Section 3.0

DESCRIPTION OF THE AFFECTED ENVIRONMENT

3.1 Physical Environment

3.1.1 Topography. HIA is located on the island of Oahu, which is the third largest island in the Hawaiian Chain. Oahu is approximately 44 miles long, 30 miles wide and covers a land area of 608 square miles. The island is divided into four main topographic areas; the Waianae Range, the Koolau Range, the Schofield Plateau, and the coastal plains.

The Airport and Environs are located in the coastal plains, the area adjacent to the ocean formed from coral reefs and alluvial sediments. Slopes are smooth and gentle, and the coastal plains are used mostly for farming, ranching, and urban development. There are several volcanic cones near the Airport, including Diamond Head and Punchbowl. Elevations at the Airport range from about 25 feet (mean sea level) at Kamehameha Highway to 5 feet along the shoreline; slopes average less than one percent. The average airport elevation is 13 feet above mean sea level.

3.1.2 Climate. Oahu has a mild, semitropical climate. Owing to the marine influence and the prevailing northeasterly trade winds, there is very little diurnal or seasonal variation in temperature. The mean annual temperature at sea level is approximately 75°F, with seasonal fluctuations rarely exceeding ±10°F. Greater variations in temperature occur from changes in elevation. Mean temperatures decrease at the rate of about 3°F for each 1,000-foot increase in elevation. One of the outstanding features of Oahu's climate is the persistence of the northeast trade winds. The winds are usually strongest at Nuuanu Pali, Kahuku, Barbers Point, and Makapuu. Winds from the south and southwest are usually laden with moisture and bring heavy rainstorms. Crop-damaging winds and rains occur mainly in the winter months.

Rainfall varies markedly over very short distances on Oahu. The Koolau Range on the windward side of the island is the wettest area, with an annual rainfall exceeding 250 inches. The Waianae Range in the leeward section is much drier, with the annual rainfall seldom exceeding 80 inches at the highest elevation.

Along the lee and southwest shores, where the Airport and the Environs are located, the mean annual rainfall is less than 20 inches. Below the 2,000-foot elevation, the winter season is the period of highest average rainfall. Above 2,000 feet, rainfall is abundant and the amounts are fairly uniform throughout the year.

3.1.3 Geology and Soils. The varied characteristics of Oahu's lands reflect the complex relationship between the geology, climate, and soils of the island. The soils have developed primarily from volcanic materials. Much of the land mass consists of the remnants of the Waianae and Koolau shield

volcanoes, which have been diminished by fluvial and marine erosion. Particularly notable is the loss through fluvial erosion of much of the leeward side of the Waianae Volcano.

The windward side of the Koolau Range is dissected by deep canyons. Much of the flatter arable land occurs on the flows from the younger Koolau Volcanic Series in the Schofield Plateau. Characteristically, the intensity of weathering and geologic erosion increases with rainfall; thus, even on the same series of flows, the drier coastal areas have smoother topography than the wetter inland areas.

The Airport is located on surface soils and fill land (mixed FL) which are part of the Lualualei-fill land-Ewa soil association (U.S. Dept. of Agriculture, 1972). The association consists of well-drained, fine-textured and moderately fine-textured soils found on fans in drainage ways. Due to the extensive fill in the airport area, there is a problem of differential settlement (Peat, Marwick, Mitchell, 1981). However, proper engineering and construction techniques should mitigate this problem.

The soils are nearly level to moderately sloping and are formed in alluvium. Lualualei soils have a surface layer of very dark grayish-brown clay that is sticky, plastic and cracks widely upon drying. These soils are underlain by coral, gravel, sand, or clay at a depth below 40 inches. The fill land consists of areas filled with material dredged from the ocean or hauled from nearby areas, as well as garbage and material from other sources.

The Soil Conservation Service has classified the soils of Oahu into 10 Great Soils Groups (U.S. Dept. of Agriculture and Hawaii Agricultural Experiment Station, 1955). One of the groups is the Low-Humic Latosols, which are among the more productive soils. Most of the sugarcane and pineapple crops are grown on these soils, and the Ewa Soil Series is in this group. These soils are dark red to dark reddish brown, deep and well drained, and generally well suited to irrigation. The soils lack the organic matter and pronounced horizonation of soils in the wetter, cooler regions. The Low-Humic Latosols are found in portions of the Environs Ewa of the Airport. There are no areas of mineral resource extraction on the Airport or within the Environs.

3.1.4 Natural Hazards. Tsunamis are seismic sea waves that result from earthquakes or other disturbances of the earth's crust beneath the ocean floor or along the ocean perimeter. Since 1820, eight tsunamis have caused moderate-to-severe damage on Hawaiian shores, but only the 1868 tsunami was of local origin (University of Hawaii, Dept. of Geography, 1973). The threat of tsunami damage to the Airport area is not well documented, but is generally not considered to be a critical environmental issue for Airport development because of the protection provided by the barrier reef. The highest recorded tsunami heights in the vicinity are 3 feet at Hickam Air Force Base and 5 feet at Honolulu Harbor (Pier 1) (Loomis, 1976).

Flooding, due to storms, is a localized problem especially near the Manuwai canal. The canal lacks the required capacity to handle runoff exceeding 600 cubic feet per second (five year storm) (Peat,

Marwick, Mitchell, 1981). The Airport is classified as an area of undetermined but possible flood hazard (Zone D) by the Federal Emergency Management Agency.

Hurricane Storm Surge inundation was studied by Bretschneider and Noda (1985) for the south shore of Oahu. Limited inundation is expected at the southwest tip of the Reef Runway Structure during a "Worst Case Hurricane" approaching from the south or southwest. Also, inundation along the Hickam Air Force Base and HIA boundary is expected from the "Worst Case Hurricanes" approaching from the south or southwest and from those approaching from the east or southeast. The "Worst Case Hurricane" from the south or southwest are characterized by maximum sustained winds velocities of approximately 110 knots and a minimum sea level pressure of 943 millibars at a location 150 miles from shore. The "Worst Case Hurricane" from the east or southeast has maximum sustained winds of 95 knots and a minimum sea level pressure of 956 millibars at a distance of 150 miles from shore.

3.1.5 Water Supply. On Oahu, the municipal water supply is controlled by the Board of Water Supply, while the agricultural uses are controlled by individual companies. The existing municipal Oahu water supply is fed mainly from ground water sources, with less than one percent supplied from surface water sources. The ground water sources are divided into three categories: basal water, dike water and perched water.

As of 1980, the existing municipal Oahu sustainable water supply is 152.10 MGD, which is expected to be exceeded by 1990 (Board of Water Supply, 1982). The increase of demand is based on the projected population of Oahu and a projected increase of per capita water use. The Board of Water Supply, which manages the water supply for approximately 90 percent of the population, is studying ways to meet future demands. Alternatives include conversion of agricultural supplies to municipal supplies, use of nonpotable water for landscape irrigation, development of additional water sources, use of stream flows, desalination of sea water and the reuse of wastewater.

The Island of Oahu is divided into seven water use districts, of which HIA is part of the Honolulu District. This district encompasses the area south of the Koolau Mountain Ridge, from Makapuu Point to Honolulu International Airport with its primary water source being the Honolulu Basal Aquifer. Water use in this district is projected to increase from 78.30 MGD, in 1985, to 92.40 MGD by the year 2000.

3.1.6 Water Quality. The quality of marine waters affected by the Reef Runway (8R-26L) was investigated in a study conducted from September 1977 through August 1978. The report, issued in January 1979 [Environmental Consultants Inc. (AECOS), 1979], includes a summary of the results of 12 field surveys of water quality.

Measurements were taken of light penetration, turbidity, suspended solids concentration, salinity, temperature, dissolved oxygen, chlorophyll a, and the organic and inorganic fractions

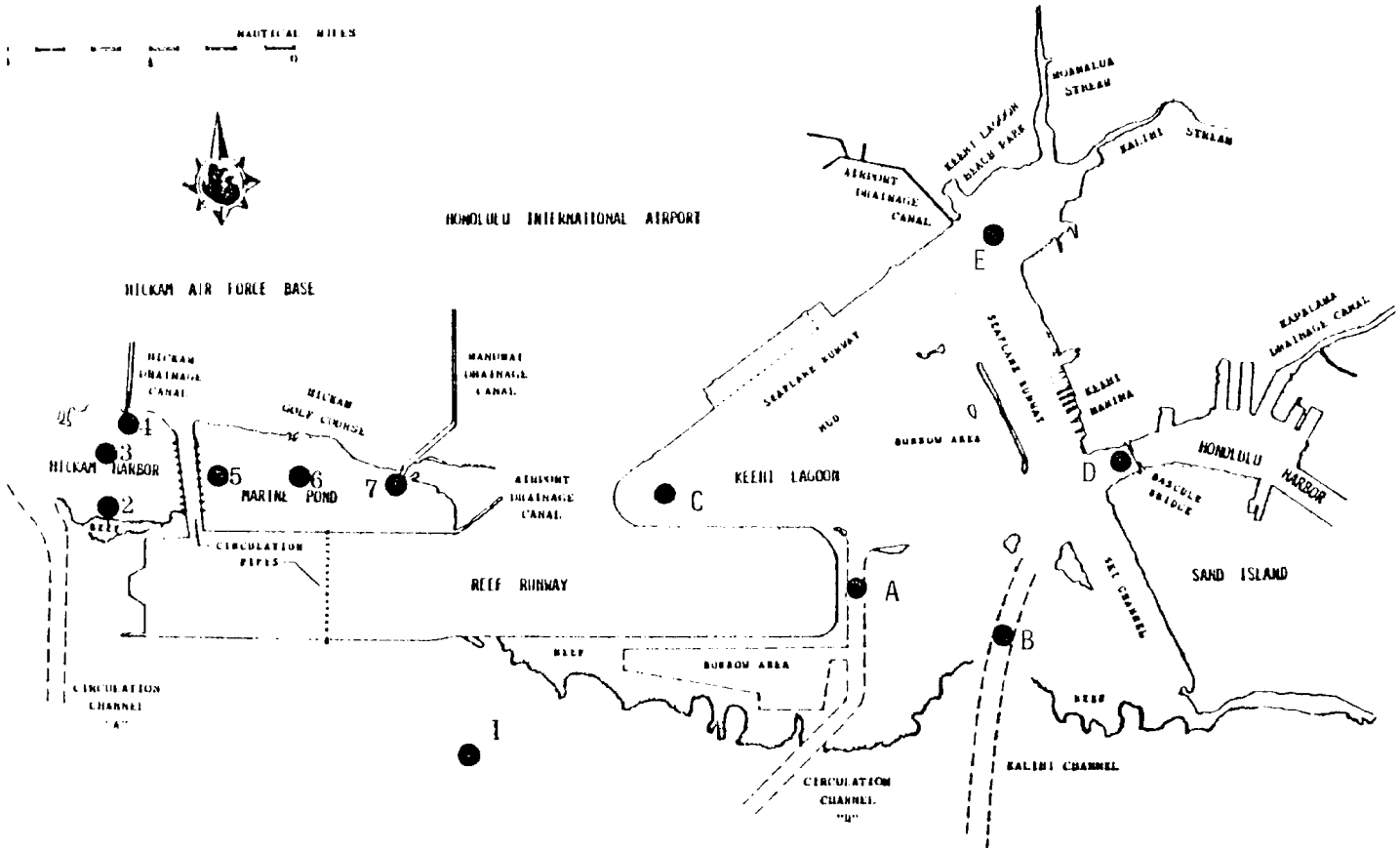
of nitrogen and phosphorus. The boundaries of the monitoring program were Hickam Harbor, the adjacent marine pond, the reef waters south of the Reef Runway, and Ke'ehi Lagoon.

Survey data on Ke'ehi Lagoon show that its water quality has improved significantly since the construction of the Reef Runway; due in part to the increased flushing of the lagoon in its post-runway configuration. The flushing in lagoon waters increased 25% over preconstruction values during Tradewinds and 33% during Kona winds (Noda, 1978). The study report states that water quality in this area is strongly dependent on water movement.

The study report also states that the improvement in basic water quality in areas surrounding the Reef Runway is probably due to the relocation of the Sand Island wastewater outfall site from nearshore to the deep ocean. This outfall is an integral part of the City and County of Honolulu's Sand Island Treatment facility which handles the wastewater generated by the Airport as well as the majority of wastewater from Honolulu. The worst water quality conditions in Ke'ehi Lagoon are found in the northern corner, where the Kalihi and Moanalua streams enter the lagoon and where flushing is least efficient. (Kalihi and Moanalua are the two major surface streams in the Airport Environs, and both streams empty into Ke'ehi Lagoon, adjacent to the Airport.)

The lower portions of the valleys drained by the two streams are extensively developed with residential uses and a moderate amount of light industrial uses, especially near the coastline. In the area near the coastline, the streams are artificially channeled and estuarine. Due to their flow through urban areas and reception of urban runoff (primarily from the industrial areas), they have been identified as contributors to the pollution of Ke'ehi Lagoon (Cox, Doak and Gordon, 1970). However, Airport activities do not, presently, affect these streams and are not expected to affect them in the future because; (1) there are no point discharges from the Airport into these streams and (2) surface runoff from the Airport does not enter these streams.

As part of the Master Plan Update, a water quality analysis was performed by Oceanic Institute, Inc. and their complete report is presented in Appendix B. The analysis showed no differences, with a few exceptions, from the 1977-1978 post construction survey [Environmental Consultants, Inc. (AECOS), 1979]. As seen in Table 1, the present mean value was lower than the 1977-1978 study mean values for suspended solids, orthophosphate, total phosphorus, and nitrate-nitrite. However, the turbidity levels during the present study were higher than previously measured at the open coastal station (Station 1) and at the Ke'ehi Beach Park station (Station E). Also, the chlorophyll levels were higher at the marine pond (Station 5), in Hickam Harbor (Station 2), and at the Ke'ehi Beach park (Station E), while the ammonium levels were higher in the circulation channel (Station A), and the seaplane runway (Station C). These differences between the present study and the previous surveys were not large, and were not indicative of any pattern of degradation in overall water quality; rather, the data represent an expansion of the range of natural conditions. See Figure 11 for Station locations.



AIRPORTS DIVISION DEPARTMENT OF TRANSPORTATION STATE OF HAWAII	HONOLULU INTERNATIONAL AIRPORT MASTER PLAN UPDATE AND NOISE COMPATIBILITY PROGRAM	KFC AIRPORT, INC. MANAGEMENT CONSULTANTS	WATER QUALITY SAMPLING LOCATIONS	FIGURE 11

Table 1

COMPARISON OF RANGE AND GEOMETRIC MEAN WATER QUALITY PARAMETER VALUES FOR 1977-1978 POST-CONSTRUCTION (PC) STUDY, MEAN VALUE FOR THE PRESENT (PRES) STUDY, AND "NOT TO EXCEED 2%" WATER QUALITY STANDARD (WQS 2%) VALUES FOR "WET EMBAYMENTS" FOR THE MARINE POND (ST. 5), HICKAM HARBOR (ST. 2), KE'EHI LAGOON (ST. A, C, D, E), AND FOR "WET OPEN COASTAL" WATERS FOR STATION 1

Station	Study	Turbidity (NTU)	Suspended Solids (mg/l)	Chlor a (mg/m 3)	Ortho-P (ug-at/l)	Total-P (ug-at/l)	Nitrate & Nitrite (ug-at/l)	Ammonium (ug-at/l)	Total-N (ug-at/l)
1	PC Range	0.1-1.2	0.2-7.2	0.01-0.28	0.14-1.07	0.42-3.33	nd-1.42	0.03-0.87	3.6-17.4
	PC Mean	0.2	2.5	0.04	0.24	1.06	0.26	0.18	6.70
	PRES	1.4	4.0	0.20	0.21	1.56	0.63	0.83	12.37
	WQ 2%	2.0	40.0	1.75	0.50	1.90	1.80	1.10	25.00
2	PC Range	1.2-9.3	2.7-13.4	0.06-0.61	0.15-0.51	0.51-2.70	nd-0.84	0.03-1.35	4.8-15.4
	PC Mean	4.4	6.9	0.15	0.26	1.19	0.14	0.21	7.9
	PRES	3.3	0.8	0.79	nd	0.55	0.09	1.10	13.02
	WQ 2%	5.0	50.0	8.50	1.30	2.30	2.50	1.40	35.70
5	PC Range	2.6-15.3	3.6-18.4	0.11-1.26	0.12-0.50	0.76-2.99	0.16-0.82	0.49-4.24	4.6-41.0
	PC Mean	4.8	10	0.25	0.3	1.48	0.39	1.05	10
	PRES	11.6	9.9	1.38	0.04	0.67	0.11	1.21	24.14
	WQ 2%	5.0	50.0	8.50	1.30	2.30	2.50	1.40	35.70
A	PC Range	0.7-3.3	1.4-8.5	0.08-1.42	0.16-0.93	0.54-4.37	nd-0.93	0.03-0.69	5.2-12.6
	PC Mean	1.7	5.1	0.15	0.23	1.31	0.23	0.23	8.00
	PRES	3.1	5.2	1.22	0.10	0.48	0.05	1.50	8.43
	WQ 2%	5.0	50.0	8.50	1.30	2.30	2.50	1.40	35.70
C	PC Range	0.9-3.9	1.2-8.2	0.08-1.79	0.10-1.07	0.54-4.70	nd-0.76	0.05-0.90	6.1-14.9
	PC Mean	2.1	5.4	0.21	0.18	1.30	0.10	0.17	8.30
	PRES	2.6	3.5	1.36	nd	0.84	0.06	1.21	15.72
	WQ 2%	5.0	50.0	8.50	1.30	2.30	2.50	1.40	35.70
D	PC Range	0.9-5.0	1.5-13.2	0.06-1.53	0.10-0.38	0.44-3.27	nd-0.52	0.05-1.09	5.7-19.3
	PC Mean	1.6	5.6	0.15	0.21	1.27	0.21	0.29	8.20
	PRES	2.1	5.3	1.13	nd	0.13	0.10	1.12	16.76
	WQ 2%	5.0	50.0	8.50	1.30	2.30	2.50	1.40	35.70
E	PC Range	2.1-4.3	4.7-13.4	0.23-3.51	0.13-0.40	0.75-2.75	nd-0.66	0.16-1.40	7.2-17.7
	PC Mean	2.9	8.3	0.33	0.23	1.45	0.29	0.26	10.80
	PRES	4.9	5.7	3.87	nd	0.21	0.16	1.13	15.34
	WQ 2%	5.0	50.0	8.50	1.30	2.30	2.50	1.40	35.70

Table 1 also shows that two parameters exceeded the two percent water quality standard criteria; the ammonium levels at the bottom of the Ke'ehi Lagoon circulation channel, and the turbidity levels in the marine pond. The high level of ammonium in the bottom channel sample may be due to contamination with bottom sediment. Upon comparison with shallower samples, with ammonium levels less than 1.40 ug-at/l, both the turbidity and suspended sediment levels in the bottom sample were higher than the levels found at the shallower depths. As for the turbidity levels in the marine pond, all samples at all depths were found to be high and representative of real levels. This high level of turbidity is probably a result of wind mixing of the shallow (less than 3 meters deep) water column which continuously resuspends the fine bottom material. The bottom material consists of a layer of fine carbonate sediment of biological origin.

3.1.7 Drainage. There are two main drainage channels on the Airport: the Manuwai Canal and the north peripheral ditch.

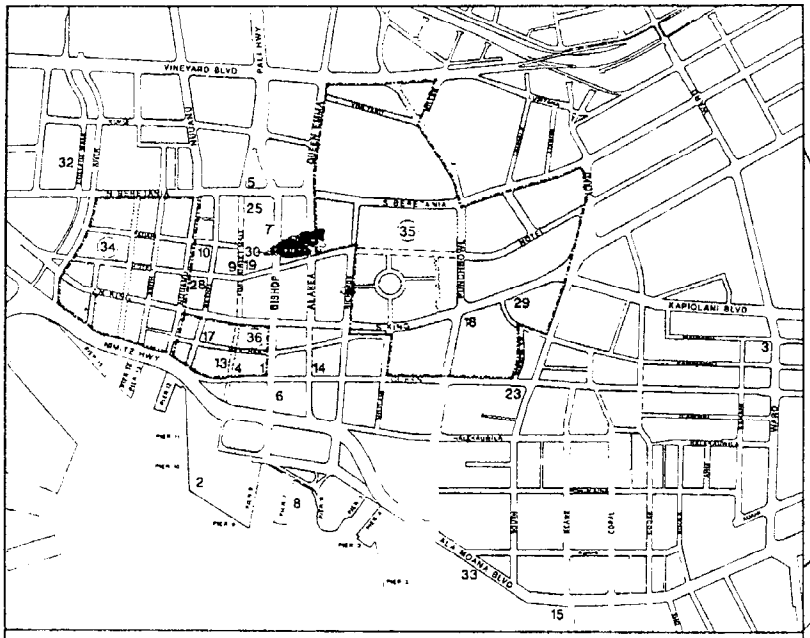
The Manuwai Canal is an unlined trapezoidal channel with bottom widths ranging from 100 feet near the Pacific Ocean to 60 feet near the junction with the 19th Street Canal. There are culverts at places where the canal crosses Runway 8L-26R, taxiway, and roadways. Periodic flooding occurs along the canal during storms when runoff exceeds 600 cubic feet per second (five-year storm). An analysis of the Airport drainage facilities during the Honolulu International Airport and Environs Master Plan Study (Park Engineering Inc., 1980) found that the Manuwai Canal does not have sufficient capacity to convey runoff from storms with recurrence intervals of five years.

The north peripheral ditch, in the vicinity of the Airport maintenance base yard, discharges into Ke'ehi Lagoon and is an unlined trapezoidal channel with a culvert crossing at Lagoon Drive. The ditch was recently improved by the State Highways Division as part of the H-1 freeway viaduct project. These improvements are designed to minimize flooding during a 50-year storm.

3.1.8 Solid Waste Management. An inventory and assessment of the solid waste management system at the Airport is documented by Park Engineering, Inc. (1980).

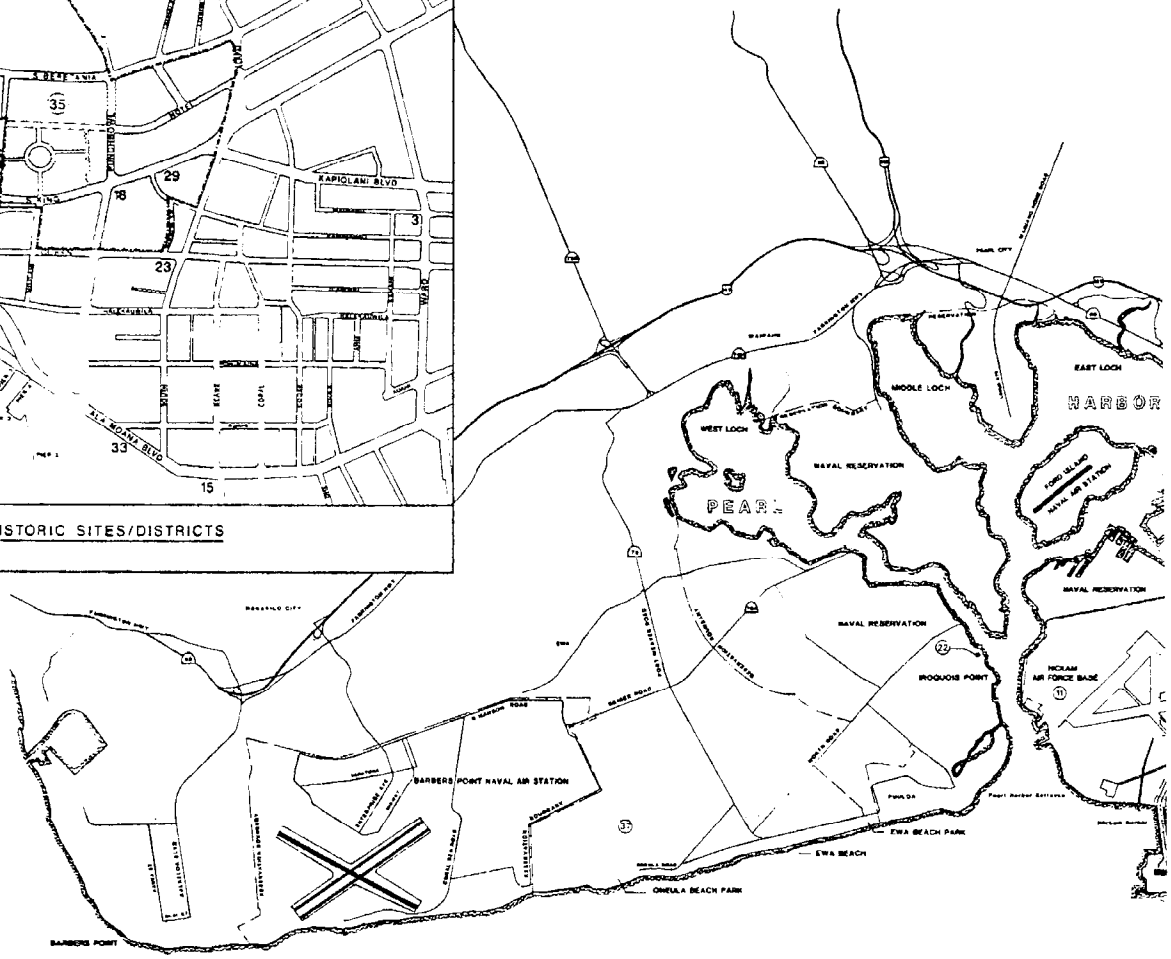
The City and County of Honolulu currently operates one incinerator, one major landfill, and smaller local landfills. An additional major landfill is privately operated. The City and County collects about 40% of the solid wastes on Oahu, mainly from residential areas. Wastes produced by commercial and industrial establishments are collected by private collection companies. However, the City and County processes and disposes of all the solid wastes.

The Airport tenants generally discard the wastes at the point of generation into small containers. These containers are later handcarried to a central bin on the tenant's site, which is then emptied periodically by a collection company.



DOWNTOWN HISTORIC SITES/DISTRICTS

NOT TO SCALE



LEGEND

1 ALEXANDER & BALDWIN BUILDING
2 ALOHA TOWER
3 BRASS FOUNDRY
4 C. BREWER BUILDING
5 CENTRAL FIRE STATION
6 DILLINGHAM TRANSPORTATION BUILDING
7 EMERALD BUILDING
8 FALLS OF CLYDE
9 HAWAII BUILDING
10 HAWAII THEATER
11 HICKAM AIR FORCE BASE
12 HOTEL STREET SIDEWALK ELEMENTS
13 J. CAMPBELL BUILDING
14 JOSEPH R. PODMORE BUILDING
15 KAKA'AKO PUMPING STATION
16 KALIHI FIRE STATION
17 KAMEHAMEHA V POST OFFICE
18 KAWAIAHAO CHURCH
19 McCORRISTON BUILDING
20 McKINLEY HIGH SCHOOL
21 OAHU STATE PRISON ADMINISTRATION BUILDING
22 OKIOKILEPE POND
23 OLD KAKA'AKO FIRE STATION
24 ORBL OFFICE & DOCUMENT STORAGE BUILDING AND STATION
25 OUR LADY OF PEACE CATHEDRAL
26 PALAMA FIRE STATION
27 PORTLAND BUILDING
28 ROBINSON BUILDING
29 ROYAL BREWERY
30 S.H. KRESS COMPANY BUILDING
31 TONG FAT COMPANY LTD
32 TOYO THEATRE
33 U.S. IMMIGRATION OFFICE
34 CHINATOWN HISTORIC DISTRICT
35 HAWAII CAPITAL HISTORIC DISTRICT
36 MERCHANT STREET HISTORIC DISTRICT
37 ONEULA ARCHAEOLOGICAL DISTRICT

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DEPARTMENT OF TRANSPORTATION
STATE OF HAWAII

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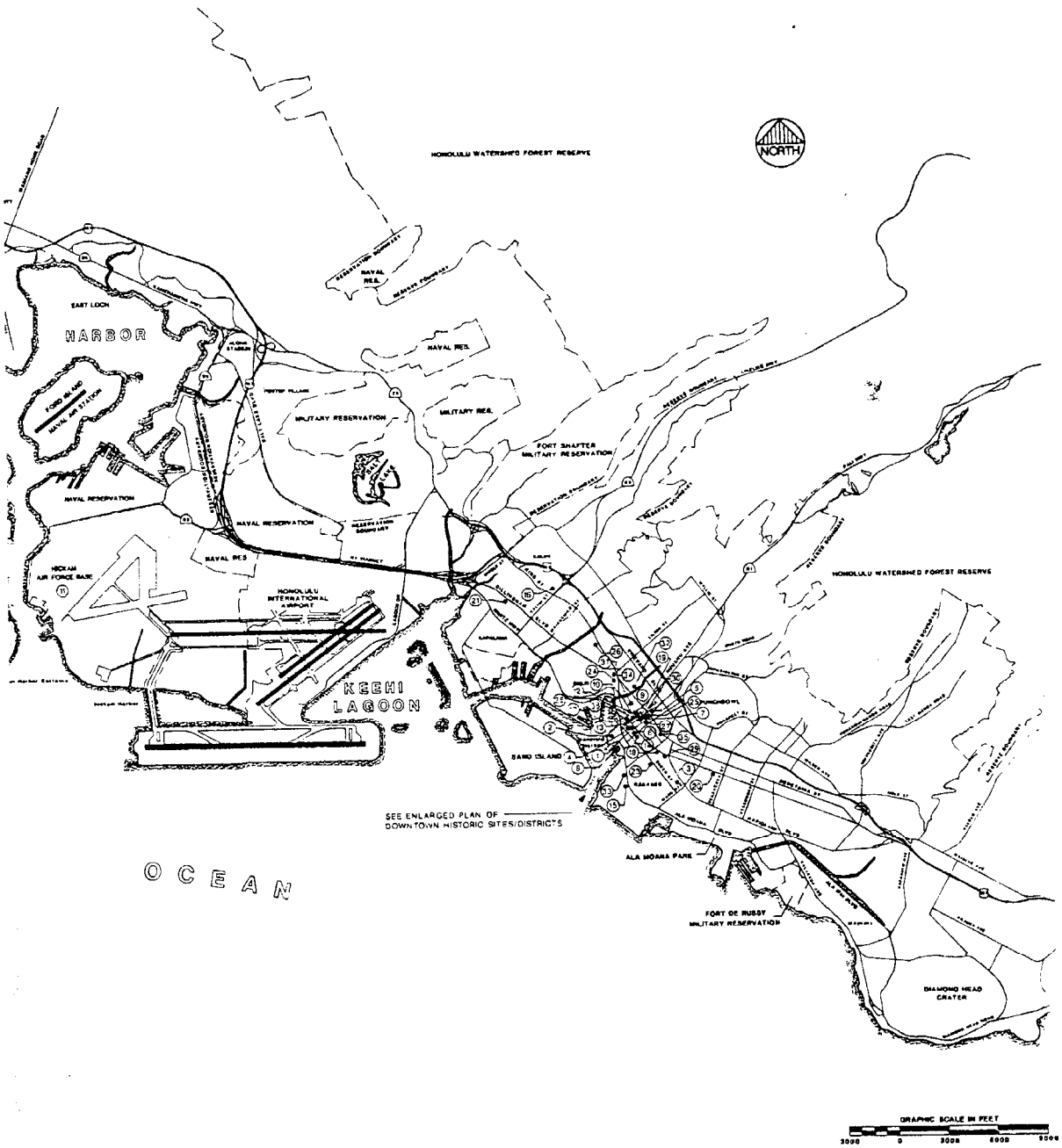

L AIRPORT
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PROGRAM

KFC AIRPORT, INC.
MANAGEMENT CONSULTANTS

LOCATION OF HISTORIC AND ARCHEOLOGICAL SITES

FIGURE
12

Some Airport tenants conduct onsite solid waste processing prior to collection. The processing methods include (1) compaction, (2) separation of food wastes and other wastes, (3) garbage grinding with disposal to the sewer system, and (4) recycling of certain materials. Wastes from international flights are sterilized before they are disposed of at a landfill.

3.1.9 Archeological and Historic Sites. Three historic districts and 37 historic sites (which are not included in the districts) are located in the Airport Environs. These are listed in the Federal and State Registers of Historic Places and are presented in Table 2 and displayed on Figure 12. Several additional individual sites of State significance are located within the Airport Environs, primarily in the Hawaii Capital Historic District.

There are no archeological sites on the Airport property. Nineteen sites have been identified by Sterling and Summers (1978) in the Airport Environs, but most of them have been destroyed. There is one Archeological District in the Ewa Plains which was recently placed on the Federal and State Registers.

3.2 Biological Environment

Because the Honolulu International Airport site is comprised primarily of fill material, and the surrounding areas have been modified by urban development or agriculture, endemic (native) vegetation either does not exist or has been almost completely destroyed. The endemic species have been replaced by more aggressive exotic (introduced or nonnative) species.

The Airport and the Environs are located within the Kiawe and lowland shrubs zone. Characteristic vegetation in this zone includes the Kiawe (Prosopis pallida), koa haole (Leucaena leucocephala), and finger grass (Chloris inflata); all exotic plants. Pili grass is an endemic species characteristic of this vegetation zone (University of Hawaii, Dept. of Geography, 1973), but is not found within the airport's boundaries.

Wetlands are coastal land areas where water is the major factor controlling the development of soils and vegetative cover, if present. Wetlands are easily recognized by the presence of water-loving plants (hydrophytes) and water logged, often organic, soils. In a 1977 study prepared for the U.S. Army Corps of Engineers (Elliot and Hall, 1977), three wetland areas where identified near the Airport; Pearl Harbor - East Loch, Middle Loch, and West Loch. Eighteen plant species were identified in East Loch, 31 species in Middle Loch, and 7 species in West Loch.

3.2.1 Wildlife and Marine Life. The two faunal groups of importance in the Airport area are birds and marine life.

Table 2

HISTORIC AND ARCHAEOLOGICAL SITES AND DISTRICTS IN THE FEDERAL AND STATE REGISTERS OF HISTORIC PLACES

Located within the Honolulu International Airport Environs

Sites and Districts	Location	Federal Register	Hawaii Register
Sites			
Alexander & Baldwin Building	822 Bishop Street	X	X
Aloha Tower	Pier 9	X	X
Brass Foundry	899 Waimanu Street	E	
C. Brewer Building	827 Fort Street	X	X
Central Fire Station	104 S. Beretania Street	X	X
Dillingham Transportation Building	735 Bishop Street	X	X
Emerald Building	1150 Bishop Street		X
Falls of Clyde	Pier 7	X	X
Hawaii Building	1108 Fort Street Mall	E	
Hawaii Theater	1130 Bethel Street	X	
Hickam Air Force Base	Hickam Air Force Base	X	
Honolulu Academy of Arts	900 S. Beretania Street	X	
Hotel Street Sidewalk Elements	Hotel Street	E	
J. Campbell Building	1042 Fort Street Mall	E	
Joseph W. Podmore Building (Bon Bon Cafe)	801 Alakea Street	X	X
Kaka'ako Pumping Station	653 Ala Moana Boulevard	X	X
Kalihi Fire Station	1742 N. King Street	X	X
Kamehameha V Post Office	Corner of Merchant & Bethel Streets	X	X
Kawaiahao Church	957 Punchbowl Street	X	X
McCorriston Building	1111 Fort Street Mall	E	
McKinley High School	1039 S. King Street	X	X
Oahu State Prison Administration Building	2199 Kam. Highway	E	
Okiokilepe Pond	0.3 miles northwest of Iroquois Point at Pearl Harbor entrance	X	
Old Kaka'ako Fire Station	620 South Street	X	X

Table 2 (continued)

OR&L Office & Document Storage Building and Station	Corner of N. King Street and Iwilei Road	E	
Our Lady of Piece Cathedral	1183 Fort Street	X	X
Palama Fire Station	879 North King Street	X	X
Pearl Harbor Naval Base	Pearl Harbor	X	
Portland Building	1111 Bishop Street	E	
Robinson Building	49 S. Hotel Street	E	
Royal Brewery	553 South King Street	X	X
S. H. Kress Company Building	1117 Fort Street Mall	E	
Tong Fat Company, Ltd.	1922 N. King Street	E	
Toyo Theatre	1230 College Walk	E	X
Thomas Square	Bounded by King, South Beretania, and Victoria Streets, and Ward Avenue	X	
U.S. Immigration Office	595 Ala Moana Boulevard	X	X
U.S. Naval Base, Pearl Harbor, U.S.S. Arizona Memorial	3 miles south of Pearl City on Highway 73	X	
<u>Districts</u>			
Chinatown Historic District	Bounded by Beretania Street, Nuuanu Street, Nuuanu Avenue, and Honolulu Harbor	X	X
Hawaii Capital Historic District	Bounded by Queen Emma, Vineyard, Miller, Beretania, Alapai, South, Kawaiahao, Mission Lane Queen, Mililani, Merchant, Richards, Hotel, and Alakea Streets	X	X
Merchant Street Historic District	Downtown Honolulu	X	X
Oneula Archeological District	Bounded by Fort Weaver Road, Papipi Road and South Hansen Road	X	X

Source: Hawaii State Historic Places Review Board, "Hawaii Register Places," 1979.

Note: E -- Eligible for National Register

3.2.1.1 Birds. Many bird surveys were conducted in the Airport vicinity during the past decade, including: 80 surveys between December 1970 and December 1971 (Berger and Walker, 1971); 97 surveys between October 1973 and August 1976 (R. M. Towill Co., 1976); and 36 surveys by R. L. Walker between January and November 1978 (Walker, 1978). The purpose of the surveys was to determine the effects of the Reef Runway (8R-26L) construction on birds of the area. Some of the conclusions reached by Walker in the 1978 survey were as follows:

- Aircraft overflights had little effect on the use of the habitat for feeding or resting in Ke'ehi Lagoon.

- The bird habitats at the Honouliuli and Waiawa Wildlife Refuges provide an important degree of mitigation for the loss of habitat at the Reef Runway site.

- At their 1978 levels of abundance and occurrence, the migratory, resident native, and exotic birds are not a hazard to aviation.

- There were no changes in occurrence, distribution, or populations of exotic birds within the area.

- Although construction of the Reef Runway caused significant loss of feeding habitat area for the Hawaiian stilt, the species has gained an important new habitat at Pearl Harbor, primarily at Honouliuli and Waiawa.

A recent study was conducted in September 1987 by Ol Consultants, Inc. for the Ke'ehi Lagoon and Pearl Harbor Regions. Their conclusions, which are similar to Walker's, were:

- The islets and mudflats of Ke'ehi Lagoon are of no significance for any of the endangered Hawaiian waterbirds. Only the Hawaiian stilt uses the area for feeding and resting, but there are no records of it ever nesting there. The significant point is that they do not nest there, and the critical factor for all of the endangered Hawaiian waterbirds is the presence of safe nesting sites.

- The "mitigation" areas provided by the Pearl Harbor National Wildlife Refuge are serving the needs of most of the waterbirds for feeding, resting and safe nesting sites very well.

- The mudflats and shores of Ke'ehi Lagoon are used by a variety of migratory shorebirds for feeding and resting, and these birds are little affected by motorboats, airplanes or people.

- None of the 17 species of introduced or alien birds found in the project area is an endangered species and a number have proven to be serious pests in Hawaii. Many of these species inhabit both urban and rural areas, and they will continue to be present in the Ke'ehi Lagoon region.

3.2.1.2 Marine Life. The nearshore marine communities in Mamala Bay, Ke'ehi Lagoon and Hickam Harbor have been subjected to various disturbances since the early 1900's. These disturbances include wastewater disposal, harbor development, channelization of streams, urbanization of the watershed, dredging and filling and the building of the Reef Runway. These processes have greatly altered the nearshore habitat for marine life. However, there is no descriptive or quantitative biological information preceding 1970.

Several studies have been done in association with the construction of the Reef Runway. These studies include the Environmental Impact Statement (U.S. Dept. of Transportation, 1972), and studies done during and after the construction of the Reef Runway (Bowers, 1976), (Chapman, 1979).

In the Environmental Consultants, Inc (AECOS, 1979) report, a single colony of coral was noted along the circulation channel B (dredged as part of the Reef Runway) and a borrow area at the southeast corner. This colony may be indicative of changes in the marine biota in the Ke'ehi Lagoon area as a result of improved water quality and circulation. Many of these changes may be too subtle to be readily noticed, except over the long term. The occurrence and diversity of corals have increased, in general, from Ke'ehi Lagoon along the reef flats to Pearl Harbor.

Inner Ke'ehi Lagoon probably was not adversely affected during the construction of the Reef Runway, and the 1979 survey [Environmental Consultants, Inc. (AECOS),1979] indicates no changes since construction. The inner lagoon is poorly populated by invertebrates and demersal fishes; species of fishes which are associated with disturbed habitats.

A recent study by OI Consultants (1986) for the Ke'ehi Lagoon, Marine Pond and Hickam Harbor, surveyed the same sites as the 1977-1978 Post-Construction survey and included the marine pond. This recent study also noted the pressure of the type of marine community commonly found in highly disturbed coral reefs. The study found that there was little evidence of significant changes in the environments previously sampled in the 1977-1978 study.

3.3 Surrounding Land Use

The land use on Oahu is controlled by the State of Hawaii, Land Use Commission and the City and County of Honolulu, Department of General Planning and Department of Land Utilization.

The State Land Use Commission is comprised of nine appointed members, and classifies all lands in the State of Hawaii into four districts; Agricultural, Rural, Urban and Conservation.

The Agricultural District supports uses directly related to farming, fish and game propagation, and cultivation of crops, forage and forestry.

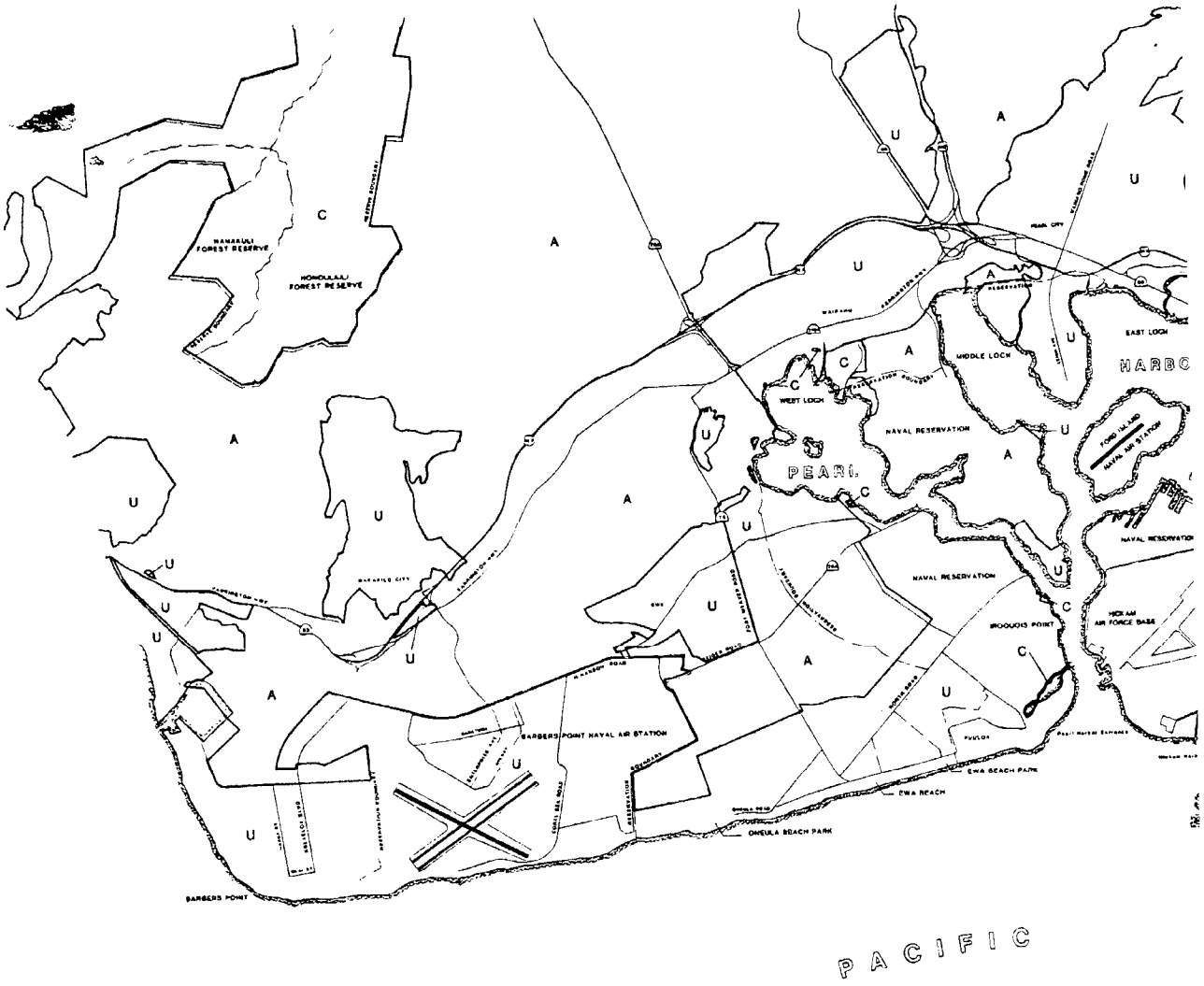
The Rural District supports activities characterized by low density residential developments of not more than one dwelling per one-half acre. These districts may include contiguous areas which are not suited to low density residential lots of small farms by reason of topography, soils and related characteristics.

The Urban District is controlled by regulations and ordinances of the County within which the district is situated.

The Conservation District is established to protect the watersheds, water resources, scenic and historic sites, wilderness, shoreline and endemic fauna and flora. Also, this district is used for flood control, creating open spaces, parks and overall enhancement of neighboring communities.

The State Land Use districts within the Airport's Environs are presented in Figure 13.

The City and County of Honolulu is responsible for the planning of the Urban and Agricultural Districts, established by the State Land Use Commission. The Department of General Planning is responsible for setting land use policy, while implementation is the responsibility of the Department of Land Utilization. The land use within the State's Land Use Districts are designated through the different zoning categories. These zoning categories are Preservation, Agricultural, Country, Residential, Apartment, Apartment Mixed Use, Resort, Business, Business Mixed Use, Industrial and Industrial-Commercial Mixed Use. Also included in the City and County zoning categories are special design districts which are as follows:



LEGEND

A AGRICULTURAL

C CONSERVATION

U URBAN

AIRPORTS DIVISION
DEPARTMENT OF TRANSPORTATION
STATE OF HAWAII

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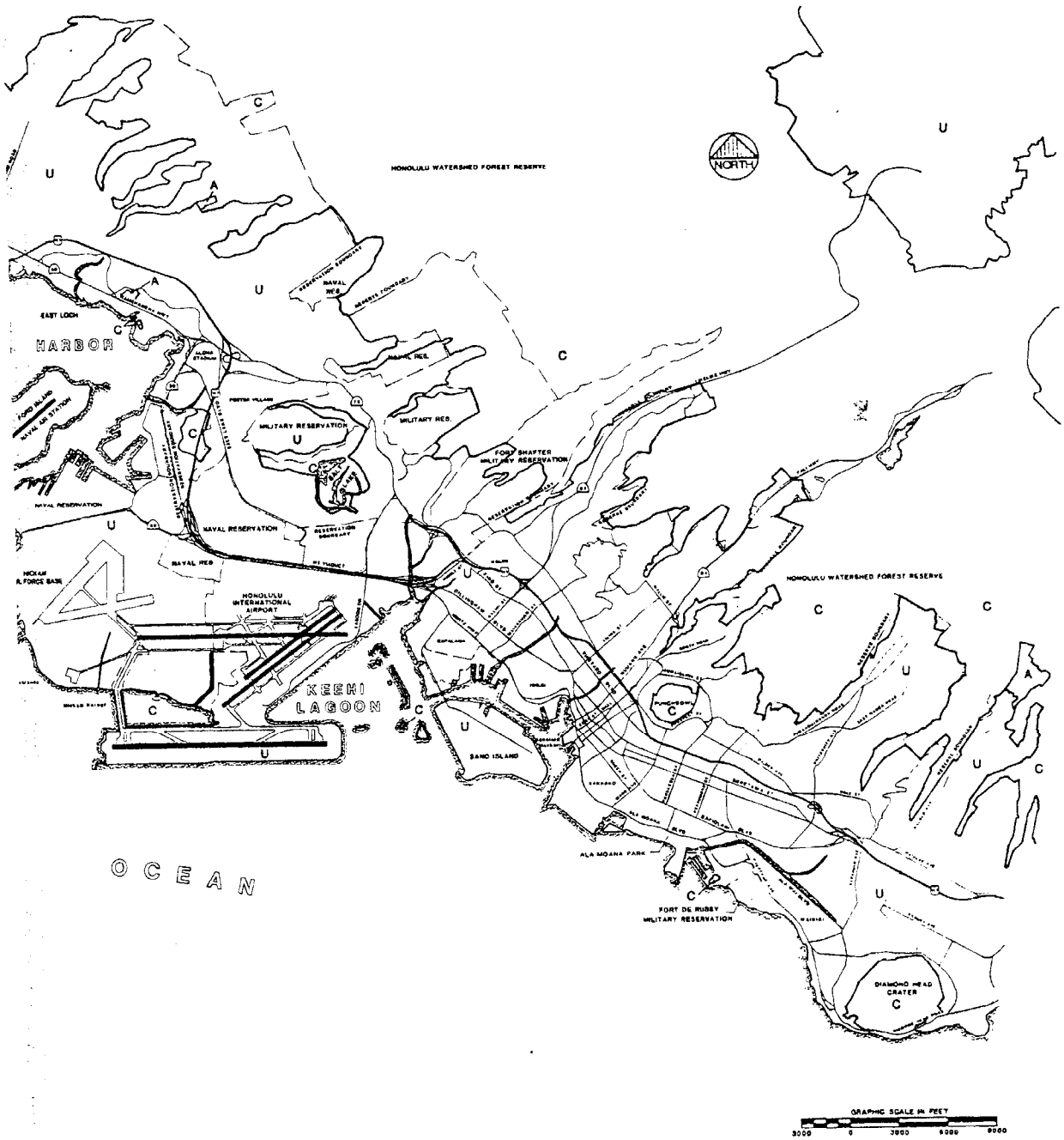


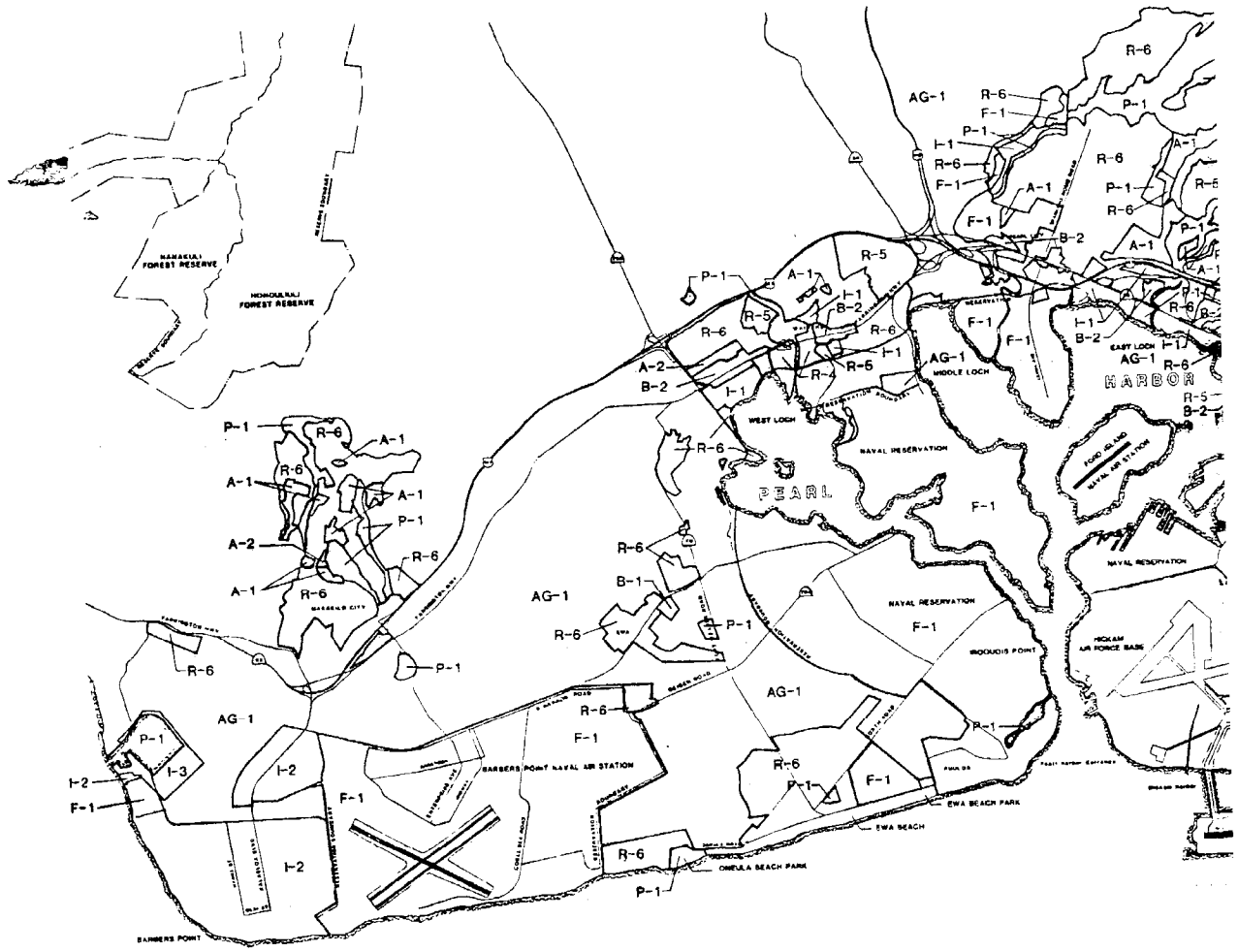
AIRPORT AND OGRAM	KFC AIRPORT, INC. MANAGEMENT CONSULTANTS	1985 STATE OF HAWAII LAND USE	FIGURE 13

- Flood Hazard Districts
- Hawaii Capital District
- Diamond Head District
- Punchbowl District
- Chinatown District
- Thomas Square/Honolulu Academy of Arts District
- Waikiki District
- Haleiwa District.

The regulations and ordinances of the City and County Districts are specified in the City and County of Honolulu, Land Use Ordinance. The zoning within the Airport's environs are presented in Figure 14.

3.3.1 Existing Land Use. The land utilization in the Airport's environs are shown on Figure 15. As can be readily seen, the land neighboring HIA to the west is comprised of Federally owned land which supports Hickam Air Force Base and Pearl Harbor Naval Shipyard. West of the Pearl Harbor entrance channel, lies the area known as the Ewa Plains. This area is comprised mainly of civilian and military residential developments, and agricultural land uses. Also, this area has been designated for future urban development by the City and County of Honolulu with emphasis on developing a "Second City Complex", which includes residential units, low and high density apartment complexes, commercial and industrial uses, and resort complexes.

Neighboring HIA to the North and East is the City of Honolulu and it's suburbs. This area is a highly urbanized area including residential uses, high density apartments, commercial, light industrial, and hotel developments.



LEGEND

AGRICULTURAL ZONES

- AG-1 RESTRICTED AGRICULTURAL
- AG-2 GENERAL AGRICULTURAL

APARTMENT ZONES

- A-1 APARTMENT
- A-2 APARTMENT
- A-3 APARTMENT
- AP APARTMENT PRECINCT

BUSINESS ZONES

- B-1 NEIGHBORHOOD BUSINESS
- B-2 COMMUNITY BUSINESS
- B-3 BUSINESS RESIDENTIAL
- B-4 CENTRAL BUSINESS
- RC RESORT COMMERCIAL PRECINCT

HOTEL ZONES

- RH RESORT HOTEL

INDUSTRIAL ZONES

- I-1 LIGHT INDUSTRIAL
- I-2 HEAVY INDUSTRIAL
- I-3 WATERFRONT INDUSTRIAL

PLANNED DEVELOPMENT ZONES

- KCDD KAKAAKO COMMUNITY DEVELOPMENT DISTRICT
- KSDD KAKAAKO SPECIAL DESIGN DISTRICT

PRESERVATION ZONES

- P-1 PRESERVATION
- F-1 MILITARY AND FEDERAL
- PP PUBLIC PRECINCT

RESIDENTIAL ZONES

- R-1 RESIDENTIAL
- R-2 RESIDENTIAL
- R-3 RESIDENTIAL
- R-4 RESIDENTIAL
- R-5 RESIDENTIAL
- R-6 RESIDENTIAL
- R-7 RESIDENTIAL

AIRPORTS DIVISION
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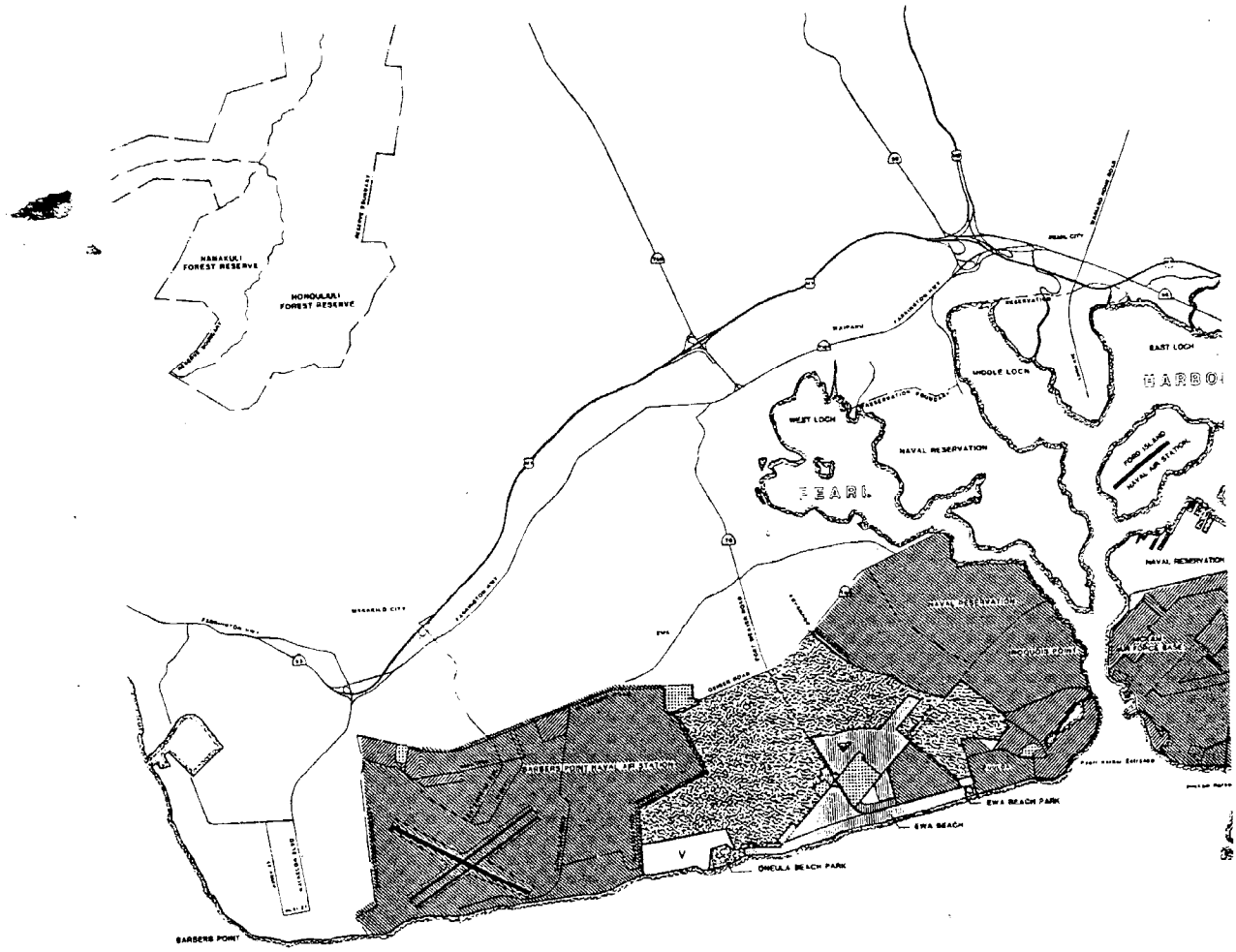
AIRPORT AND ROGRAM	KFC AIRPORT, INC. MANAGEMENT CONSULTANTS	1985 CITY & COUNTY OF HONOLULU ZONING	FIGURE 14



LEGEND

- AGRICULTURE
- COMMERCIAL (OFFICE AND RETAIL)
- INDUSTRIAL
- MILITARY
- MULTIFAMILY RESIDENTIAL (CIVILIAN)
- MULTIFAMILY RESIDENTIAL (MILITARY)
- SINGLE-FAMILY RESIDENTIAL (CIVILIAN)
- SINGLE-FAMILY RESIDENTIAL (MILITARY)
- PARK AND RECREATION FACILITIES
- PUBLIC/SEMI-PUBLIC/SCHOOLS
- V VACANT

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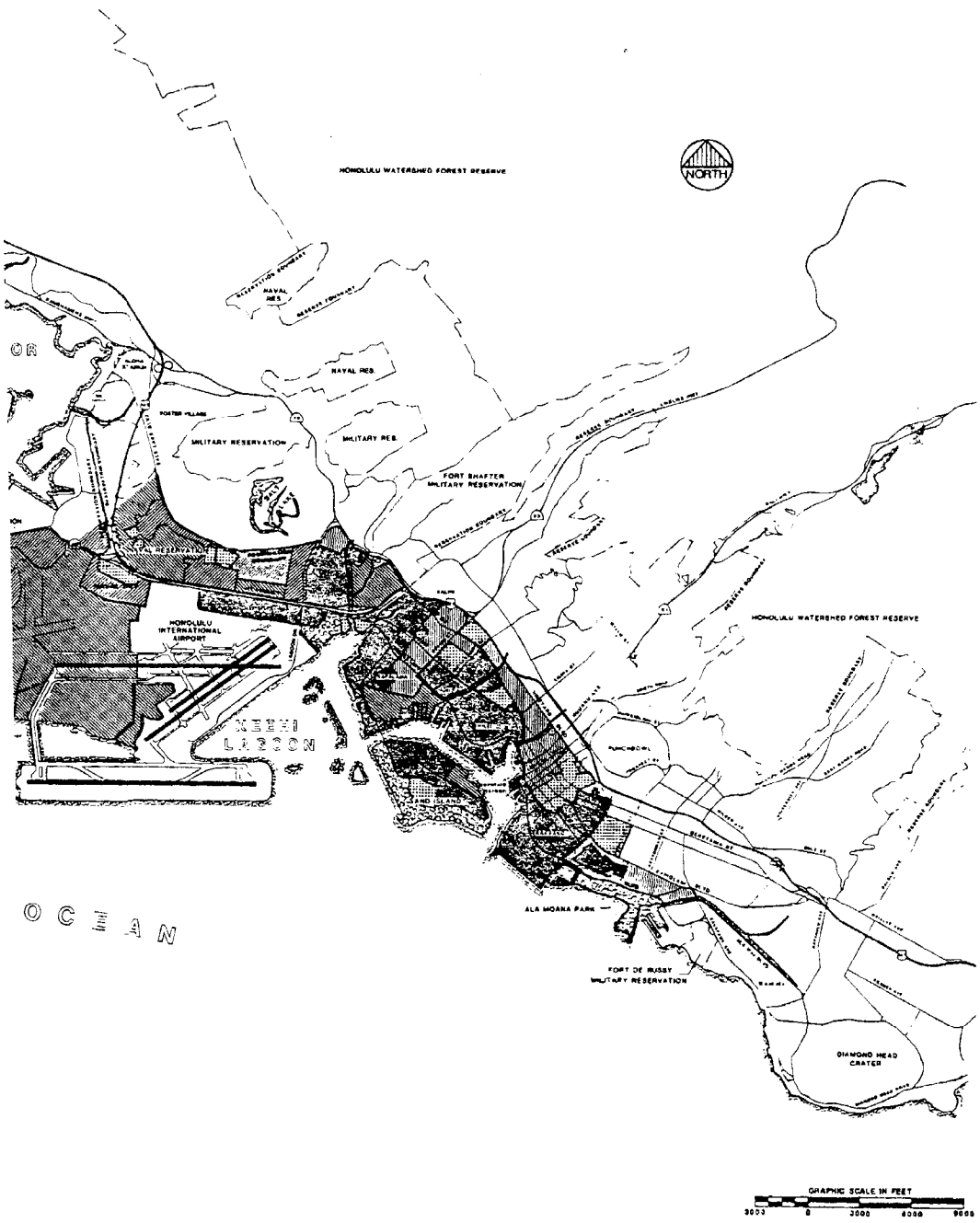

ORT AM	KFC AIRPORT, INC. MANAGEMENT CONSULTANTS	1985 LAND USE	FIGURE 15

Section 4.0
PROBABLE ENVIRONMENTAL CONSEQUENCES AND CONSISTENCY WITH FEDERAL AND LOCAL STATUTES, AUTHORITIES AND PLANS

This section describes the probable environmental consequences due to the proposed HIA Development Plan. The development of neighboring Ke'ehi Lagoon for marinas, recreational boating, parks and industrial/commercial endeavors is still in the planning stages. A complete and detailed environmental assessment for this development will be accomplished during the planning and design stages. Therefore, this Environmental Assessment will omit the impacts of the Ke'ehi Lagoon development and will be amended, if necessary, at a future date. Also, the impacts and details of the new International Terminal Facility will be addressed in a separate environmental study. This study will be accomplished as part of the planning and design process of the new facility.

4.1 Noise

The noise impacts and mitigation measures for HIA are presently being studied under a Part 150 Program. The methodology and results will be presented in Volume 2 of this series as mentioned earlier. Based on preliminary results the noise impacts for the five year study period remains the same as the present noise impacts. The noise impact within the environs would occur whether or not these proposed changes are implemented.

4.2 Compatible Land Use

The alleviation of noise impacts within the environs was studied in the FAR Part 150 Noise Compatibility Program, which is discussed in detail in Volume 2 of the Master Plan Update. The noise impact on land use in the airport environs will remain similar to the present noise impact. In fact, the Ewa Plains area will see a slight decrease over the next 5 years due to the use of quieter aircraft by military forces. However, this decrease is only temporary, as the noise will increase with increased aircraft operations. Therefore, to achieve and maintain compatible land use, the Noise Program is recommending the use of zoning, sound insulation, air conditioning and avigation easements on existing and future incompatible lands. The State of Hawaii, Department of Transportation, Airports Division (DOTA) has established the maximum compatible noise level for residential housing without noise mitigation measures at 60 L_{dn} and requires Fair Disclosure for all residential units within the 55 L_{dn} contour. Also, the DOTA has determined that marina development and recreational use in Ke'ehi Lagoon is a compatible land use with adequate noise mitigation measures.

4.3 Social Impacts

As planned, the development of the airport facilities will not disrupt any of the established communities, requires no relocation of any residences or businesses, and doesn't create an appreciable

change in employment. Also, the proposed plan does not alter off-airport surface transportation patterns. The proposed development plan will not create additional congestion on off-airport streets except for the normal increase in traffic associated with increasing passenger volumes and aircraft operations. The construction of the planned Interisland Terminal and Parking Structure will improve the airport parking and access to meet present and forecasted passenger demands to the year 2005. The no-action alternative would not relieve the congestion and parking problems at the Interisland Terminal, which are expected to increase as passenger volumes increase.

4.4 Induced Socioeconomic Impacts

The planned airport development is not of major consequence to the populace of Honolulu. The focus of the development is to upgrade the existing facilities to meet forecasted aircraft operations in the future and minimize any delays at HIA. There should be no impact on surrounding communities with the possible exception of the Ke'ehi Lagoon development and the International Terminal Building.

4.5 Air Quality

The air quality analysis for HIA was performed by J. W. Morrow (Nov. 1987) and a summary of his conclusions is given below. A detailed report of his findings is presented in Appendix C.

- "The airport and its environs are a significant source of carbon monoxide, nitrogen oxides, hydrocarbons, and to a much lesser extent, particulate matter and sulfur dioxide. Emissions of these pollutants are projected to increase over the 1985-2005 period as a result of increases in aircraft operations and the ground vehicle activity that is generated by those operations."

- "Despite the significant emissions, ambient concentrations are projected to remain generally in compliance with federal and state air quality standards. Only in the vicinity of traffic 'hot-spots' are the state carbon monoxide standards likely to be exceeded at times. These 'hot-spots' include such areas as the Interisland Terminal, Overseas Arrivals, parking exit gates, and signalized intersections along Nimitz/Kamehameha Highways during peak traffic hours. These areas are characterized by stop and go traffic movement, queuing and idling vehicles, all of which lead to higher CO emissions and ambient levels. In the future, there may be some reduction in this impact at the Interisland Terminal due to construction of the new multi-level Interisland garage, which is expected to result in less curbside activity."

- "Nonmethane hydrocarbon concentrations will continue to contribute to generation of photochemical oxidants and exceedance of the state's photochemical oxidant (ozone) standard. Compliance with emission standards and control technology requirements will contribute to reduction in ambient hydrocarbon levels."

The development plan has no significant impact on the air quality relative to the no-action alternative, with the possible exception of beneficial impacts due to the new Interisland Terminal/Parking Complex and the fixed rail rapid transit system. As stated above, the new Interisland complex should reduce curbside traffic and reduce pollutant levels at the respective "hot-spot". Also, the proposed rapid transit link may reduce the amount of traffic to and from HIA and should provide additional benefits to the air quality.

4.6 Water Quality

There should be no significant impacts to the water quality due to the implementation of this development plan, since there is no development in the neighboring bodies of water, except for the Ke'ehi Lagoon Development. Water quality within Ke'ehi Lagoon and adjacent coastal waters has not changed appreciably since construction of the Reef Runway and it is expected that implementation of the Plan will not result in significant long term degradation of water quality.

4.7 D.O.T. Act Compliance

The Development plan will not require use of any publicly owned land from a public park, recreation area, or wildlife and waterfowl refuge, or land of an historic site. Therefore, section 4(f) is not applicable and no further analysis is required.

4.8 Historical, Archeological and Cultural Resources

There are no historical, archeological or cultural sites on the airport property and therefore, there will be no direct impact on any such site. However, there are four sites presently located within the 60 L_{dn} noise curve. Three sties, the U.S. Immigration Office, the Kaka'ako Pumping Station, and the Oahu Prison Administration Building, receive a noise level of approximately 60 L_{dn}. The fourth site, Hickam Air Force Base, is subjected to noise levels of 60 L_{dn} or greater, because of its close proximity to HIA. In 1990, the noise impact on these sites remains the same or increases slightly and there are no new sites impacted. In the 2005, the noise curves are reduced and only Hickam Air Force Base is impacted by noise. At these noise levels, there should be no adverse effects on these historical sites.

4.9 Biotic Communities

4.9.1 Flora. The proposed development plan will be constructed on areas of the airport which have been previously paved over or covered with exotic plant species. Any impact on exotic flora will be reduced through planning and landscaping. This development should have no significant impact on the flora communities on the airport.

4.9.2 Fauna. As stated earlier, the proposed developments will occur on areas which are currently paved over or have been landscaped with exotic flora. There will be no significant impact to any wildlife on the airport property.

A study on marine life was performed by Oceanic Institute in September 1986. Their findings are presented in Appendix B. The airport Development Plan will not disturb the marine habitat and therefore will not result in significant impact on the marine life.

4.10 Endangered and Threatened Species of Flora and Fauna

The implementation of the Development Plan will occur in areas which are paved over or covered with introduced species of vegetation. Therefore, the implementation of the plan will not jeopardize the continued existence of endangered or threatened species of flora and fauna, nor result in the destruction or adverse modification of habitat of such species.

4.11 Wetlands

There are no wetlands in the areas of the proposed HIA development. The proposed developments are located in areas which were created by landfills and/or previously developed. The effects of the Ke'ehi Lagoon development will be studied in separate environmental study.

4.12 Floodplain

According to the Flood Insurance Rate Maps (FIRM), produced by the Federal Emergency Management Agency, HIA is designated as an area of undetermined but possible flood hazard (Zone D). The proposed development plan will not increase the severity of the flooding potential. Potential flooding due to tsunamis and storm waves is not expected to cause any significant environmental impacts.

4.13 Coastal Zone Management Program

Implementation of the Development Plan will occur on previously developed airport lands and therefore, is not expected to violate the provisions or objectives of the State of Hawaii Coastal Zone Management Act. A Special Management Area Permit, issued by the City and County of Honolulu Department of Land Utilization, will be required prior to any construction.

4.14 Coastal Barriers

Not applicable.

4.15 Wild and Scenic Rivers

There are no wild and scenic rivers in the area of the airport.

4.16 Farmland

There are no farmlands with the airport area.

4.17 Energy Supply and Natural Resources

The increase of stationary facilities in the development plan to meet forecasted operations and passenger volumes are expected to increase electrical demand for HIA. However, this increase will not significantly impact the local electrical supply.

The forecasted increase of aircraft operations and passenger volumes will increase the demand for aviation and automobile fuel. However, this increase in fuel consumption may be lessened by the implementation of the proposed development plan. The new Interisland Terminal and Parking Garage will reduce the amount of curbside traffic and idling. Also, the rapid transit system should help to reduce the amount of vehicular traffic at HIA.

The effect of this plan on water usage would be comparable to the no-action alternative. Water usage will increase due to increased passenger volumes. However, the increase in water usage will not significantly effect the island's water supply.

4.18 Light Emissions

The plan will not change the existing lighting types or significantly increase the amount of lighting at HIA.

4.19 Solid Waste Impacts

The amount of solid waste is expected to increase due to the increase of passenger volumes at the airfield. This increase with the proposed plan will be similar to that of the no-action alternative. Therefore, there will be no significant impacts due to the implementation of this plan.

4.20 Construction Impacts

The construction of the new facilities throughout the airfield will generate some adverse short-term

effects to air and water quality. Also, noise and dust generated by the construction onsite and on local roadways may cause some short-term impacts.

The only possibly impacted residential area is the military housing units of Ohana Nui, neighboring the Interisland terminal, cargo, and maintenance areas.

To minimize the effects of these short-term construction impacts, all applicable local, State, FAA, Federal and OSHA regulations would be adhered to. Applicable regulations and ordinances include the FAA Advisory Circular 150/5370-10. Also, all means to insure aviation safety and airport security would be implemented. Aviation safety shall be coordinated with appropriate apron control organizations and FAA control tower personnel for each construction activity. In addition, all airport security regulations will be enforced to prevent unauthorized personnel or vehicles from entering the airfield or construction areas.

4.21 Environmental Consequences - Other Considerations

The proposed Development plan has been reviewed by local, State, and Federal officials. Due to the long-term presence of HIA, no conflicts have been found or are expected to arise.