IMPACT STATEMENT
PREPARATION NOTICE

Thank you for your response to the subject Notice. Regarding your comment about surface drainage and groundwater protection, a geohydrology and leachate study of the three alternative sites is being undertaken and will be included in the forthcoming Environmental Impact Statement. Details of any necessary protective measures will also be included.

Very truly yours,

WALLACE MIYAHIRA
Director and Chief Engineer

GEORGE R. ARIYOSHI
GOVERNOR

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

7700977

E. ALVEY WRIGHT
DIRECTOR

DEPUTY DIRECTORS
WALLACE AOKI
RYOKICHI HIGASHIONNA
DOUGLAS S. SAKAMOTO
CHARLES O. SWANSON

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DIVISION OF REFUSE
COLLECTION & DISPOSAL

February 10, 1977

IN REPLY REFER TO:
STP 8.4105

Chief
Asst. Chief
Elec. Engr.
Fac. Supt.
Fac. Supt.
Secy
Planner

Mr. Wallace S. Miyahira
Director and Chief Engineer
Department of Public Works
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Miyahira:

Subject: Environmental Impact Statement for
Leeward Sanitary Landfill

Thank you very much for offering us the opportunity to review the above-captioned document. The document should contain a table of contents to aid the reader. Other than that, we have no comments to offer.

Sincerely,

E. Alvey Wright

E. ALVEY WRIGHT
Director

FRANK F. FASI
MAYOR

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

WALLACE MIYAHIRA
DIRECTOR AND CHIEF ENGINEER

R 77-284

April 25, 1977

Mr. E. Alvey Wright, Director
Department of Transportation
State of Hawaii
869 Punchbowl Street
Honolulu, Hawaii 96813

Dear Mr. Wright:

SUBJECT: LEEWARD SANITARY LANDFILL
ENVIRONMENTAL IMPACT STATEMENT
PREPARATION NOTICE

Thank you for your response to the subject Notice. The Environmental Impact Statement will contain a table of contents.

Very truly yours,

Wallace Miyahira

WALLACE MIYAHIRA
Director and Chief Engineer

PROJECT OFFICES

MANILA OFFICE
P. O. BOX 125
KAMUELA, HAWAII 96743

KEAUHAHA OFFICE
P. O. BOX 803
HILO, HAWAII 96720

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DIVISION OF REFUSE COLLECTION & DISPOSAL

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STATE OF HAWAII
DEPARTMENT OF HAWAIIAN HOME LANDS
P. O. BOX 1879
HONOLULU, HAWAII 96805

PROJECT OFFICES

MAUI OFFICE
P. O. BOX 22
KAHULUI, MAUI 96732

MOLOKAI OFFICE
P. O. BOX 196
HOOLEHUA, MOLOKAI 96729

KAUAI OFFICE
P. O. BOX 332
LIHUE, KAUAI 96766

ENV III
Refuse W25

January 24, 1977

Mr. Wallace S. Miyahira
Director and Chief Engineer
City and County of Honolulu
Department of Public Works
659 South King Street
Honolulu, Hawaii 96813

Dear Mr. Miyahira:

SUBJECT: Environmental Impact Statement for Leeward Sanitary Landfill

In accordance with your letter dated January 14, 1977, the Department has reviewed your EIS Preparation Notice and, based on the information presented, concurs with the consultant's recommendation.

No comparison of land acquisition cost is made except for a brief reference to the Kaloi site. This comparison should be made, as it may strengthen the case for the Makaiwa site where acquisition involves only 17 acres of land classified agriculture as opposed to the Nanakuli site which involves 611 acres of which a significant portion is classified urban.

Should there be further question, please contact William Blaisdell, telephone 548-2684.

Thank you for the opportunity to comment.

Owau no me ka ha'aha'a,
(I am, humbly yours)

Billie Beamer

(MRS.) BILLIE BEAMER, CHAIRMAN

WB:kt

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

WALLACE MIYAHIRA
DIRECTOR AND CHIEF ENGINEER

R 77-283

April 25, 1977

Mrs. Billie Beamer, Chairman
Department of Hawaiian Home Lands
State of Hawaii
P. O. Box 1879
Honolulu, Hawaii 96805

Dear Mrs. Beamer:

SUBJECT: LEEWARD SANITARY LANDFILL
ENVIRONMENTAL IMPACT STATEMENT
PREPARATION NOTICE

Thank you for your response to the subject Notice. Estimates for the cost of development including land acquisition for the three sites have been made. These will be included in the Environmental Impact Statement.

We wish to apologize for an error in the acreage of the Makaiwa Site. It is 300± acres and not 17 acres as reported in the preparation notice.

Very truly yours,

Wallace Miyahira

WALLACE MIYAHIRA
Director and Chief Engineer

7/80 948

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII

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

RECEIVED
FEB 17 2 25 PM '77
DIVISION OF REFUSE COLLECTION & DISPOSAL

CHRISTOPHER COBB, CHAIRMAN
BOARD OF LAND & NATURAL RESOURCES

EDGAR A. HAMASU
DEPUTY TO THE CHAIRMAN

DIVISIONS:
CONVEYANCES
FISH AND GAME
FORESTRY
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

Div. Chief
Asst. Chief
Div. Engr.
Dist. Supt.
Dist. Supt.
County Planner

February 10, 1977

Wallace Miyahira
Director and Chief Engineer
Department of General Planning
City and County of Honolulu

Dear Mr. Miyahira:

Subject: EIS Preparation Notice by Dept. of Public Works, City and County for Leeward Sanitary Landfill, Oahu Island

It is recommended that intensive archaeological surveys be conducted for each sanitary landfill site. The results and recommendations of this survey should then be included in the EIS and discussed accordingly. After the EIS has been accepted and the site selected, appropriate mitigative measures for archaeological resources that will be adversely affected should then be initiated and completed before construction starts.

Sincerely yours,

Jane L. Silverman
Historic Preservation Officer
State of Hawaii

cc: Gordon Soh
Dept. of Land and Natural Resources
Planning Office

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

WALLACE MIYAHIRA
DIRECTOR AND CHIEF ENGINEER

R 77-288

April 25, 1977

Ms. Jane L. Silverman
Historic Preservation Officer
Department of Land and Natural Resources
State of Hawaii
P. O. Box 621
Honolulu, Hawaii 96809

Dear Ms. Silverman:

SUBJECT: LEEWARD SANITARY LANDFILL
ENVIRONMENTAL IMPACT STATEMENT
PREPARATION NOTICE

Thank you for your response to the subject Notice. In response to your comments about the archaeological resources, an archaeological survey of all three alternative sites has been undertaken and will be discussed in the forthcoming Environmental Impact Statement. Our staff and the archaeological consultant will be working closely with you to determine any effect on archaeological resources.

Very truly yours,

WALLACE MIYAHIRA
Director and Chief Engineer

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BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA
HONOLULU, HAWAII 96843

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OFFICE OF PUBLIC WORKS
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FRANK F. FASI, Mayor
YOSHIE H. FUJINAKA, Chairman
STANLEY S. TAKAHASHI, Vice Chairman
Wallace S. Miyahira
EDWARD F. C. LAU
TERESITA R. JUBINSKY
E. ALVEY WRIGHT
EDWARD Y. HIRATA
Manager and Chief Engineer

January 25, 1977

RECEIVED
FEB 3 2 56 PM '77
DIVISION OF REFUSE
COLLECTION & DISPOSAL

Mr. Wallace S. Miyahira
Director and Chief Engineer
Department of Public Works
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Miyahira:

SUBJECT: Your Letter of January 14, 1977 re Environmental Impact Statement Preparation Notice for Leeward Sanitary Landfill

We concur with your selection of the Makaiwa Gulch site for the Leeward Sanitary Landfill. The Nanakuli site is an acceptable alternative. Both sites do not pose any threat to potable groundwater resources in the area. However, the environmental impact statement should address the effects Kaloi Gulch would have on groundwater resources in the area. We are willing to accept the Kaloi Gulch site only if adequate precautions are taken to protect potable groundwater resources.

We request that construction plans be coordinated with us.

Please call Mr. Lawrence Whang at 548-5221 if further information is needed.

Very truly yours,

EDWARD Y. HIRATA
Manager and Chief Engineer

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

WALLACE MIYAHIRA
DIRECTOR AND CHIEF ENGINEER

R 77-276

April 25, 1977

TO : EDWARD Y. HIRATA, MANAGER AND CHIEF ENGINEER
BOARD OF WATER SUPPLY

FROM : WALLACE MIYAHIRA, DIRECTOR AND CHIEF ENGINEER

SUBJECT: LEEWARD SANITARY LANDFILL
ENVIRONMENTAL IMPACT STATEMENT PREPARATION NOTICE

Thank you for your response to the subject Notice. The forthcoming Environmental Impact Statement will address the effects a sanitary landfill at Kaloi Gulch would have on groundwater resources and the mitigative measures that would have to be taken.

WALLACE MIYAHIRA
Director and Chief Engineer

DEPARTMENT OF PARKS AND RECREATION
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

YOUNG SUK KO
DIRECTOR

770679

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DIVISION OF REFUSE
COLLECTION & DISPOSAL

February 1, 1977

MEMORANDUM

TO : WALLACE S. MIYAHIRA, DIRECTOR AND CHIEF ENGINEER
DEPARTMENT OF PUBLIC WORKS

FROM : YOUNG SUK KO, DIRECTOR

SUBJECT: ENVIRONMENTAL IMPACT STATEMENT FOR PROPOSED
LEEWARD SANITARY LANDFILL SITES

We have evaluated the Environmental Impact Statement Notice for Proposed Leeward Sanitary Landfill in answer to your letter of January 14, 1977. The impact statement covers only three sites in the Makakilo-Nanakuli area as follows:

1. Makaiwa, 464 acres (gulch near Honokai Hale);

2. Nanakuli, 611 acres (straddling Lualualei Access Road);

3. Kaloi, 400 acres (gulch northwest of Makakilo town).

Our evaluation is only with respect to each area's potential as a future park site exclusive of other sociological or ecological considerations.

With respect to the foreseeable future, the Nanakuli site has the best potential for a City and County park. This is based

on the eventual need for a ten to twenty-acre site for a community, district or regional park to correspond with further urbanization of Nanakuli.

The other two areas have a potential for park purposes if their development costs can be justified after the sanitary landfill use has been exhausted.

Young Suk Ko
YOUNG SUK KO, Director

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

WALLACE MIYAHIRA
DIRECTOR AND CHIEF ENGINEER

R 77-277

April 25, 1977

TO : MR. YOUNG SUK KO, DIRECTOR
DEPARTMENT OF PARKS AND RECREATION

FROM : WALLACE MIYAHIRA, DIRECTOR AND CHIEF ENGINEER

SUBJECT: LEEWARD SANITARY LANDFILL
ENVIRONMENTAL IMPACT STATEMENT PREPARATION NOTICE

Thank you for your response to the subject Notice. Your evaluation of each area's potential as a future park site will be included in the forthcoming Environmental Impact Statement.

Wallace Miyahira
WALLACE MIYAHIRA
Director and Chief Engineer

DEPARTMENT OF LAND UTILIZATION
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

GEORGE S. MORIGUCHI
DIRECTOR

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LU1/77-260

February 14, 1977

WSS
Div. Chief
Asst. Chief
Eng. Supr.
Supt.
Supt.
Safety
Planner

MEMORANDUM

TO : MR. WALLACE S. MIYAHIRA, DIRECTOR & CHIEF ENGINEER
DEPARTMENT OF PUBLIC WORKS

FROM : GEORGE S. MORIGUCHI, DIRECTOR

SUBJECT: ENVIRONMENTAL IMPACT STATEMENT PREPARATION NOTICES FOR (1) LEEWARD SANITARY LANDFILL AND (2) KANEOHE SEWAGE TREATMENT PLANT EXPANSION

Thank you for including this department as one of the consulted parties in the preparation of two Environmental Impact Statements.

We have no specific comment to make on either of the two projects at this point in time. However, we look forward to reviewing the Environmental Impact Statements which are produced. We would forewarn you that the Kaneohe Sewage Treatment Plant expansion will apparently take place within the Special Management Area created by Ordinance No. 4529 (Interim Shoreline Protection Ordinance). It will be necessary after the EIS process is complete to secure a Shoreline Management Permit for this project.

Should you have any questions, please contact Mr. Carl Smith of our staff at 523-4077.

GEORGE S. MORIGUCHI
Director of Land Utilization

GSM:ey

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

WALLACE MIYAHIRA
DIRECTOR AND CHIEF ENGINEER

R 77-279

April 25, 1977

TO : MR. GEORGE S. MORIGUCHI, DIRECTOR
DEPARTMENT OF LAND UTILIZATION

FROM : WALLACE MIYAHIRA, DIRECTOR AND CHIEF ENGINEER

SUBJECT: LEEWARD SANITARY LANDFILL
ENVIRONMENTAL IMPACT STATEMENT PREPARATION NOTICE

Thank you for your response to the subject Notice.

WALLACE MIYAHIRA
Director and Chief Engineer

7-10-0178

DEPARTMENT OF GENERAL PLANNING
CITY AND COUNTY OF HONOLULU

FRANK F. FASI
MAYOR

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DIVISION OF REFUSE COLLECTION & DISPOSAL

TO Rqure DGP1/77-001(JB)

ROBERT R. WAY
CHIEF PLANNING OFFICER

Div. Chief
Asst. Chief
Div. Engr.
Dir. Supt.
Safety
Admin

January 7, 1977

Mr. Wallace S. Miyahira
Director and Chief Engineer
Department of Public Works
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Miyahira:

Leeward Sanitary Landfill
EIS Preparation Notice

This is in reference to the above-captioned.

The material as provided in the Environmental Impact Statement Preparation Notice appears adequate. In developing the draft EIS, however, we suggest a comprehensive discussion be given with regard to the visual impact and the major drainage improvement system requirement of the Makaiwa Gulch Site since it is being proposed as the location for the Leeward Sanitary Landfill site.

Sincerely,

ROBERT R. WAY
Chief Planning Officer

RRW:ak

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

WALLACE MIYAHIRA
DIRECTOR AND CHIEF ENGINEER

R 77-280

April 25, 1977

TO : MR. ROBERT R. WAY, CHIEF PLANNING OFFICER
DEPARTMENT OF GENERAL PLANNING

FROM : WALLACE MIYAHIRA, DIRECTOR AND CHIEF ENGINEER

SUBJECT: LEEWARD SANITARY LANDFILL
ENVIRONMENTAL IMPACT STATEMENT PREPARATION NOTICE

Thank you for your response to the subject Notice. Visual impact analyses and in-depth discussions of the drainage systems for the Makaiwa Gulch, Nanakuli and Kaloi sites will be included in the forthcoming Environmental Impact Statement.

WALLACE MIYAHIRA
Director and Chief Engineer

DEPARTMENT OF TRANSPORTATION SERVICES

CITY AND COUNTY OF HONOLULU

HONOLULU MUNICIPAL BUILDING
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

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FRANK F. FASI
MAYOR

Kazu Hayashida
DIRECTOR

TE1/77-123

February 11, 1977

Div. Chief
Asst. Chief
Engr.
Supt.
Sanitary
Planner

MEMORANDUM

TO : WALLACE S. MIYAHIRA, DIRECTOR AND CHIEF ENGINEER
DEPARTMENT OF PUBLIC WORKS

FROM : KAZU HAYASHIDA, DIRECTOR
DEPARTMENT OF TRANSPORTATION SERVICES

SUBJECT: ENVIRONMENTAL IMPACT STATEMENT FOR LEEWARD SANITARY LANDFILL (REF: R77-30)

The department has no additional comments to offer on the Environmental Impact Statement Preparation Notice.

KAZU HAYASHIDA
Director

DEPARTMENT OF PUBLIC WORKS

CITY AND COUNTY OF HONOLULU

650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

WALLACE MIYAHIRA
DIRECTOR AND CHIEF ENGINEER

R 77-278

April 25, 1977

TO : MR. KAZU HAYASHIDA, DIRECTOR
DEPARTMENT OF TRANSPORTATION

FROM : WALLACE MIYAHIRA, DIRECTOR AND CHIEF ENGINEER

SUBJECT: LEEWARD SANITARY LANDFILL
ENVIRONMENTAL IMPACT STATEMENT PREPARATION NOTICE

Thank you for your response to the subject Notice.

WALLACE MIYAHIRA
Director and Chief Engineer

7701076

OAHU SUGAR COMPANY LTD.

P.O. BOX "O"
WAIPAHU, HAWAII 96797
TELEPHONE 677-3577

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an Amfac company

Div. Chief
Asst. Chief
Dep. Engr.
RC Supt.
Inc. Supt.
Chief
Engineer

February 16, 1977

Refuse RECEIVED
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DIVISION OF REFUSE
COLLECTION & DISPOSAL

RECEIVED
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EISC

Mr. Wallace S. Miyahira,
Director and Chief Engineer
Department of Public Works
City and County of Honolulu
650 South King Street
Honolulu, HI 96813

Dear Mr. Miyahira:

EIS PRELIM. FOR
LEEWARD SANITARY LANDFILL

Thank you for permitting Oahu Sugar Company to comment on the preparation notice.

Our principal concern is the safe operation of our vehicles in the Palehua-H-1 area. The use of collector trucks and private refuse vehicles does not appear to be at all compatible with our large haul cane units. We request that in your EIS the separation of the traffic be explored in depth together with such other measures as are needed for safety. Oahu Sugar Company's harvesting is scheduled to start March 1 with maximum operations during the summer.

Your A site, Makaiwa Gulch is the superior choice from Oahu Sugar Company's viewpoint as it eliminates the possibly unsafe operations discussed in the previous paragraph and it also protects the quality of an important pumped water complex at our Pump 5 station.

Oahu Sugar Company looks forward to working with you and reviewing the EIS.

Very truly yours,

OAHU SUGAR COMPANY, LIMITED

D.W. Ballie

D.W. Ballie, President

OAT:cla
cc: J.E. Loomis

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

WALLACE MIYAHIRA
DIRECTOR AND CHIEF ENGINEER

R 77-286

April 25, 1977

Mr. D. W. Ballie, President
Oahu Sugar Company Ltd.
P. O. Box "O"
Waipahu, Hawaii 96797

Dear Mr. Ballie:

SUBJECT: LEEWARD SANITARY LANDFILL
ENVIRONMENTAL IMPACT STATEMENT
PREPARATION NOTICE

Thank you for your response to the subject Notice.

Traffic impacts at the Kaloi Gulch site will be addressed in detail in the Environmental Impact Statement. Mitigating measures will also be discussed.

Very truly yours,

Wallace Miyahira

WALLACE MIYAHIRA
Director and Chief Engineer

ferguson management corporation

SUITE 1106, FINANCIAL PLAZA OF THE PACIFIC, HONOLULU, HAWAII 96813 - TELEPHONE (808) 521-0381

7704075

May 25, 1977

Mr. Wallace Miyahira, Chief Engineer
City and County of Honolulu
Department of Public Works
650 South King Street
Honolulu, Hawaii 96813

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DIVISION OF REFUSE COLLECTION & DISPOSAL

Div. Chief
Asst. Chief
Disp. Engr.
RC Supt.
Inc. Supt.
Safety
Planner

Fred - I'd like to visit this site w/you soon. R.Y. OK

Dear Mr. Miyahira:

Re: Proposed Leeward District
Sanitary Landfill

Ferguson Management Corporation is the Managing Agent for the Puu Heleakala Community Association, a 391 unit PD-H located in Nanakuli adjacent to one of the proposed sites of the Leeward landfill.

The Board of Directors of the Association has reviewed at length, the Environmental Impact Statement Preparation Notice For Leeward Sanitary Landfill. The Board is unanimous in its opposition to selection of the Nanakuli site for the landfill. The opposition is primarily due to the fact that the proposed site: 1) borders the Mauka edge of our property; 2) is incompatible with the existing residential use; and 3) the project is downwind of the proposed site during trade wind conditions.

Please include our Association on your mailing list for all future correspondence and meeting notices on this matter.

Sincerely,

FERGUSON MANAGEMENT CORPORATION, MANAGING AGENT, PUU HELEAKALA COMMUNITY ASSOCIATION

by David A. Ferguson
David A. Ferguson, Its President

DAF/df
cc: Rannie Henderson

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

WALLACE MIYAHIRA
DIRECTOR AND CHIEF ENGINEER

R 77-434

July 19, 1977

Mr. David A. Ferguson
Ferguson Management Corporation
Suite 1106, Financial Plaza of
the Pacific
Honolulu, HI 96813

Dear Mr. Ferguson:

Subject: Leeward Sanitary Landfill
Environmental Impact Statement
Preparation Notice

Thank you for informing us of the action taken by the Board of Directors of the Puu Haleakala Community Association. Their concerns are being considered in preparing the Environmental Impact Statement.

We will include the Puu Haleakala Community Association on our mailing list.

Very truly yours,

Wallace Miyahira

WALLACE MIYAHIRA
Director and Chief Engineer

770 5073

"REPRESENTING ALL THE PEOP. OF WAIPAHU"

Waipahu Community Association

HONOLULU SAVINGS AND LOAN BUILDING
94-229 WAIPAHU DEPOT STREET
WAIPAHU, HAWAII 96797
TELEPHONE 677-4950

DEPT OF PUBLIC WORKS
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TO Envl Mgt

Div. Chief
Asst. Chief
Div. Engr.
DO Engr.
Ins. Supt.
Safety
Planner

June 30, 1977

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DIVISION OF REFUSE
COLLECTION & DISPOSAL

Mr. Wallace Miyahira
Director and Chief Engineer
Department of Public Works
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Miyahira,

The Waipahu Community Association has the following points and questions relating to the "Environmental Impact Statement Preparation Notice for Leeward Sanitary Landfill":

1. Are there any plans for the use of the landfill site once it is filled with refuse?

2. We find it hard to believe that out of all the sites considered for a leeward landfill, one of the three sites with the highest potential would cost $64 million (Kaloi Gulch). How many sites were considered in the beginning?

3. How long would leachnate material remain dangerous to groundwater resources? What has been the long term performance of the impervious membrane proposed to be used at the Kaloi site?

4. How many more years is the Waipahu Incinerator expected to remain active? (We request that the final EIS summarize the City's latest Solid Waste Management Plan. It would be useful to see the leeward landfill proposal have an overall perspective. Please also discuss your resource recovery plans as well in your final EIS.)

Sincerely yours,

Diane M. Akau

Diane M. Akau
President

aam

COMPRISING OF:
Crestview/Seaview Association, D. O. E. - Leeward District, Friends of Waipahu Cultural Garden Park, Harbor View Neighborhood Association, Leeward Community College, Oahu Sugar Company, Robinson Heights Association, Waiau Neighborhood Association, Waiau Rise Association, the Association for the Elderly, Waipahu Businessmen's Association, Waipahu Homeowners Association, Waipahu Jackrabbits, Waipahu

---

R 77-47-7

August 11, 1977

Ms. Diane M. Akau
President
Waipahu Community Association
Honolulu Savings & Loan Bldg.
94-229 Waipahu Depot Street
Waipahu, HI 96797

Dear Ms. Akau:

Subject: Leeward Sanitary Landfill
Environmental Impact Statement
Preparation Notice

Thank you for responding to the subject preparation notice.

We will address your concerns in the draft of the environmental impact statement.

Very truly yours,

WALLACE MIYAHIRA
Director and Chief Engineer

cc: Chew Lun Lau
EISC

Makakilo Community Association

August 12, 1977

RECEIVED
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DIVISION OF REFUSE
COLLECTION & DISPOSAL

Mr. Robert Young
Assistant Chief, Refuse Division
City and County of Honolulu
Honolulu, Hawaii 96813

Dear Mr. Young:

The following thoughts and comments are provided in response to your letter of June 22, 1977, subject: E.I.S. Preparation Notice for Leeward Sanitary Landfill.

First, The Makakilo Community Association does not favor the creation of sanitary landfills as a means for solving waste disposal problems. As you know, Makakilo is adjacent to the privately operated Palailai Landfill. This has affected the AESTHETIC beauty of our area, the real property values of our community, and the morale of our residents. Another "dump" in our area would be intolerable.

Second, we recognize the need for solid waste disposal, however, with the fragile ecological balance of Hawaii in jeopardy from increasing dependence on throw away items, we feel that other approaches should be examined.

We are aware that other forms of waste disposal are currently being used by mainland cities such as Milwaukee and Baltimore. One such system, called "Americology" by American Can Company, was demonstrated to City officials about two years ago. A brochure describing that system is provided for your information.

The Community Association endorses any system that will recover and recycle solid wastes and opposes all temporary measures such as landfills. The landfill concept is illogical in our environment.

We look forward in working with your office to find a solution to this complex problem.

Very truly yours,

WALLY INOUYE
President

Enclosure

cc: Oahu Sugar Co., Ltd.
P. O. Box "O"
Waipahu, Hawaii 96797

H.S.P.A.
99-193 Aiea Hts. Dr.
Aiea, Hawaii 96701

Waipahu Community Association
c/o Waipahu Satellite City Hall
94-300 Farrington Hwy.
Waipahu, Hawaii 96797

Ewa Beach Community Association
c/o Ewa Beach Satellite City Hall
91-923 Ft. Weaver Road
Ewa Beach, Hawaii 96706

Nanakuli Community Association
c/o Waianae Sattelite City Hall
85-555 Farrington Hwy.
Waianae, Hawaii 96792

R 77-601

October 18, 1977

Mr. Wallace Inouye, President
Makakilo Community Association
92-650 Aoloko Street
Ewa Beach, HI 96706

Dear Mr. Inouye:

Subject: EIS Preparation Notice for the
Leeward District Sanitary Landfill Project

Thank you for commenting on our EIS Preparation Notice. Our environmental impact statement will discuss the resource recovery alternative as well as the usual impact and aesthetics of the proposed project.

We also wish to thank you for the opportunity to explain the City's solid waste disposal program to your members at the association's October 6, 1977 meeting.

Very truly yours,

FOR WALLACE MIYAHIRA
Director and Chief Engineer

cc: EISC

SECTION 12

AGENCIES AND ORGANIZATIONS INCLUDED IN THE EIS REVIEW PROCESS

The following agencies and organizations commented on the EIS during the review period. Comments and the corresponding responses are included in the order presented in the list.

FEDERAL

U.S. Airforce, 15th Air Base Wing

U.S. Army, Corps of Engineers

U.S. Army, Directorate of Facilities Engineering

U.S. Army, Directorate Health Services

U.S. Department of Agriculture, Soil Conservation Service

U.S. Department of the Interior, Fish and Wildlife Service

U.S. Navy

STATE OF HAWAII

Department of Accounting and General Services

Department of Agriculture

Department of Defense

Department of Land & Natural Resources

Department of Planning and Economic Development

Department of Social Service and Housing

Department of Transportation

Office of Environmental Quality Control

University of Hawaii, Environmental Center

University of Hawaii, Water Resources Research Center

CITY AND COUNTY OF HONOLULU

Board of Water Supply

Department of Housing and Community Development

Department of Land Utilization

Department of Parks and Recreation

Department of Transportation Services

OTHER

Campbell Estate

Ferguson Management Corp.

Hawaiian Electric Company

Oahu Sugar Company, Ltd.

Security Pacific Mortgage Corp.

The Hawaii Corporation

Waipahu Community Association

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 15TH AIR BASE WING (PACAF)
HICKAM AIR FORCE BASE, HAWAII 96853

REPLY TO ATTN OF: DEEV (Mr. Nakashima, 4491831)

17 NOV 1977

SUBJECT: Environmental Impact Statement (EIS) for the Proposed Leeward Sanitary Landfill, Oahu, Hawaii

TO: Mayor, City and County of Honolulu
Dept of General Planning
Honolulu Municipal Building
Honolulu, Hawaii 96813

1. This headquarters has reviewed the subject EIS and has no comment to render relative to the proposed project.

2. We greatly appreciate your cooperative efforts in keeping the Air Force apprised of your project and thank you for the opportunity to review the EIS.

ROBERT Q. K. CHING
Chief, Engineering, Construction
and Environmental Planning Div
Directorate of Civil Engineering

Cy to: Dept of Public Works
City and County of Honolulu
Honolulu Municipal Bldg.
Honolulu, Hawaii 96813

12-13

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

WALLACE MIYAHIRA
DIRECTOR AND CHIEF ENGINEER

R 78-270

April 13, 1978

Mr. Robert Q. K. Ching
Chief, Engineering, Construction
and Environmental Planning Division
Directorate of Civil Engineering
Headquarters 15th Air Base Wing (PACAF)
Department of the Air Force
Hickam Air Force Base, Hawaii 96853

Dear Mr. Ching:

SUBJECT: LEEWARD SANITARY LANDFILL
ENVIRONMENTAL IMPACT STATEMENT

Thank you for your review of the subject Environmental Impact Statement.

Very truly yours,

FOR WALLACE MIYAHIRA
Director and Chief Engineer

dmr

cc: Office of Environmental Quality Control
Dept. of Land Utilization

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

PODED-PV

Mr. Wallace Miyahira
Department of Public Works
City and County of Honolulu
Honolulu Municipal Building
Honolulu, Hawaii 96813

Dear Mr. Miyahira:

We have reviewed the Environmental Impact Statement for the Propo
Leeward Sanitary Landfills at Kaloi Gulch, Makaiwa Gulch and Nanaku
We commend your interest and efforts in identifying leachate contami
of groundwaters as a potential environmental problem and in institutin
monitoring program to determine the need to develop a leachate collect
system. We assume that a monitoring program will also be incorporated
with the leachate collection system at the Kaloi site.

As you are aware federal guidelines in Flood Plain Management requires flood damage prevention planning for a base flood, normally the 100-year flood. As a consequence, the effects of the sanitary landfills on the 100-year floodplain and flood levels, and the effects of flooding on the sanitary landfills should be evaluated to prevent and minimize potential flood damages, soil erosion, littering and pollution of downstream waters and properties. It appears that any large flood at the Makaiwa and Kaloi Gulch could cause erosion and subsequent downstream problems, and that the Nanakuli Site A encroaches upon the flood plain of Ulehawa Stream.

Based upon your information that the streams in all project areas are intermittent, the construction of drainage structures in the streams will not require Department of the Army Permits.

We thank you for the opportunity to review and comment on the environmental statement.

Sincerely yours,

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

WALLACE MIYAHIRA
DIRECTOR AND CHIEF ENGINEER

R 78-264

April 13, 1978

Colonel F. M. Pender
District Engineer
Corps of Engineers
U. S. Army Engineer District,
Honolulu
Department of the Army
Building 230
Fort Shafter, Hawaii 96858

Dear Colonel Pender:

SUBJECT: LEEWARD SANITARY LANDFILL
ENVIRONMENTAL IMPACT STATEMENT

Thank you for your comments on the subject Environmental Impact Statement. Our responses are presented in the order of your comments:

Leachate Monitoring
Should the Kaloi Gulch site be selected for a landfill, a monitoring program will be incorporated with the leachate collection system.

Flood Plain Management
Thank you for informing us that the Nanakuli Site A encroaches upon the flood plain of Ulehawa Stream. After the selection of the Leeward District Sanitary Landfill site, a detailed engineering study will be performed for the site during the design phase. This study will include an evaluation of drainage/flood requirements. The final design of the landfill will provide for these requirements. Improvements will be constructed to prevent potential flood damage, soil erosion, littering and pollution of downstream properties.

We appreciate your thorough review of the EIS.

Very truly yours,

WALLACE MIYAHIRA
Director and Chief Engineer

ls

cc: Office of Environmental Quality Control
Stanley Shimabukuro & Associates, Incorporated
Dept. of Land Utilization

DEPARTMENT OF THE ARMY
HEADQUARTERS UNITED STATES ARMY SUPPORT COMMAND, HAWAII
FORT SHAFTER, HAWAII 96858

AFZV-FE-EE

NOV 02 1977

Office of the Governor
State of Hawaii
Environmental Quality Commission
550 Halekauwila Street, Room 301
Honolulu, Hawaii 96813

Gentlemen:

We have reviewed the Environmental Impact Statement for the Leeward Sanitary Landfill and have no comments at this time.

We appreciate the opportunity to review the document, and if we can be of further assistance, please feel free to call us.

Sincerely,

CARL P. RODOLPH
Colonel, CE
Director of Facilities Engineering

Copies furnished:
Department of General Planning
City and County of Honolulu
Honolulu Municipal Building
Honolulu, Hawaii 96813

Department of Public Works
City and County of Honolulu
Honolulu Municipal Building
Honolulu, Hawaii 96813

12-6

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

WALLACE MIYAHIRA
DIRECTOR AND CHIEF ENGINEER

R 78-268

April 13, 1978

Colonel Carl P. Rodolph, CE
Director of Facilities
Engineering
Headquarters United States
Army Support Command,
Hawaii
Department of the Army
Fort Shafter, Hawaii 96858

Dear Colonel Rodolph:

SUBJECT: LEEWARD SANITARY LANDFILL
ENVIRONMENTAL IMPACT STATEMENT

Thank you for your review of the subject Environmental Impact Statement.

Very truly yours,

FOR WALLACE MIYAHIRA
Director and Chief Engineer

dmr

cc: Office of Environmental Quality Control
Dept. of Land Utilization

GEORGE R. ARIYOSHI
GOVERNOR

STATE OF HAWAII
ENVIRONMENTAL QUALITY COMMISSION
OFFICE OF THE GOVERNOR
550 HALEKAUWILA ST
ROOM 301
HONOLULU, HAWAII 96813

ALBERT D. TOM
CHAIRMAN

TELEPHONE NO.
548-6915

October 21, 1977

Dear Reviewer:

Attached for your review is an Environmental Impact Statement (EIS) prepared pursuant to Chapter 343, Hawaii Revised Statutes and its Rules and Regulations:

Title - Leeward Sanitary Landfill
Location - (Makaiwa Gulch, Kaloi Gulch & Nanakuli Sites), Oahu
Classification - Agency Action

We would appreciate your comments or acknowledgement of no comments. Please submit one copy each to:

1) Accepting Authority: Mayor, C&C of Hon. (Dept. of General Services, C&C of Hon.)
Address: Honolulu Municipal Bldg.
Honolulu, HI 96813

2) Proposing Party: Dept. of Public Works, C&C of Honolulu
Address: Honolulu Municipal Building
Honolulu, HI 96813

Your comments must be received or postmarked by: Nov. 22, 1977

If you have no future use for this document, please return the EIS to the Commission. (Comments or acknowledgement of no comments should be directed to both the accepting authority and proposing party.

Thank you for your participation and cooperation in the EIS process!

---

16 November 1977

No comment.

Patricia A. Greene
PATRICIA A. GREENE
Colonel, ANC
Chief, Health and Environment Activity
Directorate of Health Services, USASCH

12-7

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

WALLACE MIYAHIRA
DIRECTOR AND CHIEF ENGINEER

R 78-267

April 13, 1978

Colonel Patricia A. Greene, ANC
Chief, Health and Environment Activity
Directorate of Health Services, USASCH
Tripler ANC, Hawaii 96859

Dear Colonel Greene:

SUBJECT: LEEWARD SANITARY LANDFILL ENVIRONMENTAL IMPACT STATEMENT

Thank you for your review of the subject Environmental Impact Statement.

Very truly yours,

for WALLACE MIYAHIRA
Director and Chief Engineer

dmr

cc: Office of Environmental Quality Control
Dept. of Land Utilization

cc: Dept. of General Planning

P. O. Box 50004, Honolulu, HI 96850

November 1, 1977

Environmental Quality Commission
Office of the Governor
550 Halekauwila St., Room 301
Honolulu, HI 96813

Gentlemen:

Subject: Environmental Impact Statement for the Proposed Leeward Sanitary Landfill, Makaiwa, Kaloi and Nanakuli Sites, Oahu

We have reviewed the EIS and have no comments to offer on the proposed project. The EIS is returned.

Thank you for the opportunity to review this document.

Sincerely,

Jack P. Kanalz
State Conservationist

Enclosure

cc:
Department of General Planning, C&C of Honolulu
Department of Public Works, C&C of Honolulu

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

WALLACE MIYAHIRA
DIRECTOR AND CHIEF ENGINEER

R 78-258

April 13, 1978

Mr. Jack P. Kanalz
State Conservationist
Soil Conservation Service
United States Department
of Agriculture
P.O. Box 50004
Honolulu, Hawaii 96850

Dear Mr. Kanalz:

SUBJECT: LEEWARD SANITARY LANDFILL
ENVIRONMENTAL IMPACT STATEMENT

Thank you for your review of the subject Environmental Impact Statement.

Very truly yours,

WALLACE MIYAHIRA
Director and Chief Engineer

dmr

cc: Office of Environmental Quality Control
Dept. of Land Utilization

Division of Ecological Services
300 Ala Moana Blvd., Rm. 9202
P. O. Box 50167
Honolulu, Hawaii 96850

Reference: ES

November 28, 1977

Environmental Quality Commission
State of Hawaii
550 Halekauwila Street, Rm. 301
Honolulu, Hawaii 96813

Re: Leeward Sanitary
Landfill - EIS
Oahu

Dear Sir:

This responds to the request for comments, dated 21 October 1977, concerning subject EIS as proposed by the Department of Public Works, City and County of Honolulu.

The project consists of site selection and construction of a major sanitary landfill to meet the needs of a serious waste disposal problem in leeward Oahu.

We have reviewed the EIS with regard to fish and wildlife resources within the three proposed alternative sites and believe it adequately addresses our concerns. We have confirmed the absence of endangered plants and animals at each site.

We do not recommend Kolei Gulch as a potential sanitary landfill site. Leachate intrusion and potential groundwater pollution problems could occur. Makaiwa Gulch and Nanakuli sites would essentially be free of such problems.

With regard to Makaiwa Gulch and Nanakuli sites, we understand that adequate drainage system will be installed. However, nothing was stated about erosion control. In order to minimize erosion during and after construction, we suggest the following:

1. Provide for erosion control in the site development plan.

2. Grade at a minimum and remove only undesireable trees wherever possible.

3. Do not leave bare areas uncovered for long periods. Sod as soon as possible.

We appreciate the opportunity to comment.

Sincerely yours,

Maurice H. Taylor
Field Supervisor

cc: EA
Dept. of Public Works, C&C of Honolulu

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

WALLACE MIYAHIRA
DIRECTOR AND CHIEF ENGINEER

R 78-265

April 13, 1978

Mr. Maurice H. Taylor
Field Supervisor
Division of Ecological Services
U. S. Department of Interior,
Fish and Wildlife Service
P.O. Box 50167
Honolulu, Hawaii 96850

Dear Mr. Taylor:

SUBJECT: LEEWARD SANITARY LANDFILL
ENVIRONMENTAL IMPACT STATEMENT

Thank you for your comments on the subject Environmental Impact Statement. We note that you have confirmed the absence of endangered plants and animals at each site and that you have recommended that the Kaloi Gulch site should not be used as a sanitary landfill site.

Your suggestions to minimize erosion during and after construction are much appreciated. These erosion control measures will be incorporated into the construction plans for the project and into the operational procedures for the landfill.

Thank you for participating in the review of the EIS document.

Very truly yours,

WALLACE MIYAHIRA
Director and Chief Engineer

ls

cc: Office of Environmental Quality Control
Stanley Shimabukuro & Associates
Department of Land Utilization

HEADQUARTERS
FOURTEENTH NAVAL DISTRICT
BOX 110
FPO SAN FRANCISCO 96610
Pearl Harbor, Hawaii 96860

IN REPLY REFER TO
002:09F:SH:mm
Ser 2386

Mr. Wallace Miyahira
Director and Chief Engineer
Department of Public Works
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Miyahira:

Environmental Impact Statement (EIS)
Leeward Sanitary Landfill

The subject EIS, which was forwarded by a letter of the Office of Environmental Quality Control of October 21, 1977 has been reviewed, and the following comments are submitted:

a. As stated in our earlier letter of 8 February 1977, published in the Section 11 of the EIS, the U.S. Navy objects to a sanitary landfill operation in Kaloi Gulch as the danger of contamination of the basal groundwater which supplies Naval Air Station, Barbers Point would be great. The problem of leachate should be a major determining factor in site selection.

b. An examination has been made of two studies that discuss the potential for leachate in the Kaloi Gulch site. The first is "Hydrogeologic and Soils Study of Proposed Sanitary Landfills for Leeward and Windward Oahu" (Bowles and Mink, 1977). The second is "Leachate Study Landfill Inventory Study" (EMCON Associates, 1977).

c. The first study indicates that leachate from the Kaloi landfill could contaminate the water tunnel. The second study maintains that due to the low rainfall in the Kaloi, Makaiwa, and Nanakuli areas, no leachate is expected to be produced. This second study admits to the difficulties of leachate prediction due to its various nature and suggests that because of the moderately permeable nature of the underlying bedrock materials that there is a high probability of gas migration.

d. The U.S. Navy continues its objection to the Kaloi Site as the least desirable of the three under consideration and recommends selection of the Makaiwa or Nanakuli Landfill Sites as not adversely effecting Navy interests in the area.

The delay in providing reply by 22 November 1977 has been necessary in order to secure and analyze the two reports cited in b.

Thank you for the opportunity to review this EIS and register objection to the Kaloi Landfill Site.

Sincerely,

R. P. [illegible]
CAPTAIN, CEC, USN
DISTRICT CIVIL ENGINEER
BY DIRECTION OF THE COMMANDANT

Copy to:
Department of General Planning
City and County of Honolulu
Honolulu Municipal Building
Honolulu, HI 96813

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

WALLACE MIYAHIRA
DIRECTOR AND CHIEF ENGINEER

R 78-266

April 13, 1978

12-12

Captain R. P. Nystedt, CEC, USN
District Civil Engineer
Headquarters, Fourteenth
Naval District
P.O. Box 110
Pearl Harbor, Hawaii 96860

Dear Captain Nystedt:

SUBJECT: LEEWARD SANITARY LANDFILL
ENVIRONMENTAL IMPACT STATEMENT

Thank you for commenting on the subject Environmental Impact Statement. We wish to acknowledge your continuing objection to the use of the Kaloi site for sanitary landfill purposes. Your objections are based on the danger of contamination of basal groundwater which supplies the Naval Air Station at Barber's Point. We also wish to acknowledge your recommendation of either the Nanakuli site or the Makaiwa site for landfill use. Your concerns will be so indicated in the Revised EIS.

We appreciate your thorough evaluation of the environmental aspects of this document.

Very truly yours,

WALLACE MIYAHIRA
Director and Chief Engineer

ls

cc: Office of Environmental Quality Control
Dept. of Land Utilization

12-13

GEORGE R. ARIYOSHI
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF ACCOUNTING AND GENERAL SERVICES
P.O. BOX 119, HONOLULU, HAWAII 96810

HIDEO MURAKAMI
COMPTROLLER

MIKE N. TOKUNAGA
DEPUTY COMPTROLLER

LETTER NO. (P)2204.7

NOV 17 1977

Dr. Richard E. Marland
Director
Office of Environmental
Quality Control
550 Halekauwila Street, Room 301
Honolulu, Hawaii

Dear Dr. Marland:

Subject: EIS for Leeward Sanitary Landfill

Our review of the subject document showed that any of the three sites being considered for the landfill project will not have adverse environmental impact on any existing or planned facilities serviced by our department.

Thank you for this opportunity to comment.

Very truly yours,

HIDEO MURAKAMI
State Comptroller

cc: Mayor, C&C of Honolulu
Dept. of Public Works, C&C of Honolulu

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

WALLACE MIYAHIRA
DIRECTOR AND CHIEF ENGINEER

R 78-261

April 13, 1978

Mr. Hideo Murakami
State Comptroller
Department of Accounting and
General Services
State of Hawaii
P.O. Box 119
Honolulu, Hawaii 96810

Dear Mr. Murakami:

SUBJECT: LEEWARD SANITARY LANDFILL
ENVIRONMENTAL IMPACT STATEMENT

Thank you for informing us that the sites we are considering for the proposed landfill project will not have adverse environmental impact on existing or planned facilities serviced by your department.

Very truly yours,

FOR WALLACE MIYAHIRA
Director and Chief Engineer

ls

cc: Office of Environmental Quality Control
Dept. of Land Utilization

GEORGE R. ARIYOSHI
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF AGRICULTURE
1428 SO. KING STREET
HONOLULU, HAWAII 96814

November 15, 1977

JOHN FARIAS, JR.
CHAIRMAN, BOARD OF AGRICULTURE

YUKIO KITAGAWA
DEPUTY TO THE CHAIRMAN

BOARD MEMBERS:

ERNEST F. MONGADO
MEMBER-AT-LARGE

Sidney Goo
MEMBER-AT-LARGE

SHIZUTO KADOTA
HAWAII MEMBER

STEPHEN Q. L. AU
KAUAI MEMBER

FRED M. OGASAWARA
MAUI MEMBER

MEMORANDUM

To: Environmental Quality Commission
Office of the Governor

Subject: EIS - Proposed Leeward Sanitary Landfill
Kaloi TMK: 9-02, 03 & 04
Makaiwa 9-2-03
Nanakuli 8-7-9: 1 & 3
8-7-21: 26

The Department of Agriculture has reviewed the subject document and has no recommendation to offer.

We appreciate the opportunity to comment.

JOHN FARIAS, JR.
Chairman, Board of Agriculture

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

WALLACE MIYAHIRA
DIRECTOR AND CHIEF ENGINEER

R 78-255

April 13, 1978

Mr. John Farias, Jr.
Chairman, Board of Agriculture
Department of Agriculture
State of Hawaii
1428 South King Street
Honolulu, Hawaii 96814

Dear Mr. Farias:

SUBJECT: LEEWARD SANITARY LANDFILL
ENVIRONMENTAL IMPACT STATEMENT

Thank you for your review of the subject Environmental Impact Statement.

Very truly yours,

WALLACE MIYAHIRA
Director and Chief Engineer

dmr

cc: Office of Environmental Quality Control
Dept. of Land Utilization

GEORGE R. ARIYOSHI
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF DEFENSE
OFFICE OF THE ADJUTANT GENERAL
FORT RUGER, HONOLULU, HAWAII 96816

VALENTINE A. SIEFERMANN
MAJOR GENERAL
ADJUTANT GENERAL

HIENG

27 OCT 1977

Mr. Donald Bremner, Chairman
Environmental Quality Commission
550 Halekauwila Street, Room 301
Honolulu, Hawaii 96813

Dear Mr. Bremner:

Leeward Sanitary Landfill
Makaiwa Gulch, Kaloi Gulch & Nanakuli Sites

Thank you for sending us a copy of the "Leeward Sanitary Landfill" Environmental Impact Statement. As requested by your October 21, 1977 letter, the attached document is returned for your use.

Yours truly,

WAYNE R. TOMOYASU
Captain, CE, HARNG
Contr & Engr Officer

Enclosure

12-15

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

WALLACE MIYAHIRA
DIRECTOR AND CHIEF ENGINEER

R 78-269

April 13, 1978

Captain Wayne R. Tomoyasu
CE, HARNG
Contracting and Engineering Officer
Office of the Adjutant General
Department of Defense
State of Hawaii
Ft. Ruger, Honolulu, Hawaii 96816

Dear Captain Tomoyasu:

SUBJECT: LEEWARD SANITARY LANDFILL
ENVIRONMENTAL IMPACT STATEMENT

Thank you for your review of the subject Environmental Impact Statement.

Very truly yours,

FOR WALLACE MIYAHIRA
Director and Chief Engineer

dmr

cc: Office of Environmental Quality Control
Dept. of Land Utilization

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII

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

W. Y. THOMPSON, Chairman
BOARD OF LAND & NATURAL RESOURCES

EDGAR A. HAMASU
DEPUTY TO THE CHAIRMAN

DIVISIONS
CONVEYANCES
FISH AND GAME
FORESTRY
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

November 14, 1977

12-16

Honorable Frank F. Fasi
Mayor of Honolulu
Honolulu Hale
Honolulu, HI

Dear Sir:

We have reviewed the EIS for a proposed landfill for leeward Oahu.

On page 3-1 appears a statement that to use the Makaiwa Gulch site, a special use permit must be obtained from this department. This is in error. The permit should be obtained from the Land Use Commission. The same error appears in a discussion of the Nanakuli site.

The discussion of the Makaiwa site does not contain detailed data on the probable effect on a proposed amusement park in a neighboring gulch. Site specific data on wind are needed.

The question of fire hazard and nuisance -- a recurring event at landfill sites -- is not covered adequately. The alternative sites are all surrounded by vegetation with high fire potential and control measures, such as a perimeter road, must be planned.

Natural revegetation of the fills cannot be counted on because soil temperatures will be higher than usual. An agressive revegetation scheme, taking soil conditions and site specific temperatures into account, is suggested.

If cover material is to be brought in, a discussion should also be included about the impact of borrow sites.

We are concerned about the lack of site specific data on runoff. The three sites have different topography, soils and watershed characteristics. Waste material and choice of cover material will also affect runoff at the site. We think more details are needed.

Among the groups to be consulted, we suggest: Hawaiian Electric Co., Leeward Neighborhood Board, and the Nanakuli Community Association.

Very truly yours,

W. Y. Thompson

W. Y. THOMPSON
Chairman of the Board

cc: C&C/Public Works

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

WALLACE MIYAHIRA
DIRECTOR AND CHIEF ENGINEER

R 78-263

April 13, 1978

12-17

Mr. W. Y. Thompson
Chairman of the Board
Department of Land and Natural
Resources
State of Hawaii
P. O. Box 621
Honolulu, Hawaii 96809

Dear Mr. Thompson:

SUBJECT: LEEWARD SANITARY LANDFILL
ENVIRONMENTAL IMPACT STATEMENT

Thank you for your comments on the subject Environmental Impact Statement. Our responses are presented in the same order as your comments.

Corrections will be made in the Revised EIS concerning special use permit applications for the Makaiwa and Nanakuli sites.

Discussion on potential impacts at the Makaiwa site are in Section 4 of the EIS. The impacts presented in this section for Makaiwa would be applicable for the proposed Amusement Park in the neighboring gulch. Of these impacts, the ones of most concern relate to dust, noise and odor. But even these would have minimal impact because of the distance (1/2 mile) separating the 2 sites. Also these nuisances will be kept under control by proper landfill operations. Dust will be minimized by regular intervals of water sprinkling. Odor will be removed through application of extra cover material and rapid continuous coverage of raw waste. Noise should not be a problem since the landfill site is in excess of 2500' away from the proposed park. Also, the landfill will not be seen from the proposed park project.

Fires usually occur at open dumps when burning of waste was previously permitted. Fires are not a recurring problem at properly operated sanitary landfills. A fire is most likely to occur at the working face of the landfill, and this section will always be readily accessible. If a surface fire should occur, additional cover material will be added to smother the fire. If the fire is within a cell, the construction of the cell will allow the fire to burn out within the cell and not spread to other cells. Water can also be injected into the cell. All sites will have water facilities for fire control

Your suggestions on revegetation of the fills are much appreciated. We agree that a landscaping program taking into account soil conditions and site specific temperatures is needed and will be provided for.

If insufficient cover is available on-site, the City's practice is to purchase cover material. We believe that there is enough cover material available commercially to supply the City's needs. If the City plans to implement use of borrow sites, the City will prepare an environmental assessment at that time.

Runoff data and conceptual drainage schemes are shown on the development plans in the EIS (Makaiwa site on page 2-19, Nanakuli site on page 2-29 and 2-30, and Kaloi site on page 2-39). Additional information on the geology, hydrology and drainage for the Makaiwa site can be found in the EIS on pages 2-12 to 2-13, for the Nanakuli site on pages 2-24 to 2-26, and for the Kaloi site on pages 2-34 to 2-36. The main channels of the drainage system will be designed for a 50-year storm and the small diversion systems for a 10-year storm. The conceptual designs on the development plans will be reevaluated during the preparation of final plans when more data are available and adjustments can be made accordingly.

The Hawaiian Electric Company, Waianae Coast Neighborhood Board and the Nanakuli Community Association were all consulted for their input on this project.

We appreciate your thorough evaluation of the EIS document.

Very truly yours,

WALLACE MIYAHIRA
Director and Chief Engineer

ls

cc: Office of Environmental Quality Control
Dept. of Land Utilization

STATE OF HAWAII
DEPARTMENT OF PLANNING AND
ECONOMIC DEVELOPMENT
P.O. BOX 2359
HONOLULU, HAWAII 96804

November 14, 1977

Ref. No. 4967

Mr. Wallace Miyahira
Director and Chief Engineer
Department of Public Works
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Miyahira:

Subject: Environmental Impact Statement - Leeward Sanitary Landfill

We have reviewed the subject EIS and wish to offer the following comments for your consideration.

There seems to be considerable confusion within the text of the EIS as to whether Special Use Permits are acquired from the State Department of Land and Natural Resources, the State La d Use Commission or the Honolulu Planning Commission. For example, a comment made on page 3-1 states that "a State Special Use Permit must be obtained through the Department of Land and Natural Resources (DLNR)" while comments made on page 10-1 indicate that Special Use Permits are obtained from the State Land Use Commission and the Honolulu Planning Commission.

Pursuant to rules and regulations of the Land Use Commission, petitions for Special Permits in the Agricultural or Rural land use districts are first reviewed by the appropriate County planning commission, in this case the Planning Commission of the City and County of Honolulu. Upon approval by the Planning Commission, the petition for a Special Permit together with the Planning Commission's decision, are forwarded to the State Land Use Commission for its review and final action. Further, for portions of the project situated in the State Land Use Conservation District, a Conservation District Use Application (CDUA) must be approved by the Department of Land and Natural Resources. May we recommend that appropriate corrective and clarifying statements be made within the EIS to improve discussions on this matter.

We have no further comments to offer at this time but appreciate the opportunity to review and comment upon this project.

Sincerely,

HIDETO KONO

cc: Mr. Ramon Duran

12-19

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

WALLACE MIYAHIRA
DIRECTOR AND CHIEF ENGINEER

R 78-262

April 13, 1978

Mr. Hideto Kono
Director
Department of Planning and
Economic Development
State of Hawaii
P.O. Box 2359
Honolulu, Hawaii 96804

Dear Mr. Kono:

SUBJECT: LEEWARD SANITARY LANDFILL
ENVIRONMENTAL IMPACT STATEMENT

Thank you for commenting on the subject Environmental Impact Statement. From the information you have provided us, the text of the EIS will be corrected to show the correct procedures for obtaining Special Use Permits and for the filing of a Conservation District Use Application (CDUA).

Your participation in the review of the EIS is much appreciated.

Very truly yours,

WALLACE MIYAHIRA
Director and Chief Engineer

ls

cc: Office of Environmental Quality Control
Dept. of Land Utilization

GEORGE R. ARIYOSHI
GOVERNOR

ANDREW I. T. CHANG
DIRECTOR OF SOCIAL SERVICES & HOUSING

STATE OF HAWAII
DEPARTMENT OF SOCIAL SERVICES AND HOUSING
P. O. Box 339
Honolulu, Hawaii 96809

November 1, 1977

MEMORANDUM

TO: Environmental Quality Commission
550 Halekauwila St., Room 301
Honolulu, Hawaii 96813

FROM: Andrew I. T. Chang, Director
Department of Social Services and Housing

SUBJECT: Environmental Impact Statement,
Leeward Sanitary Landfill

Subject EIS has been reviewed for its impact on departmental programs.

We have no comment to make and we are returning the EIS for your usage.

Thank you for the opportunity to review and comment.

DIRECTOR

Attachment
cc: Mayor, C&C of Honolulu (Dept. of General Planning)
Dept. of Public Works, C&C of Honolulu

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

WALLACE MIYAHIRA
DIRECTOR AND CHIEF ENGINEER

R 78-256

April 13, 1978

Mr. Andrew I. T. Chang
Director
Department of Social Services
and Housing
State of Hawaii
P.O. Box 339
Honolulu, Hawaii 96809

Dear Mr. Chang:

SUBJECT: LEEWARD SANITARY LANDFILL
ENVIRONMENTAL IMPACT STATEMENT

Thank you for your review of the subject Environmental Impact Statement.

Very truly yours,

WALLACE MIYAHIRA
Director and Chief Engineer

dmr

cc: Office of Environmental Quality Control
Dept. of Land Utilization

GEORGE R. ARIYOSHI
GOVERNOR

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

E. ALVEY WRIGHT
DIRECTOR

DEPUTY DIRECTORS
WALLACE AOKI
RYOKICHI HIGASHIONNA
DOUGLAS S. SAKAMOTO
CHARLES O. SWANSON

IN REPLY REFER TO:

November 18, 1977

STP 8.4557

12-21

Office of Environmental
Quality Control
550 Halekauwila Street
Honolulu, Hawaii 96813

Gentlemen:

Subject: Leeward Sanitary Landfill

Thank you for giving us the opportunity to review the above-captioned EIS. We have no comments to offer which might improve the statement.

Sincerely,

E. Alvey Wright

E. ALVEY WRIGHT
Director

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

WALLACE MIYAHIRA
DIRECTOR AND CHIEF ENGINEER

R 78-257

April 13, 1978

Ryokichi Higashionna, Ph.D.
Director
Department of Transportation
State of Hawaii
869 Punchbowl Street
Honolulu, Hawaii 96813

Dear Dr. Higashionna:

SUBJECT: LEEWARD SANITARY LANDFILL
ENVIRONMENTAL IMPACT STATEMENT

Thank you for your Department's review of the subject Environmental Impact Statement.

Very truly yours,

WALLACE MIYAHIRA
Director and Chief Engineer

dmr

cc: Office of Environmental Quality Control
Dept. of Land Utilization

GEORGE R. ARIYOSHI
GOVERNOR

RICHARD E. MARLAND, PH.D.
DIRECTOR

TELEPHONE NO.
548-6915

STATE OF HAWAII
OFFICE OF ENVIRONMENTAL QUALITY CONTROL
OFFICE OF THE GOVERNOR
550 HALEKAUWILA ST.
ROOM 301
HONOLULU, HAWAII 96813

November 29, 1977

Mr. George Moriguchi, Director
Department of Land Utilization
City and County of Honolulu

SUBJECT: Environmental Impact Statement for the Proposed Leeward Sanitary Landfill, Oahu

Dear Mr. Moriguchi,

We have reviewed the EIS for the Proposed Leeward Sanitary Landfill. Copies of comments on the EIS which were sent to this Office are attached. We wish to offer the following comments for your consideration:

1. The location of the Keehi Transfer Station could be shown on Figure 1-10 (p.1-23).

2. Due to the lack of suitable cover material at the three proposed sites potential borrow sites were shown in Appendix C. There is apparently no discussion of the environmental impacts associated with the use of these borrow sites. We recommend that the potential impacts be identified along with each of the proposed landfill sites so as to obtain a total view of the impacts, and not just of the landfill sites alone.

3. On page 4-11 the statement, "...emissions that will be generated by vehicles should be significant..." appears incorrect. We suggest a clarification of this paragraph.

4. What might the noise level be at the outer edge of the buffer zone at the Nanakuli site (page 4-22)? We note that residences would be nearby and downwind from the proposed site.

5. The potential brush fire hazard should be recognized in the EIS.

6. The last sentence on page 4-28 reads, "odor mog present a short-term nuisance to residents of surrounding developments if a combination of highly organic refuse and warm weather occurs." Since these conditions appear to be quite probable, the nuisance mog prove to be of a duration greater than short-term.

7. How much longer would the landfill life be with the proposed resource recovery program in effect?

8. The potential use of the landfill sites for parks use is discussed in the EIS. If these parks are landscaped and irrigated, would not the possibility of leacheate production continue after the actual closing of the landfill?

9. There are numerous "if" statements in the text, as on page 4-31, concerning proper practices of landfill operation and the prevention of impacts. We wish to suggest that the EIS be more specific on what will be done rather than on what might be done.

10. Since no discription of plant species are provided in the discussion (p. 4-36) on the landscaped buffer, it is difficult to assess its potential effectiveness for noise and visual impact mitigation. Will the landscaped buffer be irrigated? Will the Makaiwa site be visible from the proposed resort developments at West Beach?

Thank you for allowing us to review this EIS. We trust that our comments will be useful in the preparation of the revised EIS for this project. We have not attempted to summarize the comments made by others on this EIS. Instead, we recommend that each comment be given careful consideration by yourself.

Sincerely,

/S/ Richard E. Marland

Richard E. Marland
Director

Attachments

cc: Dept. of Public Works
City and County of Honolulu
with attachments

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

WALLACE I. MIYAMINA
DIRECTOR AND CHIEF ENGINEER

R 78-254

April 13, 1978

12-23

Mr. Richard L. O'Connell
Director
Office of Environmental
Quality Control
State of Hawaii
550 Balekauwila Street
Room 301
Honolulu, Hawaii 96813

Dear Mr. O'Connell:

SUBJECT: LEEWARD SANITARY LANDFILL
ENVIRONMENTAL IMPACT STATEMENT

Thank you for your comments on the subject Environmental Impact Statement. Our responses are presented in the order of your comments:

1. The location of the Keehi Transfer Station will be shown on Figure 1-10 of the Revised EIS.

2. If insufficient suitable cover material is available on-site, the City's practice is to purchase the cover material. We believe that there is enough cover material available commercially to supply the City's needs. If the City plans to implement use of borrow sites in the future, the City will prepare a separate environmental assessment at that time.

3. Thank you for pointing out this error. We will make corrections in the Revised EIS.

4. At Nanakuli, the working surface will be about 300' away from the nearest residence. At this distance, landfill operational noise is expected to be from 60-66 dBA. This noise will be brought down to acceptable levels by installing a thick landscape buffer, earth berms or other types of noise barriers. When landfill areas adjacent to the residential area are completed, operational noise will be less noticeable.

5. The potential of brush fires will be recognized in the EIS. With proper landfill practices, including proper cover and proper cell construction, we do not anticipate that the landfill will be a contributing source to brush fires.

6. Proper landfilling procedures should prevent an odor problem. If odors are detectable in adjacent areas, the cover operation will be accelerated and more cover material would be used as necessary to remove any odors.

7. Most resource recovery processes can reduce the volume of solid waste to 10 percent of its original volume. Therefore, the total landfill life remaining will be increased appreciably by implementing resource recovery. Taking into account any unprocessable and demolition waste, we estimate that landfill life on the island can be increased 5 times.

8. The usual amount of water used in irrigation of landscaping should not produce leachate. The normal processes of evaporation and transpiration and the tremendous capacity of the landfill to absorb moisture (before field capacity is reached) will prevent the production of leachate from irrigation moisture.

9. The City's Department of Public Works will adhere to proper landfill procedures and construct necessary improvements to minimize landfill nuisances and problems. Section 4 of the EIS will be reviewed and revised to reflect this policy.

10. Many options are available as to plant and tree species which can be used for the landscaped buffer. These will be selected and specified in the final design plans of the landfill. The landscaped buffer will be irrigated.

The Makaiwa site will be visible from the proposed West Beach area, but the landscaping program and earth berms will mitigate potential visual impacts.

Thank you for your thorough evaluation of the EIS.

Very truly yours,

WALLACE MIYAHIRA
Director and Chief Engineer

ls

cc: Office of Environmental Quality Control
Dept. of Land Utilization

University of Hawaii at Manoa

Environmental Center
Crawford 317 - 2550 Campus Road
Honolulu, Hawaii 96822
Telephone (808) 948-7361

Office of the Director

MEMORANDUM

TO: Chairman
Environmental Quality Commission

FROM: Doak C. Cox, Director

SUBJECT: Review of Leeward Sanitary Landfill
Environmental Impact Statement

The Environmental Center has received the above EIS and will not take part in a formal review due to constraints in time and available personnel.

DCC/lmk

cc: Office of Environmental Quality Control
Department of Public Works ✓
Department of General Planning

AN EQUAL OPPORTUNITY EMPLOYER

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

WALLACE MIYAHIRA
DIRECTOR AND CHIEF ENGINEER

R 78-259

April 13, 1978

Doak C. Cox, Ph.D.
Director
Environmental Center
Crawford 317
2550 Campus Road
University of Hawaii
Honolulu, Hawaii 96822

Dear Dr. Cox:

SUBJECT: LEEWARD SANITARY LANDFILL
ENVIRONMENTAL IMPACT STATEMENT

Thank you for your response. We hereby acknowledge that you are unable to take part in a formal review of the subject Environmental Impact Statement.

Very truly yours,

PR WALLACE MIYAHIRA
Director and Chief Engineer

dmr

cc: Office of Environmental Quality Control
Dept. of Land Utilization

12-26

UNIVERSITY OF HAWAII

Water Resources Research Center

Office of the Director

November 22, 1977

Mr. Wallace Miyahira
Director & Chief Engineer
Department of General Planning
City and County of Honolulu
Honolulu, Hawaii 96813

Dear Mr. Miyahira:

We have reviewed the Leeward Sanitary Landfill EIS and have no comment on environmental concerns. It has been suggested, however, that the presentation in Section 7 could be improved by itemizing or tabulating the following:

a. Land area to be committed for landfill at each site.

b. Estimated life of each site in years.

c. Estimated percent of fill area filled per year compared against life of site, and how this might be altered if other feasible alternatives of handling and disposing solid waste are developed.

d. Site ownership information as well as land value at each site.

e. Need and source for cover material to operate and complete the site.

Thank you for the opportunity to participate in this review.

Sincerely,

Reginald H. F. Young
Asst. Director, WRRC

RHFY:jmn

cc: Env. Ctr
Y. S. Fok
Mayor, C&C of Honolulu

2540 Dole Street Honolulu Hawaii 96822

DEPARTMENT OF PUBLIC WORKS

CITY AND COUNTY OF HONOLULU

650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

WALLACE MIYAHIRA
DIRECTOR AND CHIEF ENGINEER

R 78-260

April 13, 1978

Mr. Reginald H. F. Young
Assistant Director
Water Resources Research Center
University of Hawaii
2540 Dole Street
Honolulu, Hawaii 96822

Dear Mr. Young:

SUBJECT: LEEWARD SANITARY LANDFILL
ENVIRONMENTAL IMPACT STATEMENT

Thank you for commenting on the subject Environmental Impact Statement. As you suggested, we will tabulate the information mentioned in items a to e inclusive in Section 7 of the Revised EIS. A copy of this tabulation is attached.

Your evaluation of the document is much appreciated.

Very truly yours,

WALLACE MIYAHIRA
Director and Chief Engineer

Attachment

ls

cc: Office of Environmental Quality Control
Dept. of Land Utilization

Synopsis

1. Land area to be committed for landfill at each site:

   a. Makaiwa Gulch Site - 338± acres, of which approximately 254± acres will be used for fill

   b. Nanakuli Site - 611± acres, of which 288± acres will be used for fill

   c. Kaloi Gulch Site - 400± acres, of which 265± acres will be used for fill

2. Estimated life of each site in years, based on 500 TPD disposal rate:

   a. Makaiwa Gulch Site - 31± years

   b. Nanakuli Site - 27.3± years

   c. Kaloi Gulch Site - 50± years

3. Estimated percent of fill area filled per year compared against life of site, and how this might be altered by resource recovery (based on 500 TPD):

	% Area Per Year	Resource Recovery by Waterwall Incineration
a. Makaiwa Gulch Site	3.2	.64
b. Nanakuli Site	3.7	.74
c. Kaloi Gulch Site	2	.4

4. Site ownership and estimated land value:

   a. Makaiwa Gulch Site:

      (1) Owner: J. Campbell Trust Estate, Hawaii Meat Co. lessee, Tongg Ranch, sublessee

      (2) Estimated land cost: $1,690,000

   b. Nanakuli Site:

      (1) Owner: Shigeru Horita, et al; The Hawaii Corp.; U.S. Financial, Inc.; Security Pacific Mortgage Corporation

      (2) Estimated land cost: Site A - $2,660,000
      Site B - $2,200,000

   c. Kaloi Gulch Site:

      (1) Owner: James Campbell Trust Estate (Oahu Sugar Co. and Hawaii Meat Co. lessee, Tongg Ranch, sublessee)

      (2) Estimated land cost: $2,000,000

5. Need for cover material:

   a. Makaiwa Gulch Site - very limited amount available on site; cover material to be purchased

   b. Nanakuli Site A - on site cover material available
      Nanakuli Site B - on site cover material available

   c. Kaloi Gulch Site - some cover material available on site, must purchase remainder

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA
HONOLULU, HAWAII 96843

FRANK F. FASI, Mayor
YOSHIE H. FUJINAKA, Chairman
STANLEY S. TAKAHASHI, Vice Chairman
FRED DAILEY
TERESITA R. JUBINSKY
WALLACE S. MIYAHIRA
DAT QUON PANG
C. ALVEY WRIGHT

EDWARD Y. HIRATA
Manager and Chief Engineer

November 21, 1977

TO: MR. RAMON DURAN,
ACTING CHIEF PLANNING OFFICER
DEPARTMENT OF GENERAL PLANNING

FROM: EDWARD Y. HIRATA

SUBJECT: ENVIRONMENTAL IMPACT STATEMENT FOR LEEWARD SANITARY LANDFILL

We reaffirm our concurrence with the selections of the Makaiwa Gulch and the Nanakuli sites for the Leeward Sanitary Landfill. In regard to the Waimanalo Gulch site, we believe it is a better alternative than the Kaloi Gulch site because of the lesser hazard to our potable ground water source.

If you should have any further questions on this matter, please call Lawrence Whang at 548-5221.

EDWARD Y. HIRATA
Manager and Chief Engineer

cc: Mr. Wallace Miyahira
Director and Chief Engineer
Dept. of Public Works

12-28

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

WALLACE MIYAHIRA
DIRECTOR AND CHIEF ENGINEER

R 78-253

April 13, 1978

Mr. Edward Y. Hirata
Manager and Chief Engineer
Board of Water Supply
City and County of Honolulu
630 South Beretania Street
Honolulu, Hawaii 96843

Dear Mr. Hirata:

SUBJECT: LEEWARD SANITARY LANDFILL
ENVIRONMENTAL IMPACT STATEMENT

Thank you for your review of the subject Environmental Impact Statement.

We acknowledge your reaffirmation of concurrence with the selections of the Makaiwa Gulch site or the Nanakuli site for the Leeward Sanitary Landfill. We also note your indication that the Waimanalo Gulch site would be a better alternative than the Kaloi Gulch site because of the lesser hazard to potable ground water sources.

Very truly yours,

for WALLACE MIYAHIRA
Director and Chief Engineer

ls

cc: Office of Environmental Quality Control
Dept. of Land Utilization

DEPARTMENT OF HOUSING AND COMMUNITY DEVELOPMENT
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813
PHONE 523-4181

FRANK F. FASI
MAYOR

RICHARD H. SHARPLESS
MANAGING DIRECTOR

TYRONE T. KUSAO
DIRECTOR

T. HARRY ENGO
DEPUTY DIRECTOR

November 18, 1977

State of Hawaii
Environmental Quality Commission
550 Halekauwila Street
Honolulu, Hawaii 96813

Gentlemen:

Subject: Leeward Sanitary Landfill
Environmental Impact Statement

We have reviewed the subject environmental impact statement and have no objections to the project.

Per your request, we are returning the copy of the environmental impact statement which was forwarded to us.

Sincerely,

TYRONE T. KUSAO
Director

Enclosure

cc: Dept. of Land Utilization
Dept. of Public Works
City and County of Honolulu

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

WALLACE MIYAHIRA
DIRECTOR AND CHIEF ENGINEER

R 78-252

April 13, 1978

TO : Mr. Tyrone T. Kusao, Director
Department of Housing and Community Development

FROM : WALLACE MIYAHIRA, DIRECTOR AND CHIEF ENGINEER

SUBJECT : LEEWARD SANITARY LANDFILL
ENVIRONMENTAL IMPACT STATEMENT

Thank you for your review of the subject Environmental Impact Statement.

WALLACE MIYAHIRA
Director and Chief Engineer

dmr

cc: Office of Environmental Quality Control
Dept. of Land Utilization

DEPARTMENT OF LAND UTILIZATION
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

GEORGE S. MORIGUCHI
DIRECTOR

LU10/77-6534(LC)
77/EC-9

November 22, 1977

MEMORANDUM

TO : MR. WALLACE MIYAHIRA, DIRECTOR & CHIEF ENGINEER
DEPARTMENT OF PUBLIC WORKS

FROM : GEORGE S. MORIGUCHI, DIRECTOR

SUBJECT: COMMENTS ON ENVIRONMENTAL IMPACT STATEMENT
FOR LEEWARD SANITARY LANDFILL

We have reviewed the Environmental Impact Statement for the Leeward Sanitary Landfill (October 1977).

Our comments relate specifically to Section 3, Relationship of the Proposed Action to Land Use Plans, Policies and Controls for the Area. We have the following comments:

1. Because of the close proximity of Honokai Hale residential subdivision to the Makaiwa site, we suggest that the community association be contacted and added to the list of consulted parties.

2. On pages 3.1 and 3.8, references to a State Special Use Permit are incorrect. The State Special Permit is obtained through the Department of Land Utilization and not the Department of Land and Natural Resources. This should be corrected. You may also wish to include the fact that the County Planning Commission is responsible for holding the required public hearing and has the final decision in case of a denial, but must receive concurrence of the State Land Use Commission in case of an approval. These facts should be consistently stated throughout Section 3.

We have no comments on some of the more technical aspects of the project, but this does not imply our concurrence with the analysis or conclusions drawn therefrom. Please contact Mrs. Lorrie Chee of our staff at 523-4077 if you should have any questions.

GEORGE S. MORIGUCHI
Director of Land Utilization

GSM:ey

12-30

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

WALLACE MIYAHIRA
DIRECTOR AND CHIEF ENGINEER

R 78-249

April 13, 1978

TO : MR. GEORGE S. MORIGUCHI, DIRECTOR
DEPARTMENT OF LAND UTILIZATION

FROM : WALLACE MIYAHIRA, DIRECTOR AND CHIEF ENGINEER

SUBJECT: LEEWARD SANITARY LANDFILL
ENVIRONMENTAL IMPACT STATEMENT

Thank you for your comments on the subject Environmental Impact Statement. Our responses are presented in the same order as your comments:

1. The Honokai Hale Community Association was informed of the availability of the EIS Preparation Notice and the EIS document for this project. No written comments were received from the association.

2. We will make the appropriate corrections about the State Special Permit in Section 3 and include the additional information you have provided.

We appreciate your evaluation of the EIS document.

for WALLACE MIYAHIRA
Director and Chief Engineer

cc: Office of Environmental
Quality Control
Dept. of Land Utilization

DEPARTMENT OF PARKS AND RECREATION
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

YOUNG SUK AO
DIRECTOR

FRANK F. FASI
MAYOR

November 2, 1977

Environmental Quality Commission
550 Halekauwila Street, Room 301
Honolulu, Hawaii. 96813

Gentlemen:

SUBJECT: ENVIRONMENTAL IMPACT STATEMENT FOR PROPOSED LEEWARD SANITARY LANDFILL SITE

We have reviewed the above and have no comments to render relative to the subject Environmental Impact Statement.

Sincerely,

ROBERT T. FUKUDA
ACTING DIRECTOR

cc: Department of Public Works

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

WALLACE MIYAHIRA
DIRECTOR AND CHIEF ENGINEER

R 78-251

April 13, 1978

TO : Mr. Robert T. Fukuda, Director
Department of Parks and Recreation

FROM : WALLACE MIYAHIRA, DIRECTOR AND CHIEF ENGINEER

SUBJECT : LEEWARD SANITARY LANDFILL
ENVIRONMENTAL IMPACT STATEMENT

Thank you for your review of the subject Environmental Impact Statement.

WALLACE MIYAHIRA
Director and Chief Engineer

dmr

cc: Office of Environmental Quality Control
Dept. of Land Utilization

D ARTMENT OF TRANSPORTATION SERV S

CITY AND COUNTY OF HONOLULU

HONOLULU MUNICIPAL BUILDING
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

KAZU HAYASHIDA
DIRECTOR

TE10/77-4516

November 16, 1977

Environmental Quality Commission
550 Halekauwila St., Room 301
Honolulu, Hawaii 96813

Gentlemen:

Environmental Impact Statement for Leeward Sanitary Landfill

We have reviewed the subject Environmental Impact Statement and are satisfied that traffic considerations have been adequately addressed.

Very truly yours,

for KAZU HAYASHIDA
Director

cc: Dept. of Gen. Planning
Dept. of Public Works

DEPARTMENT OF PUBLIC WORKS

CITY AND COUNTY OF HONOLULU

650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

WALLACE MIYAHIRA
DIRECTOR AND CHIEF ENGINEER

R 78-250

April 13, 1978

TO : Mr. Kazu Hayashida, Director
Department of Transportation Services

FROM : WALLACE MIYAHIRA, DIRECTOR AND CHIEF ENGINEER

SUBJECT : LEEWARD SANITARY LANDFILL
ENVIRONMENTAL IMPACT STATEMENT

Thank you for your review of the subject Environmental Impact Statement.

FOR WALLACE MIYAHIRA
Director and Chief Engineer

ls

cc: Office of Environmental Quality Control
Dept. of Land Utilization

THE ESTATE OF JAMES CAMPBELL

November 29, 1977

Department of Public Works
City and County of Honolulu
Honolulu Municipal Building
650 So. King Street
Honolulu, Hawaii 96813

Gentlemen:

Environmental Impact Statement
Leeward Sanitary Landfill

We appreciate the opportunity to review this document and offer the following comments:

Appendix C, "Cover Material Information," prepared by Bowles and Mink, 1977, states, "At neither Kaloi nor Makaiwa is there sufficient cover material to handle both the daily and final requirements. But, practically anywhere on the Ewa plain at elevations between 50 and 100 feet, lying within one mile of Makaiwa and three miles of Kaloi, a nearly inexhaustible supply of clayey sediments could be excavated.

There is, however, no discussion of the impacts which would result from the excavation and transportation of cover material needed for sanitary landfill operations. Such activities will have a major impact on land-form configuration, noise levels, drainage and water quality, agriculture and other economic factors. There will also be impacts after completion of excavation of the cover material. Sections 5, 6, 7 and 8 do not discuss re-use alternatives of the cover material sites.

While the EIS shows estimated site development costs, it does not estimate the cost of acquiring the landfill sites or for acquiring the lands needed to supply the cover material. These costs should be started as they do have an effect on the site selection process and on the operation of the landfill.

Alternative sources of cover material should be investigated and evaluated so that the best possible source can be selected. The sources of cover material which have been identified in the EIS do not appear to be realistic from a practical point of view.

We hope these comments will be of assistance in your review of this EIS.

Sincerely,

Willard Struka
Land Planning Manager

WS:ag

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

WALLACE MIYAHIRA
DIRECTOR AND CHIEF ENGINEER

R 78-271

April 13, 1978

Mr. Willard Stluka
Land Planning Manager
The Estate of James Campbell
Suite 500
828 Fort Street Mall
Honolulu, Hawaii 96813

Dear Mr. Stluka:

SUBJECT: LEEWARD SANITARY LANDFILL
ENVIRONMENTAL IMPACT STATEMENT

Thank you for your comments on the subject Environmental Impact Statement. Our responses are presented in the same order as your comments:

Borrow Sites for Cover Material

If insufficient suitable cover material is available on-site, the City's practice is to purchase cover. We believe that there is enough cover material available commercially to supply the City's needs. If the City plans to implement use of borrow sites in the future, the City will prepare a separate environmental assessment at that time.

Land Costs

The estimated costs for land acquisition are $2,000,000 for the Kaloi Gulch site, $1,690,000 for the Makaiwa Gulch site, and $4,860,000 for the Nanakuli site. The costs of land acquisition or lease will be finalized after appraisals of the selected site have been completed. The actual cost of acquisition or lease will depend on the outcome of negotiations with the land owner or eminent domain proceedings.

Since suitable borrow sites nearby are apparently unavailable, the City is not contemplating purchase or lease of borrow sites at this time. Additional cover, if required, will be purchased on the open market. The comparative cost analysis shown in Table 2-2 takes into account the availability of on site cover materials versus purchase of cover material.

Your participation in the evaluation of the document is much appreciated

Very truly yours,

WALLACE MIYAHIRA
Director and Chief Engineer

ls

cc: Office of Environmental Quality Control
Dept. of Land Utilization

ferguson management corporation
SUITE 1106, FINANCIAL PLAZA OF THE PACIFIC, HONOLULU, HAWAII 96813 TELEPHONE (808) 521-0381

December 21, 1977

Mr. Wallace Miyahira, Chief Engineer
Department of Public Works
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Miyahira:

Re: Proposed Leeward District Sanitary Landfill.

Ferguson Management Corporation is the Managing Agent for the Puu Heleakala Community Association, a 236 unit PD-H located adjacent to the proposed Nanakuli site.

The Board of Directors of the Association has reviewed the Environmental Impact Statement for the Leeward District Sanitary Landfill and discussed the matter at a special meeting of the Association.

The Board of Directors reiterates its opposition to the selection of the Nanakuli site for the Leeward District Sanitary Landfill as this proposed site: 1) borders the Mauka edge of our property; 2) is incompatible with the existing residential use; and 3) the community is downwind of the proposed site during prevailing trade-wind conditions.

The members of the Association attending the special meeting concurred with the Board's position and expressed concern about the adverse environmental impact of a landfill operation immediately adjacent to their homes.

We strongly urge that the Nanakuli site not be selected due to the proximity of existing and proposed urban land uses.

Sincerely,

David A. Ferguson, President

DAF/df
cc: Frank F. Fasi, Mayor, City and County of Honolulu

12-35

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

WALLACE MIYAHIRA
DIRECTOR AND CHIEF ENGINEER

R 78-274

April 13, 1978

Mr. David A. Ferguson
President
Ferguson Management Corporation
Suite 1106
Financial Plaza of the Pacific
Honolulu, Hawaii 96813

Dear Mr. Ferguson:

SUBJECT: LEEWARD SANITARY LANDFILL
ENVIRONMENTAL IMPACT STATEMENT

Thank you for commenting on the subject Environmental Impact Statement. We wish to acknowledge Puu Heleakala Community Association's continuing opposition to the selection of the Nanakuli site for sanitary landfill development. The association's position will be noted in the Revised EIS.

Your participation in the EIS review process is much appreciated.

Very truly yours,

WALLACE MIYAHIRA
Director and Chief Engineer

ls

cc: Office of Environmental Quality Control
Dept. of Land Utilization

HAWAIIAN ELECTRIC COMPANY, INC.
Box 2750 / Honolulu, Hawaii / 96840

November 17, 1977

Mayor
City & County of Honolulu
c/o Department of General Planning
Honolulu Municipal Building
Honolulu, Hawaii 96813

Gentlemen:

Subject: EIS Leeward Sanitary Landfill

Pursuant to your request for comments on the Leeward Sanitary Landfill Environmental Impact Statement, I offer the following:

> Hawaiian Electric Co., Inc. has applied to the Department of Land Utilization for a permit to construct a 138 kv transmission line from the Kahe Generation Station to a new Campbell Estate Industrial Park substation. It is probable that the route of these transmission lines will cross Makaiwa Gulch should this permit be approved. A City Council hearing on this permit application is scheduled for today and, therefore, we should have some information on whether or not Makaiwa Gulch will be crossed by the lines very shortly.
>
> It is possible that another circuit (voltage unknown at present) will be constructed on another parallel right-of-way which was recently obtained from the Campbell Estate. Both of these lines should be installed prior to the time that the City & County landfill reaches the upper end of the gulch. Although the circuits would be suspended on structures from ridge to ridge high above Makaiwa Gulch, all due diligence and care must be exercised by the City & County during filling operations where work is being done under the high voltage circuits.

Sincerely yours,

John C. McCain

John C. McCain, Ph.D.
Manager of Environmental Department

JCMc:cm

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

WALLACE MIYAHIRA
DIRECTOR AND CHIEF ENGINEER

R 78-272

April 13, 1978

John C. McCain, Ph.D.
Manager of Environmental Department
Hawaiian Electric Company, Inc.
Box 2750
Honolulu, Hawaii 96840

Dear Dr. McCain:

SUBJECT: LEEWARD SANITARY LANDFILL
ENVIRONMENTAL IMPACT STATEMENT

Thank you for your comments on the subject Environmental Impact Statement. Our responses are presented in the order of your comments.

Pursuant to your letter we investigated Hawaiian Electric Company's (HECO) application to the Department of Land Utilization for a permit to construct the transmission line. We understand that a Shoreline Management Permit for Kahe Point has been granted by the City Council and that HECO already has an easement granted by Campbell Estate. Should Makaiwa Gulch be selected as the landfill site, the City will work closely with HECO concerning final design of the landfill so that there will be no potential conflicts between landfill operations and HECO facilities.

Standard operating procedures for the landfill will require that City personnel and operators exercise diligence and care during filling operations where work is being done under the high voltage circuits.

Your evaluation of the EIS is appreciated.

Very truly yours,

for WALLACE MIYAHIRA

Director and Chief Engineer

ls

cc: Office of Environmental Quality Control
Stan Shimabukuro & Associates, Inc.
Dept. of Land Utilization

OAHU SUGAR COMPANY LTD.

an Amfac company

P.O. BOX "O"
WAIPAHU, HAWAII 96797
TELEPHONE 677-3577

November 21, 1977

The Honorable Frank Fasi
Mayor, C&C of Honolulu
(Dept. of General Planning,
C&C of Honolulu)
Honolulu Municipal Building
Honolulu, HI 96813

Dear Mr. Fasi:

EIS LEEWARD SANITARY LANDFILL

Oahu Sugar's comments are as follows:

1. We are opposed to the proposed public use of the Kaloi Sanitary Landfill on the basis of safety, probably litter on the access, and fire danger to adjacent cane fields.

2. Our principal concern remains the safe operation of our vehicles in the Palehua-H-1 area. The proposed signalization appears to address the problem adequately. We do note that the design loading will aggravate the present situation at Palehua and Farrington. We have just completed putting signs and flashing caution lights on Farrington to try to minimize the existing safety problem.

3. Oahu Sugar wishes to call to your attention that our domestic water well for the Ewa area is located at Honouliuli where you are proposing an uncompatible Demolition Landfill Site.

Very truly yours,

OAHU SUGAR COMPANY, LIMITED

David W. Ballie, President

OAT:cla
cc: ✓DPW, C&C of Honolulu
Honolulu Municipal Bldg.
Honolulu, HI 96813
J.E. Loomis

12-38

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

WALLACE MIYAHIRA
DIRECTOR AND CHIEF ENGINEER

R 78-273

April 13, 1978

Mr. David W. Ballie
President
Oahu Sugar Company Ltd.
P. O. Box "O"
Waipahu, Hawaii 96797

Dear Mr. Ballie:

SUBJECT: LEEWARD SANITARY LANDFILL
ENVIRONMENTAL IMPACT STATEMENT

Thank you for your comments on the subject Environmental Impact Statement. Our reponses are presented in the same order as your comments:

1. We hereby acknowledge your opposition to the use of the Kaloi Gulch site for landfill purposes. Your position will be stated in the EIS.

2. We share your concern for the safe operation of vehicles on the landfill approach roads. If the Kaloi site is selected, our design consultants will reanalyze the traffic sitation in depth and will recommend appropriate safety measures for the traffic in the Palehua-H-1-Farrington Highway area. Oahu Sugar Company will be afforded an opportunity to review final plans for approach road design improvements.

3. We will mention the presence of your domestic water well at the Honouliuli site in the Revised EIS.

We appreciate your evaluation of the EIS document.

Very truly yours,

WALLACE MIYAHIRA
Director and Chief Engineer

ls

cc: Office of Environmental Quality Control
Stan Shimabukuro & Associates, Inc.
Dept. of Land Utilization

SECURITY PACIFIC MORTGAGE CORPORATION

745 FORT STREET, HAWAII BUILDING, SUITE 1109
HONOLULU, HAWAII 96813, TELEPHONE (808) 524-0132

January 9, 1978

HAND DELIVER

Mr. Wallace Miyahira
Director & Chief Engineer
Department of Public Works
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

RE: "NANAKULI SITE B" (TMK 8-7-9:1 & 3) AS SITES FOR PROPOSED LEEWARD DISTRICT SANITARY LANDFILL

Dear Mr. Miyahara:

Pursuant to several conversations with Mr. Fred Chan, Planning Engineer for the city's Refuse Division, this letter is to provide you with a statement of our position regarding the above-captioned project.

With regard to TMK 8-7-9:1 (179 Acre Parcel) please be advised that SECURITY PACIFIC MORTGAGE CORPORATION ("SPMC") is the fee owner of that property, having taken a deed in lieu of foreclosure from THE HAWAII CORPORATION ("THC") in 1976.

With regard to TMK 8-7-9:3 (219 Acre Parcel) please be advised that SPMC, although not the fee owner, has contracted with THC to acquire it. Accordingly, SPMC expects either to consummate that transaction and be in title within a few weeks, or to reach an understanding with THC whereby a unified effort will be made to dispose of this property.

At the present time, SPMC perceives that the 179 Acre Parcel, together with the 219 Acre Parcel, is a homogenous 398 Acre Parcel the collective value of which is maximized if the total 398 acres can be preserved as a "package" and offered for sale as such. Since we are an institutional lender and not a land speculator our objective is merely to dispose of the 398 acre package on optimal terms and to return our entire attentions to the more productive aspects of mortgage banking.

I am delighted to learn of the City and County of Honolulu's prospective interest in acquiring the "Nanakuli Site B" 398 acres, and I therefore welcome the opportunity to discuss an arrangement with you that could lead to an acquisition without the costly and time consuming agonies of an Eminent Domain proceeding. Our basis in this property is somewhat less than the $2.2 Million figure shown for "Nanakuli Site B" in the section entitled "Estimated Land Costs", on page 8, of your department's INFORMATION HAND-OUT FOR LEEWARD DISTRICT SANITARY LANDFILL, which means that we are in a position to dispose of this property for less than that amount; and indeed we would do so if an arrangement could be consummated within the next few months.

Obviously we would be opposed to any activities on adjacent or nearby properties that would devalue our property or impede our abilities to dispose of it. We could, therefore, be expected to vigorously oppose an attempt to utilize the property you have designated at "Nanakuli Site A" for a sanitary landfill if "Nanakuli Site B" were not similarly utilized.

In closing, let me say that I am available at any time to answer any additional questions you may have, or to meet with City representatives to discuss the matter in greater detail.

Aloha

Phil Gray
Assistant Vice President

PG:gmt

bcc: Cliff Jenkins
Peter Snowden
Curt Carlsmith
Fred Chan

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

WALLACE MIYAHIRA
DIRECTOR AND CHIEF ENGINEER

R 78-275 a

April 13, 1978

Mr. Phil Gray, Ass't. Vice President
Security Pacific Mortgage Corporation
745 Fort Street, Suite 1100
Hawaii Building
Honolulu, HI 96813

Dear Mr. Gray:

Subject: Leeward Sanitary Landfill
Environmental Impact Statement

Thank you for commenting on the subject EIS and for informing us of Security Pacific Mortgage Corporation's (SPMC) interests in TMK 8-7-9:1 and TMK 8-7-9:7.

This is to acknowledge the positions SPMC has taken: a) that the two parcels of land (TMK 8-7-9:1 and 7) should be considered as a 'package' and b) that SPMC would oppose the landfill project if the City decides to utilize Site A only for sanitary landfill purposes. We wish to inform you that should the City select the Nanakuli site for landfill development, a detailed engineering study will be performed. This study will establish the schedule for utilization of Sites A & B. City acquisition of Site B will depend on this schedule as well as the availability of funds.

Your review of the EIS document is much appreciated.

Very truly yours,

Wallace Miyahira

WALLACE MIYAHIRA
Director and Chief Engineer

cc: Dept. of Land Utilization
Office of Environmental
Quality Control

THE HAWAII CORPORATION

In Reorganization

Suite 515
677 Ala Moana Blvd
Honolulu, Hawaii 96813
Tel. 536 6602

January 3, 1978

Mr. Wallace Miyahira
Director and Chief Engineer
Department of Public Works
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Miyahira:

We have been requested to comment on that portion of your environmental impact statement, Leeward Sanitation Landfill, identified as the Nanakuli site. Our primary concern and objection would be related to your proposed condemnation or lease of only a portion of our property contained in your Nanakuli B area. According to the maps in the report, Nanakuli B is comprised of all of parcel 8-7-09-7 and a portion of parcel 8-7-09-1; THC in Reorganization has a primary interest in the latter parcel which is zoned conservation land except for a small portion zoned agricultural. Assuming that your map shown as Nanakuli B would involve utilization of only a portion of the property that THC in Reorganization is concerned with, we would like to point out that it would leave us a small segment of land which would be completely unusable. Our present suggestion is that you consider the leasing or purchasing of the property from the Lualualei Naval road to the ridge line which includes both parcels, 8-7-09-7 and 8-7-09-1. This would eliminate a basic objection to your plan.

At the present time our interest would be in the outright sale of this property rather than a long term lease. This position could be changed depending upon the outcome of the study for the reorganization of THC.

Very truly yours,

John T. Goss
Trustee

JTG/bs

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

WALLACE MIYAHIRA
DIRECTOR AND CHIEF ENGINEER

R 78-275

April 13, 1978

Mr. John T. Goss
Trustee
The Hawaii Corporation
In Reorganization
Suite 515, 677 Ala Moana Blvd.
Honolulu, HI 96813

Dear Mr. Goss:

SUBJECT: LEEWARD SANITARY LANDFILL
ENVIRONMENTAL IMPACT STATEMENT

Thank you for your review of the subject Environmental Impact Statement. Your concern and objection to a partial taking of your property will be noted in the Revised EIS.

We hereby acknowledge your suggestion to the City to lease or purchase for Site B the property from the Lualualei Naval Access Road to the ridge line, which includes both parcels, 8-7-09-7 and 8-7-09-1. Should the Nanakuli site be selected for landfill development, a detailed engineering study will be performed for the site. This study will clearly establish how much of the property designated by TMK 8-7-09-1 will be needed for landfill development. As to when this property will be purchased, should this site be selected, it will depend on the phasing of landfill development as well as the availability of funds.

Your interest in this project is much appreciated.

Very truly yours,

WALLACE MIYAHIRA
Director and Chief Engineer

cc: Office of Environmental Quality Control
Department of Land Utilization

RETAINING THE PEOPLE OF WAIPAHU

Waipahu Community Association

HONOLULU SAVINGS AND LOAN BUILDING
94-229 WAIPAHU DEPOT STREET
WAIPAHU, HAWAII 96797

TELEPHONE 677-4950

November 23, 1977

Department of General Planning
City & County of Honolulu
Honolulu Municipal Bldg.
Honolulu, Hawaii 96813

12-43

Gentlemen:

Subject: Environmental Impact Statement for Proposed Leeward Sanitary Landfill

The Waipahu Community Association has the following questions and comments:

1. What is the design capacity for the drainage system to be built around the landfill to divert surface runoff? 10 year storm, 50 year storm?

2. The report fails to address the impact that the Makaiwa landfill may have on the future development in the West Beach area.

3. What is the distance between the Honokai Hale - Nanakai subdivisions from the Makaiwa landfill site?

Thank you for the opportunity to review this document.

Yours truly,

Diane M. Akau

Diane M. Akau
President

DMA:lfo

CHAPTERING OF
Sea Life Park/Makaiwa Association, D. D. E. - Leeward District, Friends of Waipahu Cultural Garden Park, Harbor View Neighborhood Association, Leeward Community College, Oahu Sugar Company, Robinson Heights Association, Waipahu Neighborhood Association, Waipahu Rate Association, Waipahu Advocates for the Elderly, Waipahu Businessmen's Association, Waipahu Highland Association, Waipahu Jaycees, Waipahu

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

WALLACE MIYAMIRA
DIRECTOR AND CHIEF ENGINEER

R 78-276

April 13, 1978

Ms. Diane M. Akau
President
Waipahu Community Association
94-229 Waipahu Depot Street
Waipahu, Hawaii 96797

Dear Ms. Akau:

SUBJECT: LEEWARD SANITARY LANDFILL
ENVIRONMENTAL IMPACT STATEMENT

Thank you for your comments on the subject Environmental Impact Statement. Our responses are presented in the same order as your comments:

1. The main channels of the drainage system will be designed for a 50 year storm while the smaller diversion systems will be designed for a 10 year storm. Conceptual drainage schemes are shown on the preliminary development plans for the 3 alternative sites. The drainage system will be reevaluated in depth during the final design of the landfill.

2. Impacts that were discussed in the Section 4 of the EIS pertaining to the Makaiwa Gulch site will be applicable to the West Beach area. Of these impacts, the most serious would be that of visual impact. To minimize visual impact, we plan to expose only those areas necessary for landfilling at a given time, to landscape increments as they are completed, and to use earth berms or other appurtenances to reduce potential visual intrusion from landfill activities.

The visual aspect of the landfill will be given special consideration during the design phase and in the preparation of the standard operating procedures for the management of the landfill.

Other impacts which may be applicable are those relating to odor, dust and noise. Odor problems will be minimized by judicious use of cover material. Dust will be controlled with appropriate water sprinkling schedules while noise impact diminishes with distance. Highway traffic noise will be the dominant noise factor for the West Beach area.

3. Although the Makaiwa site is directly across the highway from a portion of the Honokai Hale subdivision, we expect the working surface of the nearest point of the fill to be at least 750 feet from the nearest residence. The subdivision will be screened from landfill operations by a heavily landscaped buffer area, open space and possibly earth berms.

Your participation in our solid waste disposal program is much appreciated.

Very truly yours,

WALLACE MIYAHIRA
Director and Chief Engineer

ls

cc: Office of Environmental Quality Control
Dept. of Land Utilization

87 123 Helelua St. #103
Waianae, Hawaii 96792
December 11, 1977

Director of Public Works and Chief Engineer
Department of Public Works
650 King St.
Honolulu, Hawaii 96813

Gentlemen:

My husband I are strongly opposed to the location of the proposed Sanitary Landfill Site in Nanakuli. We are retired, and recently purchased a home in Nanakuli. We certainly do not wish to live the rest of our days with the MIST, DUST & ODORS of a landfill permeating our home. We certainly would have great difficulty selling our house and moving to another more pleasant spot.

In addition, I notice that the consideration for the impact of such a landfill on the most important item of the entire environmental study—Man, is omitted. As a registered nurse I am aware that the nuisance factors relative to a sanitary landfill can greatly aggravate the health status of many people, and of all ages.

Noise (and the garbage trucks are putting about 100 decibels of noise, contrary to your EIS.) I tested with a sound meter for a week in Waikiki, and garbage trucks at a standstill tested at 95 decibels. As you know, noise can also cause severe health problems, as well as learning problems, The Nanakuli Pono School is located just a short distance from the highway where these garbage trucks would be travelling, round trip.

No mention has been made, that I can specifically find in the EIS, is the seepage of water from the landfall site into the ocean, A very large beach, and one of the most beautiful on the Island of Oahu is just about ½ mile from the proposed landfill site. What quality water will there be for beachgoers? The odor, noise and dust will certainly destroy the enjoyment of the beach.

No, Gentlemen, I feel that there must not be a landfill site located in Nanakuli. Preferably, it should be located in a remote area (that is, not near residential and people occupied places) where it will be offensive to no one.

Copies to:

Councilman George Akahane
Mayor Frank Fasi
Dr. George Yuen, Dir. State Health Dept.
Rep. James Aki
Sen. Joseph Kurodo

Yours truly,

Marjorie L. Ackerman

Marjorie L. Ackerman, R. N., P.H.N. School Audiometrist.
Howard R. Ackerman

Howard R. Ackerman

12-46

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

WALLACE MIYAHIRA
DIRECTOR AND CHIEF ENGINEER

R 78-57

January 17, 1978

Mr. and Mrs. Howard R. Ackerman
87-123 Helelua Street #103
Waianae, Hawaii 96792

Dear Mr. and Mrs. Ackerman:

Subject: Proposed Leeward District Sanitary Landfill

Thank you for commenting at our public informational meeting and your letter dated December 11, 1977, informing us about your opposition to as well as other concerns about the selection of the Nanakuli Site.

Sanitary landfills are generally not very well received in the areas in which they may be implemented. However, these projects are presently required as part of basic municipal refuse service and necessary for the safety, health and welfare of our island community. A properly operated sanitary landfill will minimize such nuisances as dust, fire, odor, noise and similar rodent problems frequently objected to by those opposed to these facilities.

As we have previously announced, your comments as well as those of others will be evaluated and given serious consideration in the site selection process. For your information, we have extended the period for receiving comments to January 31, 1978. Additional comments may be submitted up to this date. We now expect to finalize the site selection early February 1978.

We appreciate your interest and participation in our solid waste disposal program.

Very truly yours,

Wallace Miyahira

WALLACE MIYAHIRA
Director and Chief Engineer

Norman Mau Realty, Inc.
85-998 Farm. Hwy. • Waianae, Hawaii 96792 • 808 696-6325

Carol Aki
87-244 Maaloa St.
Waianae, Hi. 96792

December 18, 1977

Director and Chief Engineer
Department of Public Works
650 South King Street
Honolulu, Hi. 96813

Dear Sir,

I am writing to voice my disapproval of the proposed sanitary landfill in Nanakuli. The project strikes me as being unnecessarily close to residential areas, as well as constituting health and safety hazards.

The particular area designated to become a landfill is notorious for high winds and dry foliage. This, and the fact that it is in a very close proximity to N.A.D.(Ammunition Depot) would, to my mind, negate its desirability.

Possibly, my fears are unfounded. However, my community already lives with the threat of an ammunition depot disaster on one end, and the Army playing war games at the other. Its been my experience that neither of these fears are totally groundless.

Further, the last thing Nanakuli needs to add to its already poor reputation is a dump. Its unfortunate that of all the rest of the island Nanakuli can't achieve anything greater than dump site!

I realize the need for another landfill; but, please, we really can't afford this sort of a come down.

Sincerely,

Carol Aki

Carol Aki
Mother, Resident and Realtor

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

WALLACE MIYAHIRA
DIRECTOR AND CHIEF ENGINEER

R 78-58

January 17, 1978

Mrs. Carol Aki
87-244 Maaloa St.
Waianae, HI 96792

Dear Mrs. Aki:

Subject: Proposed Leeward District Sanitary Landfill

Thank you for commenting at our public informational meeting and your letter dated December 18, 1977, informing us about your opposition to as well as other concerns about the selection of the Nanakuli Site.

Sanitary landfills are generally not very well received in the areas in which they may be implemented. However, these projects are presently required as part of basic municipal refuse service and necessary for the safety, health and welfare of our island community. A properly operated sanitary landfill will minimize such nuisances as dust, fire, odor, noise and similar rodent problems frequently objected to by those opposed to these facilities.

As we have previously announced, your comments as well as those of others will be evaluated and given serious consideration in the site selection process. For your information, we have extended the period for receiving comments to January 31, 1978. Additional comments may be submitted up to this date. We now expect to finalize the site selection early February 1978.

We appreciate your interest and participation in our solid waste disposal program.

Very truly yours,

Wallace Miyahira

WALLACE MIYAHIRA

245 North Kukui Street, Honolulu, Hawaii 96817, Telephone (808) 537-5966

AMERICAN LUNG ASSOCIATION of Hawaii

December 22, 1977

Mr. Wallace Miyahara
Director and Chief Engineer
City & County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Miyahara:

Subject: Leeward Sanitary Landfill

In reviewing the various documents related to the selection of a sanitary landfill site in Leeward Oahu, we have concluded that the Nanakuli site would not be desirable for the following reasons:

1. There are residential areas downwind during tradewind conditions which occur more than 50% of the time.

2. The low annual rainfall in that area will be highly conducive to dust generation both during site preparation work and during daily cover operations. Fugitive dust emissions are a function of vehicular activity, effective rainfall, wind speed, and soil silt content. EPA investigations have shown that twice daily watering with complete coverage is only up to 50% effective. Because of the above factors, watering would have to be much more frequent to keep downwind dust concentrations below State and Federal air quality standards.

3. Because of the naturally occurring conditions at the site and the close proximity of residences, the proposed action would very likely result in continuous complaints to City and State agencies and possibly even violations of ambient air quality standards.

It appears to us that the Makaiwa site would be a better choice.

Sincerely,

James W. Morrow, Director
Environmental Health

JWM:ct

Christmas Seals Fight TB, Asthma, Emphysema, Air Pollution

12-48

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

WALLACE MIYAHIRA
DIRECTOR AND CHIEF ENGINEER

R 78-52

January 17, 1978

Mr. James W. Morrow
Director of Environmental Health
American Lung Association of Hawaii
245 No. Kukui St.
Honolulu, HI 96817

Dear Mr. Morrow:

Subject: Proposed Leeward District Sanitary Landfill

Thank you for commenting on the site selection for the proposed Leeward District Sanitary Landfill.

Sanitary landfills are generally not very well received in the areas in which they may be implemented. However, these projects are presently required as part of basic municipal refuse service and necessary for the safety, health and welfare of our island community. A properly operated sanitary landfill will minimize such nuisances as dust, fire, odor, noise and similar rodent problems frequently objected to by those opposed to these facilities.

As we have previously announced, your comments as well as those of others will be evaluated and given serious consideration in the site selection process. For your information, we have extended the period for receiving comments to January 31, 1978. Additional comments may be submitted up to this date. We now expect to finalize the site selection in early February 1978.

We appreciate your interest and participation in our solid waste disposal program.

Very truly yours,

WALLACE MIYAHIRA
Director and Chief Engineer

Citizens Against Noise
1178 Fort Street Mall, Room
Honolulu, Hawaii 96813

(808) 537-3490

December 7, 1977

Mr. Wallace Miyahira
Director and Chief Engineer
Department of Public Works
City and County of Honolulu
650 S. King Street
Honolulu, Hawaii 96813

Dear Mr. Miyahira:

RE: PROPOSED LEEWARD DISTRICT SANITARY LANDFILL PROJECT

Citizens Against Noise, "CAN", is concerned about the potential noise problem which would follow selection of the Nanakuli site for a Leeward District Sanitary Landfill. Existing and proposed residential houses border directly on the Nanakuli site with some residences located less than 300 feet from the proposed working surface (200 feet within the landfill area). The closest house is 20 feet from the landfill boundary. The environmental impact statement for the project, section 4-22, states that:

> "A noise barrier wall may be provided along the makai perimeter of the landfill between the working face of the landfill and the residential area should noise problems persist."

CAN believes that a noise problem with the residents of the area will occur, and the potential problem need not "persist" before action is taken. CAN recommends that the Nanakuli site not be selected due to the proximity of residential land uses.

We feel the City should avoid building in noise problems for its citizens. We note that the Makaiwa Gulch site is 750' from the nearest housing and that Farrington Highway noise will drown out dumping activity noise. According to the Environmental Impact Statement there would be no noise impact on residents if the Kaloi Gulch site were to be selected.

Sincerely,

Joan Hayes

Joan Hayes
Chairman of the Board

JH/cs

12-49

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

WALLACE MIYAHIRA
DIRECTOR AND CHIEF ENGINEER

R 78-53

January 17, 1978

Ms. Joan Hayes
Chairman of the Board
Citizens Against Noise
1178 Fort Street Mall, Room 9
Honolulu, HI 96813

Dear Ms. Hayes:

Subject: Proposed Leeward District Sanitary Landfill

Thank you for commenting on the site selection for the proposed Leeward District Sanitary Landfill.

Sanitary landfills are generally not very well received in the areas in which they may be implemented. However, these projects are presently required as part of basic municipal refuse service and necessary for the safety, health and welfare of our island community. A properly operated sanitary landfill will minimize such nuisances as dust, fire, odor, noise and similar rodent problems frequently objected to by those opposed to these facilities.

As we have previously announced, your comments as well as those of others will be evaluated and given serious consideration in the site selection process. For your information, we have extended the period for receiving comments to January 31, 1978. Additional comments may be submitted up to this date. We now expect to finalize the site selection early February 1978.

We appreciate your interest and participation in our solid waste disposal program.

Very truly yours,

Wallace Miyahira

WALLACE MIYAHIRA

ferguson management corporation
SUITE 1106, FINANCIAL PLAZA OF THE PACIFIC, HONOLULU, HAWAII 96813 TELEPHONE (808) 521-0381

December 21, 1977

Mr. Wallace Miyahira, Chief Engineer
Department of Public Works
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Miyahira:

Re: Proposed Leeward District Sanitary Landfill.

12-50

Ferguson Management Corporation is the Managing Agent for the Puu Heleakala Community Association, a 236 unit PD-H located adjacent to the proposed Nanakuli site.

The Board of Directors of the Association has reviewed the Environmental Impact Statement for the Leeward District Sanitary Landfill and discussed the matter at a special meeting of the Association.

The Board of Directors reiterates its opposition to the selection of the Nanakuli site for the Leeward District Sanitary Landfill as this proposed site: 1) borders the Mauka edge of our property; 2) is incompatible with the existing residential use; and 3) the community is downwind of the proposed site during prevailing trade-wind conditions.

The members of the Association attending the special meeting concurred with the Board's position and expressed concern about the adverse environmental impact of a landfill operation immediately adjacent to their homes.

We strongly urge that the Nanakuli site not be selected due to the proximity of existing and proposed urban land uses.

Sincerely,

David A. Ferguson

David A. Ferguson, President

DAF/df
cc: Frank F. Fasi, Mayor, City and County of Honolulu

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

WALLACE MIYAHIRA
DIRECTOR AND CHIEF ENGINEER

R 78-56

January 17, 1978

Mr. David A. Ferguson, President
Ferguson Management Corporation
Suite 1106, Financial Plaza of The Pacific
Honolulu, Hawaii 96813

Dear Mr. Ferguson:

Subject: Proposed Leeward District Sanitary Landfill

Thank you for commenting at our public informational meeting and your letter dated December 21, 1977, informing us about your opposition to as well as other concerns about the selection of the Nanakuli Site.

Sanitary landfills are generally not very well received in the areas in which they may be implemented. However, these projects are presently required as part of basic municipal refuse service and necessary for the safety, health and welfare of our island community. A properly operated sanitary landfill will minimize such nuisances as dust, fire, odor, noise and similar rodent problems frequently objected to by those opposed to these facilities.

As we have previously announced, your comments as well as those of others will be evaluated and given serious consideration in the site selection process. For your information, we have extended the period for receiving comments to January 31, 1978. Additional comments may be submitted up to this date. We now expect to finalize the site selection early February 1978.

We appreciate your interest and participation in our solid waste disposal program.

Very truly yours,

Wallace Miyahira

WALLACE MIYAHIRA
Director and Chief Engineer

87 123 Helelua St. #208
Waianae, Hawaii, 96792
December 10, 1977

Director and Chief Engineer
Department of Public Works
650 King St.
Honolulu, Hawaii 96813

Gentlemen:

We, the undersigned home owners of the Kahe Kai Condominium home project, located in Nanakuli, vigorously oppose the proposed location of the Sanitary Landfill Site next to residential areas in Nanakuli.

We protest this because:

No consideration appears to have been made for the welfare and health of the people who reside in this area. Acording to the Site Selection and Evaluation Criteria, there will be NOISE, DUST, LITTER and ODORS, as well as insects, rodents, and many other nuisance problems.

We also believe that prevailing winds will greatly increase the problems, especially that of ODORS, NOISE, AND DUST.

If the proposed Sanitary Landfill is located in Nanakuli, we believe there will be a severe and adverse impact on the economic conditions in Nanakuli, and possibly affect the health of many area residents.

We request that the proposed Sanitary Landfill be located as far as possible from all the residential areas and beaches.

Copies to:
Councilman George Akahane
Mayor Frank Fasi
Dr. George, Dir. State Health Dept.
State Rep. James Ahi
State Senator Joseph Kurodo

Yours Truly,
Henry Badeaux

NAME	ADDRESS
Henry Badeaux	87-123 Helelua St. 6208 Waianae
[illegible]	87-123 Helelua St 6301, Waianae
John L Earl	87-123 Helelua St. 6305 Waianae
Foster A Lesal	87-123 Helelua St 6 203 Waianae
Marjorie A Ackerman	87-123 Helelua #103 Waianae
Howard R. Ackerman	
[illegible]	87-123 Helelua St Apt 105 Waianae

Director and Chief Engineer,
Department of Public Works

Re: Proposed Sanitary Landfill in Nanakuli

NAMES	ADRESS
Betty Lyles	87-123 Helelua St #204G Waianae
Connie Torres	87-123 Helelua St #6203 Waianae
William W. Torres	- same as above -
Jose R. Antonio Jr	87-123 Helelua St #107G, Waianae
Antonio C. Dias	87-123 Helelua St Apt. 101
Carmel Lee Kama	87-123 Helelua St., 202 96792
Clarence C Angelly	87-119 Helelua St. 102 96792
Joseph F. Kapulu Jr.	87-119 Helelua St. #302
Mary Harmon	87-119 Helelua St. #302
Danny R. Harmon	87-119 Helelua St. #302F
Ernest Yee Hong	87-119 Helelua St. #103
Mr & Mrs S. dela Cruz	87-127 Helelua St #104
Mr + Mrs. Roland D. Torres	87-127 Helelua St #203
Mr. + Mrs Constantino Dallas	87-127 Helelua St. #101
Mr + Mrs Herman Al Oh	87-131 Helelua St. #104
Mr + Mrs. E Leighton	87-131 Helelua St #105
Mr. + Mrs W J Rubio	87-131 Helelua St #305
Mr + Mrs Wanda K. Fagalua	87-131 Helelua St #303
Jim M. Campbell	87-131 Helelua St., #304 J
N J Lakamp	87-131 Helelua St. #304-J
Randolph Moon	87-119. Helelua St #203F

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

WALLACE MIYAHIRA
DIRECTOR AND CHIEF ENGINEER

R 78-54

January 17, 1978

Kahe Kai Condominium Owners
c/o Mr. Henry Badeaux
87-123 Helelua St., #208
Waianae, HI 96792

12-52

Gentlemen:

Subject: Proposed Leeward District Sanitary Landfill

Thank you for informing us about your opposition to as well as other concerns about the selection of the Nanakuli Site.

Sanitary landfills are generally not very well received in the areas in which they may be implemented. However, these projects are presently required as part of basic municipal refuse service and necessary for the safety, health and welfare of our island community. A properly operated sanitary landfill will minimize such nuisances as dust, fire, odor, noise and similar rodent problems frequently objected to by those opposed to these facilities.

As we have previously announced, your comments as well as those of others will be evaluated and given serious consideration in the site selection process. For your information, we have extended the period for receiving comments to January 31, 1978. Additional comments may be submitted up to this date. We now expect to finalize the site selection early February 1978.

We appreciate your interest and participation in our solid waste disposal program.

Very truly yours,

Wallace Miyahira

WALLACE MIYAHIRA
Director and Chief Engineer

CHANEY INC

Property Management & Rental
Commercial/Industrial & Residential
Real Estate Sales & Leasing
Hotel & Resort Management

December 20, 1977

12-53

Mr. Wallace Miyahira
Chief Engineer, Department of Public Works
City & County of Honolulu
Honolulu, Hawaii 96813

Dear Mr. Miyahira:

Kahe Kai I recently had a Board of Directors' meeting at which the President, Marjorie Ackerman, reported on your recent public hearing concerning the proposed "garbage" landfill program for the old Nanakuli Quarry. She reported most people felt it was a forgone conclusion that your department had already selected the Nanakuli Quarry site even though other alternative sites were available.

After considerable discussion, the Board of Directors requested that you be informed that Kahe Kai I strongly opposes the Nankuli Quarry as a landfill site. Many owners have just made sizable investments in their condominium purchase and as owner/occupants, do not either want to experience a loss in value of their property or wish to experience the inconvenience of noxious odors originating from this kind of activity. It was further pointed out that many owners are retired older persons who could suffer severe health risks from the exposure of fumes or noises from the many trucks which would pass by close to the project.

Mailing Address: P.O. Box 212, Honolulu, Hawaii 96810 / Phone 521-0551

CHANEY

I am sure that you have heard all the reasons for not situating the "landfill" close to an inhabited area. I will not further elaborate. However, the Kahe Kai Board of Directors does want you to consider as most appropriate the Kaloi site, since it is the furthest away from habitation, has no prevailing trades which run across inhabited areas and, at this point, does not jeopardize property values for many people who can ill afford such loss.

Please be judicious in evaluating the sites before you, using the criteria that people's needs must be the consideration. Should you find that none of the sites proposed best solves the people's needs, Kahe Kai will support your investigations into other more remote areas.

Sincerely yours,

AARON M. CHANEY, INC.
MANAGING AGENT

Floyd C. Loving Jr.

Floyd C. Loving, Jr.
Account Manager

A/20-5

cc. Director, Environmental Quality Control
Director, Department of Land Utilization
Director, Office of Information & Complaints
Representative Henry Peters
Representative James Aki
Senator Donald Ching
Senator Joe Kuroda
Senator Francis Wong
Senator Patsy Young
Councilman George Akahane

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

WALLACE MIYAHIRA
DIRECTOR AND CHIEF ENGINEER

R 78-51

January 16, 1978

Mr. Floyd C. Loving, Jr.
Account Manager
Chaney Inc.
P. O. Box 212
Honolulu, HI 96810

12-54

Dear Mr. Loving:

Subject: Proposed Leeward District Sanitary Landfill

Thank you for informing us of Kahe Kai I's position and concerns regarding the site selection for the proposed Leeward District Sanitary Landfill.

Sanitary landfills are generally not very well received in the areas in which they may be implemented. However, these projects are presently required as part of basic municipal refuse service and necessary for the safety, health and welfare of our island community. A properly operated sanitary landfill will minimize such nuisances as dust, fire, odor, noise and similar rodent problems frequently objected to by those opposed to these facilities.

As we have previously announced, your comments as well as those of others will be evaluated and given serious consideration in the site selection process. For your information, we have extended the period for receiving comments to January 31, 1978. Additional comments may be submitted up to this date. We now expect to finalize the site selection in early February 1978.

We appreciate your interest and participation in our solid waste disposal program.

Very truly yours,

Wallace Miyahira

WALLACE MIYAHIRA
Director and Chief Engineer

NEIGHBORHOOD BOARD NO. 24
(Waianae Coast)
P.O. Box 566
Waianae, Hawaii 96792

TESTIMONY IN OPPOSITION TO THE PROPOSED LAND FILL FOR THE VICINITY OF THE LUALUALEI ACCESS ROAD IN NANAKULI

December 7, 1977

Good evening ladies and gentlemen, my nameis Pat Nozaki. I represent the Nanakuli sub-district of the Waianae Coast Neighborhood Board. The Neighborhood Board is definitely against the City and County of Honolulu's proposal for a land fill project in the Nanakuli area. The board feels that the land fill will create a great amount of dust, smoke, flies, stench, and noise which are detriments to the safety and health of Nanakuli residents. The proposed site for the land fill is immediately adjacent to two residential subdivisions, the Auyong Homestead and the Ocean Breeze Estates. The people living in homes bordering the proposed site will suffer extremely both physically and psychologically if they must live with air and noise pollution. Therefore, the Waianae Coast Neighborhood Board recommends that the City Department of Public Works plan its new land fill in one of the alternative areas - either the Kaloi Gulch or the Makaiwa Gulch.

Pat Pang Nozaki
PAT PANG NOZAKI
Planning and Zoning Chairperson

Attachments: petitions in opposition to the poposed land fill.

12-55

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

WALLACE MIYAHIRA
DIRECTOR AND CHIEF ENGINEER

R 78-65

January 17, 1978

Ms. Pat Nozaki
Waianae Coast Neighborhood Board
87-1934 Mohihi St.
Waianae, Hawaii 96792

Dear Ms. Nozaki:

Subject: Proposed Leeward District Sanitary Landfill

Thank you for commenting at our public informational meeting of December 7, 1977, at the Nanakuli High School Library.

Sanitary landfills are generally not very well received in the areas in which they may be implemented. However, these projects are presently required as part of basic municipal refuse service and necessary for the safety, health and welfare of our island community. A properly operated sanitary landfill will minimize such nuisances as dust, fire, odor, noise and similar rodent problems frequently objected to by those opposed to these facilities.

As we have previously announced, your comments as well as those of others will be evaluated and given serious consideration in the site selection process. For your information, we have extended the period for receiving comments to January 31, 1978. Additional comments may be submitted up to this date. We now expect to finalize the site selection early February 1978.

We appreciate your interest and participation in our solid waste disposal program.

Very truly yours,

Wallace Miyahira
WALLACE MIYAHIRA
Director and Chief Engineer

WE, THE UNDERSIGNED, FEEL THAT THE LAND FILL PROJECT PROPOSED FOR THE VICINITY OF THE ABANDONED QUARRY OFF LUALUALEI NAVAL ACCESS ROAD WILL RESULT IN UNHEALTHFUL CONDITIONS FOR THE RESIDENTS THERE, AND SHOULD, THEREFORE, BE PLANNED FOR ANOTHER AREA SUCH AS THE MAKAIWA GULCH AND THE KALOI GULCH.

NAME	ADDRESS
L. Lemingo	87-270 Maeloa St. Nanakuli
M. Pae	92-105 Halelani Pl. Ewa Beach HI 96706
Matthew Candelario	89-040 Pelekeki Ave. Nanakuli
Maybelle Brown	87-147-A Hakimo Rd. Waianae
Dennis Pikaloha	89-445B Pohakuowi Ave Nanakuli
Ethel Homea	89-261 Kawao Ave Nanakuli
Leonette Homea	87-261 Kawao Ave Nanakuli
Gracie L. Kipii	87-215 Kipapai Pl Nanakuli
Apostolom Kipii	87-215 Kipapai Pl. "
John Kelii Kapela	87-419 Akowai Rd.
Mario Patino	87-429 Hakiro Rd.
Barbara Lessenia	87-1101 Ilikili Rd
Danette R. Kong	87-767 Kuala Pl.
Jesse Domingo	87-244 Mikana St.
Lorna Pestana	87-919A Hakimo Rd.
Noreen Barker	87-919 B Hakimo Rd
Marlene Kitamaki	92-712 Paaku St
M. Moon	89-611 Nonakuli Ave.
Emma Moon	89-148 Pelekunu St. Wana.
Lucille Kau	87-1492 Akowai Rd. 96792
Lenda Wright	87-1934 Mohiki St
Tony Bulue	87-1934 Mohiki St.

WE, THE UNDERSIGNED, FEEL THAT THE LAND FILL PROJECT PROPOSED FOR THE VICINITY OF THE ABANDONED QUARRY OFF LUALUALEI NAVAL ACCESS ROAD WILL RESULT IN UNHEALTHFUL CONDITIONS FOR THE RESIDENTS THERE, AND SHOULD, THEREFORE, BE PLANNED FOR ANOTHER AREA SUCH AS THE MAKAIWA GULCH AND THE KALOI GULCH.

NAME	ADDRESS
Erik Kiaha	89-216 A Kelekaa Ave Nanakuli
Nell Kiaha	" " " "
John & Catherine Hill	Nanakuli Ave
Jacqueline M. Hazeli	87-1698-K Farr. Hwy Nanakuli
Edward Lee	87-163 Hila St.
Elizabeth Lee	87-163 Hila St
Alfonso Galindo	87-275 Milana St.
Kapiolani J. Naui	89-543 Pohakunui Ave, Nanakuli
Dorcelia D. Naui	89-543 Pohakunui Ave "
Joann L. Wilkins	87-1916 Mohiki St.
Arlene Williams	89-346 Maio Ave
Charles T. Agong	89-351 Paiko St.
Georgina P. Agong	" "
Gloria A. K. Akakio	87-215 Anyang Hwy Rd.
Diane Feliciano	85-125 Na Mau Waianae
Barbara Adams	P.O Box 5082 Nanakuli 96792
Ethel T. Branigan	87-1492 Mohiki MAUI 96792
Rev. C. Allen Russell	87-1948 Mohiki Nanakuli 96792
Frances Yamanoha	87-288 Maio Nanakuli 96792
Rose Y. Tomamoto	87-1938 Mohiki St. Nanakuli 96792
Edward C. Holstein	87-1926 Mohiki St Nanakuli 96792
Hazel K. Holstein	" " " "
Mike Lyons	87-1926 Mohiki St. Nanakuli 96792
Pauline M. Kinson	87-1920 Mohiki St. Nanakuli 96792
Mrs. Mary M. Akaga	87-266 Maeloa St. Nanakuli Hi 96792
Mr & Mrs E.K. Kanahele Sr.	89-712 Lepeka Ave Nanakuli Hi 96792
Mr. & Mrs. Mazelwilko Sr.	87-151 Helekua St. Wai'anae Hi 96792
Mr & Mrs Hyelk Ching III	87-151 Milana St. Nanakuli 96792
Mr. & Mrs. Kalani P. Kalani	87-042-14 Farr. Hwy Nanakuli
Mike Dwight	87-164K Mohiki
Fabian Nozile	87-1934 Mohiki, Waianae

WE, THE UNDERSIGNED, FEEL THAT THE LAND FILL PROJECT PROPOSED FOR THE VICINITY OF THE ABANDONED QUARRY OFF LUALUALEI NAVAL ACCESS ROAD WILL RESULT IN UNHEALTHFUL CONDITIONS FOR THE RESIDENTS THERE, AND SHOULD, THEREFORE, BE PLANNED FOR ANOTHER AREA SUCH AS THE MAKAIWA GULCH AND THE KALOI GULCH.

NAME	ADDRESS
Harriet Kuni	87-231 Merlon St
Victoria Bartels	89-150 Halawa Drive
Donna Kaine	89-381 Makaiwa Street
Mary J. Kahue	89-381 Makaiwa St
Mr & Mrs Kahue	89-381 Makaiwa Street
Benedine Kahue	89-381 Makaiwa St
Bartolomeo R Pacheco	87-145-7 Helelua St.
Jim D Pagoso	87-127 Meipelo St.
Jim Cook	87-222 Oikawa St
Audrey Eli	87-640 Farrington Hwy
Joseph Chai	87-186-1 Helelua St
Mary O Pinson	87-234 Holopono St
Robert Kawakami	87-181 Holomalia St
Linda D. Chai	87-186-1 Helelua St.
Hunalanga K Kuakahua	87-177 Makaiwa St
P J Mitchell	89135 Kawaiola Ave
Mrs Celoma P Wright	89-368 Makaiwa St
Paula Ah Sui	89-008 Farrington Hwy
Ramon Ah Sui	89-008 Farrington Hwy
Mel Bettencourt	87266 Mikana St
Philip Murray	89-693 Pohakunui Ave
Florence Castro	87-252 Holopono St
Rosie Hoopai	87-643 Holopono St
Ronnie Dofries	87-643 Holopono
Lori Miranda	87-1573 E Kawa
Rueline Ahue	87-1698 F Farr Hwy
Pauline Pagoetta	87-208 Mana St
Mr & Mrs Andrew Kalu	89-216A Pikiawa Ave Nanakuli
Moana Kiehu	89-216 A Pikiawa Ave. Nanakuli
Verne Kiehu	" " " "

WE, THE UNDERSIGNED, FEEL THAT THE LAND FILL PROJECT PROPOSED FOR THE VICINITY OF THE ABANDONED QUARRY OFF LUALUALEI NAVAL ACCESS ROAD WILL RESULT IN UNHEALTHFUL CONDITIONS FOR THE RESIDENTS THERE, AND SHOULD, THEREFORE, BE PLANNED FOR ANOTHER AREA SUCH AS THE MAKAIWA GULCH AND THE KALOI GULCH.

NAME	ADDRESS
Linda Potello	87-221 A Auwaiolimu Hwy
Loretta M. Reis	87-238 Hakimo Rd
Manuel T. Reis	87-238 Hakimo Rd
Eleanor Cagle	87-252 Mikana St
Pat Rooney	87-252 Mikana St
Moni Ollero	89-118 Pilikaai Ave.
Deborah Ollero	89-118 Pilikaai Ave.
Elizabeth J Cerfero	89-254 Mikee St Nanakuli 96792
Ruth K Akiona	87-2135-4 Helelua Place Nanakuli 96792
Hannah Kawakami	87-1181 B Hakimo Rd. Nanakuli
Aki Gill	87-1934 Mokuli St.
Mrs Lucina Solandaka	87-1934 Mokuli St.
Mrs Lucille C Bates	87-475 Hakimo Rd
Donna Lukenbaugh	87269 Mikana St.
Ruth L. Makuta	89-521 Hakuhola Ave
Elizabeth A. Jury	89-039 Pilikahi Ave.
Julia K. Kawaiaea	89-130 Kawaiola Ave.
Walter Kahoa	87-040 Farrington Hwy
[illegible]	87-205-1 Helelua St
Gerald Makia	89-224 Halealai Ave

Department of Public Works
City and County of Honolulu

TO Whom it May Concern:

I just wanted to let you know that I as a concerned parent and resident of Puu Heleakala oppose the "Dump" Sanitary Land Fill, you have proposed for Nanakuli.

If you have to build a Dump, why don't you do it away from a residential area? Why should we as tax payers have to put up with the smell as well as the rodents.

There is also the problem with the extra traffic on Farrington Highway. With the school right next to the Highway, it will probably mean that some more of our children will get hurt crossing the street.

There is also the question of what it will do to our property value? Most of us, hope to eventually sell our townhouses and move to a single family resident (house) but if we end up losing money on our townhouses, that may never happen.

I vote NO for a dump in Nanakuli.

Mrs. Thomas R Pacheco
(Beatrice Pacheco)

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

WALLACE MIYAHIRA
DIRECTOR AND CHIEF ENGINEER

R 78-55

January 17, 1978

Mrs. Thomas R. Pacheco
87-145-7 Helelua St.
Waianae, HI 96792

12-59

Dear Mrs. Pacheco:

Subject: Proposed Leeward District Sanitary Landfill

Thank you for informing us about your opposition to as well as other concerns about the selection of the Nanakuli Site.

Sanitary landfills are generally not very well received in the areas in which they may be implemented. However, these projects are presently required as part of basic municipal refuse service and necessary for the safety, health and welfare of our island community. A properly operated sanitary landfill will minimize such nuisances as dust, fire, odor, noise and similar rodent problems frequently objected to by those opposed to these facilities.

As we have previously announced, your comments as well as those of others will be evaluated and given serious consideration in the site selection process. For your information, we have extended the period for receiving comments to January 31, 1978. Additional comments may be submitted up to this date. We now expect to finalize the site selection early February 1978.

We appreciate your interest and participation in our solid waste disposal program.

Very truly yours,

Wallace Miyahira

WALLACE MIYAHIRA
Director and Chief Engineer

SYNOPSIS OF SITE PREFERENCE

Agency/Organization	Makaiwa	Nanakuli	Kaloi
Board of Water Supply	Yes	Yes	No, Waimanalo Gulch is better alternative
Oahu Sugar Company, Ltd.			No
Puu Heleakala Community Association		No	
The Hawaii Corporation		*Yes, but objects to partial taking of property	
U.S. Navy	Yes	Yes	No
U.S. Department of the Interior, Fish and Wildlife Service			No
Security Pacific Mortgage Corporation		*Yes, but objects to City use of Site A only	
**Marjorie Ackerman Howard Acherman		No	
**Carol Aki		No	

* Please refer to letters of respective parties in Section 12, EIS comments and responses

**From written comments received as a result of Public Meeting held on December 7, 1977.

SYNOPSIS OF SITE PREFERENCE (continued)

Agency/Organization	Makaiwa	Nanakuli	Kaloi
**American Lung Association		No	
**Citizens Against Noise		No	
**Ferguson Management Corp.		No	
**Kahe Kai Condominium Project		No	
**Kahe Kai I (Chaney, Inc.)		No	Yes
**Neighborhood Board No. 24	Yes	No	Yes
**Mrs. Thomas Pacheco		No	

**From written comments received as a result of Public Meeting held on December 7, 1978.

APPENDIX A

LANDFILL CRITERIA

(SHIMABUKURO AND ASSOCIATES, 1977)

SITE SELECTION AND EVALUATION CRITERIA

In this study, the selection and evaluation of landfill sites were based primarily on the following criteria, not necessarily listed in order of importance:

1. Capacity - Each potential site must have sufficient volume to make it worthwhile, since opening a new landfill involves major capital cost. Capacity is a very important factor in landfill development economics. Desirable minimum capacity should provide for approximately 5 years life based on 500 tons/day of refuse.
2. Access to Adequate Roads - Any major landfill operation will attract additional traffic to the roadways in the area and an adequate, modern highway is needed to prevent excessive congestion and hazards. Site should be within 2,000 ft. of an adequate main highway.

3. Availability of Utilities - All major landfill sites will need power, communication, sanitary and water systems for proper operation. The immediate availability of these utilities can be a major factor in the evaluation of the site.

4. Proximity to Incompatible Land Uses - A landfill operation is a nuisance type activity, similar to heavy construction work, and most land uses would conflict with it. Generally, a buffer area with landscaping is needed to isolate the landfill if its location is not in low land use areas or is not remote.

5. Pollution of Ground and Surface Water - A landfill can produce leachates and silt. Our potable ground water supply sources must be protected from leachates and our surface water needs protection from siltation. The protection of our potable ground water supply is absolute.

6. Availability of Cover Material - Cover material is an important ingredient in a sanitary landfill. Without it, an ordinary dump exists. The economic availability of this cover material can be decisive. When cover material must be imported, the cost, depending on the location, of the landfill site can vary from $1.50 to $5.00 per ton.

7. Travel Distance - When conditions permit, landfill sites should be located close to the refuse generation centers. Hauling is an important factor in the economic operation of a landfill.

8. General Nuisance - A landfill operation will cause noise, dust, litter, odor and other nuisances. Unless these nuisances are properly provided for, the site should be remote. Wind direction is a factor. This item relates directly to 4 and 7.

9. Existing Land Use - The existing land use of sites should be low or open so as not to be objectionable to owners and interested groups.

10. Final Land Use of Landfill - The final land use after the landfill operation should be of equal or higher use than at present and should be compatible with the surrounding land uses. This item relates directly to item 9.

11. Zoning, City General Plan and State Land Use District - An active landfill may operate for an extended time and could affect the overall growth plan of the island. This item relates directly to land acquisition cost, the overall general plan of the island and items 9 and 10.

12. Geology - The geology of the site must be considered to protect the ground water supply and to determine the amount of cover material available. This item relates directly to items 5 and 6. It must be studied in greater detail in the EIS stage.

13. Drainage - On and off site drainage systems are required to minimize the generation of leachates and silt and for protection against floods. Gullies with large drainage basins behind them present major drainage problems and costs.

14. Topography - The topography of the site determines the capacity and a substantial portion of the development cost. It also determines the visual impact of the site. Generally, gullies, swamps and low lying areas are desirable sites.

15. Objection by Landowners, Adjacent Landowners, Public and Community Organizations, etc. - This item can be an important factor, as the City's need for additional landfill space is becoming critical. Protests by owners or interested groups can cause major delays and produce a crisis situation, but should not be the major consideration in the landfill site selection process.

16. Destruction of Natural Resources - Our natural resources must be protected from irreparable damages as much as possible while providing suitable landfill sites for the general welfare of the public.

17. Other Environmental Factors, Including Displacement, Historical and Archeological Sites, and Flora and Fauna - Historical and archeological significance and flora and fauna of the sites must be studied. Also visual pollution and displacement of persons and businesses must be considered. This item must be studied further in the EIS stage.

18. Safety - Site must have safe access and must not present any hazard to the public or to property. Site must be able to meet State Department of Health requirements. Public Health Regulations, Chapter 46, Solid Waste Management Control.

19. Major Development Costs - These costs are generally related to most of the items previously discussed. These costs can become prohibitive when:

    a. Leachate abatement measures are required.
    b. New access to site must be constructed to an adequate roadway.
    c. Utilities are not available nearby and must be brought in from remote sources.
    d. Cover material is not available on site or nearby and must be hauled in from afar and stored.
    e. Land is zoned for high uses such as residential or higher, or when land is in use.

Although this tabulation lists nineteen items as the criteria, each site was only required to have the following essential basic characteristics before being considered for further evaluation as a potential landfill site:

1. Adequate capacity.
2. Adequate protection of our ground water supply.
3. No apparent significant environmental damage to the land, air, ocean or population.
4. Apparent economical feasibility.

To rank the sites, all of the nineteen criteria were considered in total. Due to some of the criteria not lending themselves to measurement, an attempt to obtain objectivity was made by placing weighted subjective values on the criteria.

See Summary of Evaluations and Rankings of Site, Windward Oahu and Leeward Oahu, pages II-7 and II-13, respectively.

APPENDIX B

SOIL MAPS

(BOWLES AND MINK, 1977)

NANAKULI A

Three soil units are shown on the map. Coral or corralline deposits (CR) underly the entire site. Approximately one half of the site represents an old quarry site which has been excavated from 10 to 15 feet below the surrounding land. Mamala (MnC) and Lualualei (LPE) soils overly the reef on the remainder of the site.

The underlying reef and lagoonal deposits are very permeable although the rainfall is low.

SOIL TABLE

	Soil Type	Slope
CR	Coral Outcrop	
LPE	Lualualei extremely stony clay	0-35%
MnC	Mamala stony silty clay loam	0-12%

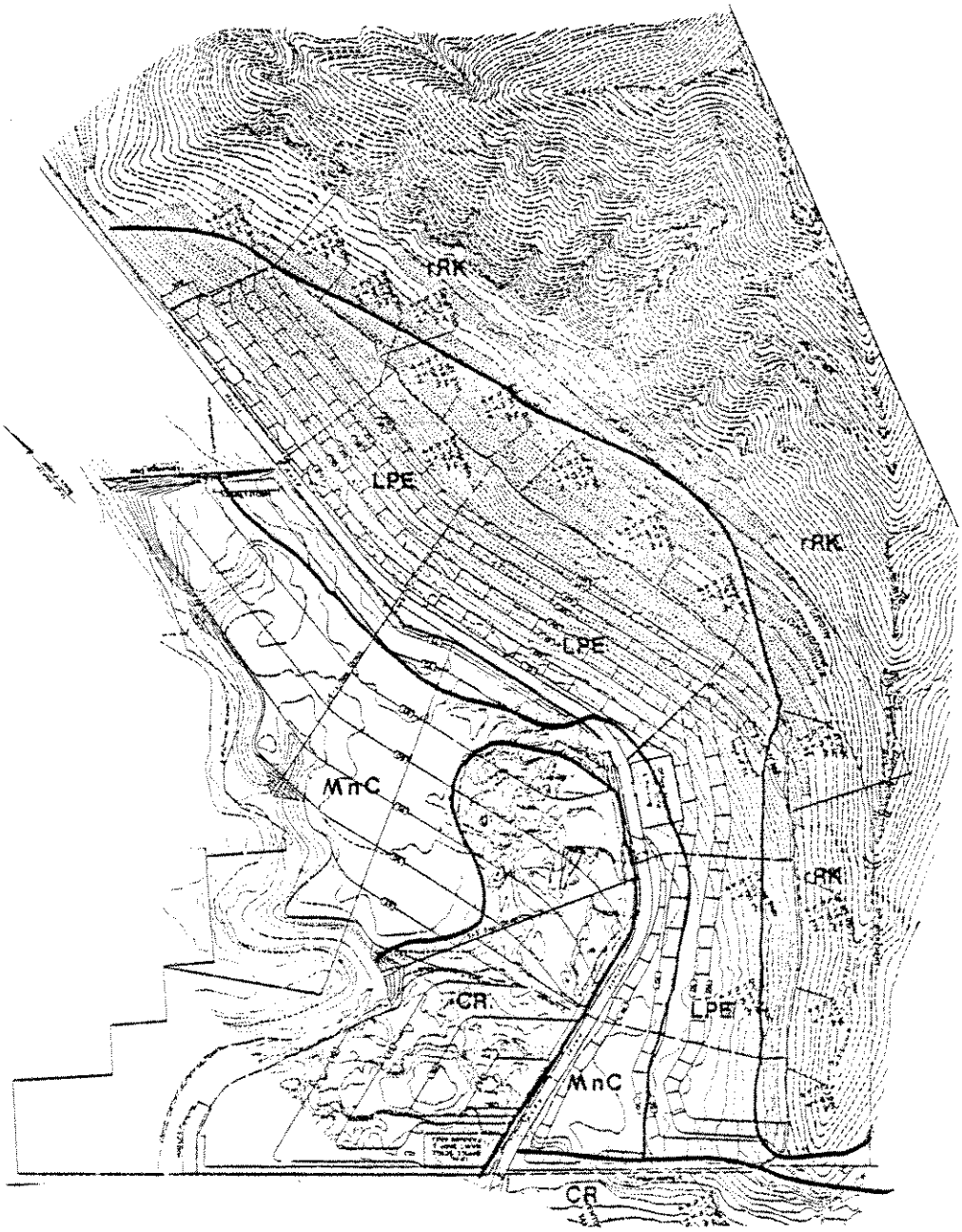
NANAKULI B

This site contains two principle soils, Lualualei and Mamala. The land is mostly sloping and must be terraced for site preparation. Lualualei (LPE) soils on site are very stony and contain boulders up to 2 feet across. Nanakuli B could be a source of fill for site A while accomplishing terracing of B. Most probably there is adequate material on site B for handling both sites.

Flooding is potentially serious problem on B because of the proximity to the pali. Flood frequency will be low as noted in the section on climate.

SOIL TABLE

	Soil Type	Slope
CR	Coral Outcrop	
LPE	Lualualei extremely stony clay	0-35%
MnC	Mamala stony silty clay loam	0-12%
rRK	Rockland	



NANAKULI SOILS MAP
(Adapted from Bowles and Mink, 1977)

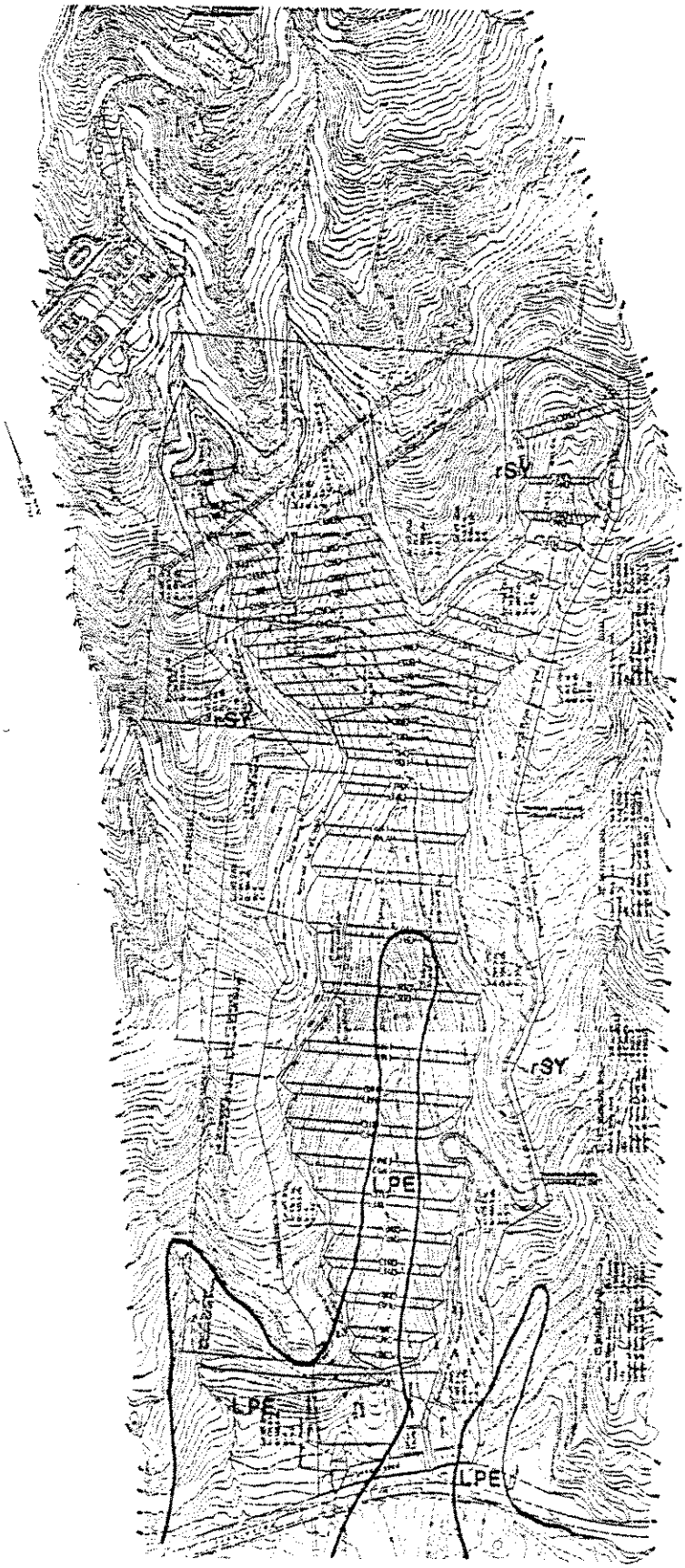
MAKAIWA

The principle on site soil is extremely stony Lualualei. As a bottom blanket, it should be adequate, although it will be thin on the steeper slopes. Potential Lualualei fill lies across Farrington Highway in what are now sugar cane fields.

Flooding in Makaiwa could be severe but infrequent.

SOIL TABLE

	Soil Type	Slope
CR	Coral Outcrop	
EmA	Ewa silty clay loam, moderately shallow	0-2%
LPE	Lualualei extremely stony clay	0-35%
LuA	Lualualei clay	0-2%
LvB	Lualualei stony clay	2-6%
rSY	Stony steep land	
WlB	Waialua stony silty clay	3-8%



MAKAIWA SOILS MAP
(Adapted from Bowles and Mink, 1977)

KALOI SOILS MAP
(Adapted from Bowles and Mink, 1977)

KALOI

This site is by far the most difficult to evaluate in terms of a sanitary landfill. Generally, the gulch in the lower portions is workable and consists of bedrock in the upper half. Soils on the highlands surrounding Kaloi are principally of the Molokai and Mahana series. These soils have a high errodability factor and while they have stability on steep slopes, they are subject to serious errosion if disturbed. Fill material from the Kawaihapai series near the gulch flood plain probably is the most suitable.

SOIL TABLE

	Soil Type	Slope
EaB	Ewa silty clay loam	3-7%
HLMG	Helemano silty clay	30-90%
HxA	Honouliuli clay	0-2%
KlB	Kawaihapai clay loam	2-6%
KlaB	Kawaihapai stony clay loam	2-6%
KlgC	Kawaihapai very stony clay loam	0-15%
McC2	Mahana silty clay loam	6-12%
McD2	Mahana silty clay loam	12-20%
McE2	Mahana silty clay loam	20-35%
MBL	Mahana Badland Complex	
MuB	Molokai silty clay loam	3-7%
MuC	Molokai silty clay loam	7-15%
MuD	Molokai silty clay loam	15-25%
rRK	Rockland	
rSY	Stony steep land	
rTP	Tropohumults-Dystrandepts association	

APPENDIX C

COVER MATERIAL INFORMATION

(Bowles and Mink, 1977)

At neither Kaloi nor Makaiwa is there sufficient cover material to handle both the daily and final requirements. But practically anywhere on the Ewa Plain at elevations between 50 and 100 feet, lying within 1 mile of Makaiwa and 3 miles of Kaloi, a nearly inexhaustible supply of clayey sediments could be excavated. Bore holes drilled by the USGS at points on the Ewa Plain between Makaiwa and Kaloi showed the following sequence of sediments:

Bore Hole EP-10; near Fort Barette; Elevation 75 feet

Depth (feet)	Material
0-10	Dry brown clay
6-24	Moist brown clay
24-64	Moist gray brown compact plastic clay
64-71	Clay and marl

Bore Hole EP-12; near USN Shaft; elevation 93 feet.

Depth (feet)	Material
0-13	Moderately hard brown clay
13-18	Soft brown clay
18-39	Hard brown clay with gravel
39-45	Soft brown clay
45-87	Very soft moist brown clay
87-95	Yellow to gray mottled ash

Bore hole EP-15; near Fort Barrette; elevation 64 feet

Depth (feet)	Material
0-6	Dry brown soil
6-18	Brown clay with gravel
18-36	Compact brown damp clay
36-42	Moist brown clay with gravel
42-48	Green gray silty ash or tuff
48-52	Plastic brown clay with gravel
52-71	Gray green mottled tuff or ash

The water table lies 10 to 15 feet above sea level. Practically all of the Ewa Plain underlain by the sediments given above is planted to sugar cane.

EVALUATION OF COVER MATERIAL AVAILABILITY ONSITE & OFFSITE

Table 1 is a summary estimate of cover material availability onsite or offsite as based landfill estimates.

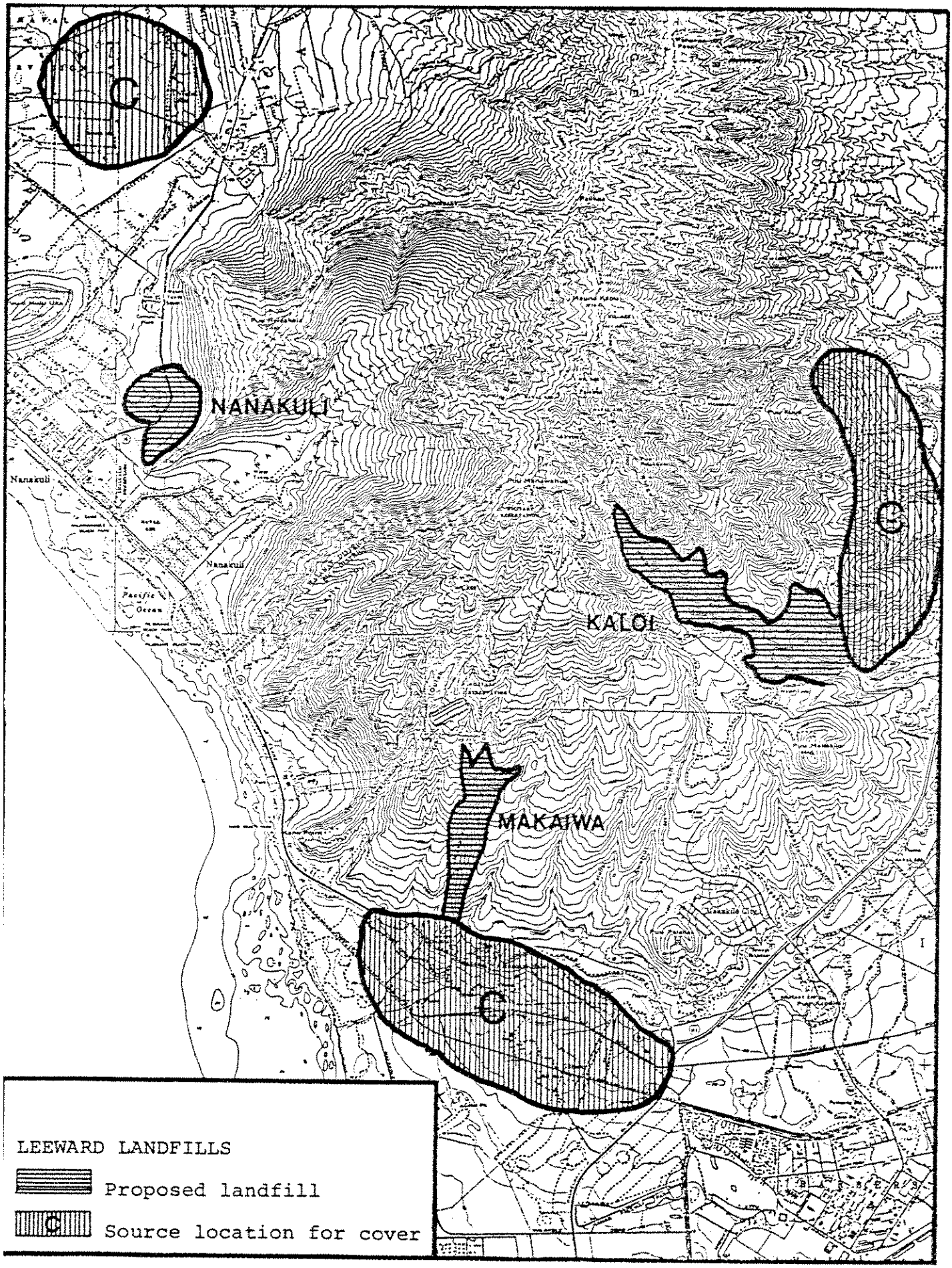
All estimates are based on soil cover constituting approximately 25% of total landfill volume.

Maps 1 & 2 show the approximate location of suitable soils for cover purposes. No attempt was made at this point to consider land use on borrow sites. Other possible borrow sites are available in proximity of each landfill site.

Nanakuli A & B and Kapaa appear to have adequate types and quantities of cover material on site. Test borings will be needed for final confirmation of adequate cover material.

TABLE 1

SITE	ACRES	ESTIMATED LANDFILL VOLUME CU. YDS.	COVER VOLUME CU YDS.	COVER VOLUME AC.FT.	REQUIRED COVER THICKNESS ONSITE IN FT.	AMOUNT OF COVER IN CU. YDS. ONSITE	AMOUNT OF COVER IN CU. YDS. IMPORTED
Nanakuli A	116	5.3×10^6	1.3×10^6	806	7	1.3×10^6	0
Nanakuli B	141	6.1×10^6	1.5×10^6	930	6.6	1.5×10^6	0
Makaiwa	154	15.2×10^6	3.8×10^6	2356	15.3	0	3.8×10^6
Kaloi	400	24.3×10^6	6.1×10^6	3782	9.4	3.05×10^6	3.05×10^6
Kapaa	132	5.4×10^6	1.3×10^6	806	6.1	$.97 \times 10^6$	$.33 \times 10^6$


NANAKULI
KALOI
MAKAIWA
Nanakuli
Pacific Ocean
LEEWARD LANDFILLS
Proposed landfill
Source location for cover

ADDENDUM (communication with Shimabukuro)

An additional 150,000 C.Y. would be available from a Fire and Police Training Facility if it is constructed in Waipahu.

APPENDIX D

ENVIRONMENT IMPACT STUDY CORPORATION

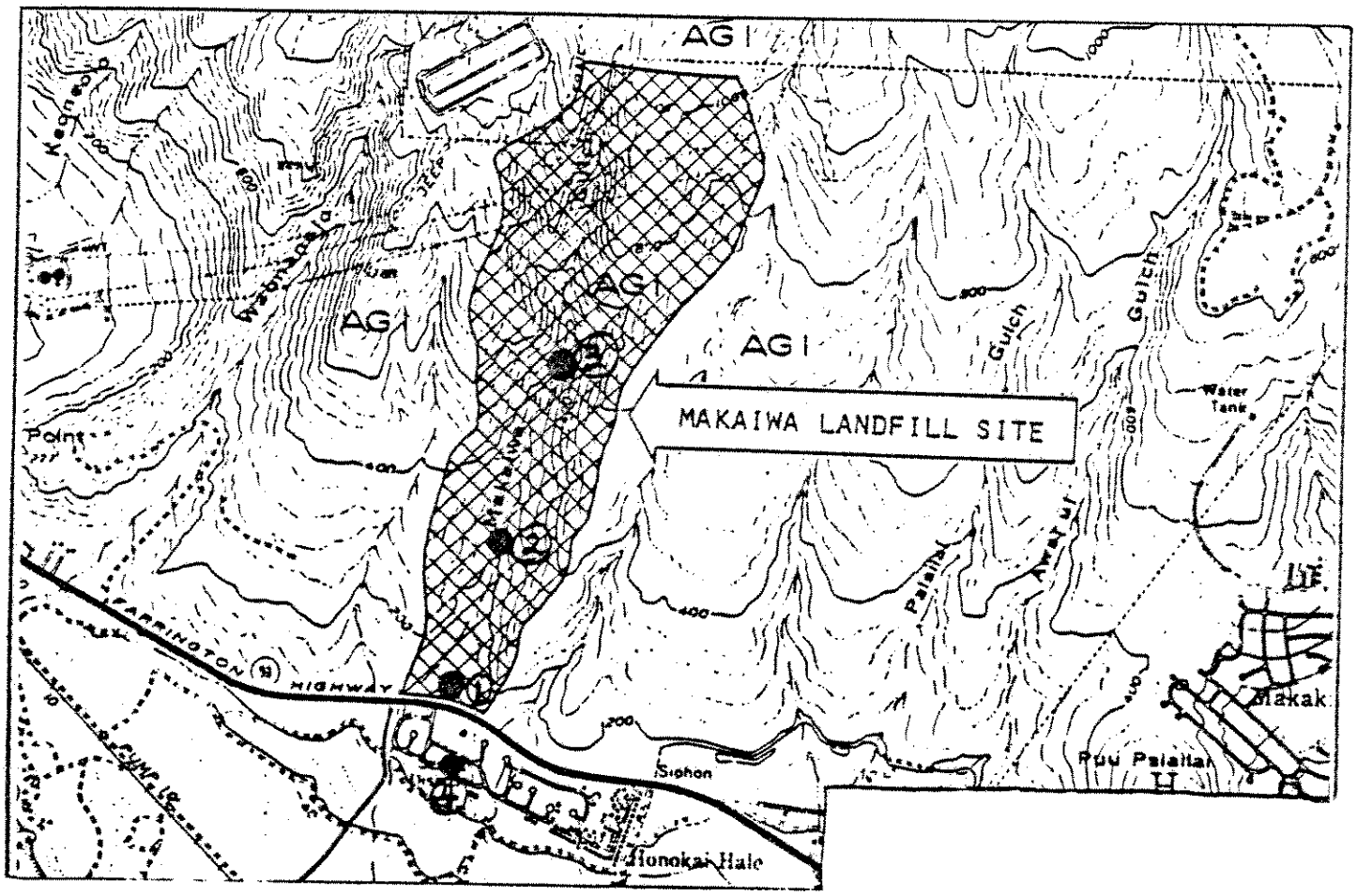
AMBIENT NOISE SURVEY

PROJECT # 9 DATE July 14, 1977

LOCATION Makaiwa Site INITIAL MTM

STATION	dBA	TIME	DURATION	COMMENT
1	72	9:40AM		Passing cars
1	58	9:42AM		No traffic
1	82	9:45AM		Heavy truck
2	45-56	10:40AM		Bird - cardinal
2	42-46	10:45AM		Background
3	35	10:50AM		Bird
4	52-54	11:15AM		Background - heavy equipment
	54-58			

DIAGRAM



ENVIRONMENT IMPACT STUDY CORPORATION

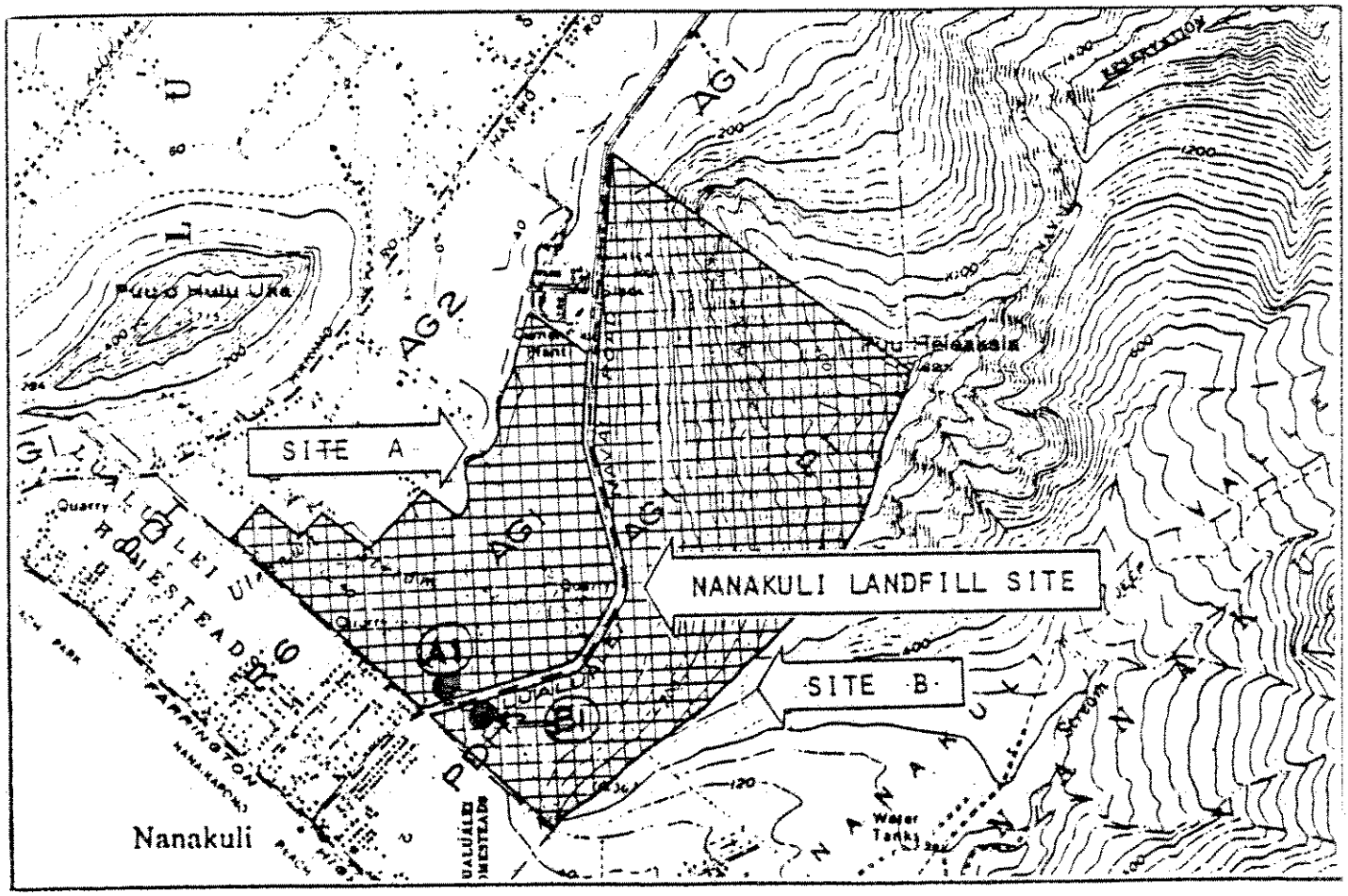
AMBIENT NOISE SURVEY

PROJECT # 9 DATE July 14, 1977

LOCATION A1 & B1 Nanakuli Site INITIAL MTM

STATION	dBA	TIME	DURATION	COMMENT
A1 & B1	44	10:00AM		Birds - chicken
	44-46	10:05AM		
	44-46	10:07AM		
	44-70	10:15AM		Passing truck

DIAGRAM



ENVIRONMENT IMPACT STUDY CORPORATION

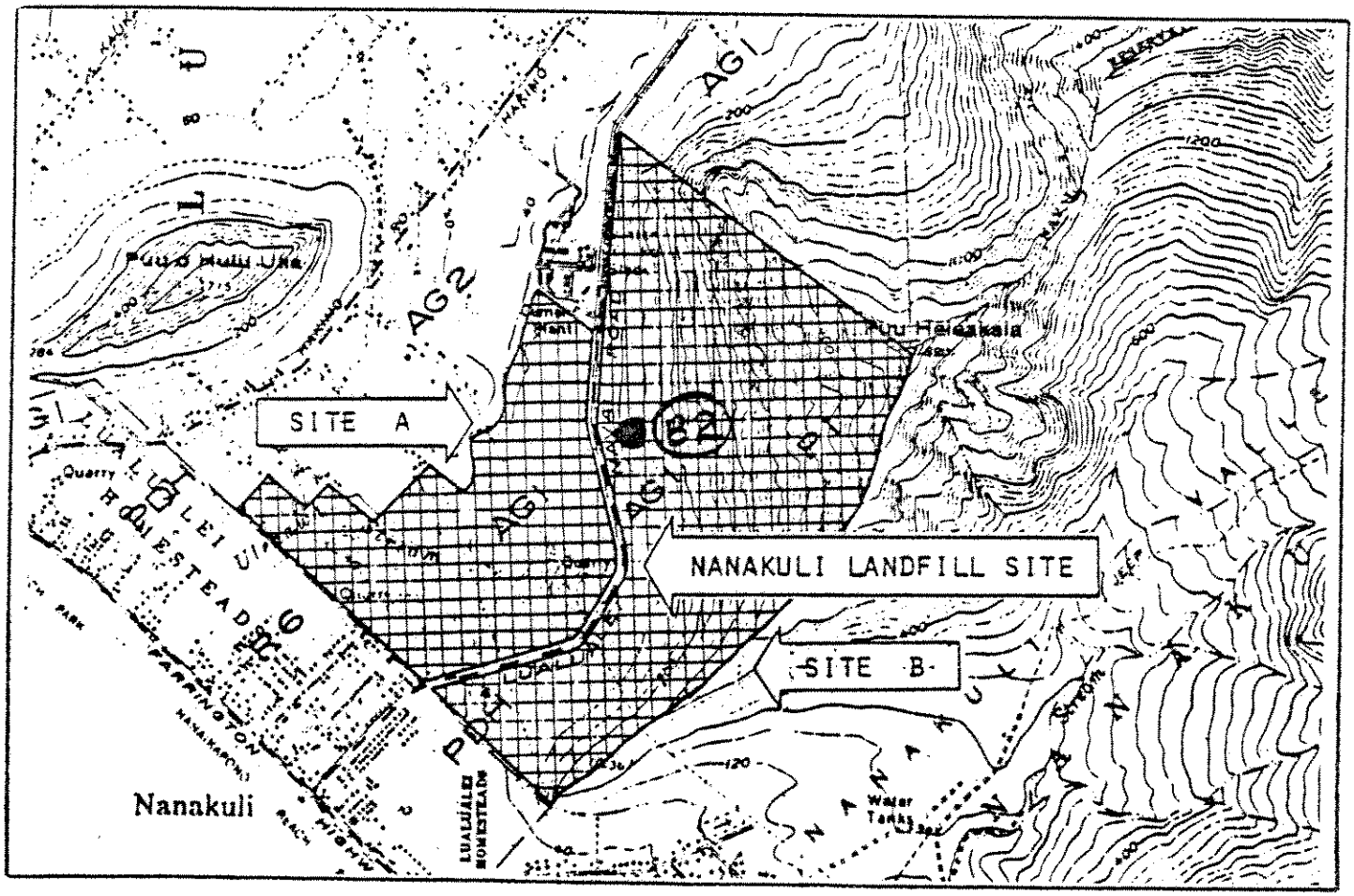
AMBIENT NOISE SURVEY

PROJECT # 9 DATE July 14, 1977

LOCATION B2 Nanakuli Site INITIAL MTM

STATION	dBA	TIME	DURATION	COMMENT
B2	35-40	10:15AM		Bird; wind through trees
	35-40 - 65-76	10:16AM		Passing car

DIAGRAM



ENVIRONMENT IMPACT STUDY CORPORATION

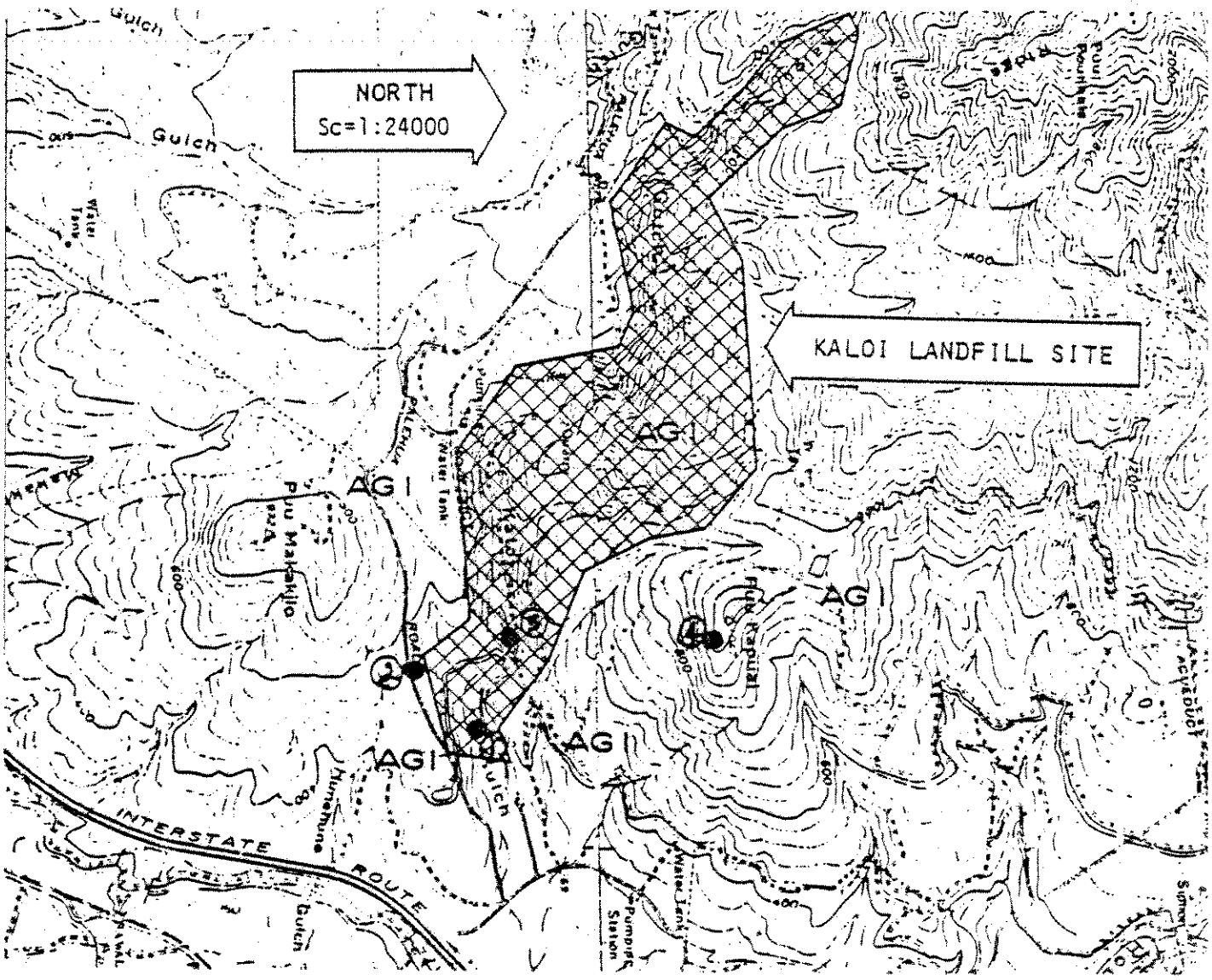
AMBIENT NOISE SURVEY

PROJECT # 9 DATE July 14, 1977

LOCATION Kaloi Site INITIAL MTM

STATION	dBA	TIME	DURATION	COMMENT
1	41	8:35AM		Background
2	43	9:30AM		Background
3	64	8:40AM		Plane flying overhead
4	41	9:00AM		Background

DIAGRAM



APPENDIX E

BACKGROUND LEACHATE STUDY

(EMCON AND ASSOCIATES, 1977)

TABLE 2

LEACHATE LABORATORY STUDIES

ITEM	CALIFORNIA STUDIES	W. VIRGINIA STUDIES	DREXEL STUDIES	GEORGIA TECH STUDIES
1. Experimental setup	Wooden bin (8x4x12') used at landfill site and covered with soil.	Concrete cylinders 3 feet in diameter. Height: A. 4 feet B. 8 feet C. 12 feet	Laboratory lysimeter: 6x6x14 feet.	Corrugated steel pipe 36 inches in diameter, 14 feet in height.
2. Fill used	Fresh domestic rubbish excluding cans, bottles cardboard boxes and large pieces of miscellaneous material.	Municipal refuse excluding metals, cans, bottles, stones and large pieces of wood.	Municipal refuse.	Simulated municipal refuse.
3. Depth of refuse	10 feet	A. 3.6 feet B. 7.6 feet C. 11.6 feet (including covers)	8 feet	10 feet
4. Total water applied	18.7 inches	70 inches		
5. Total leachate produced	6.2 inches (410 gal.)	A. 37.33 inches B. 31.32 inches C. 20.36 inches		
6. Duration of study	216 days	163 days	700 days	600 days
7. Number of samples analyzed	35	16		
8. Controlled parameter	Applied water.	Applied water - fill depth.	Applied water.	
9. Reference	State of California (1952)	Qasim and Burchinal (1970)	Fungaroli (1971 a,b)	Mao and Pohland (1973)

Source: Per Table 1. (EMCON Associates, 1977)

Note: Refer to Table 1 for leachate parameters.

TABLE 3 LEACHATE FIELD STUDIES

ITEM	CALIFORNIA STUDIES	S. DAKOTA STUDIES	PENNSYLVANIA STUDIES	ILLINOIS STUDIES
1. Location of landfill	Riverside, California.	Brookings, S. Dakota.	Centre County, Pennsylvania.	1. DuPage County 2. Winnetka 3. Elgin 4. Woodstock 5. Blackwell Forest Pr.
2. Type of fill material	Domestic and commercial refuse.	Municipal refuse. Combustible material burned before filling.	Municipal refuse.	1. Municipal 2. Municipal 3. 40% Mun., 60% Ind. 4. 40% Mun., 60% Ind. 5. Municipal
3. Age of fill at end of study	4 years	6 years	9 years	1. 12 years 2. 23 years 3. 22 years 4. 30 years 5. 5 years
4. Mode of collection	Wells	Wells	Suction lysimeters	Wells
5. Duration of study	2 years	6 months	4 years	4 years
6. Frequency of sampling	12 samples/2 years	3-4 weeks	Monthly and bimonthly	
7. In contact with water table?	Yes	Yes	No	1. No 2. Yes 3. No 4. Yes 5. Undetermined
8. Reference	State of California (1954)	Andersen & Dornbush (1966)	Apgar & Langmuir (1971)	Hughes, et al. (1971)

Source: Per Table 1 Note: Refer to Table 1 for leachate parameters. (EMCON Assoc., 1977)

APPENDIX F

LEACHATE CONTAINMENT

(EMCON AND ASSOCIATES, 1977)

The following discussion is from EMCON Associates (1977)

C. CONTAINMENT

1. Methodology

There are several opposing philosophies as to the best methodology for eventual disposition of leachate. One school of thought believes mother nature can do an excellent job of attenuating the contaminants exfiltrating from a landfill through natural processes such as filtration, dilution and adsorption. If site conditions are amenable, then this is probably the best system. The opposing philosophy is that the leachate should be fully contained within the landfill, and treated to the extent that the liquid can be safely discharged to the environment. Proponents of this position believe that man can properly manage the collection, treatment and discharge of the leachate. The proponents of the former philosophy, on the other hand, believe that any time man is involved in the management of the treatment system something can go wrong. Laws and regulations today are established on the basis that the containment-treatment methodology is to be adopted. That philosophy, therefore, is utilized in the ensuing discussion.

2. Liner Materials

Liner materials for impoundment sites that contain landfill leachate should be: (1) impermeable to leachate, (2) durable, (3) flexible over a wide range of temperatures, (4) resistant to chemical, biological and mechanical damage, weathering and deterioration, (5) low in cost, and (6) easy to install.

Traditionally, containment systems have been lined to prevent the excessive seepage of liquids into the ground. Clay or bentonite, wood, concrete, asphalt and metal linings were the earlier lining materials and have been used in a wide variety of applications, for many years. Some of these materials do not possess all of the desired properties listed. More recently a different class of impervious lining materials has been developed-flexible synthetic membranes.

a. Synthetics

A number of synthetic lining materials are currently on the market to suit different purposes and conditions. They may be broadly classified as rubbers and plastics. Formula variations of both types of materials can result in end products that will be better suited to a specific application than will be another liner of the same material.

Several manufacturers may produce a particular base polymer, i.e., polyvinylchloride (PVC). These manufacturers in turn may sell the basic PVC to fabricators who "formulate" by adding various materials such as plasticizers, resins, fungicides, biocides, etc., to achieve more specific properties. In addition, they further process the PVC by rolling or calendering the PVC into large sheets and join or seam these sheets into larger sections which are ultimately sold to suppliers and/or installers. Therefore, the chemical and physical properties of the resulting sheet material may or may not be the same as the original base polymer. Although the properties of the sheet material may be well characterized, the above processing steps account for the fact that there are basic materials (PVC, CPE, etc.) whose properties vary, depending on the commercial source.

The selection of a liner material for a leachate containment impounding should involve the following considerations:

a. The liner material should satisfactorily resist attack from the chemicals and salts, ozone, ultraviolet radiation, soil bacteria, mold, fungus, and vegetation to which it will be exposed.

b. It should have ample weather resistance to withstand the stresses associated with wetting and drying, freezing and thawing, and periodic shifts of the earth as dictated by the geographic location of the impoundment site.

c. The liner material should have adequate physical properties to withstand without failure the stresses of installation and damage from machinery or equipment.

d. It should resist laceration, abrasion and puncture from any matter that may be found in the fluids that it will contain.

e. The liner material should be capable of being repaired easily at any time during its lifetime, particularly in instances where repairs are feasible; moreover, it should be the most economical material that can adequately fill the specific application need.

f. The liner material should be properly installed; for improper installation of even the best material will defeat the purpose of the lining.

g. In order to provide longer life and protection against mechanical damage and weathering, any flexible membrane liner materials, whether exposable or unexposable, should be covered, if possible, with a layer of sand or fine textured soil.

h. Proper filling and maintenance of the liner and impoundment site should be practiced.

Flexible membrane liners may be also classified as exposable and unexposable materials. Exposable membranes are those materials that are formulated to resist ozone and ultraviolet exposure for a longer period of time than unexposable membranes. In the exposable materials category are butyl (synthetic rubber), EPDM (ethylene propylene diene monomer), Hypalon (DuPont registered and patented chlorosulfonated polyethylene), CPE (chlorinated polyethylene), neoprene (synthetic rubber), and DuPont's 3110 (polyolefin).

Unexposable materials include PVC (polyvinylchloride), polyethylene, and polypropylene. While these materials do not resist ozone and ultraviolet attack as well as exposable materials, they can be expected to provide satisfactory service in many applications, particularly if covered by a protective layer of soil. Costs of the exposable membranes are higher, ranging to as much as 60 percent more than the cost of unexposable liners.

The designation of a material as exposable or unexposable does not necessarily indicate that one group or the other has superior physical properties for all applications. An unexposable liner may have qualities of chemical resistance that would adapt to a specific application as well as, or better than, an exposable material. It should be pointed out that severe chemical attack of the liner material results in dramatic loss in the liner's physical properties; in an impoundment site such dramatic losses in tensile strength, in particular, results in failure

of the liner. There are instances of liner failure, particularly in the early years of use when quality control was inadequate.

The most important advantages of flexible synthetic membrane liners for the containment of waste water are their ability to contain a wide variety of fluids with a minimum of loss from permeation and seepage, their high resistance to chemical and bacterial deterioration, and their relative ease and economy of installation and maintenance.

In the selection of a flexible membrane liner for a specific impoundment site, the following criteria should be considered:

- The liner material should satisfactorily resist attack from the chemicals and salts, ozone, ultraviolet radiation , soil bacteria, mold, fungus to which it will be exposed as evidneced by sufficient laboratory testing.

- It should have ample weather resistance to withstand the stresses of freezing, thawing, and periodic shifts of the earth.

- The liner should have adequate tensile strength, flexibility, and should be able to elongate sufficiently to withstand the stresses of installation or use of machiney or equipment without failure.

- It should resist laceration, abrasion and puncture from any matter that may be found in the fluids that it will contain.

- All the membrane material in a given installation should be of uniform thickness, of the same material, furnished by the same manufacturer to ensure compatibility.

- The liner should be free of gels, streaks, particles of foreign matter and undispersed raw material. There should be no physical defects such as cracks, crazes, tears, or blisters. Pinholes should not exceed one per 8.4 sq. m. (10 sq. yd.) of liner material.

- It should be of sufficient thickness to guarantee long-term service in the specific application.

- The liner should be capable of being repaired easily at any time during its lifetime and it should be the most economical material that can adequately fill the specific application need.

The choice of both the membrane liner and the installing contractor is very important in constructing impoundment sites for the containment of waste water, particularly since these structures would be expected to perform without significant leakage for several decades. Such a choice cannot be made only by evaluating data on liner materials. Rather, the ultimate success of the impoundment site will depend to a large extent on the experience of the liner-vendor and the installing contractor.

Many parameters should be evaluated in order that optimum performance for cost can be obtained. Such parameters should include, for example, a complete description of the factory-produced seam and its properties, as well as the field-seam used by the contractor and the effect of long-term immersion in the fluid to be contained on the factory and field joints. Ultimately, however, the success of the impoundment site depends on the integrity and experience of the membrane liner manufacturer and the installing contractor, as well as their guarantees and their financial abilities to support the guarantees.

The installation of the liner is as important as the selection of the material itself. Improper installation of even the best material will defeat the purpose of the lining. The following may serve as guidelines in the installation of a flexible membrane liner.

Planning - The pre-planning and laying out of the evaporation pond should be done very carefully for this is the first step that will determine the ultimate success of the installation.

Installing - The installation of the liner should be done by a qualified, experienced contractor. Even though a turnkey job may not be desired, a contractor experienced in design, building, piping and lining, the complete job, can be a definite asset.

Surfacing - The surface over which the liner is to be placed should be clear of all debris, vegetation, and sharp objects, and must properly support the liner. If possible, the surface should be covered with a few inches of sand, clay or other fine textured soil. All surfaces should be sufficiently compacted.

Sloping - Side slopes of the berms of the installation should be at least 3:1, preferably flatter unless specifically designed.

Trenching - An excavation perimeter trench on top of the slope should be used for anchoring the edges of the liner. This trench should be at least two feet from the top inside slope of the dike.

Joining - Factory joints or seams are usually better than field seams, and should be used where practical. Before making the field seams, all wrinkles should be removed from the surfaces of the liner to be sealed. These surfaces should also be clean and dry.

Covering - In order to provide longer life and protection against mechanical damage from falling objects, vandalism, and sunlight, consideration should be given to covering membrane liners with a layer of sand or gravel.

ASPHALT CONCRETE

The possibilities of admixed materials such as asphalt concrete for use as linings in liquid impoundment sites have long been recognized. Primarily, the advantages of asphaltic materials are their universal availability, low cost, extreme versatility in available physical forms, and the fact that asphaltic materials are one of the most logical engineering materials available for large-scale waterproofing construction. The use of pure asphalt in membrane form constitutes a most effective construction form, from the standpoint of seepage control and cost effectiveness, but its use in this form, if fully exposed, had serious disadvantages in subgrade foundation requirements, weathering and aging due to exposure to solar radiation and heat, erosion from turbulent water, and damage from mechanical equipment. To a large degree, correction of these disadvantages was proven possible in prime-membrane type asphaltic linings in which deep subgrade treatments and filled asphalt membranes were used, but the cost of such construction remained unduly high. To retain the advantages of a membrane lining, while eliminating or minimizing the disadvantages, new types of asphaltic materials, including asphalt concrete, were developed.

Asphalt concrete is a carefully controlled mixture of asphalt cement and graded aggregate, mixed, placed and compacted under elevated temperatures. Asphalt concrete is especially well adapted to the construction of linings for all types of hydraulic structures. It may be used for the entire lining structure or it may be a principal part of a more complex lining. Depending on mix design and placement, it may serve as an impermeable layer or as aporous layer. Properly mixed and placed, it forms a stable, durable, and erosion-resistant lining.

Asphalt cements of 40-50 or 60-70 penentration grades are preferable for hydraulic linings. The higher penetration grades produce harder asphalt cement linings which are more resistant to the destructive action of water, the growth of vegetation, and extremes of weather. They are more stable on side slopes than linings made with sulfur asphalt cements, but they retain sufficient flexibility to conform to slight deformation of the subgrade.

Mix design of asphalt concrete for hydraulic linings follow general principles, such as are described in publications of the Asphalt Institute. The maximum stone size will generally be from ½ to 1 inch in size, and the amount of mineral filler passing a No. 200 size sieve will usually be from 8 to 15 percent. The mix should have 6 to 9 percent asphalt content by weight of the total mix. The aggregate gradation and asphalt content should be such that the mix will be stable, yet easily compacted to less than 4 percent air voids.

Asphalt concrete linings should have less than 4 percent voids if compacted properly. If so, it is widely accepted that the coefficient of permeability, K, will be less than $1x10^{-7}$ cm/sec. Also, the permeability of a dried asphalt coating 1/8 inch thick (measured by the wet cup method) is about 0.01 grains of water vapor per hour, per square foot, per inch of mercury pressure differential across the film, or 0.01 perms. It is also accepted that this is considered to be water proof. Seepage calculations for a given head, lining thickness, and lining area may indicate otherwise. However, from the experiences of the Asphalt Institute and tests in their laboratory, a well designed mix will be impermeable (K=0). Any voids in an asphalt lining can be attributed to trapped air bubbles more than anything else, and as long as they are not interconnected, the compacted lining will be watertight.

In a practical sense, the design should not allow for construction inequities that may occur during the placing and compacting of the lining. Construction or paving joints are subject to be the weakest part of the lining, and steps should be taken to minimize possible leakage at these joints. Therefore, the impermeable portion of the liner should consist of at least two paving courses, with offset paving joints.

To assure good control in the spreading and compacting of these layers, a leveling course of minimum thickness is generally recommended to provide a satisfactory surface. Depending on the conditions, an additional course with offset paving joints may be placed on a leveling course. The minimum course thickness will be governed by the maximum size of stone particles in the asphalt mix. The paving course should be

at least three times the maximum particle size 1/2-inch aggregate, 1½-inch course thickness.

Finally, a well-designed and placed asphalt lining will not require a surface seal to insure a watertight liner. However, liner consultants frequently require this, possibly as a final assurance.

Properly constructed, an asphalt lining should require little, if any, maintenance. Sometimes an algae or clay deposit along the waterline may tend to pull the asphalt seal from the surface through repeated drying and wetting, or there may be some evidence of some scour, as has been observed in asphalt lined canals. Timely treating of these areas with an asphalt seal, or even a slurry seal, can minimize wear. These are exceptions and are evident in only a few potable water installations. Sometimes cracks occur, especially at paving joints. However, with multilayer construction, these cracks are only one paving course deep unless cracks result from differential settlement of the structure to an excessive degree. Ordinary crack-filling methods have been used with success. A properly designed and constructed lining installation should pose few maintenance problems.

CLAY SOIL LINING

When a liner is required to impound liquid or solid waste, natural clay soil is always considered, as it is the oldest and most used of our lining materials. Clay is a conventional earthwork material and both design engineers and constructors are familiar with its properties, performance, and use as lining material. Clay has the advantage that it generally becomes less pervious with aging, continuing its progress of aging to a finer grained end product. In some instances, however, a temporary interruption in a specific property, or several, can occur as a physio-chemical reaction or activity happens.

Engineers who have dealt with the physical mechanical aspects of clay soil when water is the liquid moisture environment fully understand these properties, as do the contractors. However, when the liquid which fills the void space is other than water, then permeability, plasticity, and other properties can be affected. The degree of change depending on such parameters as dielectric constant of permeant, ion exchange phenomena pH, clay particle surface charge density and distribution, clay mineralogy, etc.

The compaction of soil generally reduces its porosity, thus restricting the flow of a fluid through the soil. The characteristics of a soil suitable for compaction include low permeability, high stability, and good resistance to erosion. The moisture level in a soil affects the degree of compaction and consequently the permeability. An optimum moisture level exists for maximum compaction after which increased permeability occurs. Also, the optimum moisture level for maximum compaction depends upon the type of soil. Therefore, compaction tests should be performed on each soil in order to determine the optimum conditions. Even under the most optimum conditions of compaction, soil permeabilities may change over a period of time.

The leachate contained in a compacted earth-lined impoundment have both detrimental and beneficial effects on the permeability of the soil.

From the negative standpoint, acid wastes can react with the soil and limit its expansion capabilities and increase its permeability by depressing the so-called fixed layer(s); from the positive, alkaline wastes may contain compounds, such as sodium carbonate, that are beneficial in reducing the soil permeability. Adequate field and laboratory testing should be conducted to determine the soil permeability effects of the wastes to be contained.

In addition, physical factors such as freezing, thawing, drying, and wetting may affect the compacted liner. Cracking of the liner caused by one or more of these factors can result in large increases in permeability. The compacted earth liner should be kept moist, if possible, to maintain stable conditions.

The cost of clay liners may vary considerably; factors affecting the economics of clay liners are the following:

1. Material Cost - This is the cost of purchasing material at the borrow pit. If the material exists on the site it has no assigned cost. If the clay must be imported, however, costs may fluctuate widely, ranging from $0.01 to $2.00 per cubic yard depending on local circumstances. Most often this cost is in the range of $0.10 to $0.25 per cubic yard.

2. Excavation and Loading - This cost includes excavation and loading of haul vehicles. If the material is generated on the landfill site excavation and hauling by scraper is probably the most economical approach. If an off-site borrow pit is used, front loader or drag line equipment will likely be used to excavate the clay and load trucks. Costs will rnage from $0.15 to $0.50 per cubic yard.

3. Transportation - This is the cost to make a round trip to the borrow area, including truck loading and unloading time. Equipment could consist of scrapers or over highway vehicles. Cost is a function of haul distance and haul road conditions (i.e., surface condition, grades, traffic, etc.). Costs for highway haul will range between $0.09 and $0.15 per cubic yard mile.

4. Placement and Compaction - The work involved includes spreading moisture conditioning and conjunction; costs should range between $0.20 and $0.40 per cubic yard.

5. Inspection and Testing - This is the cost of a qualified inspector to attest that the quality of work product, in fact, meets project specifications. This cost is dependent upon locale and job requirements.

These cost variables clearly demonstrate the wide cost fluctuation potential in clay lining. The relative impact of the clay lining cost, however, should be related to the actual disposal cost (dollars per ton of refuse disposed). Many times a high cost lining installation may only increase the disposal cost a minor amount.

a. Synthetic Linings

Because the use of synthetic liners is a relatively recent phenomenon, literature relating to their actual longterm longevity is somewhat inadequate. Thus, the first, reported use of PVC was in a project constructed in 1957; the first documented Hypalon use, in 1966, and CPE lining in the early 1970's. Moreover, good quality control was frequently lacking in calendering, fabrication, and installation of linings in the early days, causing a number of poor results. As a consequence, nowhere can we find examples of a synthetic lining in existence for half of the required active life of the proposed project. Therefore the "show me" or "demonstrate" approach to acceptance of a synthetic membrane lining is just not possible.

The U.S. Bureau of Reclamation commenced studies of PVC in 1957 on the Shoshone Project. Their study has extended through the present and includes numerous other projects related to canal conveyance systems and surface water impoundments. They have the longest field documentation records. The first use of PVC by the writer was in a reservoir restoration project near King City, California about 1963.

Hypalon, first used for liquid impoundment about 1966, is a widely used lining material costing about $.30 per square foot (compared with $.20 per square foot for PVC). DuPont Company holds the Hypalon trademark and has exposure data on Hypalon linings in Panama and Philadelphia from 1964-66 to present. They predict that after 35 years, tensile strength will range from 1100 to 5000 psi, and elongation at break will range from 90 percent to 290 percent. One manufacturer-installer of Hypalon, for an estimated 40 years under a wide range of conditions, in support of this assertion they provide a 20-year warranty.

Chlorinated polyethylene (CPE) has less case history time than either PVC or Hypalon. Theoretically it should have a better service life than PVC, but I have received a report of rapid deterioration which bears careful checking.

A new product, DuPont's 3110, holds considerable promise as the coming preferred lining material. It comes in 20 mil thickness, costs about $.25 per square foot (less than Hypalon) and contains no plasticizer. It has excellent chemical and weathering resistance and should approach Hypalon in life expectancy.

The service life of most exposable materials should be expected to range from 20 to 40 years or more under normal atmospheric exposure with compatible chemicals, while unexposable liners could only be expected to perform satisfactorily for roughly half as many years under similar conditions.

b. Asphalt Linings

Most of the documented information concerning the life expectancy of asphalt linings exist for the buried membrane linings. However, asphalt concrete linings have and are serving satisfactorily for the life of the structure. Potable water reservoir linings placed in California more than 20 years ago continue to serve with no projected failure or termination date established for the lining. The Montgomery Dam in

the United States, performs satisfactorily after nearly 20 years of continuous service. Also, a buried asphalt membrane lining waterproofs a waste lagoon at the Rocky Mountain Arsenal in Colorado. This has been in place for about 20 years and the lagoon is still watertight. Unfortunately, the use of ashalt for lining waste holding and treatment ponds does not have a long history. Therefore, with the exception of the Colorado installation, documentation of any long service is limited, as is the case for synthetic linings.

c. Clay Linings

One of the pleasant aspects of dealing with clay soil linings is that the basic ingredient--the clay soil particle--is not adversely impacted by aging, insofar as permeability is concerned. What occasionally occurs is that physio-chemical activity can affect the void space through which the liquid moves freely. This variation in performance can be evaluated by laboratory investigation and supported by field demonstration. Thus, once properly evaluated and found suitable, clay lining can be accepted as a lining that, if anything, will improve with age. This conclusion assumes that normal maintenance will be provided and the permeant will not adversely change its character.

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