Draft Environmental Assessment

PROPOSED KONA INTERNATIONAL AIRPORT IMPROVEMENTS AT KEAHOLE, NORTH KONA, HAWAI`I

Prepared for:

State of Hawai`i,
Department of Transportation,
Airports Division

May 2008

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Executive Summary

Project Name:	Proposed Kona International Airport (KOA) Improvements at Keahole, North Kona, Hawai`i
Type of Document:	Draft Environmental Assessment
Legal Authority:	Chapter 343, Hawai`i Revised Statutes
Agency Determination:	Anticipated Finding of No Significant Impact (FONSI)
Applicable Environmental Assessment Review "Trigger":	Use of State Lands
Location:	TMK: (3) 7-3-43:003 and 037 Kona, Hawai`i
Applicant:	State of Hawai`i, Department of Transportation, Airports Division 400 Rodgers Blvd., Suite 700 Honolulu, Hawai`i 96819-1880
Approving Agency:	State of Hawai`i, Department of Transportation, Airports Division 400 Rodgers Blvd., Suite 700 Honolulu, Hawai`i 96819-1880 Contact: Kevin Funasaki, Project Engineer Phone: (808) 838-8828
Consultant:	Munekiyo & Hiraga, Inc. 305 High Street, Suite 104 Wailuku, Hawai`i 96793 Contact: Mich Hirano Phone: (808) 244-2015
Project Summary:	The proposed improvements at KOA include: two (2) new interim Commuter Airlines Terminal (CAT) buildings; resurfacing and relocating of the entrance gate and ticket dispensers at the main parking lot and expanding the long-term and overflow parking lots; new photovoltaic electrical upgrades; and related infrastructure and site landscaping improvements. The new CAT buildings will be located to the south of the existing air passenger terminals. Improvements include

construction of two (2) CAT buildings and a gazebo structure. Related improvements include provision of a graded and paved area within the driveway, associated site development infrastructure, parking striping, parking lighting, and related landscaping. ADA (Americans With Disabilities Act) compliant passenger walkways, access, exits, and parking will also be provided. In addition, modifications to the existing airfield fencing and passenger gate access will be carried out in relation to the new interim CAT building improvements.

The improvements within the main parking lot include replacing the existing pavement with 2.5-inch new asphaltic concrete (AC) pavement, repainting pavement surface markings, relocating the existing entrance, gate and ticket dispensers, constructing a new entrance lane, and building a new gazebo at the new entrance. The existing landscaping at the main parking lot will be modified to meet the County Code requirements. The improvements at the long-term parking lot include expanding the parking area to the east and south to provide additional parking capacity, repaving and restriping the expansion area, developing a new entry to the parking lot from the existing roadway in the northeast corner, and landscaping along the access road and internal airport circulation road to the west. Related improvements include new dry wells for site drainage, landscaping to meet County Code requirements and, parking lot lighting and security cameras. The improvements at the over-flow parking lot include expanding the parking area to the north and southwest to provide additional capacity, grading, paving and striping the expansion area, installing guardrails as required, landscaping along the access road to meet County Code requirements, and installing parking lighting and security cameras.

The photovoltaic (PV) electrical system upgrades include the installation of photovoltaic panels at the improved and expanded main, long-term and overflow parking lots. The parking lot PV panel improvements involve construction of trellis structures with the photovoltaic solar panels attached on top of the trellises. Power generated by the system will be fed into the airport electrical grid via a connection at the main Hawaiian Electric Light Company (HELCO) meter.

Related infrastructure improvements including, but not limited to extension of water, sewer and drainage facilities,

and electrical and telephone/telecommunication services will be carried out as required. All improvements will be landscaped as required to meet County Code specifications.

PROJECT OVERVIEW

I. PROJECT OVERVIEW

A. PROJECT LOCATION, EXISTING USE, AND LAND OWNERSHIP

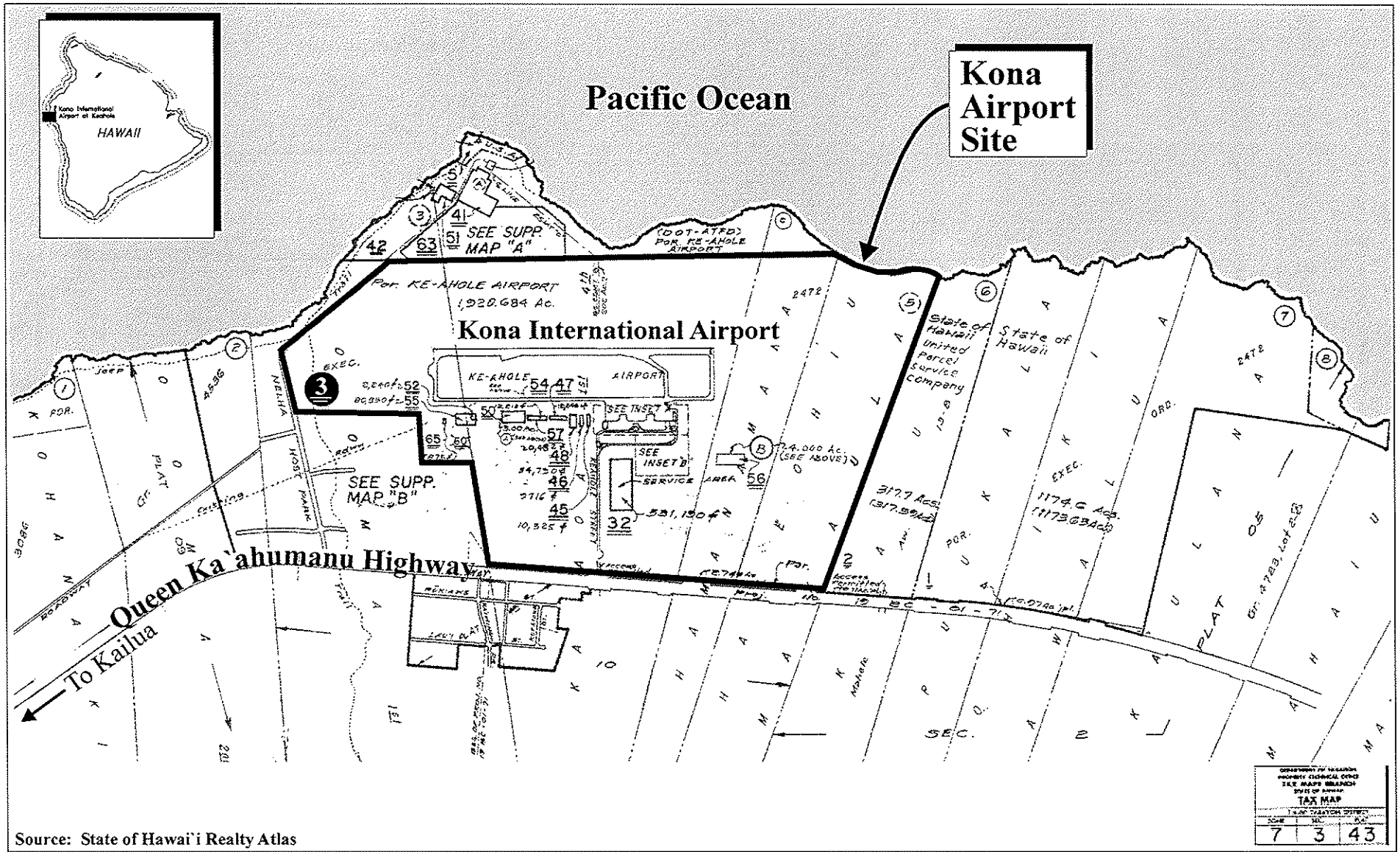
The Kona International Airport (KOA) at Keahole is located in the North Kona district on the west side of the Island of Hawai`i. The State of Hawai`i, Department of Transportation Airports Division (DOT-A) proposes improvements at KOA in areas identified by Tax Map Key (TMK) Numbers (3)7-3-43:003 and 037. The main airport lands cover an area of approximately 1,920.6 acres. However, the proposed improvements will be limited to two (2) areas covering approximately 11.36 acres located in the vicinity of the main terminal area (hereafter referred to as the "project site"). See **Figure 1** and **Figure 2**. KOA is approximately seven (7) miles north of Kailua-Kona and is located on the makai (west) side of Queen Ka`ahumanu Highway. The airport serves as the primary entry and departure point for the west side of the island, with interisland, domestic mainland, and international flights scheduled daily. The Hilo International Airport serves the east side of the island of Hawai`i and is located approximately 56 nautical miles east of KOA (Keahole Associates, Inc., 2000). The KOA lands are owned by the State of Hawai`i.

The County General Plan Land Use Pattern Allocation Guide (LUPAG) map designates the project site as "Industrial." The airport is zoned "General Industrial (MG-1a)" by the County of Hawai`i. The KOA is located within the County of Hawai`i's Special Management Area (SMA).

B. PROPOSED ACTION

The Applicant proposes improvements at KOA which include: two (2) new interim Commuter Airlines Terminal (CAT) buildings; resurfacing and relocating of the entrance gate and ticket dispensers at the main parking lot and expanding the long-term and overflow parking lots; new photovoltaic electrical upgrades; and related infrastructure and site landscaping improvements.

The scope of the proposed improvements are detailed as follows:



Source: State of Hawai`i Realty Atlas

Figure 1 Proposed Kona International Airport Improvements

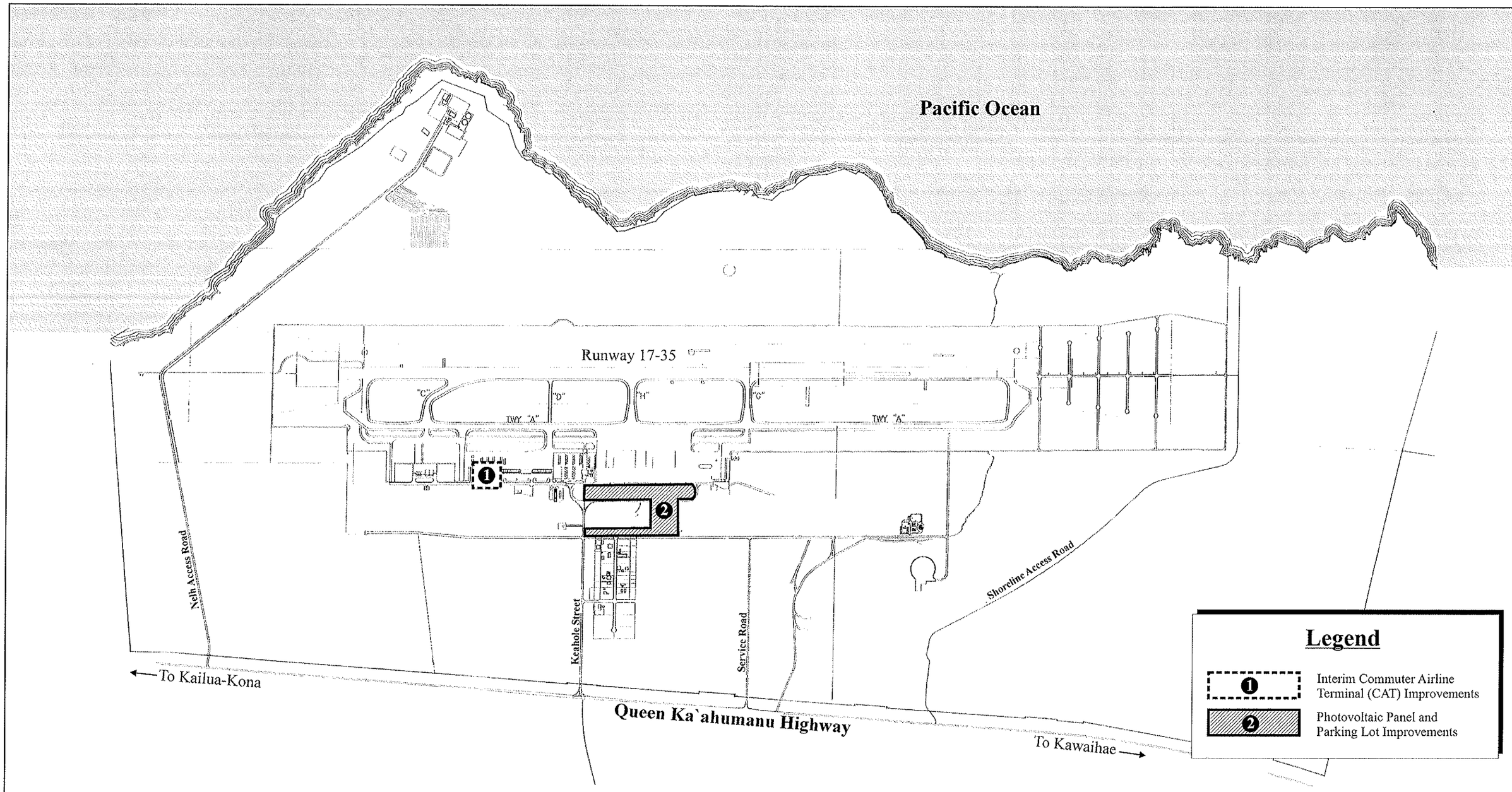
Regional Location Map

NOT TO SCALE

Prepared for: State of Hawai`i, Department of Transportation, Airports Division

MUNEKIYO & HIRAGA, INC.

KYA\Kona AP\RegionalLocationMap



Source: State of Hawai`i, Department of Transportation, Airports Division

Figure 2

Proposed Kona International Airport Improvements
Site Plan

NOT TO SCALE

Prepared for: State of Hawai`i, Department of Transportation, Airports Division

MUNEKIYO & HIRAGA, INC.

KYA\KonaAP\eclSitePlan

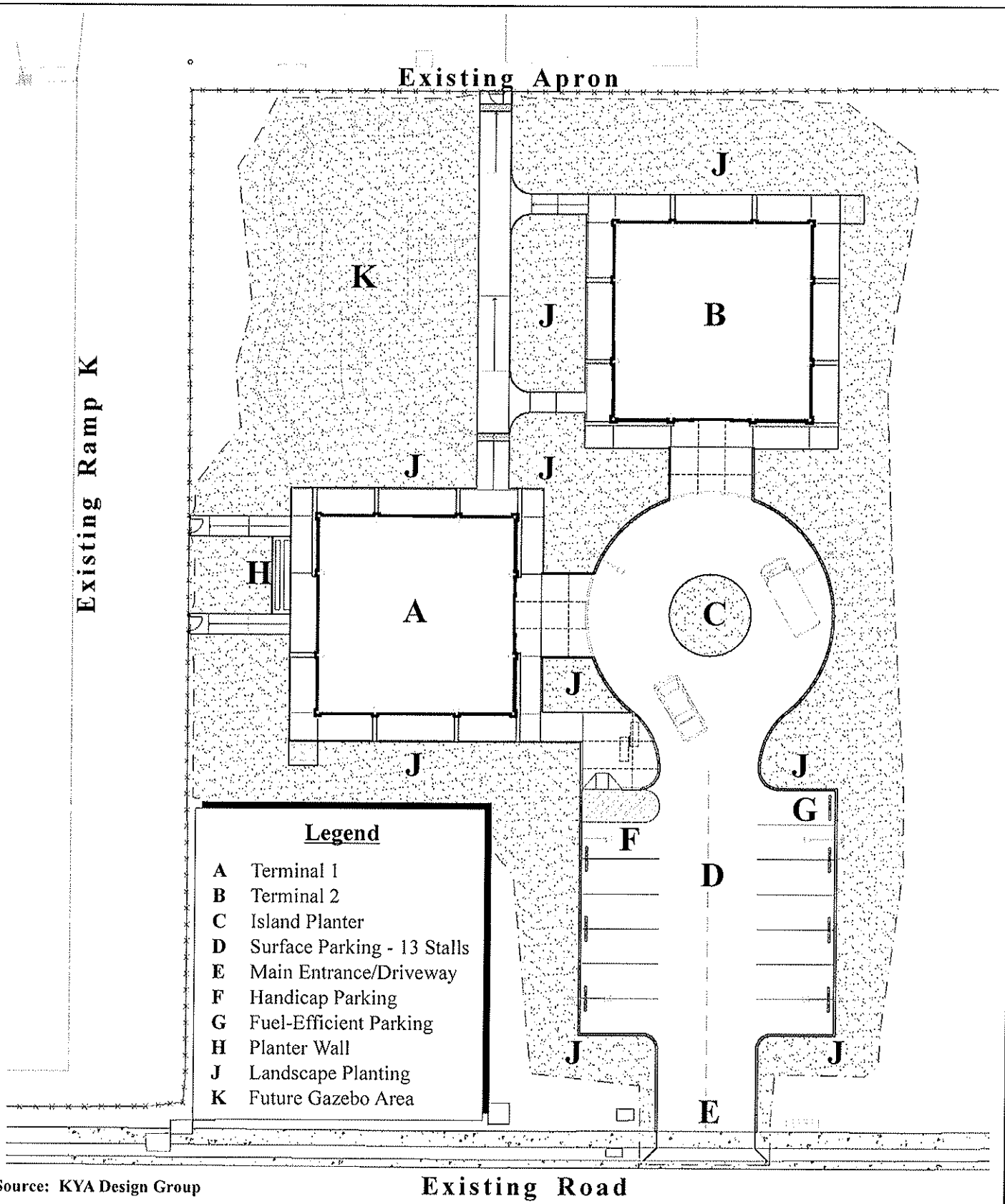
1. Interim Commuter Airline Terminal (CAT) Improvements

The new CAT buildings will be located to the south of the existing air passenger terminals. Refer to **Figure 2**. Improvements include construction of two (2) CAT buildings and a gazebo structure. See **Figure 3, Figure 4**, and **Figure 5** for a typical floor plan and elevations of the CAT buildings. Related improvements include provision of a graded and paved area within the driveway, associated site development infrastructure (including a sewage lift station), parking striping, parking lighting, and related landscaping. ADA (Americans With Disabilities Act) compliant passenger walkways, access, exits, and parking will also be provided. In addition, modifications to the existing airfield fencing and passenger gate access will be carried out in connection with the new interim CAT building improvements.

2. Parking Lot Improvements

The improvements within the main parking lot include replacing the existing pavement with 2.5-inch new asphaltic concrete (AC) pavement, repainting pavement surface markings, relocating the existing entrance, gate and ticket dispensers, constructing a new entrance lane, and building a new gazebo at the new entrance. See **Figure 6**. The existing landscaping at the main parking lot will be modified to meet the County Code requirements. The improvements at the long-term parking lot include expanding the parking area to the east and south to provide additional parking capacity, repaving and restriping the expansion area, developing a new entry to the parking lot from the existing roadway in the northeast corner, and landscaping along the access road and internal airport circulation road to the west. Related improvements include new dry wells for site drainage, landscaping to meet County Code requirements and, parking lot lighting and security cameras. The improvements at the over-flow parking lot include expanding the parking area to the north and southwest to provide additional capacity, grading, paving and striping the expansion area, installing guardrails as required, landscaping along the access road to meet County Code requirements, and installing parking lighting and security cameras.

The parking lots are being implemented in three (3) phases. Phases I and II of the long-term parking lot and overflow parking lot are in place. The scope of the proposed action will involve repaving, relocating entrances, and landscaping. The Phase III expansion will be initiated upon completion of the environmental assessment and required permits.



Source: KYA Design Group

Figure 3 Proposed Kona International Airport Improvements

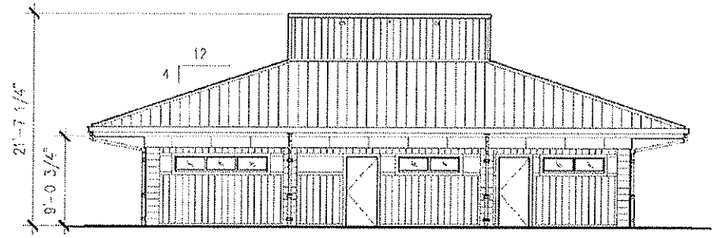
NOT TO SCALE

Interim Commuter Air Terminal (CAT) Site Plan

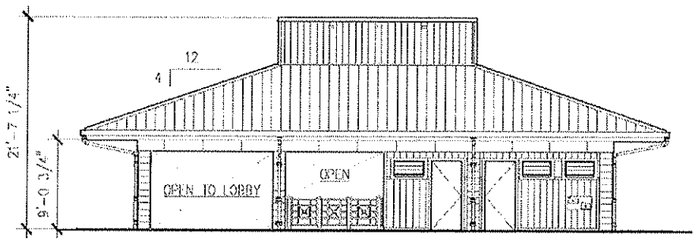
Prepared for: State of Hawai`i, Department of Transportation, Airports Division

MUNEKIYO & HIRAGA, INC.

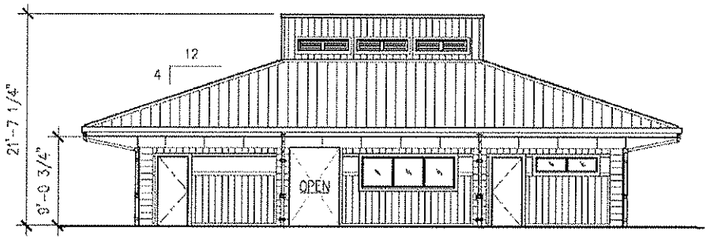
KYA/Kona AP/DEAInterimCATSitePlan



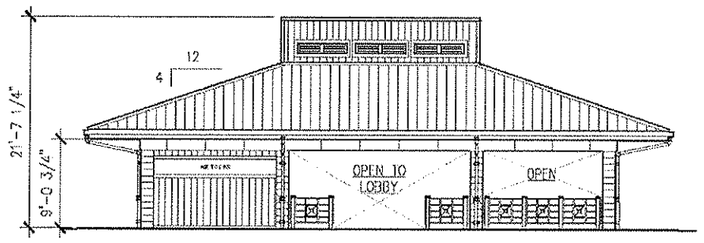
Terminal 1 - East Elevation



Terminal 1 - West Elevation



Terminal 1 - South Elevation



Terminal 1 - North Elevation

Source: KYA Design Group

Figure 4

Proposed Kona International Airport Improvements

Interim Commuter Air Terminal 1 Elevations

NOT TO SCALE

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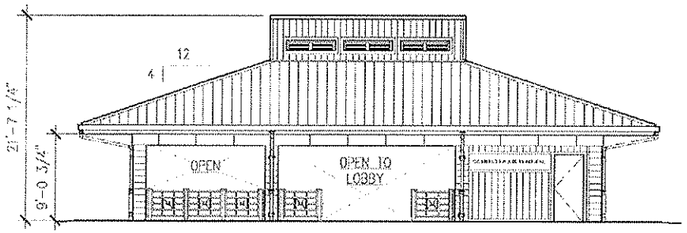
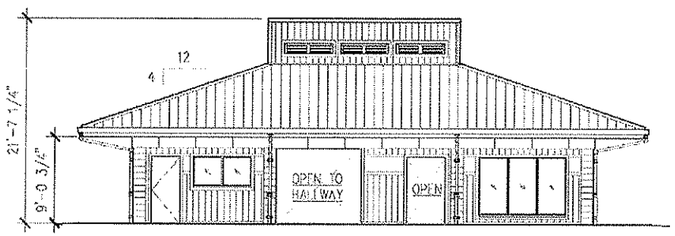
MUNEKIYO & HIRAGA, INC.

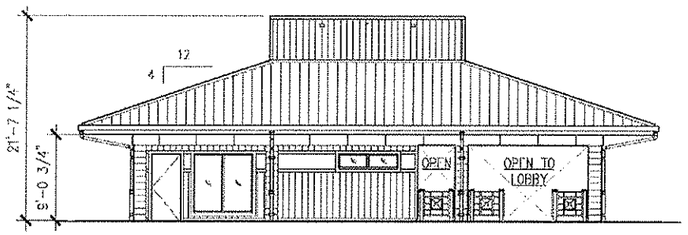
KYA\KonaAP\DEAInterimCATElevations



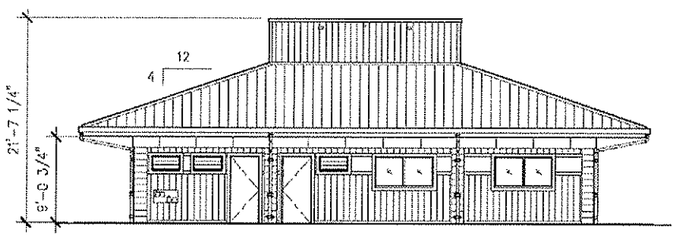
Terminal 2 - East Elevation



Terminal 2 - West Elevation



Terminal 2 - South Elevation



Terminal 2 - North Elevation

Source: KYA Design Group

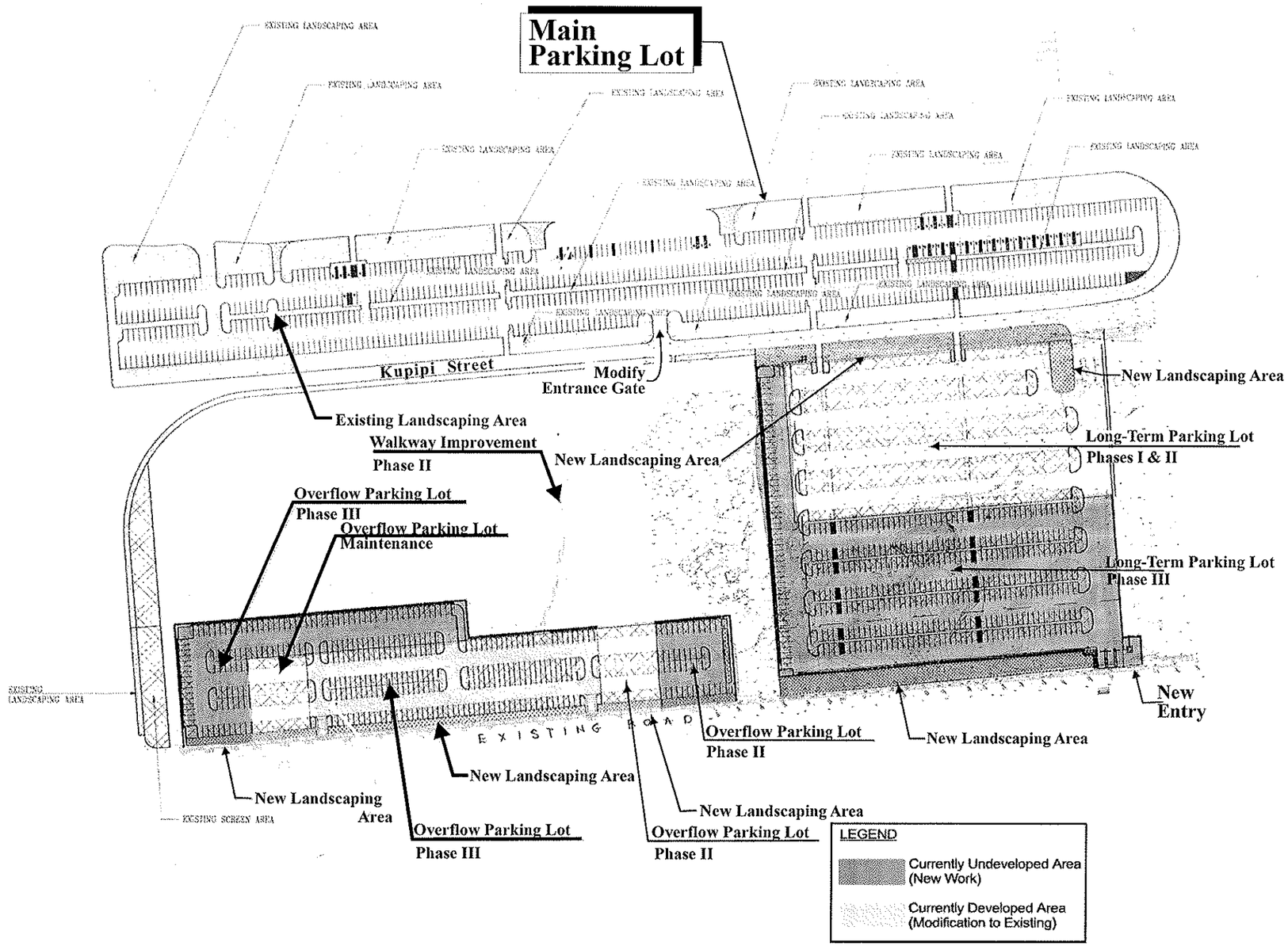
Figure 5 Proposed Kona International Airport Improvements
Interim Commuter Air Terminal 2 Elevations

NOT TO SCALE

Prepared for: State of Hawai`i, Department of Transportation, Airports Division

MUNEKIYO & HIRAGA, INC.

KYA\KonaAP\DEAInterimCAT2Elevations



Source: State of Hawai`i, Department of Transportation, Airports Division

Figure 6

Proposed Kona International Airport Improvements
Parking Lot Improvements

NOT TO SCALE

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MUNEKIYO & HIRAGA, INC.

KYA\KonaAP\eclParkingLotImprovements

3. Photovoltaic Electrical System Upgrades

The photovoltaic (PV) electrical system upgrades include the installation of photovoltaic panels at the improved and expanded main, long-term and overflow parking lots. See **Figure 7** and **Figure 8**. The parking lot PV panel improvements involve construction of trellis structures with the photovoltaic solar panels attached on top of the trellises. The proposed parking lot PV arrays would be installed in two (2) phases. Phase I would cover an area of 97,226 square feet with PV panels immediately to the east of Kupipi Street while Phase II would include 103,315 square feet of PV arrays south and west of Phase I. Refer to **Figure 6** and **Figure 7**. The power generation capacity for Phase I is estimated to be 1.4 megawatts, while the Phase II yield is estimated at 2.3 megawatts. The Phase I installation will generate enough power to support the airport load during the day. Phase II will be installed when demand increases with terminal modernation efforts.

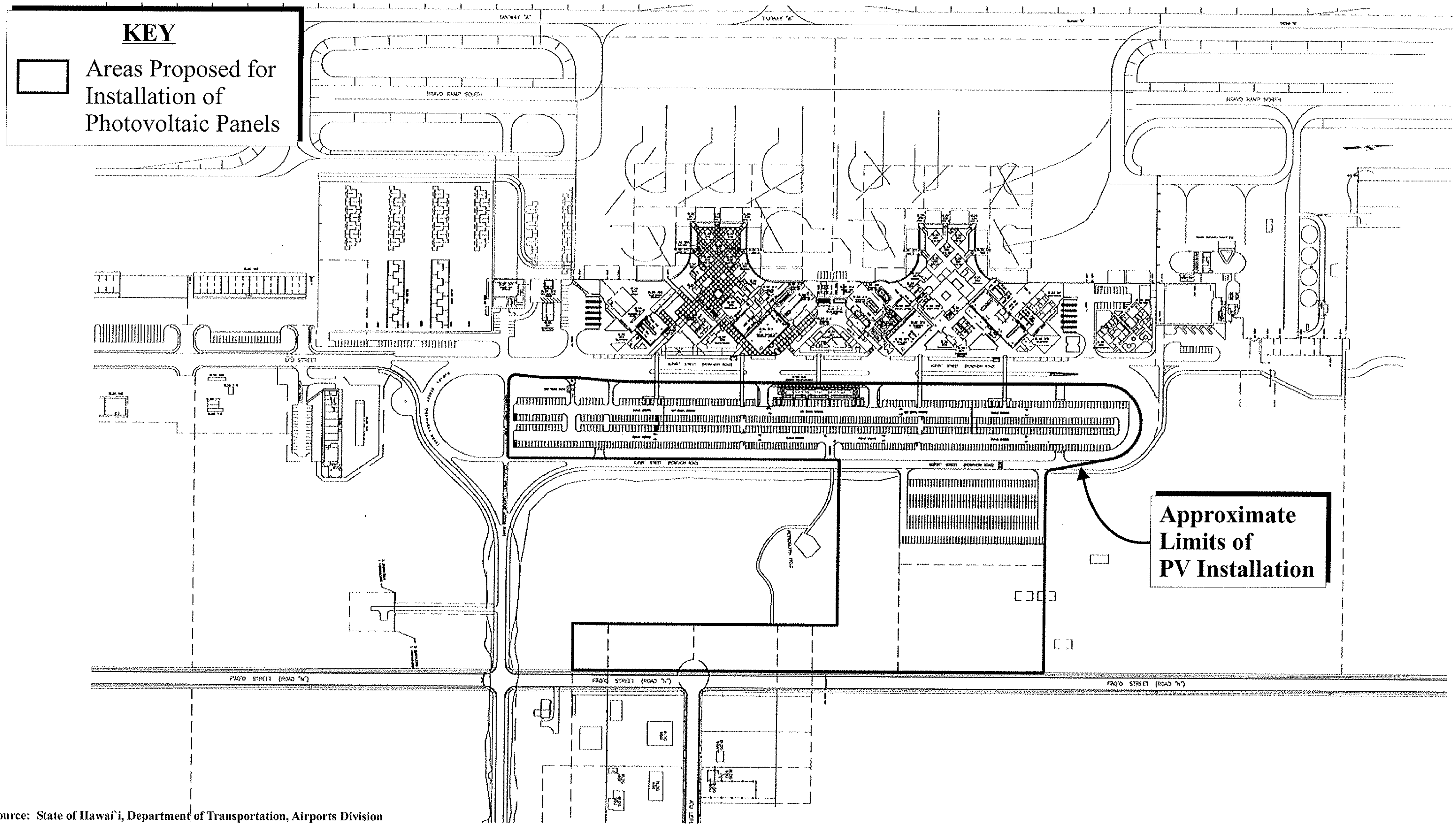
In addition to providing renewable energy, the solar panel array will also provide sun shade over the parking lots to protect the vehicles from excessive heat. The shade provided by the solar panels will also extend the life of the asphalt surfaces. The only areas within the parking lot that will not be covered with the solar panels will be the dedicated fire lanes along the main entry points and within the vehicular circulation lanes of the parking lots. Power generated by the system will be fed into the airport electrical grid via a connection at the main Hawaiian Electric Light Company (HELCO) meter.

4. Related Infrastructure and Landscaping Improvements

Other improvements, which are anticipated in connection with the proposed actions, include the installation of new drainage injection wells to accommodate increases in stormwater runoff, and related underground utility improvements. Additionally, new landscaping will be installed to ensure the appropriate visual integration of the proposed improvements with adjacent developed areas of the airport.

C. PROJECT NEED

The two (2) interim CAT buildings are necessary to reduce current overcrowding at the existing terminal facilities and to provide comfort and shade for commuter passengers. These improvements are interim facilities to accommodate existing commuter passenger demand until the long-term master plan improvements are developed.



Source: State of Hawai`i, Department of Transportation, Airports Division

Figure 7

Proposed Kona International Airport Improvements

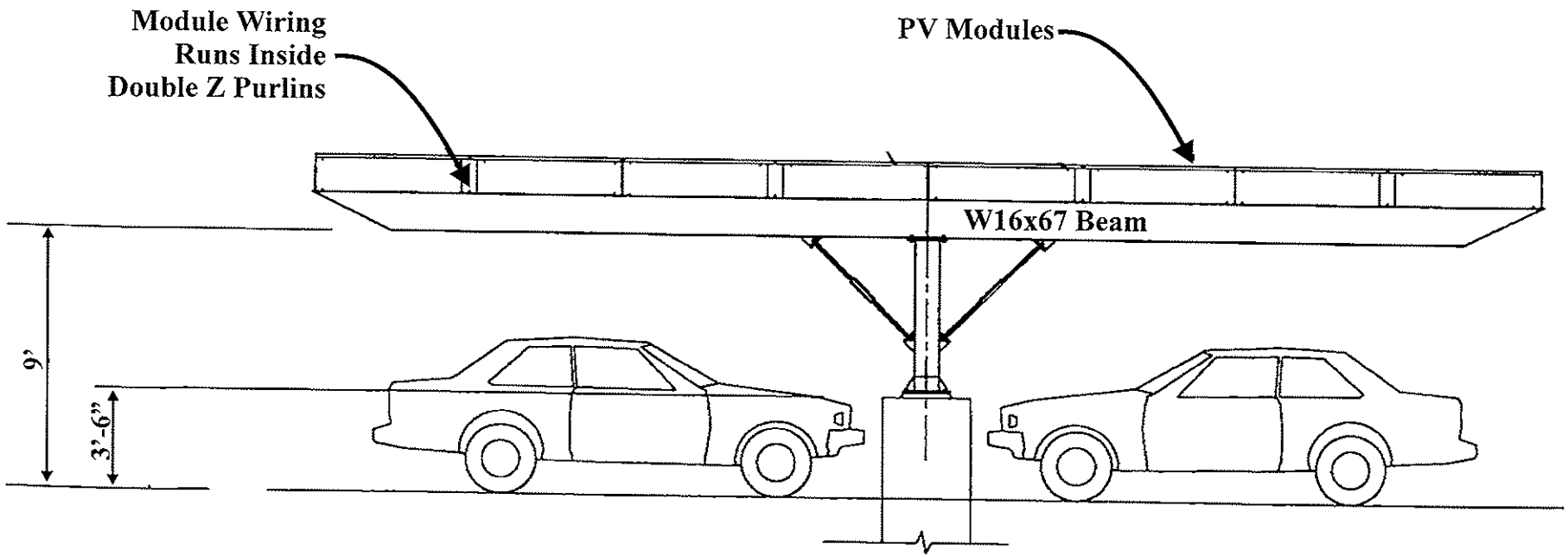
Photovoltaic Panel Installation Site Plan

NOT TO SCALE

Prepared for: State of Hawai`i, Department of Transportation, Airports Division

MUNEKIYO & HIRAGA, INC.

KYA\KonaAP\celPanelInstallation



Source: Sunpower 2008

Figure 8

Proposed Kona International Airport Improvements

Typical Photovoltaic Trellis Section

MUNEKIYO & HIRAGA, INC.

Prepared for: State of Hawai`i, Department of Transportation, Airports Division

KYA/Kona AP/Photovoltaictrellis

The parking lot expansion was determined by DOT-A to be needed to meet the long-term needs for KOA based on future growth projections of air passenger travel. The photovoltaic electrical upgrades have been identified by the State of Hawai`i as necessary energy efficient improvements to reduce the dependence on fossil fuels and establish alternative energy sources at State facilities.

D. PROJECT COST AND TIMETABLE

Overall project cost is estimated to be approximately $2.8 million and take 14 months to construct. Construction will commence upon completion of the environmental assessment and project permitting.

E. PERMITTING REQUIREMENTS

An environmental assessment for the KOA at Keahole Master Plan Update was completed in 2000. The details of the proposed improvements were not identified in the Final Environmental Assessment, Kona International Airport at Keahole, Master Plan Update (Keahole Associates, Inc., 2000). Since the proposed project involves use of State owned lands and funds, an Environmental Assessment (EA) will be prepared in accordance with Hawai`i Revised Statutes, Chapter 343 and Chapter 200 of Title 11, Department of Health Administrative Rules, Environmental Impact Statement Rules. Since federal funds are also anticipated, the EA will also be carried out pursuant to the National Environmental Policy Act (NEPA) of 1966. The KOA is located within the County of Hawaii's SMA. The Hawai`i County Planning Commission approved Special Management Area Use Permit No. 325 in the early 1990's for the earlier master plan facility improvements designed to accommodate the anticipated increase in passenger and aircraft operations to the year 2005. It was noted the airfield and terminal area plans were developed to include features which allowed for further expansion should the forecasted demand be exceeded within the planning period. The features related to the proposed project include passenger terminal facilities, parking and utility upgrades to accommodate the expansion. The County of Hawai`i Planning Department has determined the proposed improvements are covered under the scope of SMA Use Permit No. 325. Other applicable construction permits, such as those for grading and grubbing, will be needed.

II. DESCRIPTION OF THE EXISTING ENVIRONMENT, POTENTIAL IMPACTS AND MITIGATION REQUIREMENTS

II. DESCRIPTION OF THE EXISTING ENVIRONMENT, POTENTIAL IMPACTS AND MITIGATION REQUIREMENTS

A. LAND USE

1. Existing Conditions

The project site is located in Keahole, North Kona District, Island of Hawai`i. KOA is approximately seven (7) miles north of Kailua-Kona and is located to the west of Queen Ka`ahumanu Highway. Access from the Highway to the airport is provided by Keahole Street.

The gross area of the airport land owned by the State of Hawai`i is 4,244.1 acres. The total net area available for airport use is 3,407.18 acres. The airport roadways, terminal area, and runways encompass 548 acres. Approximately 421.12 acres to the south have been leased to the Hawai`i Ocean Science and Technology (HOST) Park; 321.80 acres to the west have been leased to the Natural Energy Laboratory of Hawai`i Authority (NELHA); 50 acres have been set aside to the Department of Land and Natural Resources (DLNR) in a 1984 Triparty Agreement between the Department of Transportation (DOT), DLNR, and the Department of Hawaiian Home Lands (DHHL); and 4 acres have been set aside for a U.S. Postal Service facility (Keahole Associates, Inc., 2000).

2. Potential Impacts and Mitigation Measures

The proposed action will consist of improvements to areas of the airport site already dedicated to airport uses. The PV panels on the trellises will be constructed over the existing parking areas, and future parking expansion areas. The two (2) interim commuter air passenger terminal improvements will be located to the south of the existing terminals and will not adversely affect the site's current land use or adjacent properties. The interim commuter air passenger terminals will be compatible in design and architecture style with the existing terminal facilities and will not adversely alter the architectural character of the KOA.

B. CLIMATE, TOPOGRAPHY, AND SOILS

1. Existing Conditions

Like most areas of the State, the island of Hawai`i's climate is relatively uniform year-round. Characteristic of Hawai`i's climate, the project site experiences mild and uniform temperatures year round, moderate humidity, and a relatively consistent northeasterly tradewind. Variation in climate on the island is largely left to local terrain.

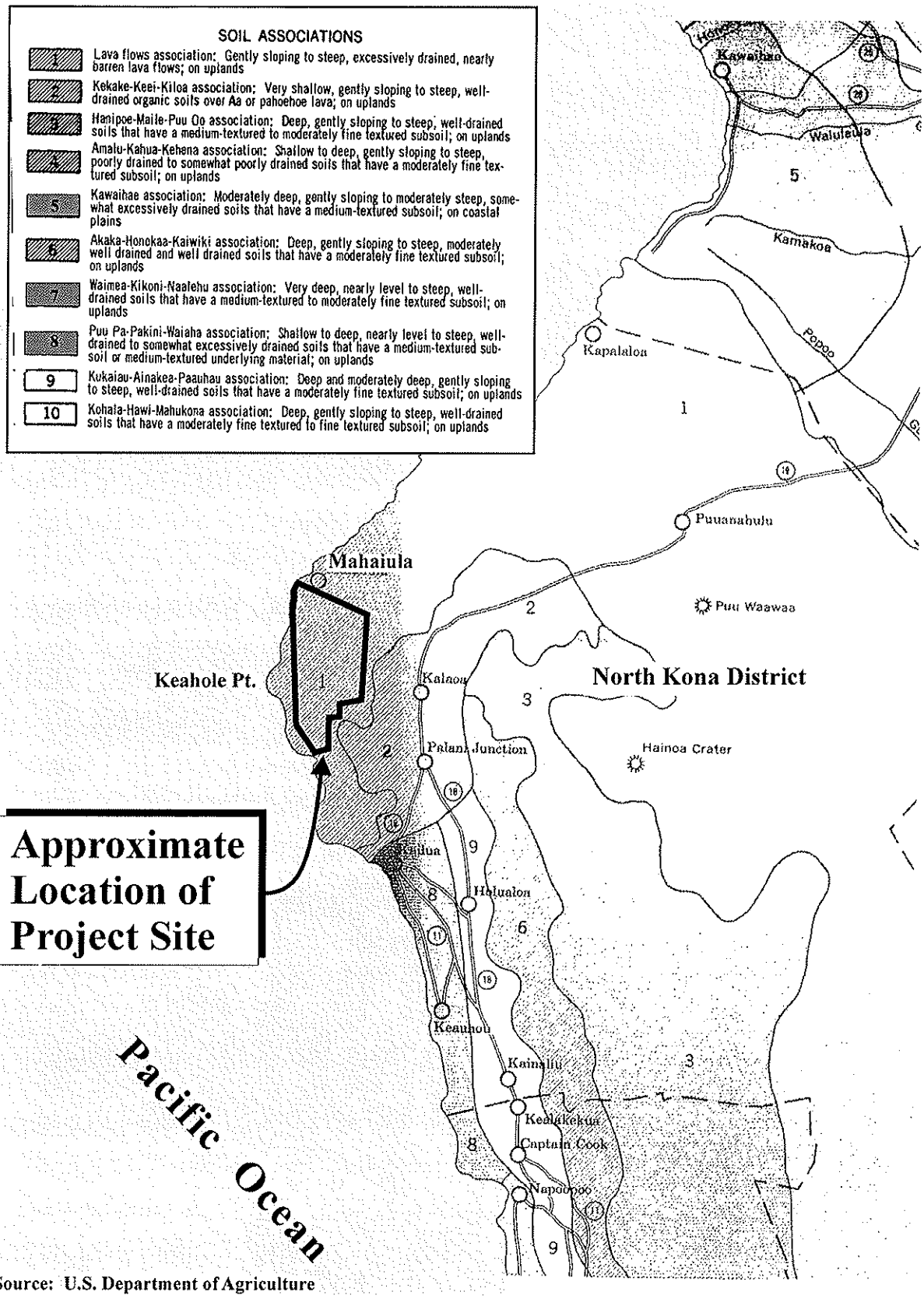
Average temperatures in the Kailua-Kona region range from 72 degrees Fahrenheit in the coolest month to 77 degrees in the warmest month. August is generally the warmest month while January is historically the coolest. KOA is located in the drier region of the island with an average annual precipitation of twenty-five (25) inches (County of Hawai`i Data Book, 2006).

The project site is located in the "lava flows" soil association, generally characterized by gently sloping to steep, excessively drained, nearly barren lava flows, on uplands. See **Figure 9**.

Underlying the project site are a'a (rLV) and pahoehoe (rLW) lava flows. See **Figure 10**. A'a lava is found at elevations ranging from near sea level to 13,000 feet and receives 10 to 250 inches of rainfall annually. This lava is rough and broken, consisting of clinkery, hard, glassy, sharp pieces piled into heaps. It has practically no soil covering and lacks vegetation, except for mosses, lichens, ferns, and a few small ohia trees. Pahoehoe lava is characterized by a billowy, glassy surface that is relatively smooth. In some areas, pahoehoe lava is rough and broken, and may have hummock and pressure domes. Like a'a, this lava has no soil covering and is typically bare of vegetations except for mosses and lichens. However, in areas of higher rainfall, scattered ohia trees, ohelo berry, and aalii grow in cracks and crevices (U.S. Department of Agriculture, Soil Conservation Service, 1973).

2. Potential Impacts and Mitigation Measures

The proposed improvements at KOA will not have an adverse effect on the vicinity's topographic characteristics, since the lands have been previously graded with the development of the KOA. Lava tubes may be encountered within the rLV and rLW soil types. Lava tubes may create dangerous conditions in the event that a tube



Source: U.S. Department of Agriculture

Figure 9 Proposed Kona International Airport Improvements

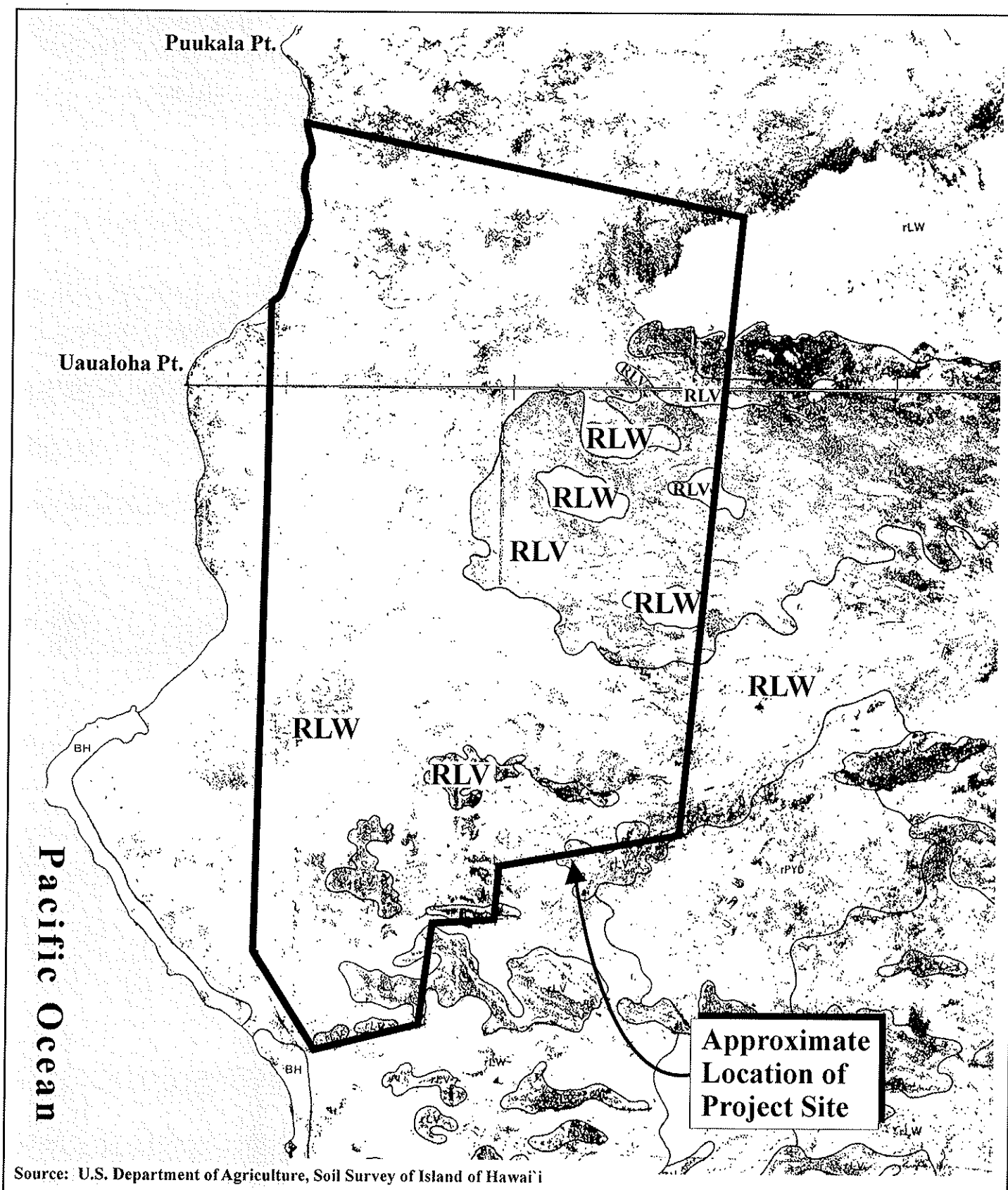
General Soil Map for Island of Hawai`i

NOT TO SCALE

Prepared for: State of Hawai`i, Dept. Of Transportation
Airports Division

MUNEKIYO & HIRAGA, INC.

KYA/Kona AP/General Soil



Source: U.S. Department of Agriculture, Soil Survey of Island of Hawai`i

Figure 10 Proposed Kona International Airport Improvements
Soil Association Map

NOT TO SCALE

Prepared for: State of Hawai`i, Dept. Of Transportatio
Airports Division

MUNEKIYO & HIRAGA, INC.

KYA/Kona AP/SoilAssoc

collapses during excavation or construction. Precautions should be taken while grading in the event that lava tubes are discovered at the project site.

C. FLOOD AND TSUNAMI HAZARDS

1. Existing Conditions

The Digital Flood Insurance Rate Map (DFIRM) indicates that the majority of the airport site, falls within Zone X, an area that is determined to be outside the 1 percent and 0.2 percent annual chance flood plains. See **Figure 11**. A small portion of the airport property on the northwestern boundary is located within Zone A, an area inundated by 1 percent annual chance flooding. The proposed project site for the CAT, parking lot expansion and PV array areas, however, are within Zone X (FEMA, 2003). A portion of the KOA property is located within the tsunami evacuation zone. The tsunami evacuation zone limits are west of the airport runway (Keahole Associates, Inc., 2000). It is noted that the proposed project sites for improvements are located outside of the evacuation zone for tsunami hazards. Refer to **Figure 11**.

2. Potential Impacts and Mitigation Measures

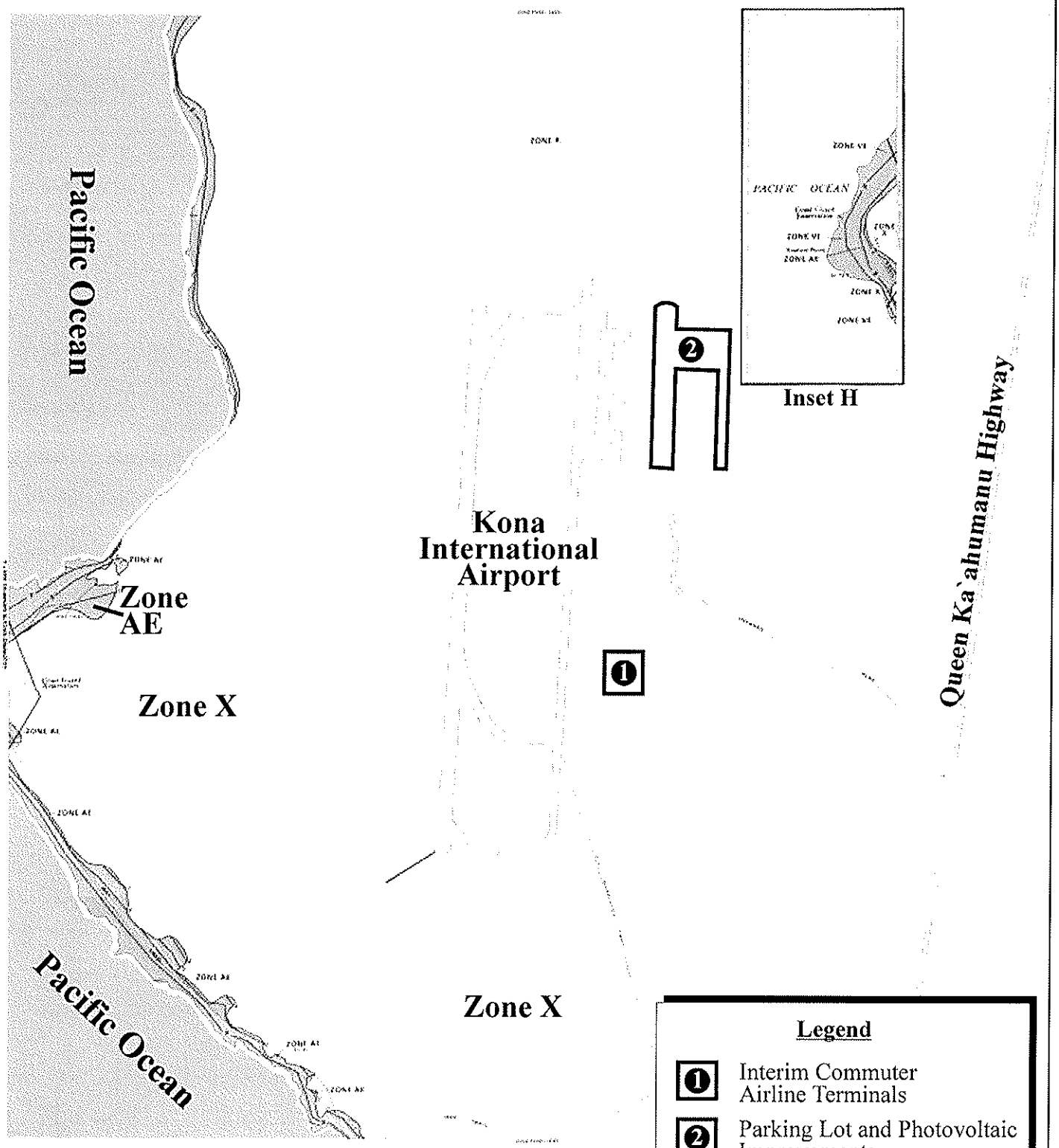
The area of proposed improvements are not located within a flood hazard district or tsunami evacuation zone. As such, no adverse impacts from the effects of flood hazard districts or tsunami evacuation zones are anticipated.

D. FLORA AND FAUNA

1. Existing Conditions

A botanical survey and fauna survey were conducted for the Kona International Airport at Keahole Master Plan Update in 2000. A botanical survey of the undeveloped portions of the urban designated lands at KOA was undertaken by Char & Associates on November 20 and 21, 1999. Fountain grass and scrub vegetation covered large parts of the airport property while ruderal or weedy vegetation was found on areas which have been graded or disturbed.

The botanical survey found 67 plant species, including 52 introduced, 2 introduced with Polynesian origin, and 13 native species. Of the native species, ten (10) are indigenous (native to Hawai`i and elsewhere), while three (3) are endemic (native only to the Hawaiian Islands). None of the identified species are threatened or



Source: Flood Insurance Rate Map, Island of Hawai`i
Community Panel No: 155166 0681C

Figure 11 Proposed Kona International Airport Improvements

Flood Insurance Rate Map

NOT TO SCALE

Prepared for: State of Hawai`i, Dept. Of Transportation
Airports Division

MUNEKIYO & HIRAGA, INC.

KYA/Kona AP/FIRM

endangered (Char & Associates, 2000).

Native and endemic species identified on the site include:

Native Hawaiian or Indigenous Species

Moa (*Psilotum nudum*)

Koali'awa (*Ipomoea indica*)

Naupaka (*Scaevola sericea*)

Spurflower or 'ala'ala wai nui pua ki (*Plectranthus parviflorus*)

'Ilima (*Sida fallax*)

'A'ali'i (*Dodonaea viscosa*)

Naio (*Myoporum sandwicense*)

'Uhaloa (*Waltheria indica*)

Fimbristylis cymosa

Pili grass (*Heteropogon contortus*)

Native Only to Hawai`i or Endemic Species

Nehe (*Lipochaeta lavarum*)

Maiapilo (*Capparis sandwichiana*)

Fimbristylis hawaiiensis

A fauna survey of the site was conducted on December 7 and 8, 1999 to determine the presence of any federally listed endangered, threatened, proposed, or candidate avian or mammalian species on or in the vicinity of KOA. The only mammalian species encountered during the survey was the Indian mongoose (*Herpestes a. auropunctatus*). In addition, skeletal remains of two (2) feral goats (*Capra h. hircus*) and one (1) domestic cow (*Bos taurus*) were found. Evidence of domestic dog (*Canis f. familiaris*), cat (*Felis catus*), donkey (*Equus a. asinus*) and goat was encountered in numerous places within the site. No live rodents were detected during the survey. However, it is likely that roof rats (*Rattus r. rattus*), Norway rats (*Rattus norvegicus*), European house mice (*Mus domesticus*) and possibly Polynesian rats (*Rattus exulans hawaaiiensis*) utilize various habitats within the site (Rana Productions, Ltd., 2000).

Fourteen (14) avian species from ten (10) families were detected in the survey. Of the fourteen (14) species identified, the Pacific Golden-Plover (*Pluvialis fulva*) was the only native species; the remaining thirteen (13) species recorded are considered to be alien to Hawai`i. The most common species detected during the survey was the House Sparrow (*Passer domesticus*). All of the avian species detected are commonly found throughout the leeward lowlands on the island of Hawai`i. No endangered or threatened avian species were detected within the KOA site (Ibid).

It is also noted from coordination with the U.S. Fish and Wildlife Service that the threatened Newell's shearwater and endangered Hawaiian Petrel are known to traverse the project site.

There is a small anchialine wetland system (26 x 19 meters) located approximately 48 meters east of the southwest fence corner at the southern end of the runway. Brackish water located in an extensive crack system around the edge of a pahoehoe depression suggests that it holds water following either very high tides or periods of extensive rain. The indigenous sedge species (*Fimbristylis dichotoma*) is the main vegetation around the edges of the wetland (Ibid).

2. Potential Impacts and Mitigation Measures

The proposed development will not impact endangered or threatened flora or fauna species. The proposed improvements will be limited to developed and/or previously graded areas of KOA and are not anticipated to impact flora and fauna conditions. Furthermore, the modification of the project site is not anticipated to negatively impact native botanical resources in the greater South Kohala region.

The botanical survey recommended that when possible, native plant species be utilized for new landscaping features associated with KOA improvements. Potential impacts to seabirds from outdoor lighting will be mitigated by shielding and downcasting all outdoor lighting.

E. AIR AND NOISE CHARACTERISTICS

1. Existing Conditions

Air quality monitoring was undertaken in July of 1997 at KOA to fulfill requirements

of the KOA Special Management Area (SMA) Use Permit No. 325. Follow-up with the State Department of Health, Clean Air Branch indicated the particulate material levels were well within State standards for the period May to July 1997. Because the study found no adverse air quality impact results, the air monitoring station was removed (Keahole Associates, Inc., 2000). A Noise Compatibility Study (NCP) is currently being updated for KOA. The NCP study is a federally required study to promote control of aircraft noise and minimize noise generated in and out of the airport and surrounding land uses.

A December 1997 Federal Aviation Regulation (FAR) Part 150 Noise Compatibility Program Report (NCPR) indicated that there are no existing incompatible land uses within the 5-year Noise Exposure Map for the KOA site. As a result, corrective noise measures are not required (Ibid).

2. Potential Impacts and Mitigation Measures

Short-term noise and air impacts may result from construction-related activities. Appropriate Best Management Practices (BMPs) will be utilized to minimize negative impacts to noise levels and air quality. Additionally, the applicant will comply with all applicable Department of Health air and noise quality requirements during construction.

In the long term, there are no air or noise impacts associated with the proposed CAT, parking lot expansion and PV parking lot arrays. The proposed improvements are not anticipated to increase aircraft noise levels at KOA.

F. WATER QUALITY

1. Surface and Groundwater Resources

a. Existing Conditions

The existing KOA site is located over a large lava flow. There are no fresh water perennial or intermittent streams located within or in the vicinity of the KOA. The area is not classified as a groundwater recharge area.

b. Potential Impacts and Mitigation Measures

The proposed improvements are not anticipated to have adverse impacts to surface and groundwater resources. As appropriate, pollution control devices will be installed in the drainage system, including screens in the drainage inlets to filter out petroleum products from the rainstorm water runoff from the parking lots.

2. Shoreline and Nearshore Water Quality

a. Existing Conditions

The coastal nearshore waters in the vicinity of KOA are classified "AA" according to the State Department of Health Water Quality Standards Map of the Island of Hawai`i (October 1987). Class "AA" waters are intended to remain in their natural pristine state as nearly as possible with an absolute minimum of pollution or alteration of water quality from any human caused source or actions.

b. Potential Impacts and Mitigation Measures

The project generated increase in stormwater runoff will be retained onsite and disposed of in existing or proposed drainage injection wells. Pollution control devices will be incorporated into the design and operation of the drainage system, as appropriate. Potential adverse impacts to downstream and adjacent properties are not anticipated by the proposed improvements. See **Appendix "A"**.

G. ARCHAEOLOGICAL RESOURCES

1. Existing Conditions

An archaeological assessment of the project site was carried out to assess potential impacts of the proposed action. See **Appendix "B"**. The lands of the project area had limited use from settlement of the leeward side of the island of Hawai`i until the construction of the Kona International Airport (KOA) in 1969 and 1970. Land use was restricted to small coastal settlements focused on fishing and trail systems

connecting these coastal settlements. There were no Land Commission awards granted in the project area or surrounding lands. There are four (4) known cultural resources within the KOA facilities. They are a pre-Contact era cave habitation site; a pre-Contact era temporary habitation feature with several low, circular stone alignments; a short segment of the Mamalahoa trail, and an area with several petroglyphs. No cultural resources were located on the project sites. Refer to **Appendix "B"**, Figure 4.

2. Potential Impacts and Mitigation Measures

The temporary habitation site and pre-contact cave habitation site have been fully documented and are not significant for inclusion on the National Register of Historic Places (NRHP). The Mamalahoa trail segment is located in a restricted area and is fenced off for protection. The collection of petroglyphs is protected by a three (3) foot high rock wall. Both these sites are significant for inclusion for the NRHP. None of these sites are within or in close proximity to the areas proposed for airport improvements. As such, the proposed action is not anticipated to adversely impact archaeological resources.

H. CULTURAL RESOURCES

1. Existing Conditions

A cultural impact assessment (CIA) was carried out for the proposed action pursuant to Act 50, enacted by the Legislature of the State of Hawai`i (2000) for purposes of the environmental assessment. Refer to **Appendix "B-1"**. There is a paucity of prehistoric information pertaining to the lands of the project area and surrounding lands. Modern use of the lands associated with KOA and the Natural Energy Laboratories Hawai`i (NELH) continues to be primarily focused on fishing and coastal access and activities.

2. Potential Impacts and Mitigation Measures

A CIA consultation letter was sent to the Office of Hawaiian Affairs (OHA), the Kuakini Civic Club, and the Kona Hawaiian Civic Club. Although, OHA acknowledged receipt of the letter, none of the organizations responded with information concerning the potential for cultural resources to occur in the project

area, or with additional suggestions for further contacts. Refer to **Appendix "B-1"**. Based on historical research data, the project area has not been used for traditional cultural purposes within recent times. The findings of the CIA concluded that Hawaiian rights related to gathering, access or other customary activities within the project area will not be affected and there will be no direct adverse effect upon cultural practices or beliefs.

I. SCENIC AND OPEN SPACE RESOURCES

1. Existing Conditions

The KOA is surrounded by open fields of a`a and pahoehoe lava. The airport facilities are west of the Queen Ka`ahumanu Highway. Eastern views from the airport present a panoramic view of Hualalai while the North Kona coastline can be viewed from the highway (Keahole Associates, Inc., 2000).

2. Potential Impacts and Mitigation Measures

The proposed improvements will be carried out within the existing developed KOA terminal area. The proposed improvements are not anticipated to adversely impact scenic open space resources, view corridors and view planes.

J. SOCIO-ECONOMIC ENVIRONMENT

1. Existing Conditions

The population of the County of Hawai`i has exhibited relatively strong growth with a growth rate of 23 percent between 1990 and 2000. The estimated County population for 2005 was 167,293 (U.S. Census Bureau).

Domestic visitor arrivals to the County of Hawai`i were at 1,272,618 in 2006 while international visitor arrivals totaled 303,662 in 2004, the most recent reporting year (County of Hawai`i Data Book, 2006).

Before the 1970s, agriculture represented the primary economic activity in the Kona area where more than 50 percent of the workforce was employed. Since then, the visitor industry has emerged as the dominant sector in the economy. The Kona area

is particularly noteworthy in terms of tourism and visitor accommodations. In 2006, there were 4,968 available visitor accommodation units in Kona, representing 44.1 percent of the total Big Island visitor units (State DBET, 2007).

The seasonally unadjusted unemployment rate for Hawai`i County was 3.2 percent in October 2007, while the statewide rate was 2.6 percent (Hawai`i Workforce Informer, January 2008).

2. Potential Impacts and Mitigation Measures

Short-term economic benefits are expected as a result of project construction. The proposed changes at KOA will improve visitor experiences while traveling to the Big Island and improve operational efficiencies at KOA. There are no adverse impacts to the socio-economic environment anticipated with the proposed action.

K. PUBLIC SERVICES

1. Recreation

a. Existing Conditions

The Kona region offers a number of recreational opportunities for residents and visitors alike. In addition to resort recreational complexes, activities such as snorkeling, scuba, biking and hiking are available.

b. Potential Impacts and Mitigation Measures

The proposed improvements at KOA are not anticipated to create new demands on existing recreational facilities. The facilities are required to safely and efficiently accommodate existing passenger traffic. No increase in passenger traffic is anticipated by the proposed improvements.

2. Police and Fire Protection

a. Existing Conditions

All certified airports are required to have an aircraft rescue and fire fighting

(ARFF) facility. The level of ARFF services required ranges from A to E and is based on the length of aircraft and scheduled daily flight frequency. KOA falls within ARFF Index D and is required to maintain a fleet of equipment and trained personnel consistent with this standard.

KOA has a 6,034 square foot ARFF facility that is centrally located on the airfield to the south of the air traffic control tower. The facility stores and maintains one 3,000 gallon storage capacity fire fighting vehicle and two 1,500 gallon storage capacity fire fighting vehicles, as well as a chief vehicle, captain truck, and a reserve 1,500 gallon Oshkosh T-series vehicle. A mobile incident command post vehicle is programmed to be added to the fleet in 2008.

The airport also has an ARFF training facility (burn pit) located northeast of the terminal area which is used for live-fire exercises.

The Kona International Airport area is served by the Hawai`i County Police Department's Area II Operations Bureau. The Kona district encompasses approximately 834 square miles and is staffed by a captain, a lieutenant, sergeants and police officers with a total authorized 78 positions. Services are provided from the Department's Kailua-Kona Stations.

Fire protection and related emergency services are provided by the Hawai`i County Fire Department. The station closest to the project site is the Kailua-Kona Station. Back-up fire protection service is provided by the Waikaloa and Waimea Fire Stations as needed.

b. <u>Potential Impacts and Mitigation Measures</u>

The proposed airport improvements will not extend service areas for emergency services provided by the police and fire departments. As the improvements are limited to already developed areas, adverse impacts to these services are not anticipated. The PV panels will not be placed over dedicated "fire lanes" along the main entry points to the parking areas and within the parking lots. Emergency equipment and fire fighting vehicular access will not be impeded by the PV panels. Security cameras within the parking areas will assist crime prevention operations at KOA.

3. Solid Waste

a. Existing Conditions

The County's Department of Environmental Management, Solid Waste Division, operates and maintains all solid waste collection and disposal facilities in the County of Hawai'i. The Division's facilities include two (2) landfills and twenty-one (21) transfer stations. Refuse collected in the region is taken to the Puuanahulu Landfill for disposal.

b. Potential Impacts and Mitigation Measures

As applicable, construction waste, including cleared and grubbed material from the site, will be recycled or disposed at an approved construction waste facility. The proposed airport improvements are not anticipated to adversely impact County solid waste collection or disposal capabilities and capacities.

4. Medical Services

a. Existing Conditions

The West Hawai`i region is served by the Hawai`i Health Systems Corporation's (HHSC) Kohala Hospital and Kona Community Hospital. Kohala Hospital, located in North Kohala, is a 26-bed critical access hospital providing 24-hour emergency care, skilled nursing and intermediate care services. Kona Community Hospital, located in Kealakekua, Kona, is a 94-bed full service medical center which provides acute inpatient care and related services.

In addition to the two (2) HHSC facilities, there is the North Hawai`i Community Hospital located in Waimea. This 40-bed facility, with 24-hour emergency services is affiliated with Adventist Health, a private entity.

In addition to these major health care facilities, there are numerous privately operated medical and dental services available in West Hawai`i.

b. Potential Impacts and Mitigation Measures

The proposed improvements at KOA are not anticipated to adversely impact regional medical service delivery capabilities.

L. INFRASTRUCTURE

1. Roadways

a. Existing Conditions

Access to KOA is provided off of the Queen Ka`ahumanu Highway, which is the primary State highway serving the area. Queen Ka`ahumanu Highway is a two-lane highway that extends from Kailua-Kona to Kawaihae. An access road, Keahole Street, stretches 3,050 feet from the Queen Ka`ahumanu Highway to the airport. The intersection of Queen Ka`ahumanu Highway and Keahole Street is signalized. Kupipi Street, a peripheral street surrounding the main parking lot, provides one-way automobile circulation to the terminal and baggage claim areas (Keahole Associates, Inc., 2000). It begins with a two (2) lane road on the east side of the parking lot and widens to four (4) lanes in the curve around the north end of the parking lot. In front of the northern and southern terminal Kupipi Street widens to six (6) lanes with a median curb. The outside lanes are dedicated to commercial transportation providers, such as buses, car rentals, and hotel shuttles. The three (3) inside lanes are reserved for private vehicles and passenger drop-off and pick-up. There are five (5) passenger crosswalks from the parking areas across Kupipi Street to the air terminals. The crossings are well marked and of sufficient width to create a safe zone for passengers and luggage.

b. Potential Impacts and Mitigation Measures

The proposed improvements at KOA are not considered traffic generators. The interim commuter facilities are required to accommodate existing levels of passenger traffic. The parking lot expansion will address applicable parking standards to accommodate existing levels of traffic at KOA. As a result, no adverse impacts to traffic conditions are anticipated for this project.

Impacts to pedestrian safety are also mitigated by project features, such as

restriping parking areas to clearly mark stalls, travel lanes, and pedestrian walkways, new lighting, and installation of security cameras. Provision of passenger pick-up and drop-off areas and 13 parking stalls (including one (1) accessible stall) at the two (2) CAT buildings also increases pedestrian and passenger safety by minimizing the need to cross Kupipi Street.

2. Water System

a. Existing Conditions

The County of Hawai`i, Department of Water Supply's (DWS) Lalamilo Water System serves the project vicinity with an existing 12-inch diameter water line fronting the subject parcels.

The KOA is served by existing 8-inch and 12-inch water mains. The project site for the proposed Interim CAT facility is located in proximity to an 8-inch ductile iron pipe.

b. Potential Impacts and Mitigation Measures

The addition of the two (2) CAT buildings can be accommodated within the design parameters of the existing onsite water system serving the KOA. The peak flow rate for the CAT buildings is estimated to be 60 gallons per minute. It is noted that the additional irrigation demand associated with new landscape improvements is estimated to be about 410 gallons per day. Irrigation demand will be met by KOA's wastewater treatment system which produces R-1 water for irrigation. There are no anticipated adverse impacts to the County or airport's water system infrastructure.

See **Appendix "C"**.

3. Wastewater

a. Existing Conditions

The KOA has an onsite wastewater treatment plant with a capacity of 1.30 million gallons (mgd) per day. The current average daily treatment capacity is 0.30 mgd. The wastewater discharged from the new CAT buildings will

flow to a new lift station which will pump flows into an existing 8-inch gravity line, which will then convey flows to the onsite wastewater treatment plant. Refer to **Appendix "C"**. The wastewater treatment plant is located north of the terminal area and is maintained under contract.

b. Potential Impacts and Mitigation Measures

The proposed sewer improvements will be designed to accommodate new flows generated by the two (2) CAT buildings. The existing wastewater infrastructure (gravity lines and treatment plant) have sufficient capacity to handle the additional flows. There are no adverse impacts anticipated to the wastewater infrastructure system.

Refer to **Appendix "C"**.

4. Drainage

a. Existing Conditions

Stormwater runoff in the airfield and parking lots is collected through a system of swales, ditches, and concrete bridge culverts. A system of pipelines and intake boxes provide drainage for the terminal facility. It is noted that lands within the KOA boundaries do not contain any naturally defined gulches or drainageways. Runoff rapidly infiltrates into the ground due to porous nature of the underlying lava formations. There are 65 existing drainage injection wells, having diameters ranging between approximately two (2) to six (6) feet, and depths between two (3) to thirty (30) feet. There are no major ponding areas within the airport boundaries. Refer to **Appendix "A"**.

b. Potential Impacts and Mitigation Measures

Based on engineering analysis of the drainage areas affected by the proposed improvements, the additional runoff generated by the projects can be accommodated by the existing injection wells and/or the provision of new injection wells. Refer to **Appendix "A"**. In this regard, there are no adverse drainage or flooding impacts anticipated to adjacent airport operations areas, nor are there any adverse impacts anticipated to adjacent and downstream

properties.

5. Electrical and Communication Systems

a. Existing Conditions

Electrical services to the airport is provided by Hawaiian Electric Light Company (HELCo) via the Keahole substation, which is located east of the Queen Ka`ahumanu Highway. The power lines enter the electrical control building located adjacent to and east of the air traffic control tower. In addition, KOA has a 175 kilowatt (KW) diesel engine emergency generator located in the electrical control building. A 1,000 gallon diesel storage tank, which is located adjacent to the control building, supplies the emergency generator with fuel. A 23 kilowatt diesel engine generator provides a separate emergency power system for the airfield. Refer to **Appendix "A"**.

b. Potential Impacts and Mitigation Measures

Phase I of the PV system is anticipated to generate approximately 1.4 megawatts of power to supplement the HELCO system. The Phase II component is estimated to provide 2.26 megawatts. The PV electrical upgrades will be energy efficient and have positive environmental benefits.

III. RELATIONSHIP TO GOVERNMENTAL PLANS, POLICIES AND CONTROLS

III. RELATIONSHIP TO GOVERNMENTAL PLANS, POLICIES AND CONTROLS

A. STATE LAND USE DISTRICTS

Pursuant to Chapter 205A, HRS, all lands in the State have been divided and placed into one (1) of four (4) land use districts by the State Land Use Commission. These land use districts have been designated "Urban", "Rural", "Agricultural", and "Conservation". The KOA site is located within the State "Urban" and "Conservation" districts. The airport roadways, terminal area, and runways are classified as "Urban" and encompasses approximately 548 acres. The proposed improvements fall within "Urban" lands and are permitted within this district. See **Figure 12**.

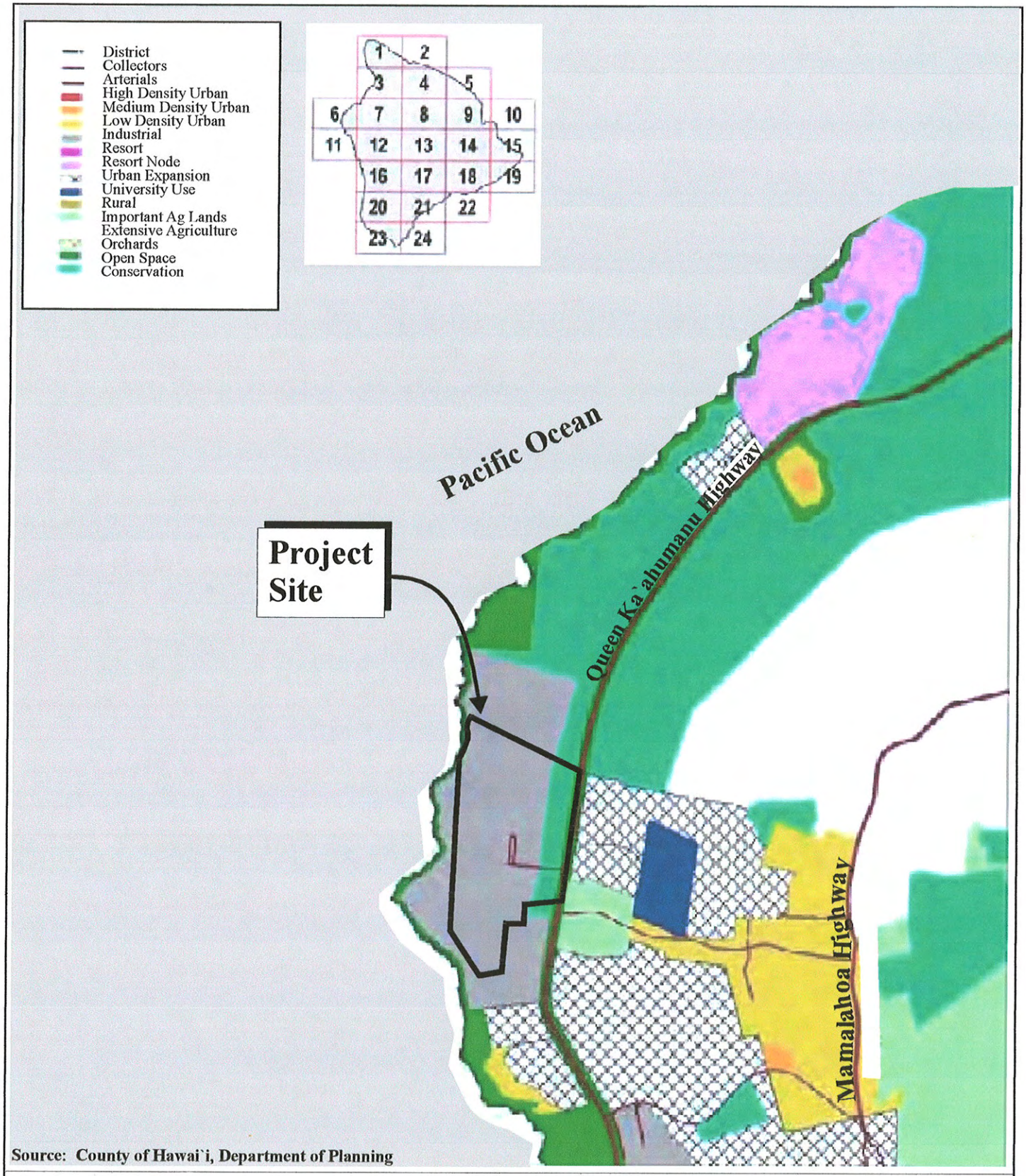
B. HAWAI`I COUNTY GENERAL PLAN

An updated version of the Hawai`i County General Plan was enacted in February 2005. The General Plan is the policy document for the long range comprehensive development on the island of Hawai`i. Purposes of the General Plan include:

- Guide the pattern of future development in this County based on long-term goals;
- Identify the visions, values and priorities important to the people of this County; and
- Effect political and technical coordination in community improvement and development.

The General Plan includes an assessment of elements relative to new data, laws and methods of analysis. Each study element is analyzed and evaluated in relation to all other elements, County and district goals and the land use pattern. The KOA site is categorized as "Industrial" in the General Plan. See **Figure 13**. The proposed improvements are in compliance with the General Plan "Industrial" land use category.

The proposed improvements are supportive of the following General Plan goals and policies.



Source: County of Hawai`i, Department of Planning

Figure 12

Proposed Kona International Airport Improvements

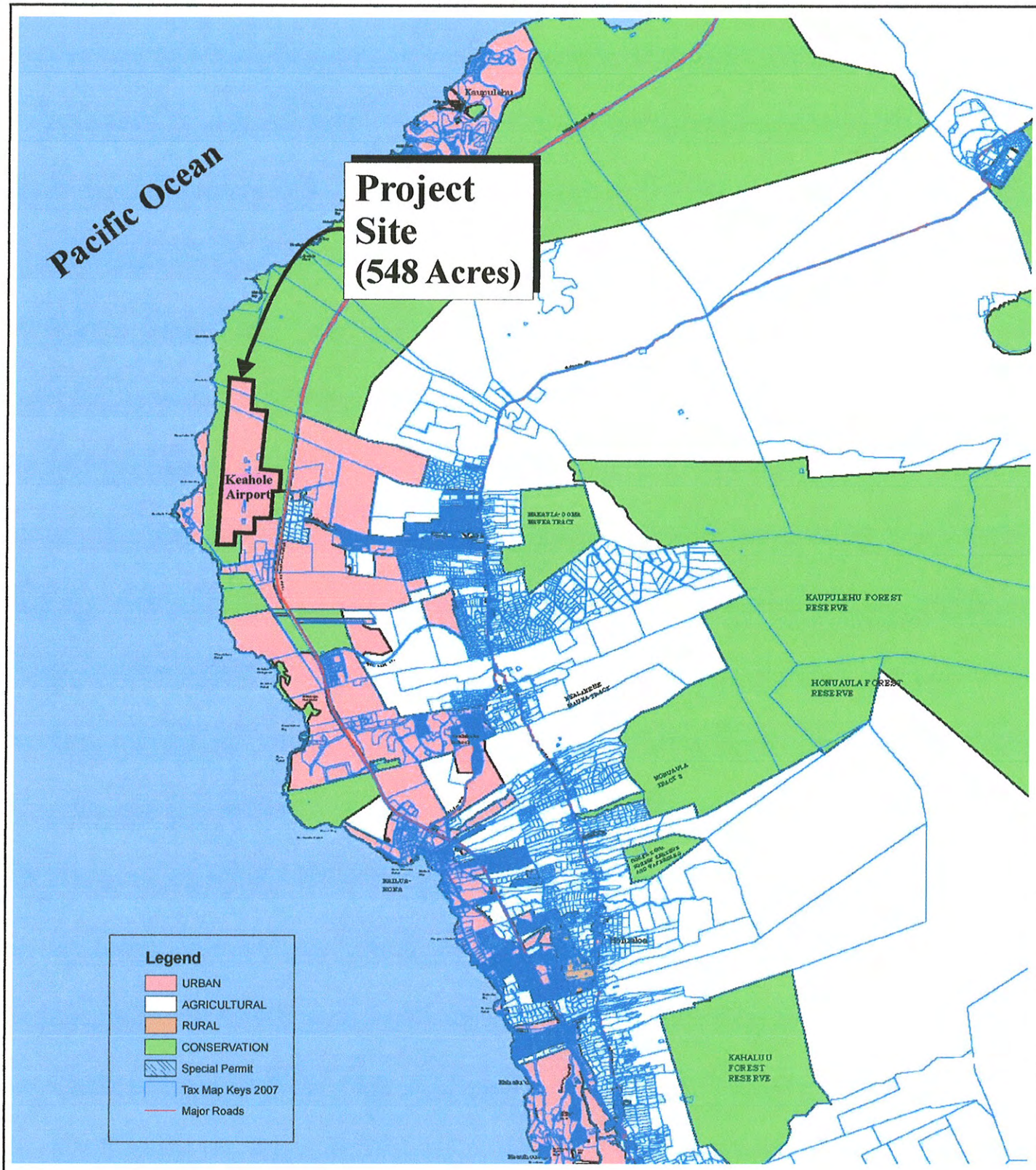
Land Use Pattern Allocation Guide Map

NOT TO SCALE

Prepared for: State of Hawai`i, Dept. Of Transportation
Airports Division

MUNEKIYO & HIRAGA, INC.

KYA/Kona AP/Land Use Pattern



Source: State of Hawai`i Land Use Commission

Figure 13 Proposed Kona International Airport Improvements

State Land Use District Boundary Map

NOT TO SCALE

Prepared for: State of Hawai`i, Dept. Of Transportation
Airports Division

MUNEKIYO & HIRAGA, INC.

KYA/Kona AP/StateLandUseDistrictBoundaryZoom

ECONOMIC

Goals

- Economic development and improvement shall be in balance with the physical, social, and cultural environments of the island of Hawai`i.
- Strive for diversification of the economy by strengthening existing industries and attracting new endeavors

Policies

- Encourage the development of a visitor industry that is in harmony with the social, physical, and economic goals of the residents of the County.
- Capital improvements program shall improve the quality of existing commercial and industrial areas.

ENERGY

Goals

- Establish the Big Island as a demonstration community for the development and use of natural energy resources.

Policies

- Encourage the development of alternate energy resources.
- Ensure a proper balance between the development of alternative energy resources and the preservation of environmental fitness and ecologically significant areas.
- Strive to diversify the energy supply and minimize the environmental impacts associated with energy use.

PUBLIC FACILITIES

Goals

- Encourage the provision of public facilities that effectively service community and visitor needs and seek ways of improving public service through better and more functional facilities in keeping with the environmental and aesthetic concerns of the

community.

Policies

- Continue to seek ways of improving public services through the coordination of service and maximizing the use of personnel and facilities.

TRANSPORTATION

Goals

- Provide a transportation system whereby people and goods can move efficiently, safely, comfortably, and economically.
- Make available a variety of modes of transportation service shall be encouraged.

Policies

- The improvement of transportation service shall be encouraged.
- Consider the provision of adequate transportation systems to enhance the economic viability of a given area.

TRANSPORTATION – AIRPORTS AND HARBORS

Goals

- Provide transportation terminals and related facilities for the safe, efficient, and comfortable movement of people and goods.

Policies

- The State Department of Transportation should continue to implement its plans for transportation terminals and related facilities to promote and influence desired land use policies.
- Transportation terminals should be developed in conjunction with the different elements of the overall transportation system.
- Encourage the maximum use of the island's airport and harbor facilities.

LAND USE

Goal

- Designate and allocate land uses in appropriate proportions and mix and in keeping with the social, cultural and physical environments of the County.

Policy

- Encourage urban development within existing zoned areas already served by basic infrastructure, or close to such areas, instead of scattered development.

C. COUNTY ZONING

The project site is currently zoned "MG-1a, General Industrial" by Hawai`i County zoning. Airfields, heliports, and private landing strips are permitted uses in the MG-1a district. Portions of the KOA property are zoned "Open", however, all the proposed improvements are within the MG-1a zone.

D. COUNTY OF HAWAI`I - SPECIAL MANAGEMENT AREA

The subject property is located within the County of Hawai`i's Special Management Area (SMA). Pursuant to Chapter 205A, HRS, and the Rules of Practice Procedure of the Hawai`i Planning Commission, actions proposed within the SMA are evaluated with respect to SMA objectives, policies and guidelines. Although the proposed actions are covered under the SMA Use Permit No. 325, this section addresses the project's relationship to applicable coastal zone management considerations, as set forth in Chapter 205A, HRS.

(1) Recreational Resources

Objective: Provide coastal recreational opportunities accessible to the public.

Policies:

(A) Improve coordination and funding of coastal recreational planning and management; and

(B) Provide adequate, accessible, and diverse recreational opportunities in the coastal zone management area by:

(i) Protecting coastal resources uniquely suited for recreational activities that cannot be provided in other areas;

(ii) Requiring replacement of coastal resources having significant recreational value, including but not limited to, surfing sites, fishponds, and sand beaches, when such resources will be unavoidably damaged by development; or requiring reasonable monetary compensation to the State for recreation when replacement is not feasible or desirable;

(iii) Providing and managing adequate public access, consistent with conservation of natural resources, to and along shorelines with recreational value;

(iv) Providing an adequate supply of shoreline parks and other recreational facilities suitable for public recreation;

(v) Ensuring public recreational use of county, state, and federally owned or controlled shoreline lands and waters having recreational value consistent with public safety standards and conservation of natural resources;

(vi) Adopting water quality standards and regulating point and non-point sources of pollution to protect, and where feasible, restore the recreational value of coastal waters;

(vii) Developing new shoreline recreational opportunities, where appropriate, such as artificial lagoons, artificial beaches, and artificial reefs for surfing and fishing; and

(viii) Encouraging reasonable dedication of shoreline areas with recreational value for public use as part of discretionary approvals or permits by the land use commission, board of land and natural resources, and county authorities; and crediting such dedication against the requirements of Section 46-6.

Response: The proposed improvements are not anticipated to impact coastal recreational opportunities. There is currently a beach access provided through the airport property. The proposed project will not affect the beach access road. As such, the proposed changes will not alter shoreline recreational access.

(2) **Historic Resources**

Objective: Protect, preserve and, where desirable, restore those natural and manmade historic and prehistoric resources in the coastal zone management area that are significant in Hawaiian and American history and culture.

Policies:

(A) Identify and analyze significant archeological resources;

(B) Maximize information retention through preservation of remains and artifacts or salvage operations; and

(C) Support state goals for protection, restoration, interpretation, and display of historic resources.

Response: The proposed actions are not anticipated to adversely impact archaeological resources or Native Hawaiian cultural practices.

Refer to **Appendix "B"** and **Appendix "B-1"**.

(3) **Scenic and Open Space Resources**

Objective: Protect, preserve and, where desirable, restore or improve the quality of coastal scenic and open space resources.

Policies:

(A) Identify valued scenic resources in the coastal zone management area;

(B) Ensure that new developments are compatible with their visual environment by designing and locating such developments to minimize the alteration of natural landforms and existing public views to and along the shoreline;

(C) Preserve, maintain, and, where desirable, improve and restore shoreline open space and scenic resources; and

(D) Encourage those developments which are not coastal dependent to locate in inland areas.

Response: Scenic and open space resources are not anticipated to be adversely affected by the proposed action. The project sites are located within the developed portions of the KOA property. Buildings and structures will be low-rise structures

and are not anticipated to adversely impact view corridors.

(4) Coastal Ecosystems

Objective: Protect valuable coastal ecosystems, including reefs, from disruption and minimize adverse impacts on all coastal ecosystems.

Policies:

(A) Exercise an overall conservation ethic, and practice stewardship in the protection, use, and development of marine and coastal resources;

(B) Improve the technical basis for natural resource management;

(C) Preserve valuable coastal ecosystems, including reefs, of significant biological or economic importance;

(D) Minimize disruption or degradation of coastal water ecosystems by effective regulation of stream diversions, channelization, and similar land and water uses, recognizing competing water needs; and

(E) Promote water quantity and quality planning and management practices that reflect the tolerance of fresh water and marine ecosystems and maintain and enhance water quality through the development and implementation of point and nonpoint source water pollution control measures.

Response: The proposed improvements are not anticipated to result in any adverse impacts to coastal ecosystems. Applicable Best Management Practices (BMPs) and erosion-control measures will be implemented to mitigate runoff from construction-related activities. Onsite drainage improvements will be designed to retain and safely discharge project-generated storm water runoff. Refer to **Appendix "A"**.

(5) Economic Uses

Objective: Provide public or private facilities and improvements important to the State's economy in suitable locations.

Policies:

(A) Concentrate coastal dependent development in appropriate areas;

(B) Ensure that coastal dependent development such as harbors and ports, and

coastal related development such as visitor industry facilities and energy generating facilities, are located, designed, and constructed to minimize adverse social, visual, and environmental impacts in the coastal zone management area; and

(C) Direct the location and expansion of coastal dependent developments to areas presently designated and used for such developments and permit reasonable long-term growth at such areas, and permit coastal dependent development outside of presently designated areas when:

(i) Use of presently designated locations is not feasible;

(ii) Adverse environmental effects are minimized; and

(iii) The development is important to the State's economy.

Response: The proposed improvements will generate short-term construction-related employment which will benefit the local economy. The proposed action does not contradict the objectives and policies for economic uses. The improvements proposed are limited to areas of the airport property already designated for urban use. The proposed action will improve transportation infrastructure and visitors' travel experiences at KOA. The proposed improvements are deemed by the State of Hawai`i Department of Transportation to be important to the State's and County's economy.

(6) Coastal Hazards

Objective: Reduce hazard to life and property from tsunami, storm waves, stream flooding, erosion, subsidence and pollution.

Policies:

(A) Develop and communicate adequate information about storm wave, tsunami, flood, erosion, subsidence, and point and nonpoint source pollution hazards;

(B) Control development in areas subject to storm wave, tsunami, flood, erosion, hurricane, wind, subsidence, and point and nonpoint source pollution hazards;

(C) Ensure that developments comply with requirements of the Federal Flood Insurance Program; and

(D) Prevent coastal flooding from inland projects.

Response: The project site is located in Zone X, an area outside the 1 percent to 0.2 percent annual chance flood plain. While the western portion of the project site is located within a tsunami evacuation zone, the proposed improvements are beyond the evacuation boundary. The proposed action will be developed in compliance with Federal Flood Insurance Program requirements, as applicable. All project generated storm water runoff will be retained onsite and will not adversely impact adjacent and downstream properties. Refer to **Appendix "A"**.

(7) Managing Development

Objective: Improve the development review process, communication, and public participation in the management of coastal resources and hazards.

Policies:

(A) Use, implement, and enforce existing law effectively to the maximum extent possible in managing present and future coastal zone development;

(B) Facilitate timely processing of applications for development permits and resolve overlapping or conflicting permit requirements; and

(C) Communicate the potential short and long-term impacts of proposed significant coastal developments early in their life cycle and in terms understandable to the public to facilitate public participation in the planning and review process.

Response: Project information will be disseminated through the Environmental Assessment (EA) pursuant to Chapter 343, Hawai`i Revised Statutes (HRS).

(8) Public Protection

Objective: Stimulate public awareness, education, and participation in coastal management.

Policies:

(A) Promote public involvement in coastal zone management processes;

(B) Disseminate information on coastal management issues by means of educational materials, published reports, staff contact, and public workshops for persons and organizations concerned with coastal issues, developments, and government activities; and

(C) Organize workshops, policy dialogues, and site-specific mediations to respond to coastal issues and conflicts.

Response: As discussed above, public awareness and participation for the project are facilitated through the Chapter 343, HRS EA process.

(9) Beach Protection

Objective: Protect beaches for public use and recreation.

Policies:

(A) Locate new structures inland from the shoreline setback to conserve open space, minimize interference with natural shoreline processes, and minimize loss of improvements due to erosion;

(B) Prohibit construction of private erosion-protection structures seaward of the shoreline, except when they result in improved aesthetic and engineering solutions to erosion at the sites and do not interfere with existing recreational and waterline activities; and

(C) Minimize the construction of public erosion-protection structures seaward of the shoreline.

Response: The proposed airport improvements will be located approximately 4,000 feet away from the shoreline and within the existing developed portion of the KOA property. Impacts to beach processes are not anticipated. Appropriate BMPs will be incorporated during construction to minimize impacts.

(10) Marine Resources

Objective: Promote the protection, use, and development of marine and coastal resources to assure their sustainability.

Policies:

(A) Ensure that the use and development of marine and coastal resources are ecologically and environmentally sound and economically beneficial;

(B) Coordinate the management of marine and coastal resources and activities to improve effectiveness and efficiency;

(C) Assert and articulate the interests of the State as a partner with federal agencies in the sound management of ocean resources within the United States exclusive economic zone;

(D) Promote research, study, and understanding of ocean processes, marine life, and other ocean resources in order to acquire and inventory information necessary to understand how ocean development activities relate to and impact upon ocean and coastal resources; and

(E) Encourage research and development of new, innovative technologies for exploring, using, or protecting marine and coastal resources.

Response: Appropriate BMPs and drainage improvements will be implemented to mitigate potential impacts to marine or coastal resources in the vicinity.

In addition to the foregoing objectives and policies, SMA permit review criteria pursuant to Act 244 (2005) provides that:

> *No special management area use permit or special management area minor permit shall be granted for structures that allow artificial light from floodlights, uplights, or spotlights used for decorative or aesthetic purposes when the light:*
>
> *(1) Directly illuminates the shoreline and ocean waters; or*
>
> *(2) Is directed to travel across property boundaries toward the shoreline and ocean waters.*

Response: The proposed PV, parking lot, and CAT lighting will be fully shielded and designed to mitigate potential impacts to seabirds from light spillage across property boundaries toward the shoreline and into the night sky.

IV. SUMMARY OF UNAVOIDABLE IMPACTS ON THE ENVIRONMENT AND RESOURCES

IV. SUMMARY OF UNAVOIDABLE IMPACTS ON THE ENVIRONMENT AND RESOURCES

The implementation of the proposed project will result in limited construction-related impacts. Potential effects include noise generated impacts occurring from construction activities. In addition, there may be temporary air quality impacts associated with dust generated from construction activities, and exhaust emissions discharged by construction equipment. The proposed action will also include a commitment of fuel, labor, funding, and material resources.

The proposed project is not anticipated to create any long-term adverse environmental effects, nor require substantial commitment of scarce resources. It is noted that the proposed PV system will provide a renewable energy source for the KOA.

V. ALTERNATIVES TO THE PROPOSED ACTION

V. ALTERNATIVES TO THE PROPOSED ACTION

The proposed CAT and parking improvements were determined to be appropriate project actions to meet existing operational needs. The PV system is viewed by DOT-A as opportunity to address energy resource issues which are pertinent to the County and State.

NO ACTION AND DEFERRED ALTERNATIVES

The "no action" alternative would eliminate construction-related impacts and resource requirements. When considered in the context of airport operational requirements and energy self-sufficiency goals, however, the "no-action" alternative was not considered appropriate.

Similar to the "no action" alternative, the "deferred" action option would not address the benefits accrued by the proposed actions.

In terms of the project benefits and the ability of the applicant to mitigate impacts associated with the proposal, the proposed actions are considered appropriate for implementation at this time.

SITE PLAN ALTERNATIVES

In developing the scope of the proposed improvements, the DOT-A considered existing capacity needs and internal space functional relationships to define project boundaries and specific layouts. For example, the process of formulating the CAT site plan included refinements to parking locations and building placements to ensure that user needs, as well as airport operational requirements could be met to the maximum extent practicable.

VI. SIGNIFICANCE CRITERIA ASSESSMENT

VI. SIGNIFICANCE CRITERIA ASSESSMENT

The "Significance Criteria", Section 12 of the Administrative Rules, Title 11, Chapter 200, Environmental Impact Statement Rules, were reviewed and analyzed to determine whether the proposed project will have significant impacts to the environment. The following criteria and analysis are provided.

1. **Involves an irrevocable commitment to loss or destruction of any natural or cultural resource.**

   The proposed project will not result in any adverse environmental impacts. There are no known, rare, threatened, or endangered species of flora, fauna or avifauna located within the project site.

   The proposed improvements will be limited to areas in the airport site already designated for urban use. The project area is not being used for traditional cultural resources. Adverse impacts to archaeological and cultural resources are not anticipated. Refer to **Appendix "B"** and **Appendix "B-1"**.

2. **Curtails the range of beneficial uses of the environment.**

   The proposed project and the commitment of land resources would not curtail the range of beneficial uses of the environment. The proposed action will be carried out within the developed portions of the KOA property.

3. **Conflicts with the state's long-term environmental policies or goals and guidelines as expressed in chapter 344, HRS, and any revisions thereof and amendments thereto, court decisions, or executive orders.**

   The State's Environmental Policy and Guidelines are set forth in Chapter 344, Hawai`i Revised Statutes (HRS). The proposed action does not contravene provisions of Chapter 344, HRS.

4. **Substantially affects the economic welfare, social welfare, and cultural practices of the community or State.**

The proposed project would have a direct beneficial effect on the local economy during construction and ongoing operations. The improvements would enhance travelers' experiences and benefit the tourism industry, which drives the island's economy in the Kailua-Kona region.

5. **Substantially affects public health.**

No adverse impacts to the public's health and welfare are anticipated as a result of the proposed project.

6. **Involves substantial secondary impacts, such as population changes or effects on public facilities.**

Population changes are anticipated as a result of the proposed project.

The proposed project will not change the existing airport use for the site and is consistent with State and County plans, policies, and controls.

No adverse impacts to water and wastewater capacities and facilities are anticipated. Post-development onsite surface runoff will be accommodated by the proposed drainage system improvements. There are no adverse impacts upon educational, recreational, and solid waste collection and disposal facilities anticipated as a result of the proposed improvements.

7. **Involves a substantial degradation of environmental quality.**

During the construction phase of the project, there will be short-term air quality and noise impacts as a result of the project. In the long term, effects upon air quality and ambient noise levels should be minimal. The project is not anticipated to significantly affect the open space and scenic character of the area. A small anchialine wetland system has been identified approximately 48 meters east at the southern end of the runway. However, there are no sensitive environments in the vicinity of the proposed improvements.

No substantial degradation of environmental quality resulting from the project is anticipated.

8. **Is individually limited but cumulatively has considerable effect upon the environment or involves a commitment for larger actions.**

The Kona Airport Master Plan is in the process of being updated and is anticipated to be completed at the end of summer 2008. The proposed improvements, however, are being pursued independent of the Master Plan update to provide interim relief to accommodate existing levels of air passenger traffic and to provide an alternative source of energy for the airport.

9. **Substantially affects a rare, threatened, or endangered species, or its habitat.**

There are no rare, threatened or endangered species of flora, fauna, avifauna or their habitats that will be adversely affected by the proposed action.

10. **Detrimentally affects air or water quality or ambient noise levels.**

Construction activities will result in short-term air quality and noise impacts. Dust control measures, such as regular watering and sprinkling, will be implemented to minimize wind-blown emissions. Noise impacts will occur primarily from construction-related activities. It is anticipated that construction will be limited to daylight working hours. Water quality is not expected to be affected.

In the long term, the project is not anticipated to have a significant impact on air and water quality. The proposed project will not affect aircraft traffic in the long term. As such, the proposed improvements are not expected to significantly add to ambient noise levels.

11. **Affects or is likely to suffer damage by being located in an environmentally sensitive area such as a flood plain, tsunami zone, beach, erosion-prone area, geologically hazardous land, estuary, fresh water, or coastal waters**.

The proposed improvements are not located within and would not affect environmentally sensitive areas. The location of the improvements is not subject to flooding or tsunami inundation. Soils within the project site are not erosion-prone. There are no geologically hazardous lands, estuaries, or coastal waters within or adjacent to the project site.

12. **Substantially affects scenic vistas and viewplanes identified in county or state plans or studies.**

The project site is not identified as a scenic vista or viewplane. The proposed project will not affect scenic corridors and coastal scenic and open space resources.

13. **Requires substantial energy consumption.**

The proposed project will involve the short-term commitment of fuel for equipment, vehicles, and machinery during construction activities. However, this use is not anticipated to result in a substantial consumption of energy resources. In the long term, the PV electrical system improvements will bring a degree of energy sufficiency to KOA and reduce the dependence on fossil fuels. In this context, the proposed project is anticipated to reduce energy consumption.

Based on the foregoing findings, it is anticipated this EA will be filed as a Finding of No Significant Impact (FONSI).

VII. LIST OF PERMITS AND APPROVALS

VII. LIST OF PERMITS AND APPROVALS

The following permits and approvals will be required prior to the implementation of the project.

State of Hawai`i

1. Community Noise Permit (as applicable)

2. National Pollutant Discharge Elimination System (NPDES) (as applicable)

County of Hawai`i

1. Construction Permits (Grubbing, Grading, Building, Electrical, Plumbing, Driveway)

VIII. AGENCIES CONSULTED DURING THE PREPARATION OF THE DRAFT ENVIRONMENTAL ASSESSMENT; LETTERS RECEIVED AND RESPONSES TO SUBSTANTIVE COMMENTS

VIII. AGENCIES CONSULTED DURING THE PREPARATION OF THE DRAFT ENVIRONMENTAL ASSESSMENT; LETTERS RECEIVED AND RESPONSES TO SUBSTANTIVE COMMENTS

The following agencies were consulted during the preparation of the Draft Environmental Assessment. Agency comments received during the early consultation phase, as well as responses to substantive comments, are included in this section. In addition, comments received after the early consultation comment period deadline and letters responding to substantive comments are contained in this section as well.

1. **Natural Resources Conservation Service**
U.S. Department of Agriculture
300 Ala Moana Blvd., Rm. 4-118
Honolulu, Hawai`i 96850

2. George Young
Chief, Regulatory Branch
U.S. Department of the Army
U.S. Army Engineer District, Honolulu
Regulatory Branch
Building 230
Fort Shafter, Hawai`i 96858-5440

3. Airports District Office
U.S. Department of Transportation
Federal Aviation Administration
P.O. Box 50244
300 Ala Moana Boulevard, Room 7-126
Honolulu, Hawai`i 96813

4. Air Traffic Manager
U.S. Department of Transportation
Federal Aviation Administration
P.O. Box 50244
300 Ala Moana Boulevard, Room 7-128
Honolulu, Hawai`i 96813

5. Field Supervisor
U. S. Fish and Wildlife Service
300 Ala Moana Blvd., Rm. 3-122
Box 50088
Honolulu, Hawai`i 96813

6. Russ Saito, State Comptroller
Department of Accounting and General Services
1151 Punchbowl Street, #426
Honolulu, Hawai`i 96813

7. Theodore E. Liu, Director
State of Hawai`i
Department of Business, Economic Development & Tourism
Strategic Industries Division
P.O. Box 2359
Honolulu, Hawai`i 96804

8. Micah Kane, Chairman
Department of Hawaiian Home Lands
P. O. Box 1879
Honolulu, Hawai`i 96805

9. Laura Thielen, Chairperson
State of Hawai`i
Department of Land and Natural Resources
1151 Punchbowl Street
Honolulu, Hawai`i 96813

10. Administrator
State of Hawai`i
Department of Land and Natural Resources
State Historic Preservation Division
601 Kamokila Blvd., Room 555
Kapolei, Hawai`i 96707

11. Brennon Morioka, Interim Director
State of Hawai`i
Department of Transportation
869 Punchbowl Street
Honolulu, Hawai`i 96813

12. Laurence K. Lau, Interim Director
Office Of Environmental Quality Control
235 S. Beretania Street, Suite 702
Honolulu, Hawai`i 96813

13. Clyde Namu`o, Adminstrator
Office of Hawaiian Affairs
711 Kapiolani Boulevard, Suite 500
Honolulu, Hawai`i 96813

14. Mary Lou Kobayashi, Planning Program Administrator
State of Hawai`i
Office of Planning
P.O. Box 2359
Honolulu, Hawai`i 96804

15. Department of Business, Economic Development & Tourism
Strategic Industries Division
235 South Beretania Street, 5th Floor
Honolulu, Hawai`i 96813

16. State of Hawai`i
Department of Health
Environmental Planning Office
P.O. Box 3378
Honolulu, Hawai`i 96801

17. Department Head
Department of Water Supply
County of Hawai`i
345 Kekuanaoa Street, Suite 20
Hilo, Hawai`i 96720

18. Bruce C. McClure, P.E., Director
Department of Public Works
County of Hawai`i
101 Pauahi Street, Suite 7
Aupuni Center
Hilo, Hawai`i 96720-4224

19. Chris Yuen, Director
Planning Department
County of Hawai`i
101 Pauahi Street, Suite 3
Hilo, Hawai`i 96720

20. Jane H. Testa, Director
Department of Research and Development
County of Hawai`i
25 Aupuni Street
Hilo, Hawai`i 96720

21. Darryl J. Oliveira, Fire Chief
Hawai`i Fire Department
County of Hawai`i
25 Aupuni Street
Hilo, Hawai`i 96720

22. Lawrence K. Mahuna, Police Chief
Hawai`i Police Department
County of Hawai`i
349 Kapiolani Street
Hilo, Hawai`i 96720

23. Bobby Jean Leithead-Todd, Director
Department of Environmental Management
County of Hawai`i
25 Aupuni Street
Hilo, Hawai`i 96720

24. **Hawaiian Telecom Headquarters**
1177 Bishop Street
Honolulu, Hawai`i 96813

25. Librarian
Kailua-Kona Library
75-138 Hualalai Road
Kailua-Kona, Hawai`i 96740

26. **Hawai`i Electric Light Company, Inc.**
P. O. Box 102
Hilo, Hawai`i 96721-1027

27. Librarian
UHH Library
200 W. Kawili Street
Hilo, Hawai`i 96720

MAR 0 4 2008

United States Department of Agriculture

NRCS
Natural Resources Conservation Service
P.O. Box 50004 Rm. 4-118
Honolulu, HI 96850
808-541-2600

March 3, 2008

Mich Hirana, AICP
Munekiyo & Hiraga, Inc
305 High Street, Suite 104
Wailuku, Hawaii, 96793

Dear Mr. Hirano,

After review of the Kona International Airport proposed improvement project site, and the associated USDA-Natural Resources Conservation Service (NRCS) soil survey map, no impacts to this site are identified. Enclosed please find the NRCS Soil Survey Map and soil legend. The soils in the proposed project area are described as Lava Flows with little or no soil or vegetative characteristics. There may be small areas of soils and vegetation included in these map units: however, these areas would be too small for any impacts to be documented. If you have any questions please contact Tony Rolfes, assistant state soil scientist, 808-541-2600, ext. 129.

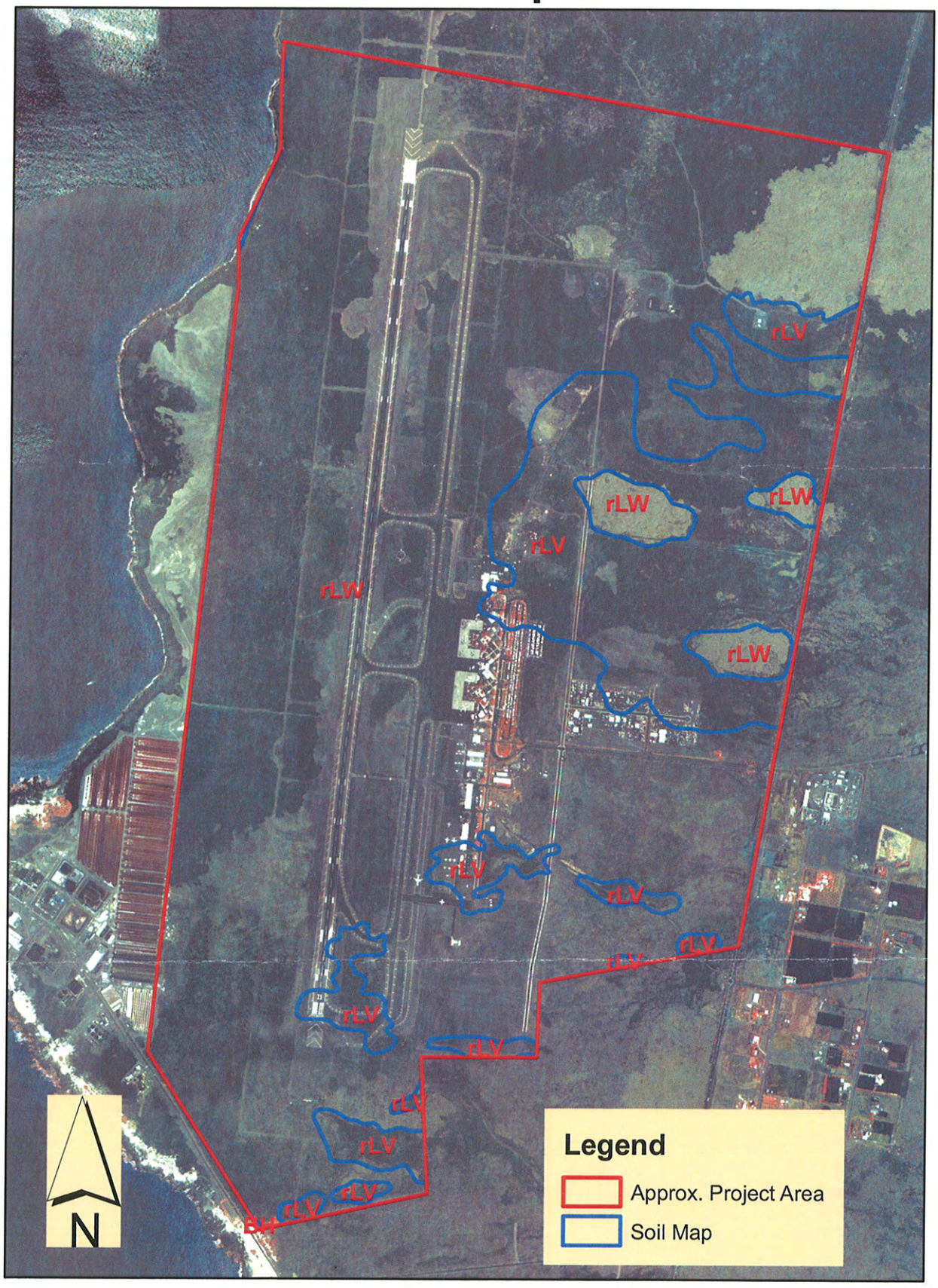
Sincerely,

LAWRENCE T. YAMAMOTO
Director
Pacific Islands Area

Enclosures:

cc: Michael Robotham, Assistant Director for Soil Science and Natural Resource Assessments, USDA-NRCS, Honolulu, HI

Kona Airport Site Project Area
Soil Map



2,200 1,100 0 2,200 Feet

NRCS
2/2008

Map Unit Legend

Island of Hawaii, Hawaii

Map symbol	Map unit name
rLV	Lava flows, aa
rLW	Lava flows, pahoehoe

MUNEKIYO & HIRAGA, INC.

MICHAEL T. MUNEKIYO
GWEN OHASHI HIRAGA
MITSURU "MICH" HIRANO
KARLYNN FUKUDA

MARK ALEXANDER ROY
KYLE GINOZA

May 14, 2008

Lawrence T. Yamamoto, Director
Pacific Islands Area
Natural Resources Conservation Service
P.O. Box 50004, Rm 4-118
Honolulu, HI 96850

SUBJECT: Proposed Kona International Airport Improvements

Dear Mr. Yamamoto:

Thank you for your comment letter of March 3, 2008 in response to our request for early consultation in preparation of the environmental assessment for the subject project. On behalf of the State of Hawai`i, Department of Transportation (SDOT), Airports Division, we wish to provide the following information in response to your comments.

We note the referenced Soil Survey Map and soil legend. This information will be provided in the environmental assessment document. We also note your comment that the small areas of soils and vegetation in the project site would be too small for any impacts to be documented.

Again, thank you for your comments.

Very truly yours,

Mich Hirano, AICP
Project Manager

MH:tn
cc: Kevin Funasaki, State of Hawai`i, Department of Transportation, Airports Division
F:\DATA\KYA\Kona AP\NRCSeclresponse.wpd

Mich Hirano

From: Steve.Wong@faa.gov
Sent: Friday, February 22, 2008 11:11 AM
To: Mich Hirano
Cc: Moses.Akana@faa.gov; Darice.B.Young@faa.gov
Subject: KOA Photovoltaic Projects

Hi Mich,

We have reviewed the proposal to install photovoltaic cells at Kona Int'l Airport. We recommend that an aeronautical evaluation be completed for the subject site development. You may file your cases via the internet at https://oeaaa.faa.gov. You need to create a new user account if you don't have a login.

If there will be non-reflective screens for each panel, please make a note of it in your submittal.

Please call me if you have any questions.

Thank you.

Steven Wong
Program Manager
FAA, Honolulu Airports District Office
(808) 541-1225

MUNEKIYO & HIRAGA, INC.

MICHAEL T. MUNEKIYO
GWEN OHASHI HIRAGA
MITSURU "MICH" HIRANO
KARLYNN FUKUDA

MARK ALEXANDER ROY
KYLE GINOZA

May 14, 2008

Steve Wong, Program Manager
Airports District Office
Federal Aviation Administration
P.O. Box 50244
300 Ala Moana Boulevard, Room 7-126
Honolulu, Hawai`i 96813

SUBJECT: Proposed Kona International Airport Improvements

Dear Mr. Wong:

Thank you for your comment in response to our recent request for early consultation on the subject project, which was received via electronic message on February 22, 2008. On behalf of the State of Hawai`i, Department of Transportation (SDOT), Airports Division, we wish to provide the following information in response to your comment.

The State of Hawai`i understands FAA concerns regarding the aeronautical evaluation of a project in the airport operating area (AOA). The referenced form 7460-1 relates to coordination of construction efforts and equipment in the AOA area. However, since the project is in the preliminary design stages, specific information relating to the construction activities and equipment in the AOA area are unknown at this time. The State will comply with the FAA requirements and will instruct the contractor to complete and submit form 7460-1 for the aeronautical evaluation review and approval prior to commencement of work. Furthermore, SDOT, Airports Division intends to have full coordination of issues with the Federal Aviation Administration related to this project.

Again, thank you for your comments.

Very truly yours,

Mich Hirano, AICP
Project Manager

MH:tn
cc: Kevin Funasaki, State of Hawai`i, Department of Transportation, Airports Division
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MAR 1 4 2008

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Pacific Islands Fish and Wildlife Office
300 Ala Moana Boulevard, Room 3-122, Box 50088
Honolulu, Hawaii 96850

In Reply Refer To:
2008-TA-0129

MAR 1 3 2008

Mr. Mich Hirano, AICP, Project Manager
Munekiyo and Hiraga, AICP
305 High Street, Suite 104
Honolulu, Hawaii 96793

Subject: Pre-Consultation for Improvements to the Kona International Airport at Keahole, Hawaii

Dear Mr. Hirano:

Thank you for your letter received on February 13, 2008, requesting our comments on the potential impacts from the above referenced project to threatened and endangered species. The project will be located seven miles north of Kailua-Kona, in the North Kona district on the island of Hawaii. This project will occur on land currently developed and utilized by the Kona International Airport. The proposed project includes interim commuter terminal improvements, parking lot improvements and photovoltaic electrical system upgrades. Based on the project information you provided and pertinent information in our files, including data compiled by the Hawaii Biodiversity and Mapping Program, and the Hawaii GAP Program, the threatened Newell's shearwater (*Puffinus auricularis newelli*) and endangered Hawaiian petrel (*Pterodroma phaeopygia sandwichensis*) (collectively referred to as seabirds) are known to traverse the project site. Unshielded outdoor lights can attract and disorient seabirds leading to the downing and death of these listed species. Potential impacts to seabirds could be minimized by shielding outdoor lights so the bulb can only be seen from below. We recommend you address potential project impacts to seabirds and include measures to minimize adverse impacts in your Environmental Assessment (EA) documents.

We hope this information assists you in drafting the EA for this project. If you have questions regarding this letter, please contact Dr. Jeff Zimpfer, Fish and Wildlife Biologist, Consultation and Technical Assistance Program (phone: 808-792-9431; fax: 808-792-9581).

Sincerely,

for Patrick Leonard
Field Supervisor

MUNEKIYO & HIRAGA, INC.

MICHAEL T. MUNEKIYO
GWEN OHASHI HIRAGA
MITSURU "MICH" HIRANO
KARLYNN FUKUDA

MARK ALEXANDER ROY
KYLE GINOZA

May 14, 2008

Patrick Leonard, Field Supervisor
Fish and Wildlife Service
U.S. Department of the Interior
Pacific Islands Fish and Wildlife Office
300 Ala Moana Boulevard, Room 3-122,
Box 50088
Honolulu, Hawaii, 96850

SUBJECT: Proposed Kona International Airport Improvements
File: 2008-TA-0129

Dear Mr. Leonard:

Thank you for your comment letter of March 13, 2008 in response to our request for early consultation in the preparation of the environmental assessment for the subject project. On behalf of the State of Hawaii, Department of Transportation (SDOT), Airports Division, we wish to provide the following information in response to your comments.

We note your comment that the threatened Newell's shearwater and endangered Hawaiian petrel are known to traverse the project site. We confirm, all project related outdoor lighting will be shielded and downcast to mitigate potential adverse impacts to seabirds from light spillage across property boundaries, towards the shoreline and into the night sky. Potential impacts to avifauna from light spillage and mitigation measures will be included in the environmental assessment.

environment
planning
government

305 High Street, Suite 104 · Wailuku, Hawaii 96793 · ph: (808)244-2015 · fax: (808)244-8729 · planning@mhplanning.com · www.mhplanning.com

Again, thank you for your comments.

Very truly yours,

Mich Hirano, AICP
Project Manager

MH:tn
cc: Kevin Funasaki, State of Hawai`i, Department of Transportation, Airports Division
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FEB 2 1 2008

LINDA LINGLE
GOVERNOR

RUSS K. SAITO
COMPTROLLER

BARBARA A. ANNIS
DEPUTY COMPTROLLER

(P)1055.8

STATE OF HAWAII
DEPARTMENT OF ACCOUNTING AND GENERAL SERVICES
P.O. BOX 119, HONOLULU, HAWAII 96810

FEB 2 0 2008

Mr. Mich Hirano, AICP
Munekiyo & Hiraga, Inc.
305 High Street, Suite 104
Wailuku, Hawaii 96793

Dear Mr. Hirano:

Subject: Proposed Interim Commuter Airline Terminals, Parking Lot Expansion, Photovoltaic Electrical Upgrades and Related Improvements at Kona International Airport at Keahole

Thank you for the opportunity to provide pre-assessment consultation comments on the subject project. This proposed project does not impact any of the Department of Accounting and General Services' projects or existing facilities, and we have no comments to offer at this time.

If you have any questions, please call me at 586-0400 or have your staff call Mr. Clarence Kubo of the Public Works Division at 586-0488.

Sincerely,

RUSS K. SAITO
State Comptroller

FEB 2 2 2008

1314 Kyn - Kona Arpt

LINDA LINGLE
GOVERNOR
THEODORE E. LIU
DIRECTOR
MARK K. ANDERSON
DEPUTY DIRECTOR

DEPARTMENT OF BUSINESS, ECONOMIC DEVELOPMENT & TOURISM

STRATEGIC INDUSTRIES DIVISION
235 South Beretania Street, Leiopapa A Kamehameha Bldg., 5th Floor, Honolulu, Hawaii 96813
Mailing Address: P.O. Box 2359, Honolulu, Hawaii 96804

Telephone: (808) 587-3807
Fax: (808) 586-2536
Web site: www.hawaii.gov/dbedt

February 15, 2008

Munekiyo & Hiraga, Inc.
Attention: Mich Hirano, AICP
305 High Street, Suite 104
Wailuku, Hawaii 96793

Dear Mr. Hirano:

Re: Pre-consultation for the Proposed Interim Commuter Airline Terminals, Parking Lot Expansion, Photovoltaic Electrical Upgrades and Related Improvements at Kona International Airport at Keahole Draft Environmental Assessment

Thank you for the opportunity to provide comments on the proposed improvements at the Kona International Airport. We would like to defer our comments until receipt of the Draft Environmental Assessment.

Please note that our office name has changed from "Energy, Resources & Technology Division" to "Strategic Industries Division."

Sincerely,

Elizabeth Corbin

Elizabeth Corbin
Acting Administrator

FEB 2 0 2008

LINDA LINGLE
GOVERNOR OF HAWAII

LAURA H. THIELEN
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

February 16, 2008

Munekiyo & Hiraga, Inc.
305 High Street Suite 104
Wailuku, Hawaii 96793

Attention: Mr. Mitch Hirano

Gentlemen:

Subject: proposed Interim Commuter Airline Terminals, Parking Lot Expansion, Photovoltaic Electrical Upgrades and Related Improvements at Kona International airport at Keahole

Thank you for the opportunity to review and comment on the subject matter. The Department of Land and Natural Resources' (DLNR) has no other comments to offer on the subject matter. Should you have any questions, please feel free to call our office at 587-0433. Thank you.

Sincerely,

Morris M. Atta
Administrator

MAR 0 5 2008

LINDA LINGLE
GOVERNOR OF HAWAII

LAURA H. THIELEN
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

RUSSELL Y. TSUJI
FIRST DEPUTY

KEN C. KAWAHARA
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
STATE HISTORIC PRESERVATION DIVISION
601 KAMOKILA BOULEVARD, ROOM 555
KAPOLEI, HAWAII 96707

February 27, 2008

Mich Hirano, AICP, Project Manager
Munekiyo & Hiraga, Inc.
305 High Street, Suite 104
Wailuku, Hawaii 96793

LOG NO: 2008.044
DOC NO: 0802MD86
Archaeology

Dear Mr. Hirano:

SUBJECT: **Section 106 Historic Preservation Review –**
Early Consultation for Proposed Interim Commuter Airline Terminals, Parking Lot Expansion, Photovoltaic Electrical Upgrades and Related Improvements at Kona International Airport at Keahole
Lalamilo Ahupua`a, South Kohala District, Island of Hawai`i
TMK: (3) 7-3-043:003, 006 through 035, 037 through 040 and 043 through 047

Thank you for the opportunity to comment on the aforementioned project.

We are unable to comment at this time on whether or not historic properties might be affected as the information provided to us was insufficient to determine the placement of the proposed project against a map of the parcels. At least one known historic site – the Mamalohoa Trail – is situated within the project site, and others (petroglyphs and a habitation complex) may also be within the proposed scope.

Before moving further, please contact our Hawai`i Island office with the planned location of your new structures, so that we may proceed with our review. Please contact Morgan Davis at (808) 896-0514 if you have any questions or concerns regarding this letter.

Aloha,

Laura H. Thielen
State Historic Preservation Officer

Cc:

Christopher Yuen, Planning Director
Department of Planning
County of Hawaii
101 Pauahi Street, Suite 3
Hilo, Hawaii 96720-4224

MUNEKIYO & HIRAGA, INC.

MICHAEL T. MUNEKIYO
GWEN OHASHI HIRAGA
MITSURU "MICH" HIRANO
KARLYNN FUKUDA

MARK ALEXANDER ROY
KYLE GINOZA

May 14, 2008

Laura H. Thielen
State Historic Preservation Officer
State of Hawai`i
Department of Land and Natural Resources
601 Kamokila Boulevard, Room 555
Kapolei, Hawai`i 96707

SUBJECT: Proposed Kona International Airport Improvements
File: DOC NO 0802MD86

Dear Ms. Thielen:

Thank you for your comment letter of March 3, 2008 in response to our request for early consultation in the preparation of the environmental assessment for the subject project. On behalf of the State of Hawai`i, Department of Transportation (SDOT), Airports Division, we wish to provide the following information in response to your comments.

We note your comment regarding historic sites in and around the Kona International Airport site. An archaeological assessment report and cultural impact assessment (CIA) report have been carried out for the environmental assessment in accordance with Act 50 enacted by the Legislature of the State of Hawai`i (2000). The studies include reference to the known historic and cultural resources within the KOA site, including the Mamalohoa Trail.

The archaeological consultant has been forwarded a copy of your letter and will coordinate with the Hawai`i Island office with more detailed information on the proposed project in the context of Section 106 (National Preservation Act) consultation.

Again, thank you for your comments.

Very truly yours,

Mich Hirano, AICP
Project Manager

MH:tn
cc: Kevin Funasaki, State of Hawai`i, Department of Transportation, Airports Division
Glenn Escott, Scientific Consultant Services, Inc.
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FEB 2 9 2008

LINDA LINGLE
GOVERNOR

BRENNON T. MORIOKA
INTERIM DIRECTOR

Deputy Directors
MICHAEL D. FORMBY
FRANCIS PAUL KEENO
BRIAN H. SEKIGUCHI

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

IN REPLY REFER TO:

STP 8.2784

February 27, 2008

Mr. Mich Hirano, AICP
Project Manager
Munekiyo & Hiraga, Inc.
305 High Street, Suite 104
Wailuku, Hawaii 96793

Dear Mr. Hirano:

Subject: Interim Commuter Terminals, Parking Lot Expansion and Photovoltaic Electrical Upgrades and Improvements
Kona International Airport at Keahole (KOA)
Environmental Assessment, Pre-Consultation

The Department of Transportation (DOT) is in full support of the subject Airports Division project to improve KOA Airport facilities. DOT looks forward to its review of the forthcoming environmental assessment and will consult with the Airports Division in the consolidation of departmental concerns.

We appreciate your advance notification and for the opportunity to provide comments.

Very truly yours,

BRENNON T. MORIOKA, PH.D., P.E.
Interim Director of Transportation

MAR 0 3 2008

PHONE (808) 594-1888

FAX (808) 594-1865

STATE OF HAWAI'I
OFFICE OF HAWAIIAN AFFAIRS
711 KAPI'OLANI BOULEVARD, SUITE 500
HONOLULU, HAWAI'I 96813

HRD08/3498

February 28, 2008

Mich Hirano, Project Manager
Munekiyo & Hiraga
305 High Street, Suite 104
Wailuku, Hawai'i 96793

RE: Pre-assessment consultation on proposed interim commuter airline terminals, parking lot expansion, photovoltaic electrical upgrades and related improvements at Kona International Airport at Keahole, Hawai'i Island.

Dear Mich Hirano,

The Office of Hawaiian Affairs (OHA) is in receipt of the above-referenced request for pre-assessment consultation. The State Department of Transportation Airports Division is proposing improvements to the Kona International Airport, which include: the development of two new interim commuter airlines terminal buildings, resurfacing and relocating of the entrance gate and ticket dispensers at the main parking lot and expanding the long-term and overflow parking lots, new photovoltaic electrical upgrades, and related infrastructure and site landscaping improvements. OHA offers the following comments.

We request the applicant's assurances that should iwi kūpuna or Native Hawaiian cultural or traditional deposits be found during the construction of the project, work will cease, and the appropriate agencies will be contacted pursuant to applicable law.

In addition, OHA recommends that the applicant use native vegetation in its landscaping plan for subject parcel. Landscaping with native plants furthers the traditional Hawaiian concept of mālama 'āina and creates a more Hawaiian sense of place.

Thank you for the opportunity to comment. If you have further questions, please contact Sterling Wong (808) 594-0248 or e-mail him at sterlingw@oha.org.

Sincerely,

Clyde W. Nāmu'o
Administrator

MUNEKIYO & HIRAGA, INC.

MICHAEL T. MUNEKIYO
GWEN OHASHI HIRAGA
MITSURU "MICH" HIRANO
KARLYNN FUKUDA

MARK ALEXANDER ROY
KYLE GINOZA

May 14, 2008

Clyde W. Namu`o, Administrator
Office of Hawaiian Affairs
State of Hawai`i
711 Kapi`olani Boulevard, Suite 500
Honolulu, Hawai`i 96813

SUBJECT: Proposed Kona International Airport Improvements
File HRD08/3498

Dear Mr. Namu`o:

Thank you for your comment letter of March 3, 2008 in response to our request for early consultation in the preparation of the environmental assessment for the subject project. On behalf of the State of Hawai`i, Department of Transportation (SDOT), Airports Division, we wish to provide the following information in response to your comments.

The Airports Division notes your Department's comment regarding iwi kupuna or native Hawaiian cultural or traditional deposits found during construction. Please be advised an archaeological field inspection and cultural impact assessment (CIA) pursuant to Act 50 of the State Legislature (2000) was carried out for the environmental assessment. The findings of the studies concluded that the project is not anticipated to adversely impact cultural practices or historic properties. Nevertheless, should cultural or traditional deposits be found during construction of the project, all work will cease and the appropriate agencies and organizations will be contacted pursuant to applicable law.

We note your comment regarding native plants in the project's landscaping and have forwarded this comment regarding the use of native plants in the project landscaping to the project design team.

305 High Street, Suite 104 · Wailuku, Hawaii 96793 · ph: (808)244-2015 · fax: (808)244-8729 · planning@mhplanning.com · www.mhplanning.com

Again, thank you for your comments.

Very truly yours,

Mich Hirano, AICP
Project Manager

MH:tn
cc: Kevin Funasaki, State of Hawai`i, Department of Transportation, Airports Division
Nelson Kajioka, KYA Design Group
F:\DATA\KYA\Kona AP\ohaec\response.wpd

FEB 2 7 2008

Harry Kim
Mayor

Bobby Jean Leithead-Todd
Director

Nelson Ho
Deputy Director

County of Hawaii

DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

25 Aupuni Street • Hilo, Hawai`i 96720-4252
(808) 961-8083 • Fax (808) 961-8086
http://co.hawaii.hi.us/directory/dir_envmng.htm

February 25, 2008

Mr. Mich Hirano, AICP
Project Manager
Munekiyo & Hiraga, Inc.
305 High Street, Suite 104
Wailuku, HI 96793

SUBJECT: PROPOSED INTERIM COMMUTER AIRLINE TERMINALS, PARKING LOT EXPANSION, PHOTOVOLTAIC ELECTRICAL UPGRADES AND RELATED IMPROVEMENTS AT KONA INTERNATIONAL AIRPORT AT KEAHOLE

Dear Mr. Hirano,

We have no comments to offer on the subject project.

Thank you for allowing us the opportunity to review and comment on this project.

Sincerely,

Bobby Jean Leithead-Todd
DIRECTOR

10453B

Harry Kim
Mayor

Christopher J. Yuen
Director

Brad Kurokawa, ASLA
LEED® AP
Deputy Director

County of Hawaii
PLANNING DEPARTMENT
101 Pauahi Street, Suite 3 • Hilo, Hawaii 96720-4224
(808) 961-8288 • FAX (808) 961-8742

MAR 1 2 2008

March 10, 2008

Mr. Mich Hirano, AICP
Munekiyo & Hiraga, Inc.
305 High Street, Suite 104
Wailuku, HI 96793

Dear Mr. Hirano:

SUBJECT: **Consultation for the Preparation of an Environmental Assessment (EA)**

PROJECT: **Kona International Airport at Keahole Interim Commuter Airline Terminals, Parking Lot Expansion, Photovoltaic Electrical Upgrades and Related Infrastructure and Landscaping Improvements**
Tax Map Key: (3) 7-3-43:03, 06-35, 37-40, 43-47; Keahole Airport, North Kona, Hawaii

This is in response to your letter dated February 12, 2008, in which you requested our comments on any special environmental conditions or impacts related to the proposed development. We have the following comments to offer:

1. As noted in your letter, a Special Management Area (SMA) Use Permit application is required to be submitted to the County Planning Commission for review and approval.
2. The parking lot improvements should be phased so that sufficient parking space is available to air travelers during construction.
3. The EA should consider how airport security will be maintained during construction of the interim commuter airline terminal buildings.
4. A discussion of how the proposed development satisfies the facility requirements identified in the HDOT's current master plan update should also be included in the EA.

Please provide this office with a copy of the draft EA upon its publication. Should you have questions, feel free to contact Maija Cottle of my staff at 961-8288 extension 253.

Sincerely,

CHRISTOPHER J. YUEN
Planning Director

MJC:cs
P:\wpwin60\Maija\EA-EIS\Pre-Consult Comments\Kona International Airport CAT & PV Pre-cmnts.doc

xc: Director
Office of Environmental Quality Control
235 South Beretania Street, Suite 702
Honolulu, HI 96813

MUNEKIYO & HIRAGA, INC.

MICHAEL T. MUNEKIYO
GWEN OHASHI HIRAGA
MITSURU "MICH" HIRANO
KARLYNN FUKUDA

MARK ALEXANDER ROY
KYLE GINOZA

May 14, 2008

Christopher J. Yuen, Director
Planning Department
County of Hawai`i
101 Pauahi Street, Suite 3
Hilo, Hawai`i 96720-4224

SUBJECT: Proposed Kona International Airport Improvements

Dear Mr. Yuen:

Thank you for your comment letter of February 20, 2008 in response to our request for early consultation in the preparation of the environmental assessment for the subject project. On behalf of the State of Hawai`i, Department of Transportation (SDOT), Airports Division, we wish to provide the following information in response to your comments. The responses are in the same order as in the comment letter.

1. Your comment regarding an application for a Special Management Area (SMA) Use Permit for the proposed action is acknowledged and noted. Upon further coordination with the Planning Department subsequent to the date of your letter, SDOT, Airports Division understands the proposed action will be covered under SMA Use Permit No. 325.

2. The parking lot improvements will be phased and sufficient parking will be available to air travelers during construction.

3. The Interim Commuter Airline Terminals (CATs) will be located to the south of the existing terminal facilities. Access to the CATs construction area will be restricted during construction. Since the CATs will not be located adjacent to the existing terminal facilities, maintaining airport security during construction should not pose an operational problem.

4. Discussion of the proposed improvements in the context of the 2000 Master Plan Update and the current 2008 Master Plan Update will be included in the environmental assessment (refer to Chapter VI, Item 8. in Draft Environmental Assessment).

305 High Street, Suite 104 · Wailuku, Hawaii 96793 · ph: (808)244-2015 · fax: (808)244-8729 · planning@mhplanning.com · www.mhplanning.com

Again, thank you for your comments.

Very truly yours,

Mich Hirano, AICP
Project Manager

MH:tn
cc: Kevin Funasaki, State of Hawai`i, Department of Transportation, Airports Division
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MAR 1 2 2008

Harry Kim
Mayor

Jane H. Testa
Director

Diane L. Ley
Deputy Director

County of Hawaii

DEPARTMENT OF RESEARCH AND DEVELOPMENT

Lanihau Professional Center • 75-5591 Palani Road, Suite 2001
Kailua-Kona, Hawaii 96740
(808) 327-3664 • Fax (808) 327-3667
E-mail: rarrigoni@co.hawaii.hi.us

Mich Hirano, AICP
Project Manager
Munekiyo & Hiraga, Inc.
305 High Street, Suite 104
Wailuku, Hawaii 96793

March 10, 2008

RE: Proposed Interim Commuter Airline Terminals, Parking Lot Expansion, Photovoltaic Electrical Upgrades and Related improvements at Kona International Airport at Keahole

Dear Mr. Hirano,

Thank you for your opportunity to provide comments on the proposed Interim Commuter Airline Terminals, Parking Lot Expansion, Photovoltaic Electrical Upgrades and Related improvements at Kona International Airport at Keahole.

On behalf of the County of Hawai`i's Department of Research and Development, please allow me to express our appreciation to the State of Hawai`i's Department of Transportation Airport Division and your team for the foresight to include extensive use of photovoltaic systems within the parking lot area. This portion of the project alone will do much to offset the increased electrical consumption and reduce expenses for power within the entire airport complex.

Additional steps can be taken to mitigate the impact of increased electrical consumption through energy efficiency measures. We recommend that all facilities meet the minimum standard of the United States Environmental Protection Agency's (EPA) Energy Star rating for energy efficiency. It is also recommended that all structures include radiative barriers or R-19 equivalent in roofs and R-11 in walls. This simple action dramatically reduces the heat load and the subsequent need for air conditioning. Finally, it is recommended that landscaping incorporate xeriscape plant materials whenever and where possible to reduce water consumption.

Again, thank you for this opportunity to provide comments.

Sincerely,

Diane Ley

Diane Ley
Deputy Director

MUNEKIYO & HIRAGA, INC.

MICHAEL T. MUNEKIYO
GWEN OHASHI HIRAGA
MITSURU "MICH" HIRANO
KARLYNN FUKUDA

MARK ALEXANDER ROY
KYLE GINOZA

May 14, 2008

Diane Ley, Deputy Director
Department of Research and Development
County of Hawai`i
75-5591 Palani Road, Suite 2001
Kailua-Kona, Hawai`i 96740

SUBJECT: Proposed Kona International Airport Improvements

Dear Ms. Ley:

Thank you for your comment letter of March 10, 2008 in response to our request for early consultation in the preparation of the environmental assessment for the subject project. On behalf of the State of Hawai`i, Department of Transportation (SDOT), Airports Division, we wish to provide the following information in response to your comments. The responses are in the same order as in the comment letter.

The SDOT, Airports Division, will assess all practicable energy efficiency measures, including initiatives to meet the standard of the U.S. Environmental Protection Agency's Energy Star rating for energy efficiency. Construction methods, which will reduce heat load, will also be investigated by the design team and measures to reduce energy consumption will be incorporated in the project design as practicable. Landscaping to incorporate xeriscape plant materials will also be investigated and incorporated into the project as practicable.

Again, thank you for your comments and suggestions on design conservation measures.

Very truly yours,

Mich Hirano, AICP
Project Manager

MH:tn
cc: Kevin Funasaki, State of Hawai`i, Department of Transportation, Airports Division
Nelson Kajioka, KYA Design Group
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305 High Street, Suite 104 · Wailuku, Hawaii 96793 · ph: (808)244-2015 · fax: (808)244-8729 · planning@mhplanning.com · www.mhplanning.com

Harry Kim
Mayor

Darryl J. Oliveira
Fire Chief

Glen P.I. Honda
Deputy Fire Chief

MAR 1 1 2008

County of Hawai'i

HAWAI'I FIRE DEPARTMENT

25 Aupuni Street • Suite 103 • Hilo, Hawai'i 96720
(808) 981-8394 • Fax (808) 981-2037

March 5, 2008

Mich Hirano
Munekiyo & Hiraga, Inc.
305 High Street, Suite 104
Wailuku, Hawaii 96793

SUBJECT: Proposed Interim Commuter Airline Terminals, Parking Lot Expansion, Photovoltaic Electrical Upgrades and Related Improvements at Kona International Airport at Keahole

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In regards to the above-mentioned project, we offer the following response:

Fire apparatus access roads shall be in accordance with UFC Section 10.207:

"Fire Apparatus Access Roads

"Sec. 10.207. (a) **General.** Fire apparatus access roads shall be provided and maintained in accordance with the provisions of this section.

"(b) **Where Required.** Fire apparatus access roads shall be required for every building hereafter constructed when any portion of an exterior wall of the first story is located more than 150 feet from fire department vehicle access as measured by an unobstructed route around the exterior of the building.

"EXCEPTIONS: 1. When buildings are completely protected with an approved automatic fire sprinkler system, the provisions of this section may be modified.

"2. When access roadways cannot be installed due to topography, waterways, nonnegotiable grades or other similar conditions, the chief may require additional fire protection as specified in Section 10.301 (b).

"3. When there are not more than two Group R, Division 3 or Group M Occupancies, the requirements of this section may be modified, provided, in the opinion of the chief, fire-fighting or rescue operations would not be impaired.

"More than one fire apparatus road may be required when it is determined by the chief that access by a single road may be impaired by vehicle congestion, condition of terrain, climatic conditions or other factors that could limit access.

"For high-piled combustible storage, see Section 81.109.

"(c) **Width.** The unobstructed width of a fire apparatus access road shall meet the requirements of the appropriate county jurisdiction.

"(d) **Vertical Clearance.** Fire apparatus access roads shall have an unobstructed vertical clearance of not less than 13 feet 6 inches.

"**EXCEPTION:** Upon approval vertical clearance may be reduced, provided such reduction does not impair access by fire apparatus and approved signs are installed and maintained indicating the established vertical clearance.

"(e) **Permissible Modifications.** Vertical clearances or widths required by this section may be increased when, in the opinion of the chief, vertical clearances or widths are not adequate to provide fire apparatus access.

"(f) **Surface.** Fire apparatus access roads shall be designed and maintained to support the imposed loads of fire apparatus and shall be provided with a surface so as to provide all-weather driving capabilities." (20 tons)

"(g) **Turning Radius.** The turning radius of a fire apparatus access road shall be as approved by the chief." (45 feet)

"(h) **Turnarounds.** All dead-end fire apparatus access roads in excess of 150 feet in length shall be provided with approved provisions for the turning around of fire apparatus.

"(i) **Bridges.** When a bridge is required to be used as access under this section, it shall be constructed and maintained in accordance with the applicable sections of the Building Code and using

designed live loading sufficient to carry the imposed loads of fire apparatus.

"(j) **Grade.** The gradient for a fire apparatus access road shall not exceed the maximum approved by the chief." (15%)

"(k) **Obstruction.** The required width of any fire apparatus access road shall not be obstructed in any manner, including parking of vehicles. Minimum required widths and clearances established under this section shall be maintained at all times.

"(l) **Signs.** When required by the fire chief, approved signs or other approved notices shall be provided and maintained for fire apparatus access roads to identify such roads and prohibit the obstruction thereof or both."

DARRYL OLIVEIRA
Fire Chief

PBW:lpc

MUNEKIYO & HIRAGA, INC.

MICHAEL T. MUNEKIYO
GWEN OHASHI HIRAGA
MITSURU "MICH" HIRANO
KARLYNN FUKUDA

MARK ALEXANDER ROY
KYLE GINOZA

May 14, 2008

Darryl Oliveira, Fire Chief
Hawai`i Fire Department
County of Hawai`i
25 Aupuni Street, Suite 103
Hilo, Hawai`i 96720

SUBJECT: Proposed Kona International Airport Improvements

Dear Mr. Oliveira:

Thank you for your comment letter of March 5, 2008 in response to our request for early consultation in the preparation of the environmental assessment for the subject project. On behalf of the State of Hawai`i, Department of Transportation (SDOT), Airports Division, we wish to provide the following information in response to your comments.

We note the standards and specifications cited with respect to the relevant project components. This information has been forwarded to the project design team. We confirm that all project components will be designed and constructed in accordance with the standards and specifications cited.

Again, thank you for your comments.

Very truly yours,

Mich Hirano, AICP
Project Manager

MH:tn
cc: Kevin Funasaki, State of Hawai`i, Department of Transportation, Airports Division
Nelson Kajioka, AIA, KYA Design Group
F:\DATA\KYA\Kona AP\HFDecresponse.wpd

FEB 2 5 2008

Harry Kim
Mayor

Lawrence K. Mahuna
Police Chief

Harry S. Kubojiri
Deputy Police Chief

County of Hawaii

POLICE DEPARTMENT
349 Kapiolani Street • Hilo, Hawaii 96720-3998
(808) 935-3311 • Fax (808) 961-2389

February 20, 2008

Mr. Mich Hirano, AICP
Project Manager
Munekiyo & Hiraga, Inc.
305 High Street, Suite 104
Wailuku, Hawaii 96793

Dear Mr. Hirano:

SUBJECT: Proposed Interim Commuter Airline Terminals, Parking Lot Expansion, Photovoltaic Electrical Upgrades and Related Improvements at Kona International Airport at Keahole

This responds to your February 12, 2008, letter requesting comments on a proposal for improvements at the Kona International Airport.

Staff has reviewed the above-referenced documents and submits the following comments:

- Recommends proposal addresses any issues or concerns related to traffic safety and flow.
- Ensure traffic design addresses emergency response plans.
- Implement strategies to address pedestrian safety.

Should you have any questions, please contact Acting Captain Chad Basque, Commander of Kona Patrol, at 326-4646 extension 249.

Mahalo,

LAWRENCE K. MAHUNA
POLICE CHIEF

HENRY J. TAVARES JR.
ASSISTANT CHIEF
AREA II OPERATIONS

MUNEKIYO & HIRAGA, INC.

MICHAEL T. MUNEKIYO
GWEN OHASHI HIRAGA
MITSURU "MICH" HIRANO
KARLYNN FUKUDA

MARK ALEXANDER ROY
KYLE SHIMODA

May 14, 2008

Lawrence K. Mahuna, Police Chief
Police Department
County of Hawai`i
349 Kapiolani Street
Hilo, Hawai`i 96720-3998

SUBJECT: Proposed Kona International Airport Improvements

Dear Chief Mahuna:

Thank you for your comment letter of February 20, 2008 in response to our request for early consultation in the preparation of the environmental assessment for the subject project. On behalf of the State of Hawai`i, Department of Transportation (SDOT), Airports Division, we wish to provide the following information in response to your comments.

We note your comments concerning traffic and confirm the draft environmental assessment document will address any issues or concerns related to traffic safety and flow. The traffic design will ensure fire lanes within the parking areas remain unobstructed by the placement of photovoltaic support structures. This measure will also address emergency response plans by maintaining traffic circulation aisles within the parking areas and improving ingress and egress from the parking lots to Kupipi Street. Strategies to address pedestrian safety include restriping the parking lots to clarify parking stalls, travel lanes and pedestrian areas, ADA (Americans with Disabilities Act) improvements, guardrails where necessary, overhead lighting, and security cameras. The interim commuter airlines terminal buildings have been designed with a convenient passenger pick-up and drop-off area and with 13 adjacent parking stalls (including one (1) accessible stall). Adjacent parking provides convenience and safety by minimizing pedestrian traffic across Kupipi Street, the main terminal circulation road. These measures will also be discussed in the environmental assessment.

Again, thank you for your comments.

Very truly yours,

Mich Hirano, AICP
Project Manager

MH:tn
cc: Kevin Funasaki, State of Hawai`i, Department of Transportation, Airports Division
Nelson Kajioka, KYA Design Group
F:\DATA\KYA\Kona AP\policeeclresponse.wpd

MAR 0 6 2008

DEPARTMENT OF WATER SUPPLY • COUNTY OF HAWAI'I
345 KEKŪANAŌ'A STREET, SUITE 20 • HILO, HAWAI'I 96720
TELEPHONE (808) 961-8050 • FAX (808) 961-8657

March 3, 2008

Mr. Micah Hirano
Munekiyo & Hiraga, Inc.
305 High Street, Suite 104
Wailuku, HI 96793

PRE-ENVIRONMENTAL ASSESSMENT CONSULTATION
PROPOSED INTERIM COMMUTER TERMINALS, PARKING LOT EXPANSION, PHOTOVOLTAIC ELECTRICAL UPGRADES, AND RELATED IMPROVEMENTS AT KONA INTERNATIONAL AIRPORT
TAX MAP KEY 7-3-043:003

We have reviewed the subject Pre-Environmental Assessment consultation information and have the following comments.

The Department will note that the existing water system serving the Kona International Airport has experienced an increase in demand in the area that has negatively affected the hydraulic performance of the system. The elements of the system that are most deficient are the transmission system and source that serves the airport.

We request, if available, calculations prepared by a professional engineer licensed in the State of Hawai'i showing the projected increase in water demand for the Kona International Airport, particularly the anticipated landscaping water usage. After review of the projected water demand, we will determine if water is available from our existing water system and the scope of water system improvements required to support the projected demand.

Should there be any questions, you may contact Mr. Finn McCall of our Water Resources and Planning Branch at 961-8070, extension 255.

Sincerely yours,

Milton D. Pavao, P.E.
Manager

FM:dfg

copy - Mr. Robert Ravenscraft, District Supervisor, DWS Kona

... Water brings progress...

MUNEKIYO & HIRAGA, INC.

MICHAEL T. MUNEKIYO
GWEN OHASHI HIRAGA
MITSURU "MICH" HIRANO
KARLYNN FUKUDA

MARK ALEXANDER ROY
KYLE GINOZA

May 14, 2008

Milton D. Pavao, P.E., Director
Department of Water Supply
County of Hawai`i
345 Kekuanao`a Street, Suite 20
Hilo, Hawai`i 96720

SUBJECT: Proposed Kona International Airport Improvements

Dear Mr. Pavao:

Thank you for your comment letter of March 3, 2008 in response to our request for early consultation in the preparation of the environmental assessment for the subject project. On behalf of the State of Hawai`i, Department of Transportation (SDOT), Airports Division, we wish to provide the following information in response to your comments.

Calculations have been prepared by a professional engineer, licensed in the State of Hawai`i, showing the projected increase in water demand related to the proposed Kona International Airport improvements. It is anticipated that the peak flow rate (excluding the landscape irrigation) for the project will be approximately 60 gallons per minute. The Kona International Airport has its own wastewater treatment facility, which provides R-1 water for irrigation. The Preliminary Engineering Report, including water demand, wastewater flow and drainage will be included in the environmental assessment (EA). A copy of the Draft EA will be submitted to your Department for further review and comment.

Again, thank you for your comments.

Very truly yours,

Mich Hirano, AICP
Project Manager

MH:tn
cc: Kevin Funasaki, State of Hawai`i, Department of Transportation, Airports Division
Nelson Kajioka, AIA, KYA Design Group
F:\DATA\KYA\Kona AP\DWSecIresponse.wpd

IX. REFERENCES

IX. REFERENCES

Char & Associates Botanical Consultants, Botanical Survey: Kona International Airport at Keahole, North Kona, Hawai`i, February 2000.

County of Hawai`i, Department of Research and Development, County Data Book, 2006.

County of Hawai`i, General Plan, February 2005.

Department of Geography, University of Hawai`i at Hilo, Atlas of Hawai`i, Third Edition, 1998.

Department of Labor and Industrial Relations, Hawai`i Workforce Informer, http://www.hiwi.org.

Federal Emergency Management Agency, Digital Flood Insurance Rate Maps (DFIRMS), 1996. Data downloaded from: State of Hawai`i GIS Program.

Keahole Associates, Inc., Kona International Airport at Keahole Master Plan Update, Keahole, North Kona, Hawai`i, November 2000.

Kona Airport Master Plan Draft, Chapter I, http://www.kona-airport.com/downloads/MP%20Inventory.pdf.

Rana Productions, Ltd., Fauna Survey of Avian and Mammalian Species: Kona International Airport, Keahole, North Kona, Hawai`i, February 2000.

State of Hawai`i, Department of Business, Economic Development and Tourism, 2006 Visitor Plant Inventory, May 2007.

U.S. Census Bureau, State and County QuickFacts-Hawai`i County, Hawai`i, 2006.

U.S. Department of Agriculture Soil Conservation Service. Soil Survey of Island of Hawai`i, State of Hawai`i, 1973.

APPENDIX A.

Drainage Report

Drainage Report

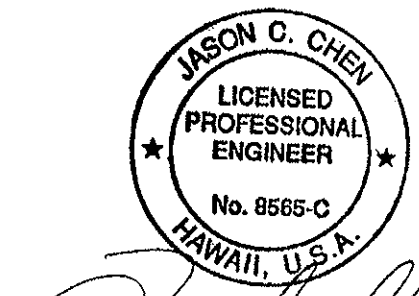
for

Parking Lot Expansion Project Phase III, Interim CAT Terminal Project,
and PV Solar Electric Power Project

at

Kona International Airport

Prepared by



JC Engineering, LLC

TABLE OF CONTENTS

FIGURES

1.0 PURPOSE

This report is prepared as a supplemental document for the Environmental Assessment (EA) of the proposed Parking Lot Expansion Phase III, Interim CAT Terminal, and PV Solar Electric Power projects at Kona International Airport (KOA).

2.0 PRE-DEVELOPMENT CONDITION

2.1 TOPOGRAPHY CONDITION

KOA (Tax Key Number of 3rd Division 7-3-43:3) is located on the western edge of Hualalai Mountain and consists almost entirely of barren a'a and pahoehoe lava flows created during the eruption 1801 (**Figure 1**). The land is generally level to gently sloping, with slopes in the 0 to 5 percent range. Elevation at the Queen Kaahumanu Highway is approximately 120 feet above the mean sea level (MSL).

The existing elevations for proposed expanded parking lot and PV solar electric power sites vary from approximately 88 to 48 feet above MSL (**Figure 2**).

The existing elevations for proposed Interim CAT Terminal site vary from 52 to 58 feet above MSL (**Figure 3**).

2.2 SOIL CONDITION

The U.S. Department of Agriculture Soil Conservation Service has classified the soil type as lava flows, a'a (rLV) and pahoehoe (rLW). The lava flows have practically no soil covering and are virtually devoid of vegetation. Detailed Land Classification Report for the island of Hawaii, published by the Land Study Bureau, has designated the lands at the airport as Class E (lands that are very poor and least suited for agriculture).

Development within the airport boundaries should not be hindered by any significant soil constraints.

2.3 CLIMATIC CONDITION

The Climate of Hawaii is relatively moderate throughout most of the State and most of the year, significant differences in these parameters may occur from one location to another. Most differences in regional and local climates within the State are caused by the mountainous topography.

The climate on the northwest side of the Island of Hawaii is influenced more by local heating and cooling of the ground than by the effect of trade-winds prevalent in the rest of the State. This is characteristic of the Kona area, which experiences a diurnal land/sea wind pattern. Normal trade-winds are blocked by the mountain masses of Mauna Kea (13,784 feet above MSL), Mauna Loa (13,680 feet above MSL), the Kohala Mountains, Kilauea, and Hualalai (8,251 feet above MSL). During the day, the land is warmer than the ocean and the resulting pressure gradient causes winds to blow from the ocean towards the land. In evening the reverse occurs and as the land cools, the evening and night breezes blow from the land towards the warmer ocean.

Average annual rainfall in the area is less than 25 inches along the coastline and temperatures average about 75 degrees Fahrenheit. The heaviest rains are brought by winter storms during the October to April season (Atlas of Hawaii, 1983).

The rainfall-frequencies at the airport boundaries by Rainfall-Frequency Atlas of the Hawaii Islands, published by the U.S. Department of Commerce Weather Bureau, 1962, are as follows:

- Rainfall density for 1-hour, 1-year: 1.15 inches
- Rainfall density for 1-hour, 2-year: 1.50 inches
- Rainfall density for 1-hour, 5-year: 1.75 inches
- Rainfall density for 1-hour, 10-year: 1.95 inches
- Rainfall density for 1-hour, 25-year: 2.10 inches
- Rainfall density for 1-hour, 50-year: 2.20 inches

Evaporation rates are typically high, in the general range of 0.18 inches per day during winter and 0.36 inches during summer as measured at Anaehoomalu. There are no pan evaporation measurements for the Keahole area.

2.4 DRAINAGE CONDITION

The land within the Kona International Airport boundaries does not contain any naturally defined waterways. Runoff rapidly infiltrates into the ground due to the porous nature of the lava fields. The area is not classified as a ground water recharge area.

The coastline surrounding the airport area is rough, rocky, and low. Near-shore waters are classified "AA" according to the Water Quality Standards Map of the Island of Hawaii, October 1987 (**Figure 4**), by the Office of Environmental Planning and State Department of Health (DOH). Class "AA" waters are one of two designations of open coastal waters by the State DOH. Class "AA" waters are intended to remain in their natural pristine state as nearly as possible with an absolute minimum of pollution or alteration of water quality from any human caused source or actions. Class "AA" waters are the most stringently regulated of open coastal water classifications.

Minimizing runoff directly discharges into Class "AA" water from the airport boundaries, 65 drainage injection wells, having a diameters of approximately 2 to 6 feet and a depth of approximately 9 to 30 feet, have been constructed within the airport boundaries (**Figure 5**), under "Underground Injection Control (UIC) Permit Number of UH-1673, Facility Identification Number of 8-4462.02", issued by the State DOH.

The permit regulates operating conditions as follows:

A. Injectant Characteristics

Untreated rainfall water from the roadway and pavement areas.

B. Injection Limitations and Prohibitions

(1) Injectant in this permit is exclusively limited to the injectant described in above; furthermore, any injectant not described in above is explicitly prohibited unless the injectant characteristics of the permit are revised accordingly.

(2) No discharge of hazardous wastes as defined by Title 40, Code of Federal Regulations (CFR), Part 261.

(3) Injection Pressure. Result of gravity flow of the runoff water into the injection well.

(4) Disposal Quantity and Rate. Intermittent and variable up to approximately 150,921 gpm at peck flow conditions for the entire drainage system.

No major ponding area within the airport boundaries has been reported after injection wells have been installed.

C. Watershed Analyses

(1) Main Parking Lot Site (Well #14)

The total area for existing main parking lot watershed is approximately 22.92 acres (approximately 10.73 acres of asphaltic concrete paved, 8.63 acres for lava flow unpaved, and 3.56 landscaped areas). Entire watershed runoff currently discharges into the existing Well #14 (the maximum permitted injection rate by the permit is 59.16 cfs or 26,594 gpm). The existing main drainage pattern is overland flow and the longest drain course for the watershed is approximately 2,360 linear feet; the highest elevation in the watershed is approximately 89.50 feet and the lowest elevation is approximately 45.50 feet. Therefore, the average drain slope is approximately (89.50 - 45.50) ÷ 2,360 = 0.0186.

Based on above data and Rules Relating to Storm Drainage Standards, published by Department of Planning and Permitting, City and County of Honolulu, the peak injection rate for Well #14 is estimated to be as follows:

a. Weighed Runoff Coefficient ("C")

Land Cover	Runoff "C"	Area	Weighed "C"
AC Paved Area	0.90	10.73 acres	9.6570
Lava Flow Unpaved Area	0.80	8.63 acres	6.9040
Landscaped Area	0.60	3.56 acres	2.1360
Weighed Coefficient	**0.82**	**22.92 acres**	**18.6970**

b. Determine Time of Concentration ("T_c"), Plate 5 of Rules Relating to Storm Drainage Standards

$K = L / (S)^{0.5}$ and $T_c = 0.0078\ K^{0.77}$

Where, L = 2.360 feet and S = 0.0186

Thus, K = 17,305 and T_c = 14.3 minutes.

c Determine Correction Factor Applied to 1-Hour rainfall, Plate 4 of Rules Relating to Storm Drainage Standards

When T_c is 14.3 minutes, the correction factor is 2.05.

The peak injection rate, does not consider evaporation, for each frequency of rainfall is estimated as,

Rainfall Frequency	"C"	"I"	"A"	Injection Rate
1-hour, 1-year	0.82	1.15 × 2.05	22.92	44.31 cfs
1-hour, 2-year		1.50 × 2.05		57,79 cfs
1-hour, 5-year		1.75 × 2.05		67.42 cfs
1-hour, 10-year		1.95 × 2.05		75.13 cfs
1-hour, 25-year		2.10 × 2.05		80.91 cfs
1-hour, 50-year		2.20 × 2.05		44.76 cfs

The existing Well #14 is capable to discharge 1-hour, 2-year, rainfall within the maximum permitted injection rate. No record has been reported, any flooding area in this watershed.

(2) Overflow Parking Lot Site (Well #11)

The total area for existing overflow parking lot watershed is approximately 2.14 acres (approximately 1.51 acres of asphaltic concrete paved and 0.63 lava flow unpaved areas). The entire watershed runoff currently discharges into the existing Well #11 (the maximum permitted injection rate by the permit is 11.60 cfs or 5,207 gpm). The existing main drainage pattern is overland flow and the longest drain course for the watershed is approximately 260 linear feet; the highest elevation in the watershed is approximately 85.50 feet and the lowest elevation is approximately 81.50 feet. Therefore, the average drain slope is approximately (85.50 – 81.50) ÷ 260 = 0.0154.

Based on above data and Rules Relating to Storm Drainage Standards, published by Department of Planning and Permitting, City and County of Honolulu, the peak injection rate for Well #11 is estimated to be as follows:

a. Weighed Runoff Coefficient ("C")

Land Cover	Runoff "C"	Area	Weighed "C"
AC Paved Area	0.90	1.51 acres	1.3590
Lava Flow Unpaved Area	0.80	0.63 acres	0.5040
Weighed Coefficient	**0.87**	**2.14 acres**	**1.8630**

b. Determine Time of Concentration ("T_c"), Plate 5 of Rules Relating to Storm Drainage Standards

$K = L / (S)^{0.5}$ and $T_c = 0.0078\ K^{0.77}$

Where, L = 260 feet and S = 0.0154

Thus, K = 2,095 and T_c = 2.8 minutes < 5.0 minutes, use 5.0 minutes.

c. Determine Correction Factor Applied to 1-Hour rainfall, Plate 4 of Rules Relating to Storm Drainage Standards

When T_c is 5.0 minutes, the correction factor is 2.75.

The peak injection rate, does not consider evaporation, for each frequency of rainfall is estimated as,

Rainfall Frequency	"C"	"I"	"A"	Injection Rate
1-hour, 1-year	0.87	1.15 × 2.75	2.14	5.89 cfs
1-hour, 2-year		1.50 × 2.75		7.68 cfs
1-hour, 5-year		1.75 × 2.75		8.96 cfs
1-hour, 10-year		1.95 × 2.75		9.98 cfs
1-hour, 25-year		2.10 × 2.75		10.75 cfs
1-hour, 50-year		2.20 × 2.75		11.26 cfs

The existing Well #11 is capable to discharge 1-hour, 50-year, rainfall within the maximum permitted injection rate. No record has been reported, any flooding area in this watershed.

(3) Long Term Parking Lot Site (Well #10)

The total area for existing long term parking lot watershed is approximately 17.64 acres (approximately 1.97 acres of asphaltic concrete paved and 15.67 lava flow unpaved areas). The entire watershed runoff currently discharges into the existing Well #10 (the maximum permitted injection rate by the permit is 59.16 cfs or 26,594 gpm). The existing main drainage pattern is overland flow and the longest drain course for the watershed is approximately 1,715 linear feet; the highest elevation in the watershed is approximately 77.00 feet and the lowest elevation is approximately 45.00 feet. Therefore, the average drain slope is approximately (77.00 – 45.00) ÷ 1,715 = 0.0187.

Based on above data and Rules Relating to Storm Drainage Standards, published by Department of Planning and Permitting, City and County of Honolulu, the peak injection rate for Well #10 is estimated to be as follows:

a. Weighed Runoff Coefficient ("C")

Land Cover	Runoff "C"	Area	Weighed "C"
AC Paved Area	0.90	1.97 acres	1.7730
Lava Flow Unpaved Area	0.80	15.67 acres	12.5360
Weighed Coefficient	**0.81**	**17.64 acres**	**14.3090**

b. Determine Time of Concentration ("T_c"), Plate 5 of Rules Relating to Storm Drainage Standards

$K = L / (S)^{0.5}$ and $T_c = 0.0078\ K^{0.77}$

Where, L = 1,715 feet and S = 0.0187

Thus, K = 12,541 and T_c = 11.2 minutes.

c. Determine Correction Factor Applied to 1-Hour rainfall, Plate 4 of Rules Relating to Storm Drainage Standards

When T_c is 11.2 minutes, the correction factor is 2.10.

The peak injection rate, does not consider evaporation, for each frequency of rainfall is estimated as,

Rainfall Frequency	"C"	"I"	"A"	Injection Rate
1-hour, 1-year	0.81	1.15 × 2.10	17.64	34.51 cfs
1-hour, 2-year		1.50 × 2.10		45.01 cfs
1-hour, 5-year		1.75 × 2.10		52.51 cfs
1-hour, 10-year		1.95 × 2.10		58.51 cfs
1-hour, 25-year		2.10 × 2.10		63.01 cfs
1-hour, 50-year		2.20 × 2.10		66.01 cfs

The existing Well #10 is capable to discharge 1-hour, 10-year, rainfall within the maximum permitted injection rate. Some records have been reported, some flooding areas in this watershed when heavier rain occurred.

(4) Interim CAT Terminal Site (Well #65)

The total area for existing watershed is approximately 2.82 acres (approximately 0.98 acres of asphaltic concrete paved and 1.84 lava flow unpaved areas). The entire watershed runoff currently discharges into the existing Well #65 (the maximum permitted injection rate by the permit is 11.60 cfs or 5,207 gpm). The existing main drainage pattern is overland flow and the longest drain course for the watershed is approximately 335 linear feet; the highest elevation in the watershed is approximately 58.75 feet and the lowest elevation is approximately 51.00 feet. Therefore, the average drain slope is approximately (58.75 – 51.00) ÷ 335 = 0.0231.

Based on above data and Rules Relating to Storm Drainage Standards, published by Department of Planning and Permitting, City and County of Honolulu, the peak injection rate for Well #65 is estimated to be as follows:

a. Weighed Runoff Coefficient ("C")

Land Cover	Runoff "C"	Area	Weighed "C"
AC Paved Area	0.90	0.98 acres	0.8820
Lava Flow Unpaved Area	0.80	1.84 acres	1.4720
Weighed Coefficient	**0.83**	**2.82 acres**	**2.3540**

b. Determine Time of Concentration ("T_c"), Plate 5 of Rules Relating to Storm Drainage Standards

$K = L / (S)^{0.5}$ and $T_c = 0.0078\ K^{0.77}$

Where, L = 335 feet and S = 0.0231

Thus, K = 2,204 and T_c = 2.9 minutes < 5.0 minutes, use 5.0 minutes.

c. Determine Correction Factor Applied to 1-Hour rainfall, Plate 4 of Rules Relating to Storm Drainage Standards

When T_c is 5.0 minutes, the correction factor is 2.75.

The peak injection rate, does not consider evaporation, for each frequency of rainfall is estimated as,

Rainfall Frequency	"C"	"I"	"A"	Injection Rate
1-hour, 1-year	0.83	1.15 × 2.75	2.82	7.40 cfs
1-hour, 2-year		1.50 × 2.75		9.66 cfs
1-hour, 5-year		1.75 × 2.75		11.26 cfs
1-hour, 10-year		1.95 × 2.75		12.55 cfs
1-hour, 25-year		2.10 × 2.75		13.52 cfs
1-hour, 50-year		2.20 × 2.75		14.16 cfs

The existing Well #65 is capable to discharge 5-hour, 50-year, rainfall within the maximum permitted injection rate. No record has been reported, any flooding area in this watershed.

3.0 POST-DEVELOPMENT CONDITION

3.1 SITE IMPROVEMENT FOR EACH PROJECT

A. Parking Lot Expansion Project

(1) Main Parking Lot

The project will replace the parking lot asphaltic pavement surface course and will not change the existing grades. Therefore, runoff from this area will discharge into the existing Well #14, which is same as pre-development condition.

(2) Overflow Parking Lot

The project will grade/pave approximately 1.25 acres (**Figure 6**) of new parking lot. Runoff from the proposed paved parking area will discharge into the existing Well #11. The grading work will divert 0.94 acres of watershed from Well #14 and 0.31 acres of watershed from Well #10 into the Well #11.

(3) Long Term Parking Lot

The project will grade/pave approximately 3.61 acres of new parking lot and install 2 proposed injection well (**Figure 7**). Runoff from the south of the parking lot will discharge into the proposed Well #10A and from the east side of the parking lot will discharge into the proposed Well #10B, remainder runoff will discharge into the existing Well #10. The grading work will divert 3.26 acres of watershed from Well #10 into Well #10A and 2.49 acres of watershed from Well #10 into the Well #10B.

B. Interim CAT Terminal Project

The project will grade/pave approximately 0.45 acres for new driveway/parking lot and construct 2 proposed buildings (**Figure 8**). Since the watershed area will not change, runoff from the site will discharge into the existing Well #65.

C. PV Solar Electric Power project

The State plans to install 3 solar panels, approximately 600 feet by 42 feet each, in the existing main parking lot; 7 solar panels, approximately 365 feet by 42 feet each, in the expanded long term parking lot; and 2 solar panels, approximately 450 feet by 42 feet each, in the expanded overflow parking lot, to produce a total of 3.66 kW power daily (**Figure 9**). Since all panels will install on the paved areas, no watershed area will be changed.

3.2 WATERSHED ANALYSES

A. Main Parking Lot Site (Well #14)

The watershed area for pre-development condition is 22.92 acres (approximately 10.73 acres of asphaltic concrete paved, 8.63 acres for lava flow unpaved, and 3.56 landscaped areas). A total of 0.94 acres of existing lava flow area will be graded and paved, runoff from the new paved area will be diverted to Well #11.

Since the highest and lowest elevations and length of drain course (2,360 linear feet) will remain same as pre-development condition, the average drain slope of 0.0186 will remain and the drainage pattern will not change.

The new weighed runoff coefficient will need to be revised as follows:

Land Cover	Runoff "C"	Area	Weighed "C"
AC Paved Area	0.90	10.73 acres	9.6570
Lava Flow Unpaved Area	0.80	7.69 acres	6.1520
Landscaped Area	0.60	3.56 acres	2.1360
Weighed Coefficient	**0.82**	**21.98 acres**	**17.9450**

Determine Time of Concentration ("T_c"), Plate 5 of Rules Relating to Storm Drainage Standards

$K = L / (S)^{0.5}$ and $T_c = 0.0078\ K^{0.77}$

Where, L = 2,360 feet and S = 0.0186

Thus, K = 17,304 and T_c = 14.3 minutes

Since T_c is same as pre-development condition, the correction factor of 2.05 is same as pre-development condition.

The peak injection rate, does not consider evaporation, for each frequency of rainfall is estimated as,

Rainfall Frequency	"C"	"I"	"A"	Injection Rate
1-hour, 1-year	0.82	1.15 × 2.05	21.98	42.49 cfs
1-hour, 2-year		1.50 × 2.05		55.42 cfs
1-hour, 5-year		1.75 × 2.05		64.66 cfs
1-hour, 10-year		1.95 × 2.05		72.05 cfs
1-hour, 25-year		2.10 × 2.05		77.59 cfs
1-hour, 50-year		2.20 × 2.05		81.29 cfs

The existing Well #14 is capable to discharge 1-hour, 2-year, rainfall within the maximum permitted injection rate. The post-development condition will not have significant change to the watershed.

B. Overflow Parking Lot Site (Well #11)

The watershed area for pre-development condition is 2.14 acres (approximately 1.51 acres of asphaltic concrete paved and 0.63 lava flow unpaved areas). The grading work will divert 0.94 acres of watershed from Well #14 and 0.31 acres of watershed from Well #10 into the Well #11. Converting 0.27 acres of the existing lava flow field to landscaped area is requested by the County Planning Code.

Since the highest and lowest elevations and length of drain course (260 linear feet) will remain same as pre-development condition, the average drain slope of 0.0154 will remain and the drainage pattern will not change.

The new weighed runoff coefficient will need to be revised as follows:

Land Cover	Runoff "C"	Area	Weighed "C"
AC Paved Area	0.90	2.76 acres	2.4840
Lava Flow Unpaved Area	0.80	0.36 acres	0.2880
Landscaped Area	0.60	0.27 acres	0.1620
Weighed Coefficient	**0.87**	**3.39 acres**	**2.9340**

Determine Time of Concentration ("T_c"), Plate 5 of Rules Relating to Storm Drainage Standards

$K = L / (S)^{0.5}$ and $T_c = 0.0078\ K^{0.77}$

Where, L = 260 feet and S = 0.0154

Thus, K = 2,095 and T_c = 2.81 minutes < 5.0 minutes, use 5.0 minutes.

Since T_c is same as pre-development condition, the correction factor of 2.75 is same as pre-development condition.

The peak injection rate, does not consider evaporation, for each frequency of rainfall is estimated as,

Rainfall Frequency	"C"	"I"	"A"	Injection Rate
1-hour, 1-year	0.87	1.15 × 2.75	3.39	9.33 cfs
1-hour, 2-year		1.50 × 2.75		12.17 cfs
1-hour, 5-year		1.75 × 2.75		14.19 cfs
1-hour, 10-year		1.95 × 2.75		15.82 cfs
1-hour, 25-year		2.10 × 2.75		17.03 cfs
1-hour, 50-year		2.20 × 2.75		17.84 cfs

The existing Well #11 is capable to discharge 1-hour, 2-year, rainfall, due to 1.25 acres of watershed increasing for the post-development condition, within the maximum permitted injection rate.

C. Long Term Parking Lot Site (Well #10, proposed Well#10A, and proposed Well #10B)

(1) Proposed Well #10A Watershed Area (sub-watershed of Well #10)

Runoff from a total of 3.26 acres (existing lava flow area, runoff coefficient is 0.80) of the existing Well #10 watershed, south of the parking lot area, will be diverted and discharged into the proposed Well #10A. The highest and lowest elevations are 82.00 feet and 55.00 feet MSL, respectively, and the longest drain course for the watershed is approximately 745 linear feet or the average drain slope is approximately (82.00 – 55.00) ÷ 745 = 0.0362.

Determine Time of Concentration ("T_c"),

$K = L / (S)^{0.5}$ and $T_c = 0.0078\ K^{0.77}$

Where, L = 745 feet and S = 0.0362

Thus, K = 3,915 and T_c = 4.56 minutes < 5.0 minutes, use 5.0 minutes.

When T_c is 5.0 minutes, the correction factor is 2.75.

The peak injection rate, does not consider evaporation, for each frequency of rainfall is estimated as,

Rainfall Frequency	"C"	"I"	"A"	Injection Rate
1-hour, 1-year	0.80	1.15 × 2.75	3.26	8.25 cfs
1-hour, 2-year		1.50 × 2.75		10.76 cfs
1-hour, 5-year		1.75 × 2.75		12.55 cfs
1-hour, 10-year		1.95 × 2.75		13.99 cfs
1-hour, 25-year		2.10 × 2.75		15.06 cfs
1-hour, 50-year		2.20 × 2.75		15.78 cfs

Based on the percolation test result, the depth of 20 feet with 5-foot diameter for proposed well can inject approximately 50 cfs of runoff. The project plans to construct a 30-foot-deep, 5-foot-diameter, new well.

(2) Proposed Well #10B Watershed Area (sub-watershed of Well #10)

Runoff from a total of 2.49 acres (1.28 acres new AC paved area, 0.69 acres existing lava flow area, and 0.52 acres new landscaping area) of the existing Well #10 watershed, south of the parking lot area, will be diverted and discharged into the proposed Well #10A. The highest and lowest elevations are 65.00 feet and 54.00 feet MSL, respectively, and the longest drain course for the watershed is approximately 610 linear feet or the average drain slope is approximately (65.00 – 54.00) ÷ 610= 0.0180.

Determine Time of Concentration ("T_c"),

$K = L / (S)^{0.5}$ and $T_c = 0.0078\ K^{0.77}$

Where, L = 610 feet and S = 0.0180

Thus, K = 4,546 and T_c = 5.1 minutes.

When T_c is 5.1 minutes, the correction factor is 2.72.

Determine Weighed Runoff Coefficient ("C"),

Land Cover	Runoff "C"	Area	Weighed "C"
AC Paved Area	0.90	1.28 acres	1.1520
Lava Flow Unpaved Area	0.80	0.69 acres	0.5520
Landscaped Area	0.60	0.52 acres	0.3120
Weighed Coefficient	**0.81**	**2.49 acres**	**2.0160**

The peak injection rate, does not consider evaporation, for each frequency of rainfall is estimated as,

Rainfall Frequency	"C"	"I"	"A"	Injection Rate
1-hour, 1-year	0.81	1.15 × 2.72	2.49	6.31 cfs
1-hour, 2-year		1.50 × 2.72		8.23 cfs
1-hour, 5-year		1.75 × 2.72		9.60 cfs
1-hour, 10-year		1.95 × 2.72		10.70 cfs
1-hour, 25-year		2.10 × 2.72		11.52 cfs
1-hour, 50-year		2.20 × 2.72		12.07 cfs

Based on the percolation test result, the depth of 20 feet with 5-foot diameter for proposed well can inject approximately 50 cfs of runoff. The project plans to construct a 30-foot-deep, 5-foot-diameter, new well.

(3) Reduced Well #10 Watershed Area

Since a total of 5.75 acres watershed will divert to Well #10A and Well #10B, the remainder runoff from watershed area of 11.89 acres (1.96 acres of existing and 2.33 new AC pavement areas, 0.44 acres of new landscaping area, and 7.16 lava flow area) will discharge into the existing Well #10.

The longest drain course for the watershed is approximately 1,495 linear feet; the highest elevation in the watershed is approximately 65.00 feet and the lowest elevation is approximately 45.00 feet. Therefore, the average drain slope is approximately (65.00 – 45.00) ÷ 1,495 = 0.0134.

Determine Time of Concentration ("T_c"),

$K = L / (S)^{0.5}$ and $T_c = 0.0078\ K^{0.77}$

Where, L = 1,495 feet and S = 0.0134

Thus, K = 12,915 and T_c = 11.4 minutes.

When T_c is 11.4minutes, the correction factor is 2.16.

DetermiAfne Weighed Runoff Coefficient ("C"),

Land Cover	Runoff "C"	Area	Weighed "C"
AC Paved Area	0.90	4.29 acres	3.8610
Lava Flow Unpaved Area	0.80	7.16 acres	5.7280
Landscaped Area	0.60	0.44 acres	0.2640
Weighed Coefficient	**0.83**	**11.89 acres**	**9.8530**

The peak injection rate, does not consider evaporation, for each frequency of rainfall is estimated as,

Rainfall Frequency	"C"	"I"	"A"	Injection Rate
1-hour, 1-year	0.83	1.15 × 2.16	11.89	24.51 cfs
1-hour, 2-year		1.50 × 2.16		31.97 cfs
1-hour, 5-year		1.75 × 2.16		37.30 cfs
1-hour, 10-year		1.95 × 2.16		41.57 cfs
1-hour, 25-year		2.10 × 2.16		44.76 cfs
1-hour, 50-year		2.20 × 2.16		46.90 cfs

When two additional wells are constructed, flooding problems in the existing Well #10 will be relieved.

D. Interim CAT Terminal Site (Well #65)

The total area for existing watershed is approximately 2.82 acres (approximately 0.98 acres of asphaltic concrete paved and 1.84 lava flow unpaved areas) and the project will convert 0.45 acres of existing lava flow unpaved area to be paved and covered areas and 0.28 acres of existing lava flow unpaved area to be landscaped area. Therefore, the runoff coefficient will be revised.

Since the highest and lowest elevations and length of drain course (335 linear feet) will remain same as pre-development condition, the average drain slope of 0.0231 will remain and the drainage pattern will not change.

The new weighed runoff coefficient will need to be revised as follows:

Land Cover	Runoff "C"	Area	Weighed "C"
AC Paved Area	0.90	1.43 acres	1.2870
Lava Flow Unpaved Area	0.80	1.11 acres	0.8880
Landscaped Area	0.60	0.28 acres	0.1620
Weighed Coefficient	**0.83**	**2.82 acres**	**2.3430**

Determine Time of Concentration ("T_c"), Plate 5 of Rules Relating to Storm Drainage Standards

$K = L / (S)^{0.5}$ and $T_c = 0.0078\ K^{0.77}$

Where, L = 335 feet and S = 0.0154

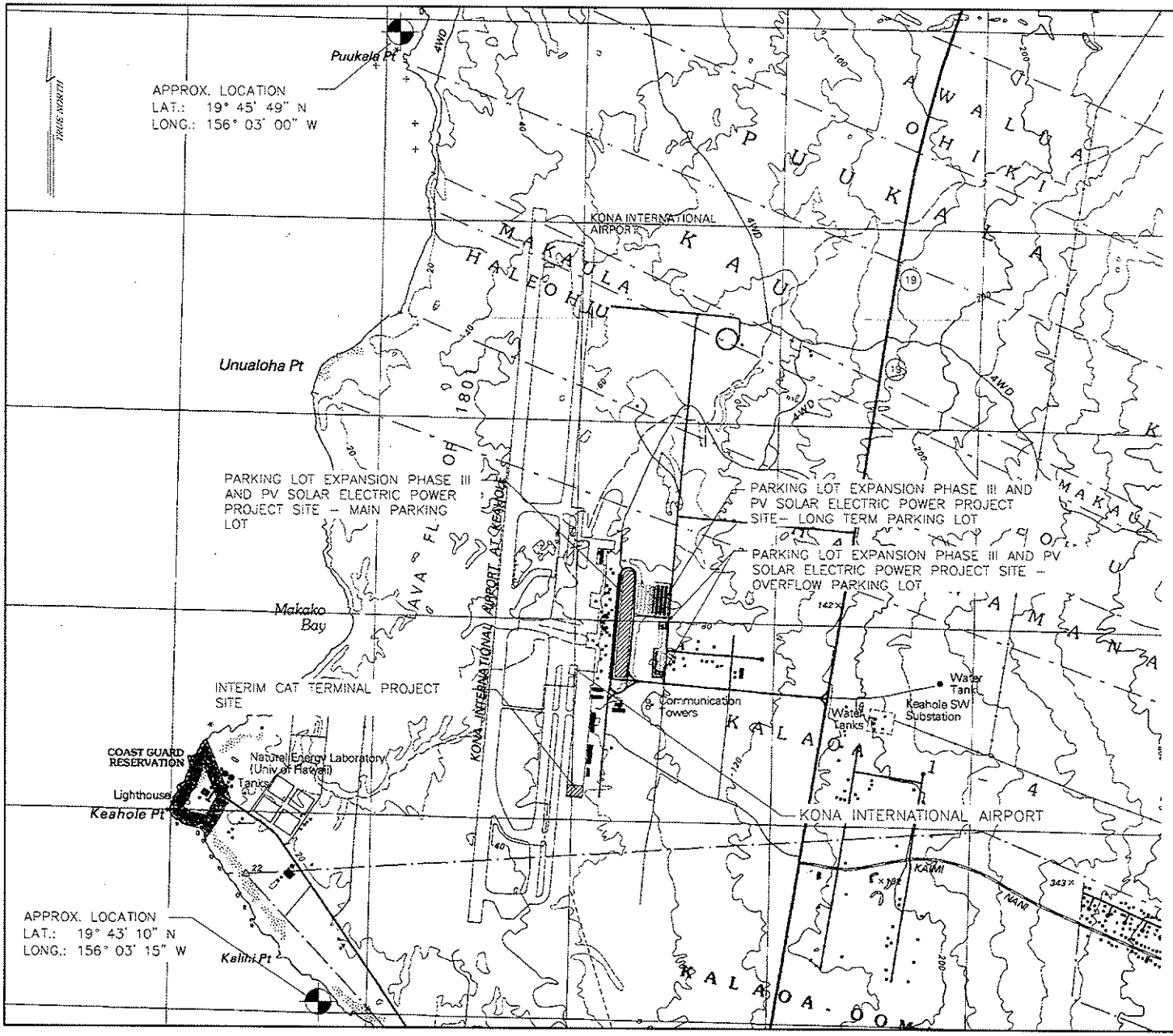
Thus, K = 2,204 and T_c = 2.93 minutes < 5.0 minutes, use 5.0 minutes

Since T_c is same as pre-development condition, the correction factor of 2.75 is same as pre-development condition.

The peak injection rate, does not consider evaporation, for each frequency of rainfall is estimated as,

Rainfall Frequency	"C"	"I"	"A"	Injection Rate
1-hour, 1-year	0.83	1.15 × 2.75	2.85	7.48 cfs
1-hour, 2-year		1.50 × 2.75		9.76 cfs
1-hour, 5-year		1.75 × 2.75		11.38 cfs
1-hour, 10-year		1.95 × 2.75		12.69 cfs
1-hour, 25-year		2.10 × 2.75		13.66 cfs
1-hour, 50-year		2.20 × 2.75		14.31 cfs

The existing Well #65 is capable to discharge 1-hour, 5-year, rainfall, due to increase of paved and covered areas for the post-development condition, within the maximum permitted injection rate.



REFERENCE:
USGS TOPOGRAPHIC MAP,
KEAHOLE POINT AND MAKALAWENA
QUADRANGLE, BOTH DATED 1996.

GRAPHIC SCALE
800' 400' 0 800' 1600'

Airports Division
DEPARTMENT OF TRANSPORTATION
STATE OF HAWAII

DSGN.	DRWN.	CHKD.	APPD.

KEY PLAN / NOTES.

NO.	DATE	REVISIONS

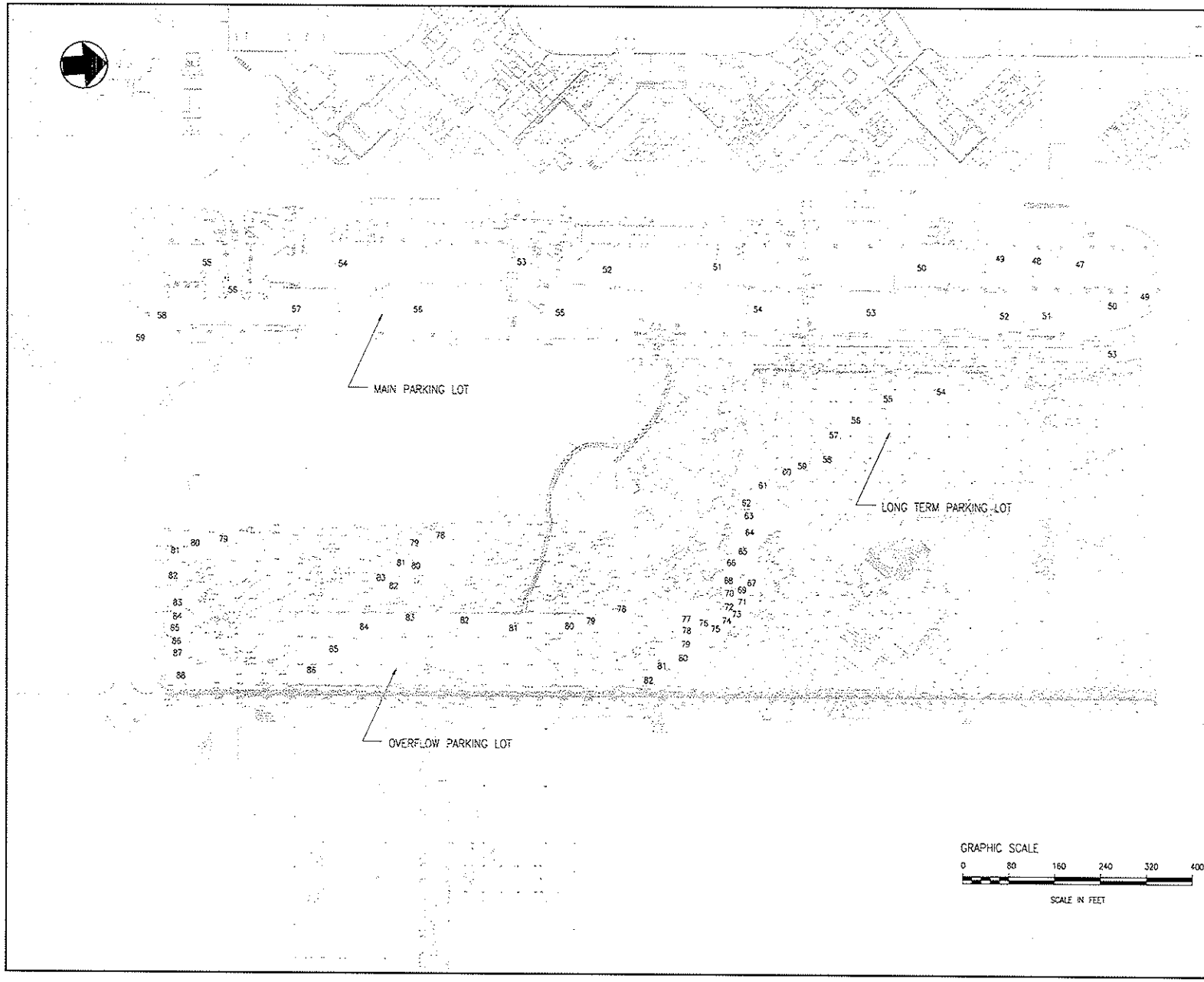
PROJECT TITLE:
AIRPORT IMPROVEMENT
AT
KONA INTERNATIONAL AIRPORT

PROJECT NO.:
STATE PROJECT NO.

SHEET TITLE:
PROJECT LOCATIONS

DATE:
MAR. 21, 2007

DWG. NO.:
FIGURE 1



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Signature 4/30/08
Expiration date of the license

DSGN.	DRWN.	CHKD.	APPD

KEY PLAN / NOTES:

NO.	DATE	REVISIONS

PROJECT TITLE:

AIRPORT IMPROVEMENT

AT

KONA INTERNATIONAL AIRPORT

PROJECT NO.:

STATE PROJECT NO.

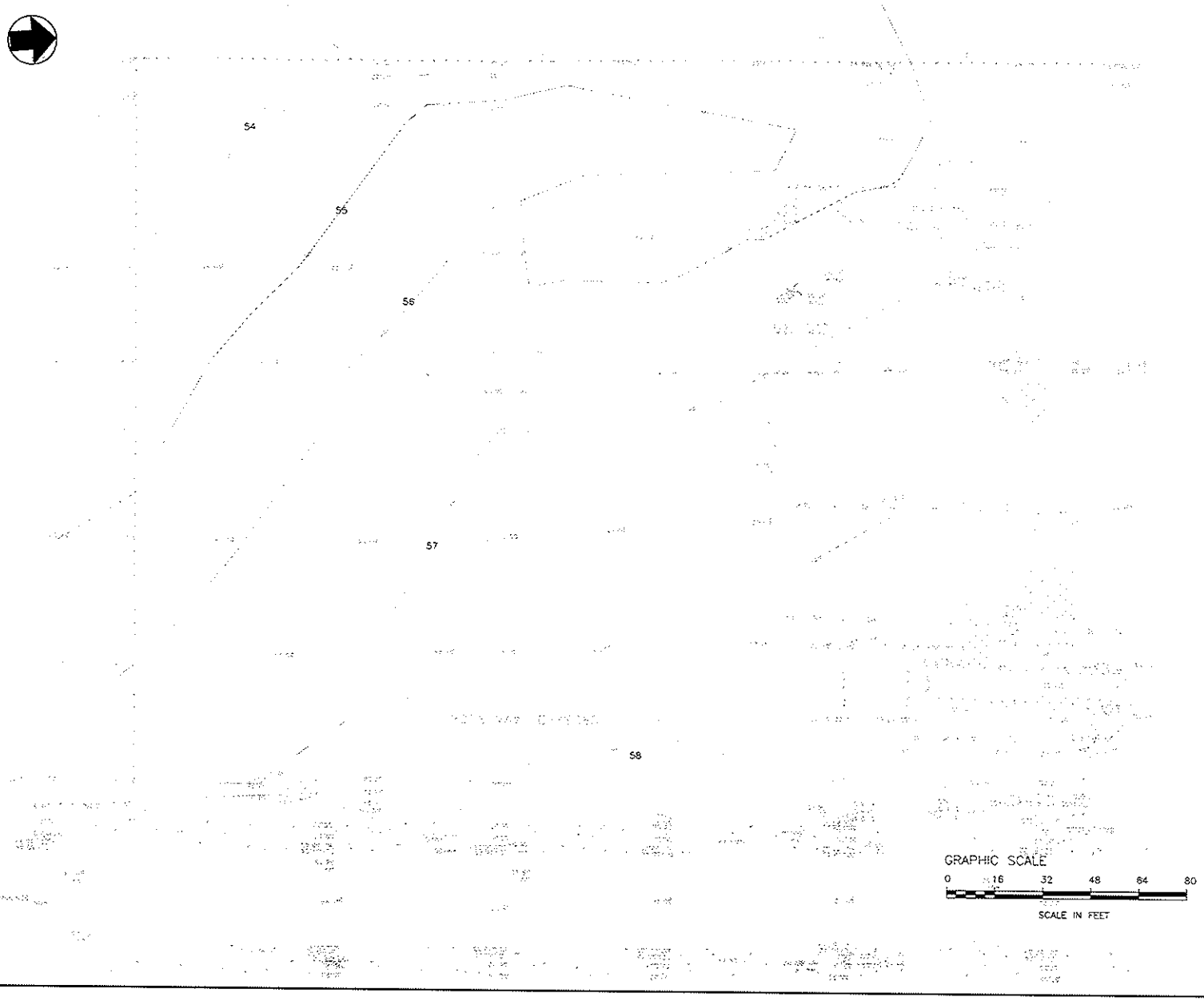
SHEET TITLE:

EXISTING TOPOGRAPHIC DATA FOR PARKING LOTS

DATE:
APRIL 2008

DWG. NO.:

FIGURE 2



Airports Division
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NO.	DATE	REVISIONS

PROJECT TITLE:

AIRPORT IMPROVEMENT

AT

KONA INTERNATIONAL AIRPORT

PROJECT NO.:

STATE PROJECT NO.

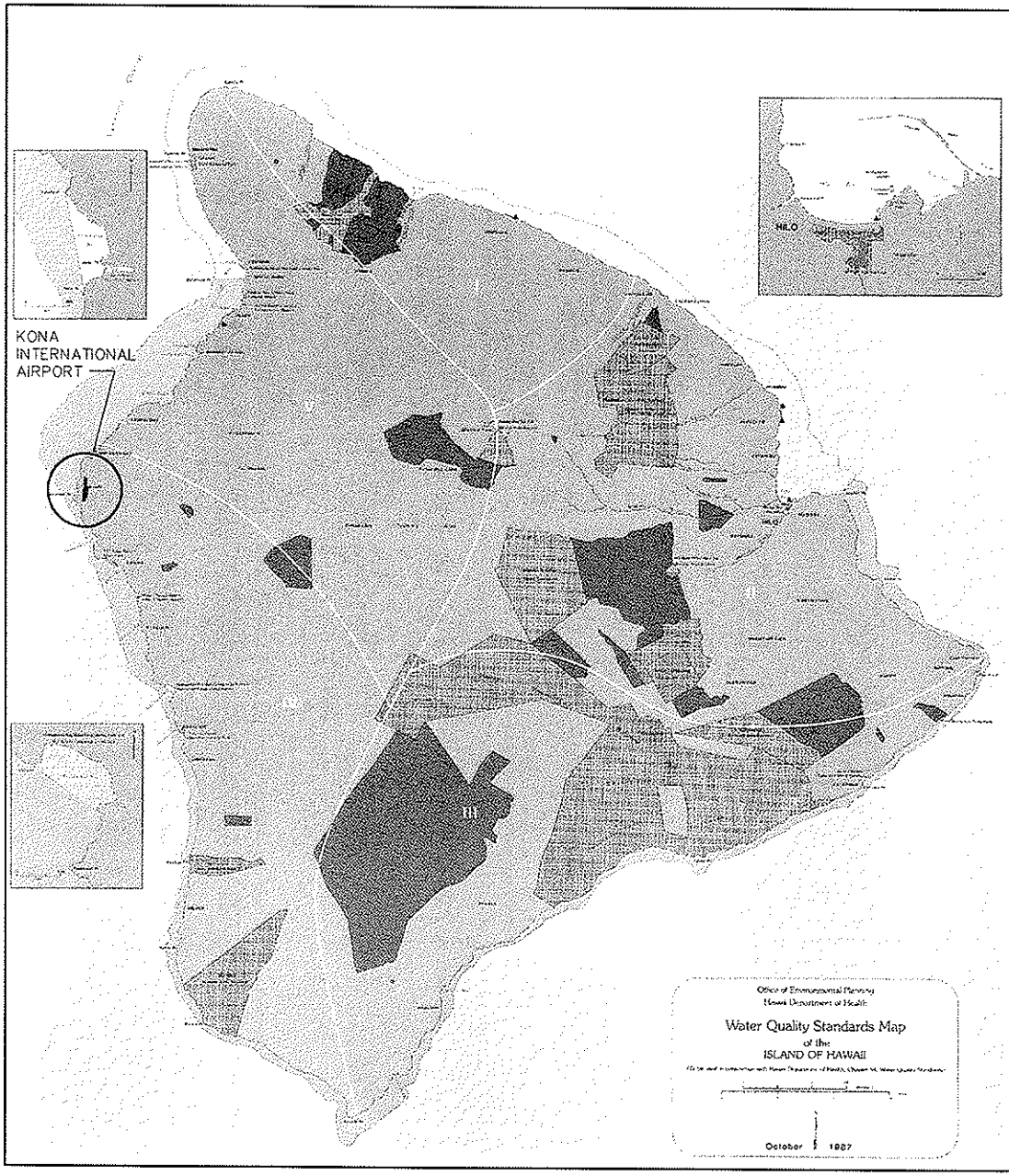
SHEET TITLE:

EXISTING TOPOGRAPHIC DATA FOR INTERIM CAT TERMINAL SITE

DATE:
APRIL 2008

DWG. NO.:

FIGURE 3



Airports Division
DEPARTMENT OF TRANSPORTATION
STATE OF HAWAII

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KEY PLAN / NOTES.

NO.	DATE	REVISIONS

PROJECT TITLE:

AIRPORT IMPROVEMENT

AT

KONA INTERNATIONAL AIRPORT

PROJECT NO.:

STATE PROJECT NO.

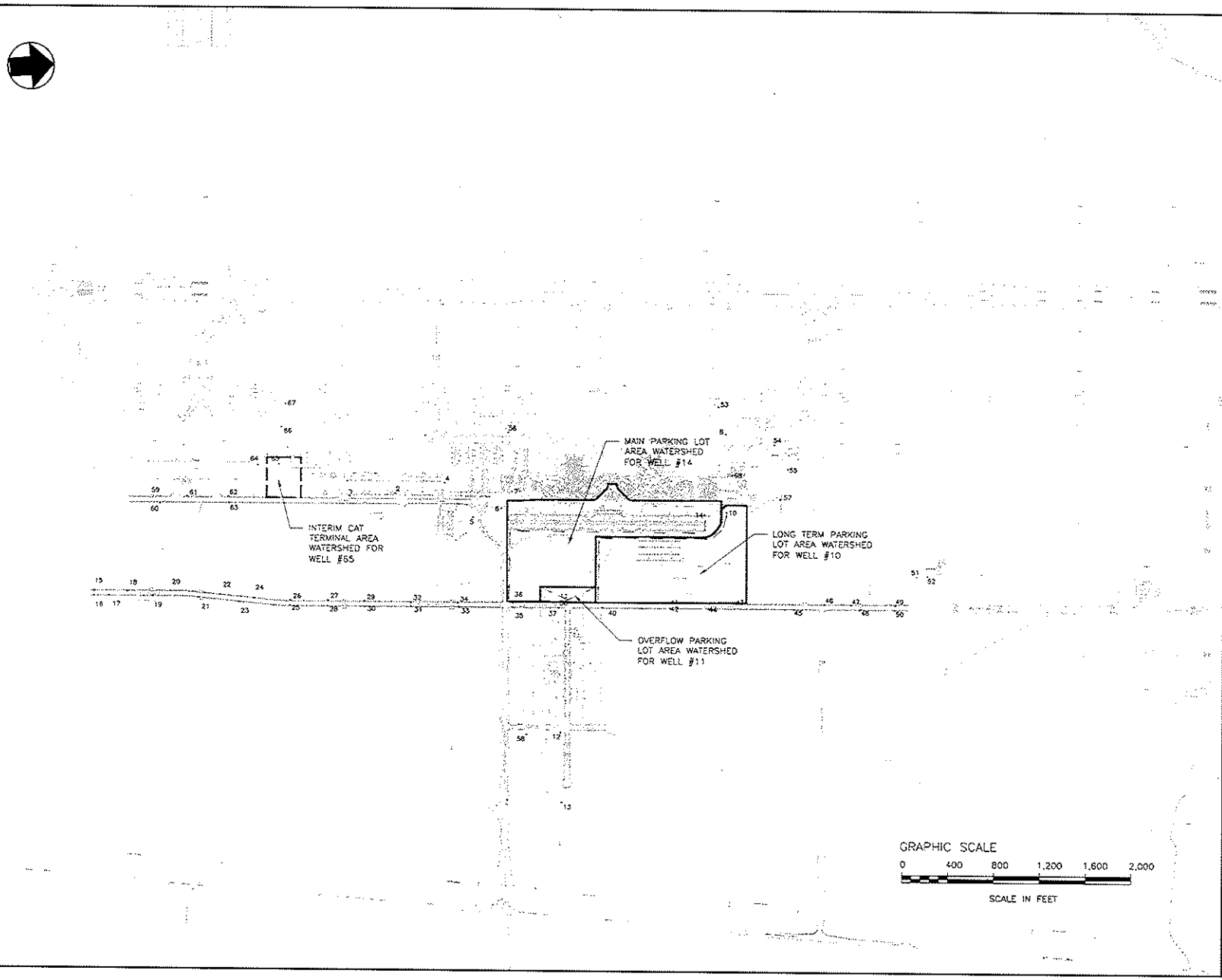
SHEET TITLE:

WATER QUALITY STANDARDS MAP

DATE:
APRIL 2008

DWG. NO.:

FIGURE 4



Airports Division
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KEY PLAN / NOTES:

NO.	DATE	REVISIONS

PROJECT TITLE:

AIRPORT IMPROVEMENT

AT

KONA INTERNATIONAL AIRPORT

PROJECT NO.:

STATE PROJECT NO.

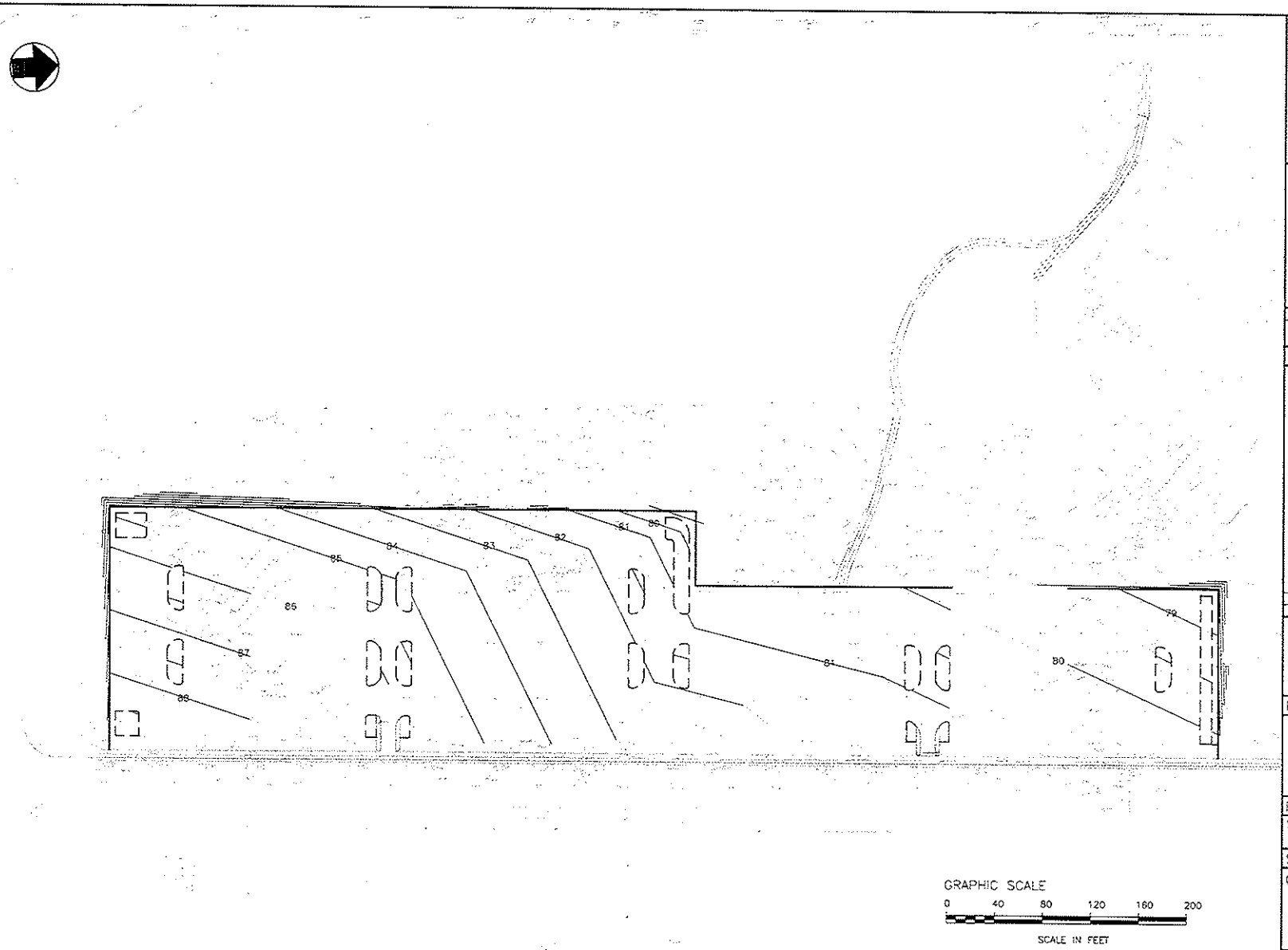
SHEET TITLE:

EXISTING DRY WELL LOCATION PLAN

DATE:
APRIL 2008

DWG. NO.:

FIGURE 5



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Signature 4/30/08
Registration Expiration Date

DSGN.	DRWN.	CHKD.	APPD.

KEY PLAN / NOTES:

NO.	DATE	REVISIONS

PROJECT TITLE:

AIRPORT IMPROVEMENT

AT

KONA INTERNATIONAL AIRPORT

PROJECT NO.:

STATE PROJECT NO.

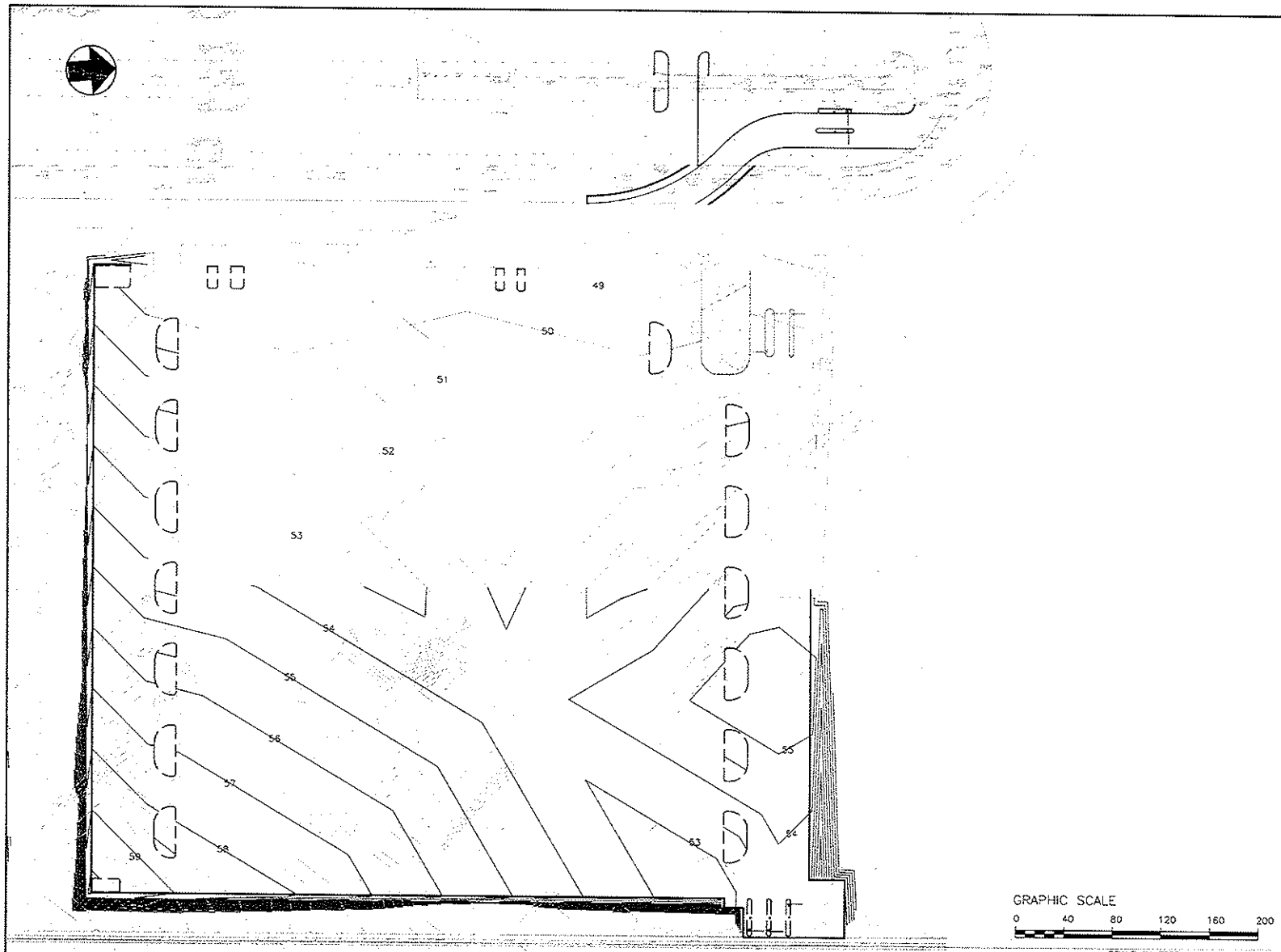
SHEET TITLE:

OVERFLOW PARKING LOT
PROPOSED GRADING
PLAN

DATE:
APRIL 2008

DWG. NO.:

FIGURE 6



Airports Division
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STATE OF HAWAII

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Signature 4/30/08 registration date of this license

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KEY PLAN / NOTES:

NO.	DATE	REVISIONS

PROJECT TITLE:

AIRPORT IMPROVEMENT

AT

KONA INTERNATIONAL AIRPORT

PROJECT NO.:

STATE PROJECT NO.

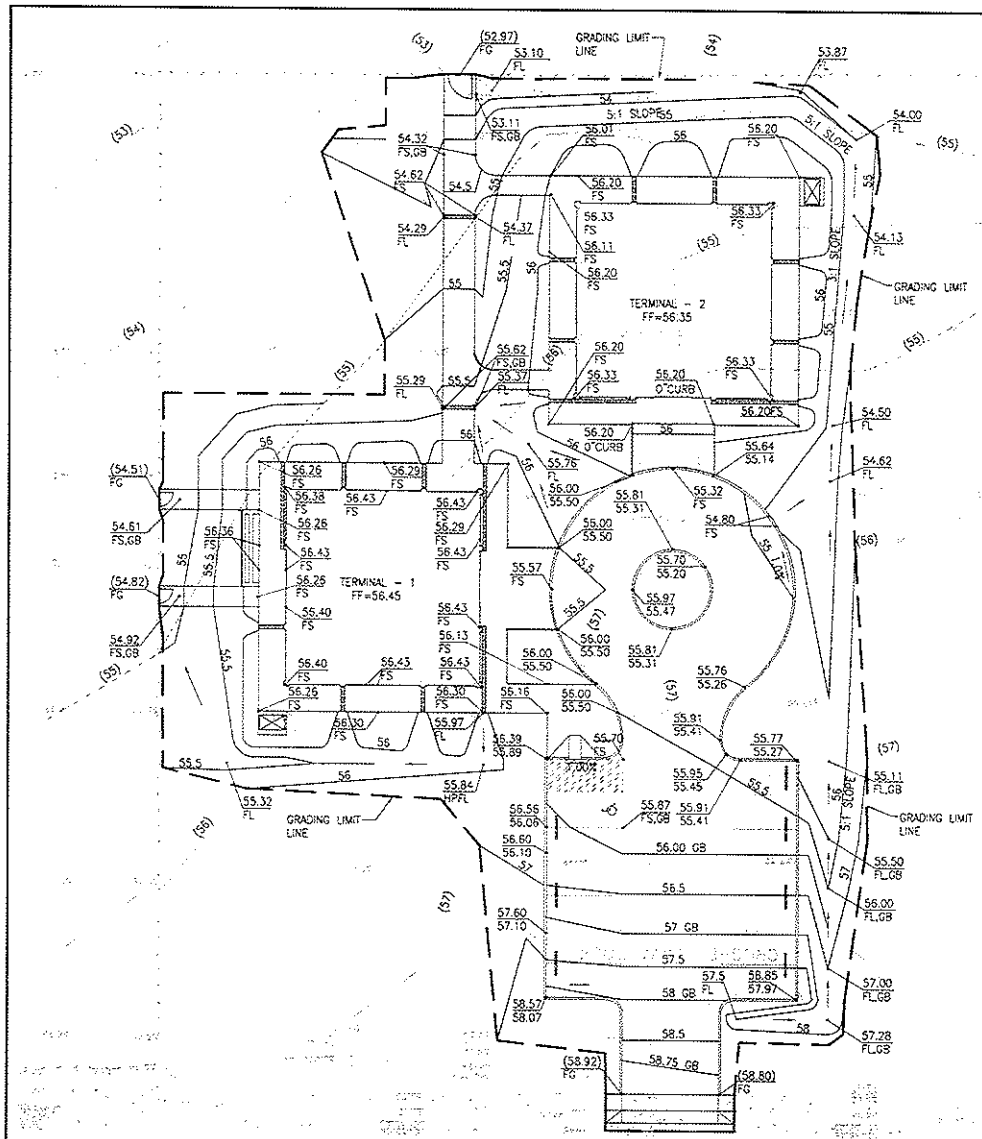
SHEET TITLE:

LONG TERM PARKING LOT PROPOSED GRADING PLAN

DATE:
APRIL 2008

DWG. NO.:

FIGURE 7



TRUE NORTH

GRAPHIC SCALE

16' 8' 0 16' 32'

Airports Division
DEPARTMENT OF TRANSPORTATION
STATE OF HAWAII

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DSGN. | DRWN. | CHKD. | APPD.

KEY PLAN / NOTES:

NO. | DATE | REVISIONS

PROJECT TITLE:

AIRPORT IMPROVEMENT

AT

KONA INTERNATIONAL AIRPORT

PROJECT NO.:

STATE PROJECT NO.

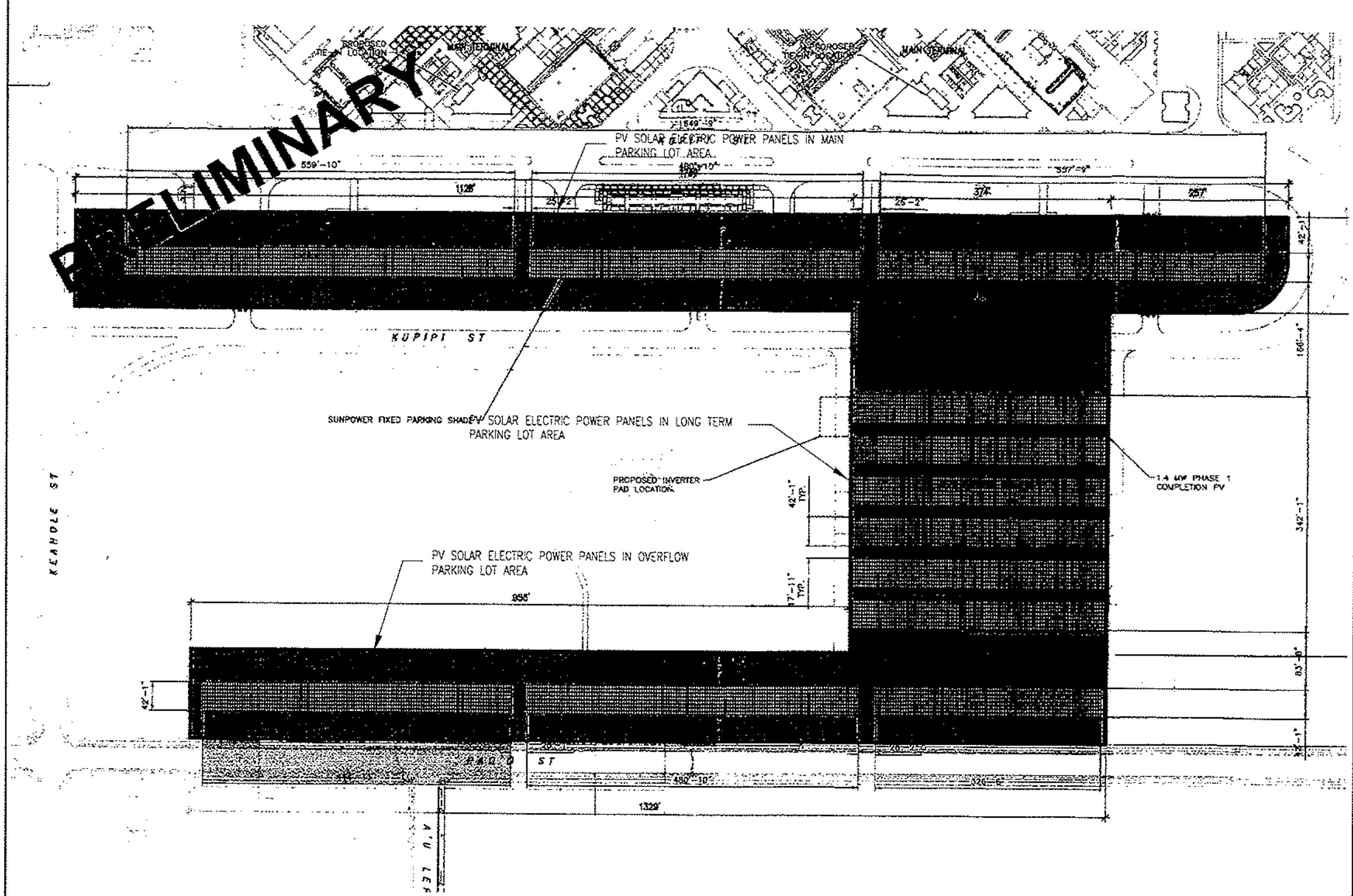
SHEET TITLE:

INTERIM CAT TERMINAL SITE PROPOSED GRADING PLAN

DATE: APRIL 2008

DWG. NO.:

FIGURE 8



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DEPARTMENT OF TRANSPORTATION
STATE OF HAWAII

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4/30/08

DSGN.	DRWN.	CHKD.	APPD.

KEY PLAN / NOTES:

NO.	DATE	REVISIONS

PROJECT TITLE:

AIRPORT IMPROVEMENT

AT

KONA INTERNATIONAL AIRPORT

PROJECT NO.:

STATE PROJECT NO.

SHEET TITLE:

PV SOLAR ELECTRIC POWER PANELS LOCATIONS

DATE: APRIL 2008

DWG. NO.:

FIGURE 9

APPENDIX B.

Archaeological Assessment Report

AN ARCHAEOLOGICAL ASSESSMENT OF A PORTION OF A 3,407.18-ACRE PARCEL LOCATED AT THE KONA INTERNATIONAL AIRPORT IN THE AHUPUA`A OF `O`OMA 1ST, KALALOA 1ST, HAMANAMANA, HALE`OHI`U, MAKAULA, NORTH KONA DISTRICT, ISLAND OF HAWAI`I, HAWAI`I [TMK: (3) 7-3-043:003, 006 THROUGH 035, 037 THROUGH 040 AND 043 THROUGH 047 por.]

Prepared By:
Glenn G. Escott, M.A.
and
Robert L. Spear, Ph.D.
March 2008

Prepared For:

Munekiyo & Hiraga, Inc.
305 High Street
Wailuku, HI 96793

TABLE OF CONTENTS

LIST OF FIGURES

INTRODUCTION

At the request of Munekiyo & Hiraga, Inc., Scientific Consultant Services, Inc. (SCS) conducted an archaeological assessment of a portion (11.36 acres) of a 3,407.18-acre parcel of land (TMK: (3)-7-3-43:003, 006 through 035, 037 through 040, and 043 through 047 por.) located at the Kona International Airport in the Ahupua'a of 'O'oma 1ST, Kalaloa 1ST, Hamanamana, Hale'ohi'u, Maka'ula, North Kona District, Island of Hawai'i (Figures 1, 2, and 3). Documents and exhibits submitted by Munekiyo & Hiraga, Inc., described the proposed development as follows:

1. Interim Commuter Airline Terminal Improvements (CAT)

   The CAT buildings will be located to the south of the existing air passenger terminals. Improvements include construction of two (2) new CAT buildings and gazebo structures for interim Commuter Airlines Terminal. See Figure 3. Related improvements include provision of graded and paved area within driveway, associated site development infrastructure, parking striping, parking lighting and related landscaping. ADA (American With Disabilities Act) compliant passenger walkways, access, exits and parking will also be provided. In addition, modifications to existing airfield fencing and passenger gate access will be carried out in relation to the new interim CAT building improvements.

2. Parking Lot Improvements

   The main parking lot improvements include replacing the existing pavement with 2.5-inch new AC pavement, repaint pavement surface markings, relocating the existing entrance, gate and ticket dispensers, constructing a new entrance lane and building a new gazebo at the new entrance. See Figure 3. The existing landscaping at the main parking lot will be modified to meet the County Code requirements. The improvements at the long-term parking lot include expanding the parking area to the east and south to provide additional parking capacity, repave and restrip expansion area, develop a new entry to the parking lot from the

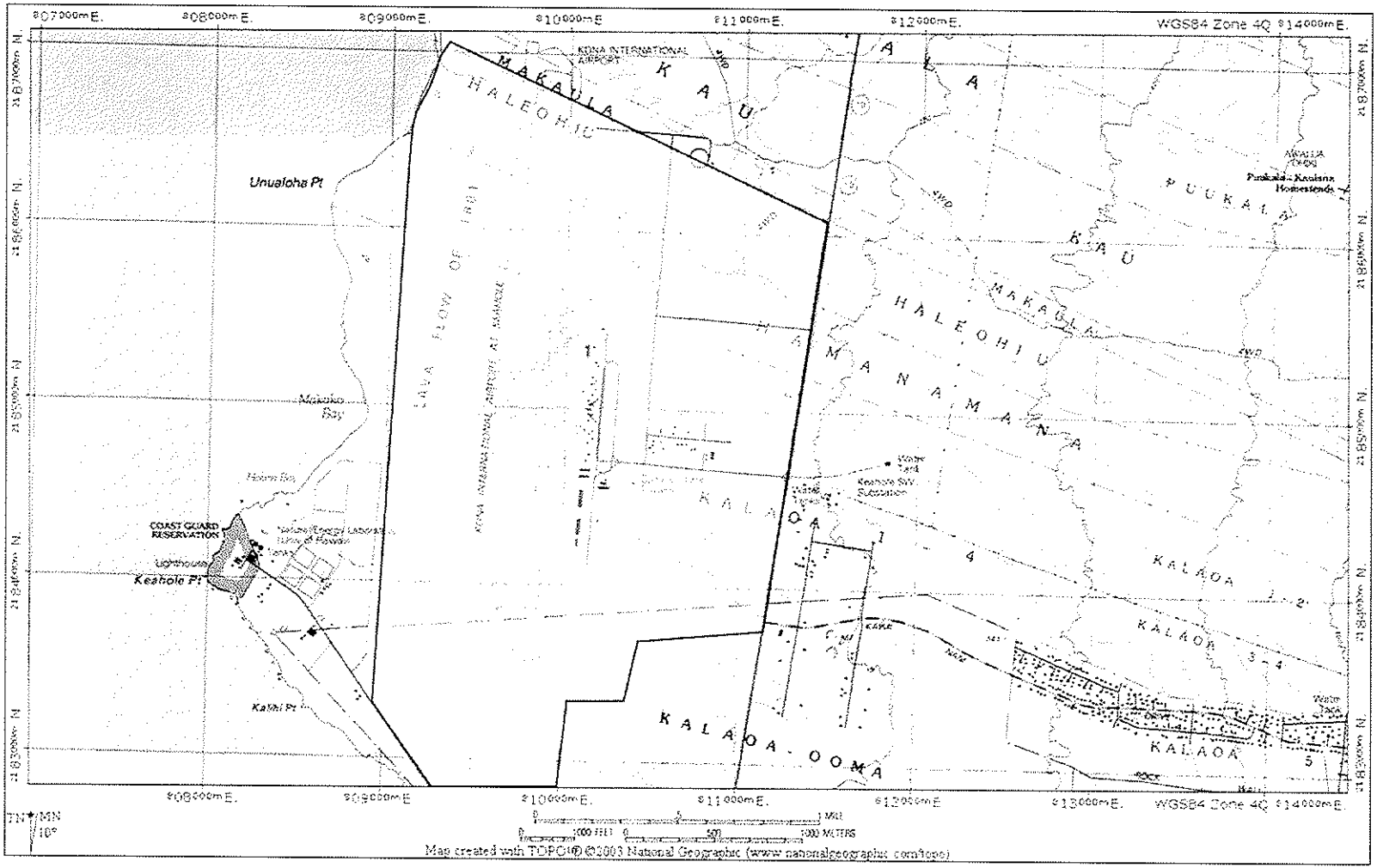

Figure 1: Kona International Airport USGS Quad.

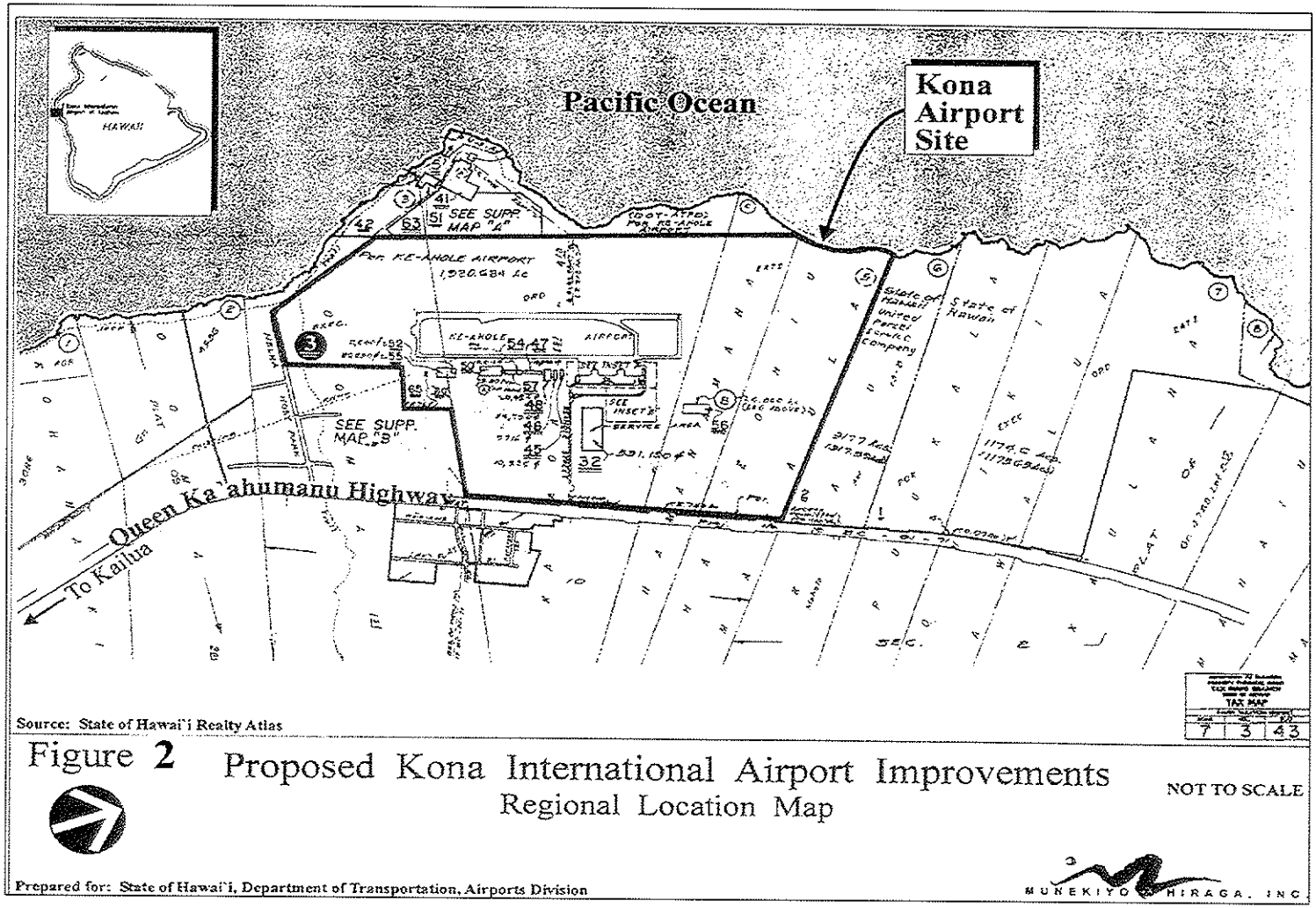

Figure 2: Kona International Airport TMK Map.

existing roadway in the northeast corner and landscaping along the access road and internal airport circulation road to the west. Related improvements include new dry wells for site drainage, landscaping to meet County Code requirements and parking lot lighting and security cameras. The improvements at the over-flow parking lot include expanding the parking area to the north and southwest to provide additional capacity, grade, pave and strip the expansion area, install guardrails as required, landscaping along the access road to meet County Code requirements and install parking lighting and security cameras.

3. Photovoltaic Electrical System Upgrades

The photovoltaic (PV) electrical system upgrades includes the installation of photovoltaic panels at the improved and expanded main, long-term and overflow parking lots and at the tiedown area. Refer to Figure 3. The parking lot PV panels involve construction of trellis structures with the photovoltaic solar panels attached on top of the trellises. The panels will be designed to mechanically track the sun during the day to maximize energy production. In addition to providing renewable energy, the solar panel array will also provide sun shade over the parking lots to protect the vehicles from excessive heat. The shade provided by the solar panels will also extend the life of the asphalt surfaces. The only areas within the parking lot that will not be covered with the solar panels will be the dedicated fire lanes along the main entry points and within the parking lots. Power generated by the system will be fed into the airport electrical grid via a connection at the main Hawaii Electric Company meter.

4. Related Infrastructure and Landscaping Improvements

Related infrastructure improvements including, but not limited to extension of water, sewer and drainage facilities, and electrical and telephone/telecommunication services will be carried out as required. All improvements will be landscaped as required to meet County Code specifications.

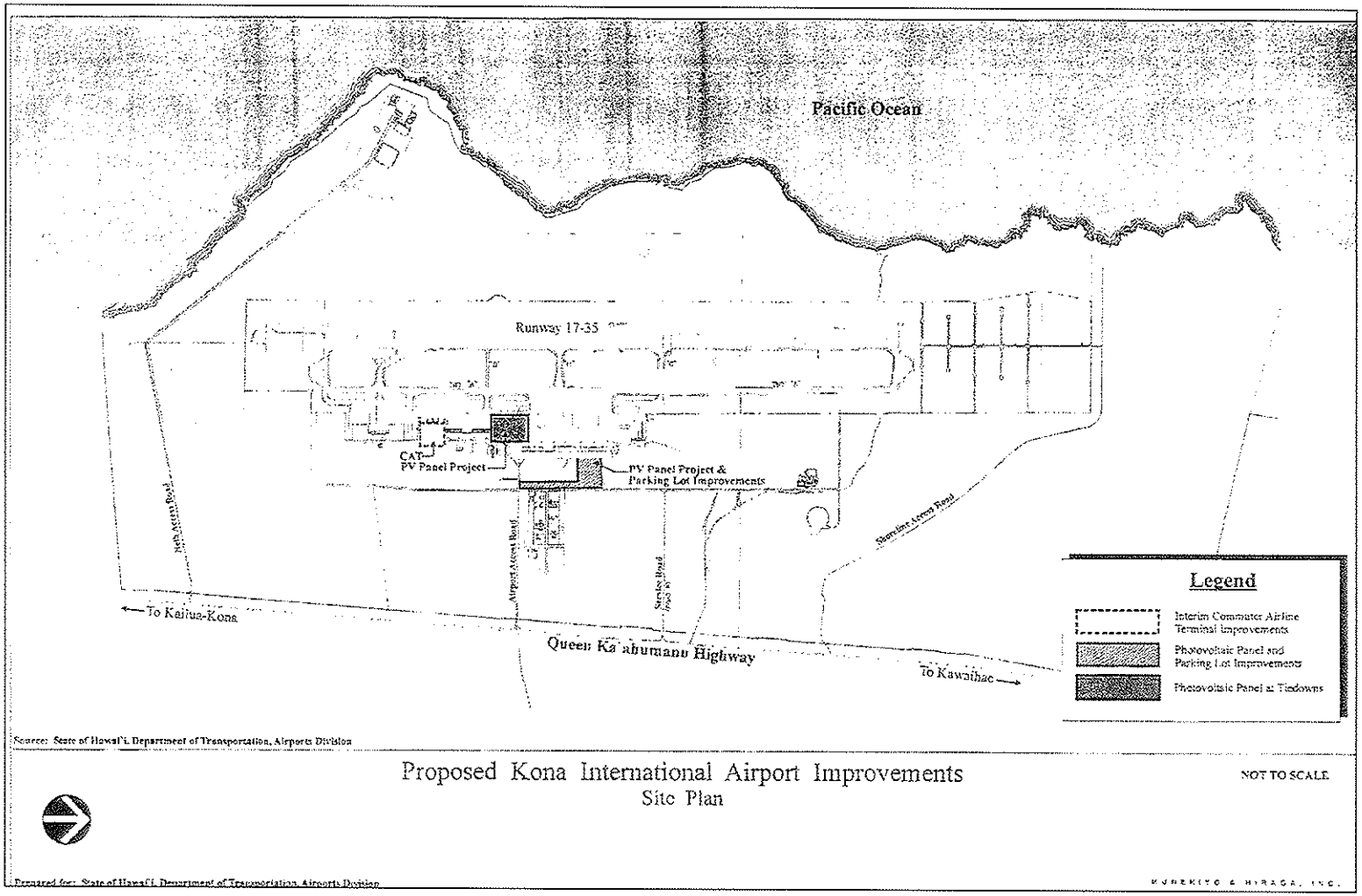

Figure 3: Map of Three Areas of Proposed Improvements (Project Area) at Kona International Airport.

PROJECT AREA AND VICINITY ENVIRONMENT

The three separate project locations for the proposed improvements/developments are located on 11.36 acres of previously disturbed ground surfaces including gravel lots, paved lots, and bulldozed *pāhoehoe* with sparse fountain grass (see Figure 3). The proposed project areas are on a Hualālai lava flow dated between 1,500 and 3,000 years before present. Ground cover is non-existent to extremely sparse fountain grass and ground surface visibility is excellent. Average annual rainfall in the project area is from ten to twenty inches. The project area is located in an ecological zone characterized as barren.

Regionally, there are three zones; the coastal zone, the barren zone, and the upland forest zone. The coastal zone is located from the coast to 300m inland (0-30ft amsl) and consists of rocky shoreline, bays, isolated coralline beaches, small ponds, brackish water, and isolated springs. Soil deposits are shallow and sparse but do support vegetation. The barren zone is located from roughly 300m to 1,030m inland (30-426ft amsl) and consists of bare lava flows with extremely sparse vegetation (fountain grass, lantana, and *noni*). The upland forest zone is located from 1,030m to 6,000m inland (426-3,379ft amsl) and consists of lava flows with thin to moderate soil deposits. Average annual rainfall in the upland forest zone is from twenty to thirty inches. The lower elevations support koa haole and Christmas-berry and the mid to upper reaches support broadleaf forest vegetation.

CULTURAL HISTORICAL CONTEXT

Early Settlement and Expansion

Archaeological evidence suggests Hawai'i was first settled between A.D. 0 and 700 by people sailing from the Marquesas (Cordy 2000). Early settlements on the Island of Hawai'i were founded on the windward shores in likely places such as Waipi'o, Waimanu, and Hilo Bay. The windward, or *ko 'olau* shores receive abundant rainfall and have numerous streams that facilitated agricultural and fishpond production (Maly and Maly 2002). The windward shores also provide rich benthic and pelagic marine resources.

Historical accounts of residential patterns, land-use, and subsistence horticulture are believed to be indicative of traditional practices developed long before contact with Europeans (McEldowney 1979). Early accounts of settlements along the windward shores describe the area as divided into several distinct environmental regions (Ellis 1963: 291-292). At Hilo Bay, from the coast to a distance of five or six miles scattered subsistence agriculture was evident, followed by a region of tall fern and bracken, flanked at higher elevations by a forest region between 10 and 20 miles wide, beyond which was an expanse of grass and lava (Ellis 1963:403).

The American Missionary C.S. Stewart wrote, "the first four miles of the country is open and uneven, and beautifully sprinkled with clumps, groves, and single trees of the bread-fruit, pandanus, and candle tree" (Stewart 1970:361-363). The majority of inhabitants (in 1825) lived within this coastal region (Ellis1963: 253). Taro, plantains, bananas, coconuts, sweet potatoes, and breadfruit were grown individually or in small garden plots. Fish, pig, dog, and birds were also raised and captured for consumption. Wood, such as *ʻōhiʻa* and *koa* for house construction, canoe building, and fires was obtained from the upland agricultural zone (McEldowney 1979:18-19), and from the dense forests above (Ellis 1963:236). Wood products and bird feathers were obtained from upland regions.

The dry leeward shores of Hawai'i Island presented a very different environment requiring a modified set of subsistence strategies. Archaeologists and historians are uncertain about the motives that lead to the establishment and spread of settlements on the leeward side of Hawai'i, but archaeological evidence suggests the process was underway between the A.D. 900s and 1100s (Cordy 2000). Coastal sites in Kona-

Kailua, South Kohala District, *makai* of Waikōloa, at Kalāhuipua'a and 'Anaeho'omalu and inland sites in the *ahupua'a* of Waimea have been dated to the A.D. 800s to 900s (Kirch 1979: 198, Cordy 2000: 130).

The early coastal settlements are located on or adjacent to the dry rocky shoreline and consist of temporary habitation caves containing midden, fishing tools, and fish remains; and two possibly permanent habitation sites (Barrera 1971, Jenson 1989a,

1989b, 1990a, and 1990b). The earlier phases of occupation were likely temporary habitations used when fishing, and later permanent habitations associated with fishpond production. Cordy suggests people who lived at inland Waimea occasionally frequented the Kalāhuipua'a and 'Anaeho'omalu area for its anchialine pond and marine resources (Cordy 2000:131). The implication is that, along the barren leeward coast, inland settlements and agriculture may have developed first, perhaps spreading from nearby Waimanu and Waipi'o. Maly suggests that people living permanently along the dry shoreline shared extended family relations with people inland, allowing for an exchange system that distributed marine resources to inland agriculturalists and brought inland agricultural products to people at the coastal settlements (Maly and Maly 2002).

The fertile plain of Waimea and the area of Kailu-Kona receive roughly 40 to 80 inches of rainfall annually and Waimea is watered by streams from the Kohala Mountains (the Waikōloa, Wai'aka, and Keanu'i'omanō streams). Inhabitants of these areas planted taro and sweet potato for subsistence. Sweet potato was the dominant crop at elevations that received from 30 to 60 inches (Cordy 2000: 135). Leeward expansion away from the coastline, at least on a permanent basis, is believed to have occurred only with the development or improvement of dry-land cultivation methods, possibly spurred by the introduction of sweet potato. Current evidence suggests that significant inland leeward settlement did not occur until 600 to 900 years after initial settlement, *i.e.*, between AD 1100 and 1400 (Green 1980; Hommon 1976; Cordy 2000). At lower elevations in North Kona and South Kohala Districts, especially along the coast, rainfall is less than thirty inches and soils are shallow or nonexistent. It is possible that mulching with rocks or cut plant materials allowed for a limited amount of root crop and arboreal agriculture in pockets of sandy soil.

In South Kona, Waimea, and Kohala, new settlements and agricultural field systems continued to spread and intensify during the A.D. 1200s to 1400s. Permanent communities were developing at Kona, Lapakahi, and along the coastal region from 'Upolu Point to Kawaihae (Cordy 2000: 140). Temporary residences and an agricultural field system were also established in the mid-elevations of Kona-Kailua and the uplands of the Waikōloa-Waimea area (Moffat and Fitzpatrick 1995, Maly and Maly 2002: 4).

As communities grew and agriculture intensified during this period, polities began to form, along with competition between polities. Large polities influencing communities within modern district-size boundaries emerged in the 1300s (Cordy 2000: 142). Cordy notes that just north of the project area "two different settlement and political zones seem to have developed prior to the 1200s and to have lasted until late in prehistory—one focused on Waimea and Kawaihae in the south, and the other in north Kohala up to 'Upolu Point" (Cordy 2000:385, footnote 15). Kona-Kailua also became an important political center south of the current project area.

By the late 1700s extensive permanent field systems were well established in the Kona-Kailua area, North Kohala, Waimea, and Lālāmilo (Clark 1981, Clark and Kirch 1983, Cordy 2000). Lands of the current project area remained barren and unoccupied except for small fishing villages located at some distance along the coast.

TRADITIONAL SETTLEMENT PATTERNS

The Hawaiian economy was based on agricultural production and marine exploitation, as well as raising livestock and collecting wild plants and birds. Extended household groups settled in various *ahupua`a*. During pre-Contact times, there were primarily two types of agriculture, wetland and dry land, both of which were dependent upon geography and physiography. River valleys provided ideal conditions for wetland *kalo* (*Colocasia esculenta*) agriculture that incorporated pond fields and irrigation canals. Other cultigens, such as *kō* (sugar cane, *Saccharum officinaruma*) and *mai`a* (banana, *Musa* sp.), were also grown and, where appropriate, such crops as *`uala* (sweet potato, *Ipomoea batatas*) were produced. This was the typical agricultural pattern seen during traditional times on all the Hawaiian Islands (Kirch and Sahlins 1992, Vol. 1:5, 119; Kirch 1985). Between A.D. 600-1100, sometimes referred to as the Developmental Period, the major focus of permanent settlement continued to be the fertile and well-watered windward valleys.

Current archaeological, linguistic, and ethnological data suggest that Hawaiian social organization initially followed a Polynesian conical clan-pattern in which individual status was based upon genealogical ranking (Green 1980:72). Kinship formed the basis for regional and island-wide societal integration; however, the most important social subsistence unit was the localized, territorial community-based, corporate kin group. Leadership within this group fell to the "highest ranking individual of the locally dominant, socially ranked lineage" (*ibid*:73). This individual acted as the local chief, overseeing the social, political, and economic functioning of the community.

The subsequent development of a uniquely Hawaiian institution, the *ahupua`a*, resulted in a more complex level of social and political integration (Cordy 1978; Hommon 1976; Green 1980; Kirch 1985). The *ahupua`a* was the fundamental land division in late pre-contact Hawai`i. Ideally this land extended from the coast to the mountains–often corresponding with a valley drainage–and thus theoretically crosscut all primary resource zones, allowing each *ahupua`a* relative economic self-sufficiency. With the emergence of the *ahupua`a*, however, production shifted from the kinship-based relationship between chief and community to an incipient state-structured hierarchy. On his succession, the paramount chief chose the best lands for himself, and allocated the rest to his...

> warrior chiefs who had assisted in his conquests...[who], after retaining...land for themselves, reallotted the remaining lands to the inferior chiefs, who in turn reallotted portions of their lands to their own followers [and so on] down the scale to the lowest tenants, the common farmers who actually tilled the soil [Chinen 1961:7].

The chief (*konohiki*) responsible for the *ahupua`a* was now a member of a non-localized ruling elite (*ali`i*) and extracted rents or tribute from the common people (*maka`ainana)* working the land. "All of these allotments to lands, from warrior chiefs down to the commoners, were on a revocable basis," and Chinen wryly notes that, "what the superior gave, he was able to take away at pleasure" (*ibid*).

WAHI PANA (LEGENDARY PLACES)

The most informative *mo`olelo* describing events that took place in the barren lands of North Kona District is The Heart Stirring Story of Ka-Miki (*Ka`ao Ho`oniua Pu`uwai no Ka-Maiki*) recorded and published between 1914 and 1917 in the weekly

Hawaiian Newspaper *Ko Hōkū o Hawai'i* and translated by Maly (excerpts cited in Maly 1992). The *mo'olelo* is set in the 1300s, though it is an early 20th Century collection of narratives about local traditions, tales, and family histories. The tales do have some time depth as they have been handed down through generations. They contain a mixture of "ancient" and 20th Century descriptions of the areas through which Ka-Miki and his brother Maka-'iole traveled. Descriptions of three places directly related to the current project area, Hale'ohi'u, Kalaoa, and 'O'oma, are described in the story.

Hale-'ohi'u is translated as "house made with a thatching shuttle". Kalua'ōlapa was the priest of Hale'ohi'u and Kamāhoe, also referred to as Nā-Kalaoa-wai'ole, translated as "the waterless Kalaoa lands" (Maly 1992:220). Kalua'ōlapa dwelt along the *'ilima (Sidafallax)* covered upland plain of Māulukua. Ka'elehuluhulu is the name of the land, Hale'ohi'u is the sub-district, Kanāhāhā is the fishing ground, and Keawehala is the landing (ibid: 220). 'O'oma is also only mentioned for its famous fishermen (ibid: 386).

EARLY ACCOUNTS OF PREHISTORIC EVENTS IN NORTH KONA

There is a paucity of prehistoric information pertaining to the lands of the project area and surrounding lands. Cordy notes that the "oral traditions are silent" for the years of early settlement of and expansion along the leeward shores of Hawai'i (Cordy 2000: 130). The little information that does exist concerns the activities of *ali'i* and was collected and published by Fornander, I'i, and Kamakau.

Hale'ohi'u is the only area within the project area to be mentioned in these early accounts. Hale'ohi'u was a well-known fishing village at the time of 'Umi-a-liloa (Kamakau 1992:216) and is a well-known place to catch "sweet-tasting *aku* fish" up through the time of Kamehameha (*ibid*:185). During the fourth year of Kamehameha's reign, he was advised by a *kaula* (a seer devoted to Pele) to go to Kekaha to make sacrifices to Pele in order to stop the lava flow threatening his fishponds and the homes of the people in the area. The lava had already flowed through the adjacent lands of Mahai'ula, Ka'ūpūlehu, and Kīholo. It was believed that Pele desired *awa* from the fishponds of Ka'ūpūlehu, the *'ahi* of Kīholo, and the *aku* from Hale'ohi'u and Ka'elehuluhulu. The flow stopped soon after Kamehameha made sacrifices to Pele.

Descriptions of lands both north and south of the project area are brief. 'Ōhiki is a stretch of sand and Kaloko has a large walled fishpond (*ibid*:56). 'O'oma is also mentioned by Kamamkau, but only as an out of way place, where the prince Ke-

aweawe'ula was raised until he was five years old. (*ibid*:264).

HISTORIC ERA LAND USE

William Ellis described two trips he made between Kawaihae and Kailua. He traveled by boat during the first trip and only remarked on the coast to say it was "a rugged and barren shore of lava" (Ellis 2004:83). During his second trip, Ellis traveled by canoe from Kawaihae to Kailua. He left the former at six in the morning, stopped at Kapalaoa around 9:00am, and arrived in Kīholo around 4:00pm. He described Kīholo as "a straggling village, inhabited principally by fishermen" (Ellis 2004:418). He also described the large fishpond created by order of Kamehameha at that village. He left Kīholo just before sunset and arrived at Ka'ūpūlehu between 7:00 and 8:00pm. He records little about the village except that everyone was asleep. When the moon had risen, by 11:00pm, he continued his journey by moonlight, arriving in Kailua an hour before sunrise. In all Ellis makes little description of the coastal area of North Kona Disctrict, perhaps because he was traveling at night.

Isabella Bird, who traveled from Kailua to Kawaihae some fifty years later described the coastal region by writing, "We sailed for some hours along a lava coast, streamless, rainless, verdureless, blazing under the fierce light of a tropical sun and some time after noon anchored in the scorching bay of Kawaihae" (Bird 2007:144).

There were no Land Commission awards granted in the project area. The area of the project area remained unusable for homesteading, ranching, or farming during the Contact and Historic eras. A review of early historic maps showed no man-made features within the project area. The only known cultural resources within the Kona International Airport facilities are a pre-Contact era cave habitation site (carbon-dated between A.D.1430-1650), a pre-Contact era temporary habitation feature with several low, circular stone alignments, a short segment of the Mamalahoa trail, and an area with several petroglyphs (Dye and Prasad 2000) (Figure 4). Both habitation areas have been fully documented and are not significant for inclusion on the National Register of Historic Places (NRHP). The Mamalahoa trail segment and the petroglyphs are significant for inclusion for the NRHP. The Mamalahoa trail segment is located in a restricted (fenced-off) area between Alpha and Delta runways, and the collection of petroglyphs is protected by a three foot high rock wall constructed around them. None of the sites are within or in close proximity to the four areas of proposed improvements

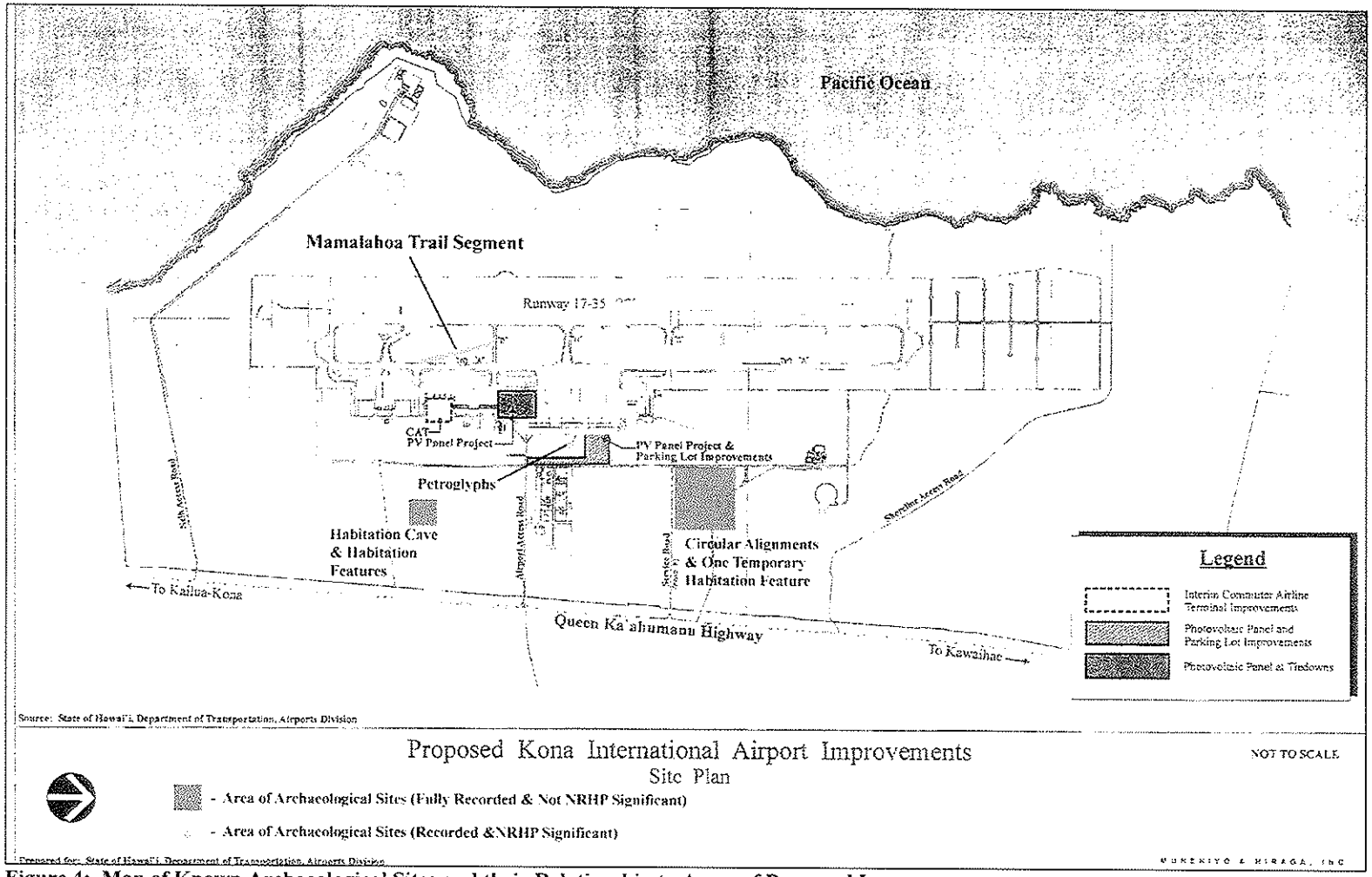

Figure 4: Map of Known Archaeological Sites and their Relationship to Areas of Proposed Improvements.

detailed in this report. No cultural resources were encountered during a March 2008 pedestrian reconnaissance survey of all four areas of proposed improvements.

MODERN LAND USE

The lands of the current project area had limited use from settlement of the leeward side of the Island of Hawai'i until the construction of the Kona International Airport in 1969 and 1970. Land use was restricted to small coastal settlements focused on fishing, and trail systems situated between these coastal villages and larger, socio-politically important populations centered in Kawaihae to the north and Kailua-Kona to the south. The Mamalaho trail and associated features (*ahu* and two habitation sites) are the only cultural resources located on the current project area. None of them is near, or will be impacted by, the proposed improvements documented in this report.

Modern use of the lands associated with the airport facility and the Natural Energy Laboratories Hawaii (NELH) continues to be primarily focused on fishing, and coastal access and activities. A study conducted to address Public Access Shoreline Hawaii (PASH) Rights (Dye and Prasad 2000:23-30) concluded that the primary use and concern for continued use of the area were:

1. Limited access to shoreline within the vicinity of existing airport properties;
2. Compromising of archaeological and historical sites;
3. Access to prime fishing grounds;
4. Loss of native (traditional) plants'
5. Observation of traditional boundaries (need to treat an *ahupua'a* as one unit);
6. Impacts to aquifers and seabeds; and
7. Boundaries compromised and/or seen as inseparable from NELH.

Eight long-time Kona residents with specific knowledge of the lands of the Kona International Airport were interviewed (December 1999 to February 2000) for the PASH study. Concerns were that, while the airport did not appreciably limit vehicle access to camping and fishing areas, the construction of the NELH facility did (Dye and Prasad 2000:25, 26-17). Moreover, those interviewed voiced concern that the NELH operations might have resulted in a reduction in the area fish supply. There was a sense that pollutants from the airport and the NELH could degrade the local aquifers and seabeds. Cultural informants also voiced concern over the possible alteration of ancestral burials,

archaeological sites, and native plant habitat.

PREVIOUS ARCHAEOLOGY

Approximately fifty individual archaeological studies have been conducted within and in the vicinity of the current project area (Figure 5). Archaeological evidence suggests the broad *ahupua'a* settlement pattern for the area is one of small coastal villages established in the early 800sAD through 1400AD. Initial habitation sites are seasonal and associated with fishing. Limited horticulture may have been practiced at coastal sites at this time. From the 1400s to the early historic period, there appears to be a limited expansion in the middle to upper reaches of the upland forest zone. Expansion in the upland zone is associated with dryland swidden agriculture (Henry *et al.* 1993:56). Likely dryland crops consisted of dryland taro, sweet potatoes, breadfruit, bananas, paper mulberry, *ti*, and sugar cane. During the historic era, there was increased population growth in the upland forest zone associated with the development of homesteads involved in the growing of coffee and sheep and cattle ranching. The barren zone does not appear to be a habitation zone at any time.

Barren zone archeological features include trail segments, *ahu*, and small rock pavements, small temporary habitation c-shape enclosures, and lava tubes (rest areas along trail segments). Sites suggesting resource extraction include excavated lava blisters, likely for the production of abraders. Other blister excavations appear to have been created while hunting nesting birds, or collecting eggs and chicks. Feature distribution is extremely sparse in this zone.

There are four areas of known archaeological sites near the current areas of proposed development (see Figure 4). None of the proposed improvements are in close proximity to known archaeological resources, and no archaeological sites will be impacted. The known cultural resources within the Kona International Airport facilities are a pre-Contact era cave habitation site (carbon-dated between A.D.1430-1650), a pre-Contact era temporary habitation feature with several low, circular stone alignments, a short segment of the Māmalahoa trail, and an area with several petroglyphs.

Both habitation areas have been fully documented and are not significant for inclusion on the National Register of Historic Places (NRHP). The Māmalahoa trail segment and the petroglyphs are significant for inclusion for the NRHP. The Māmalahoa trail segment is located in a restricted (fenced-off) area between Alpha and Delta runways, and the collection of petroglyphs is protected by a three foot high rock wall constructed around them.

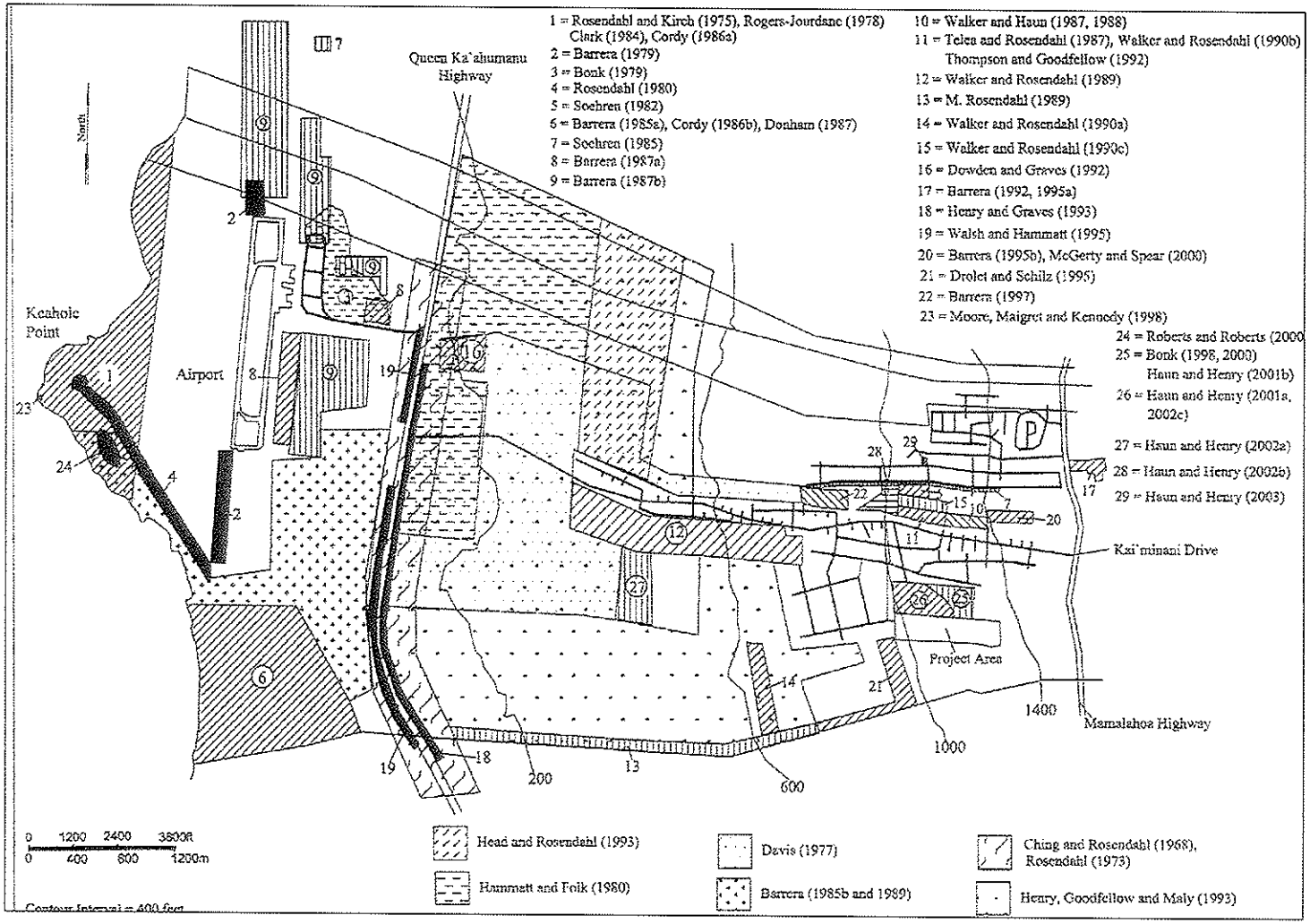

Figure 5: Map of Previous Archaeology (Haun and Henry 2004).

PROJECT AREA EXPECTATIONS

Given historical/archival resources and the previous archaeological studies, it is possible that trail segments, *ahu*, petroglyphs, and temporary habitation features will be located within the project area. Given that the distribution of these features is very sparse, it is most likely that few, if any features will be located in the current project area.

METHODS

On February 22, 2008 SCS archaeologist Glenn Escott, MA surveyed all areas at the lots slated for the proposed construction. Each project area lot was surveyed at 5.0m to 10.m transects traversed from east to west and west to east. No cultural resources were located within the areas of proposed improvements. No natural soil or sediment deposits exist within the project area.

RESULTS OF FIELDWORK

Interim Commuter Airline Terminal (CAT)

The Interim Commuter Airline Terminal Improvements (CAT) lot is located along the southeast corner of the Kona Airport facility. The area is a 0.84-acre gravel parking lot (Figure 5). The gravel in the lot is mechanically crushed basalt that appears to be from 2.0ft to 2.5ft deep, based on observation of its height along the north edge of the lot. No cultural resources were located at the CAT lot.

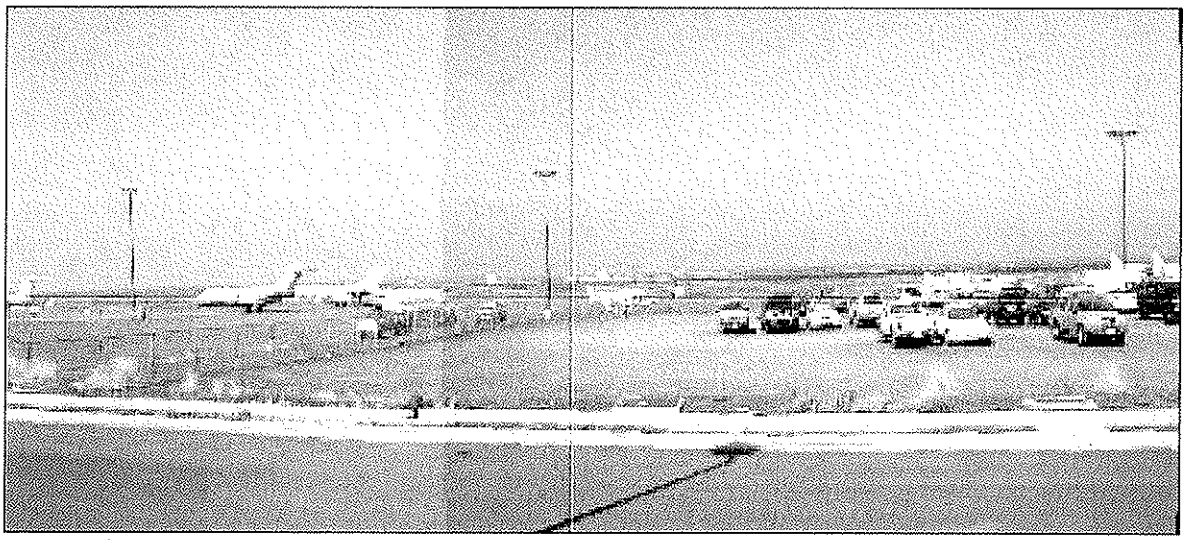

Figure 6: View of CAT lot facing west.

Parking Lot Improvements

The Parking Lot Improvements area is located along the east side of the Kona Airport facility. The area is a 9.83-acre area of existing parking lots and bulldozed *pāhoehoe* lava (Figures 6 and 7). No cultural resources were located within the parking lot improvement area.

Photo Voltaic Panel

The Photo Voltaic (PV) Panel area is located west of the airport access road in the location of the airport control tower. The area is a 0.69-acre paved small airplane parking lot. No cultural resources were located within the PV Panel project area. No cultural resources were located within the PV area.

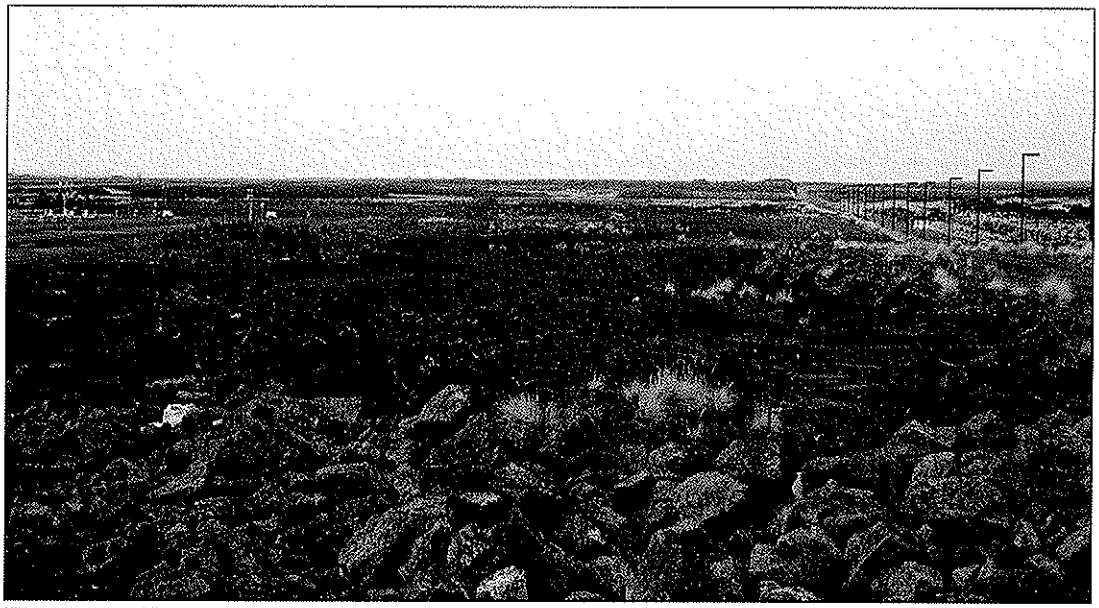

Figure 7: View of north half of Parking Lot Improvement Area facing north.

Figure 8: View of south half of Parking Lot Improvement Area facing south.

CONCLUSIONS

No cultural resources were located within the 11.36 acres selected for the three areas for proposed improvements. All three project locations are on previously disturbed ground surfaces including gravel lots, paved lots, and bulldozed *pāhoehoe*. The areas of proposed improvements are not located in close proximity to any previously documented cultural resources, and no archaeological sites will be impacted by the proposed improvements.

REFERENCES CITED

Barrera, W.

1971 Anaehoomalu-A Reconstruction in History. In *Anaeho'omulu: An Hawaiian Oasis*, ed. by W. Barrera. Pacific Anthropological Records No. 15, Dept. of Anthropology, Bishop Museum. Honolulu.

1979 Keahole Airport Emergency Service Roads: Archaeological Survey. CHINIAGO, Inc., Kalaoa, North Kona, Hawaii Island.

1985a Ooma II, Hawaii: Archaeological Reconnaissance. CHINIAGO, Inc. Prepared for Helber, Hastert, VanHorn and Kimura.

1985b Ke-ahole Point, Hawaii: Archaeological Reconnaissance (Revised Version).
CHINIAGO, Inc. Prepared for Helber, Hastert, Van Horn and Kimura.

1987a Keahole Airport, Hawaii: Archaeological Survey of South Ramp and Ground Transportation Expansion. CHINIAGO, Inc. Prepared for Richard Sato & Associates.

1987b Keahole Airport, Hawaii: Archaeological Survey of Five Areas Proposed for Airport Expansion. CHINIAGO, Inc. Prepared for R.M. Towill.

1989 Archaeological Data Recovery at the Host and NELH, Kalaoa and Ooma Ahupua'a, North Kona, Hawaii Island, CHINIAGO, Inc. Prepared for R.M. Towill.

1992 Kalaoa, North Kona, Hawaii Island: Archaeological Inventory Survey for the Church of Jesus Christ of Latter Day Saints (TMK 7-3-02:8). CHINIAGO, Inc. Prepared for Church of Jesus Christ of Latter Day Saints

1995a Kalaoa, North Kona, Hawaii Island: Archaeological Data Recovery for the Church of Jesus Christ of Latter Day Saints (TMK 7-3-02:7 and 8). CHINIAGO, Inc. Prepared for Church of Jesus Christ of Latter Day Saints

1995b Kalaoa Mauka, North Kona, Hawaii Island: Archaeological Inventory Survey of TMK: 7-3-05:98. Comstock Cultural Resource Management Inc. Prepared for Waikea Associates.

1997 Archaeological Inventory Survey at Kalaoa, North Kona, Hawaii Island: TMK: 3-7-3-10:37. Prepared for Kona Scenic Land, Inc.

Bird, I.

2007 *Six Months in the Sandwich Islands*. Mutual Publishing, Australia.

Bonk, W.

1979 An Archaeological Survey at the Keahole Airport, Kalaoa, North Kona, Hawaii. *Papers in Ethnic & Cultural Studies.* Number 3.

1989a An Archaeological Survey of a Small Portion of Land in Kalaoa, North Kona District, County of Hawaii, State of Hawaii. Papers in Ethnic and Cultural Studies 98-1. Prepared for David Bruce, Esq., Attorney of Law

1989b A Supplement to An Archaeological Survey of a Small Portion of Land in Kalaoa, North Kona District, County of Hawaii, State of Hawaii. Papers in Ethnic and Cultural Studies 98-2. Prepared for David Bruce, Esq., Attorney of Law

2000 An Archaeological Survey of a Small Portion of Land in O'oma, North Kona District, County of Hawaii, State of Hawaii (TMK:7-3-05:112). Papers in Ethnic and Cultural Studies 00-1 (Revised). Prepared for David Bruce, Esq., Attorney of Law

Chinen, J.J.

1961 *Original Land Title in Hawaii.* Published privately in Honolulu, Hawaii.

Ching, F.

1971 The Archaeology of South Kohala and North Kona from the *ahupua 'a* of Lalamilo to the *ahupua 'a* of Hamanamana. Surface Survey Kailua-Kawaihae Road Corridor (Section III). Prepared by the State of Hawaii, Department of Land and Natural Resources, Division of State Parks, Outdoor Recreation and Historic Sites.

Ching, F., and P. Rosendahl

1968 Archaeological Surface Survey of the Kailua-Kawaihae Road (Section II), Honokohau to Keahole Point and the Keahole Point Airport. Prepared by the State of Hawaii, Department of Land and Natural Resources, Division of State Parks, Outdoor Recreation and Historic Sites.

Clark, J.

1981 Archaeological Survey of the Proposed Lalamilo Agricultural Park, South Kohala, Island of Hawaii. Bishop Museum. Honolulu.

Clark, J.T. and P.V. Kirch

1983 *Archaeological Investigations of the Mudlane-Waimea-Kawaihae Road Corridor.* Report 83-1. Dept. of Anthropology. Bishop Museum. Honolulu.

Clark, S.
1984 An Archaeological Reconnaissance of Natural Energy Laboratory Hawaii (NELH) Property, Keahole Point, North Kona, Hawaii. Dept. of Anthro., B.P. Bishop Museum. Prepared for Marine Sciences Group, Dept. of Paleontology, University of California, Berkeley.

Cordy, R.
1981 *A Study of Prehistoric Social Change: The Development of Complex Societies in the Hawaiian Islands.* Academic Press. New York.

1985 Working Paper 1. Hawaii Island Archaeology, 'O'oma & Kalaoa Ahupua'a, Kekaha, North Kona. Historic Sites Section, Department of Land and Natural Resources, State of Hawaii.

1986a Field Check of Some Sites in the NELH Property, Kalaoa 5, Keahole Point, North Kona. Historic Sites Section, Division of State Parks, Dept. of Land and Natural Resources, State of Hawaii

1986b Field Check, O'oma 2, North Kona, Hawaii. Historic Sites Section, Department of Land and Natural Resources, State of Hawaii.

2000 *Exalted Sits the Chief: The Ancient History of Hawai'i Island.* Mutual Publishing. Honolulu.

Davis, B.
1977 Archaeological Survey of the Proposed Agricultural Park at Ke-ahole, North Kona, Hawaii Island. Archaeological Research Center Hawaii, Inc. Prepared for Department of Agriculture.

Donham, T.
1987 Archaeological Survey and Testing, Ooma II Resort Project Area, Land of Ooma 2, North Kona, Island of Hawaii. PHRI Report 254. Prepared for Helber, Hastert, Van Horn and Kimura.

Dowden, S., and D. Graves
1992 Archaeological Inventory Survey, HELCO Keahole Parcel Project Area, Lands of Kalaoa 1-4, North Kona District, Island of Hawaii (TMK:7-3-49:36). PHRI Report 1265. Prepared for CH2M HILL, Honolulu.

Drolet, R., and A. Schilz
1995 Final Report, Archaeological Inventory Survey, O'oma 2, North Kona, Hawaii Island. Ogden Environmental and Energy Services Co., Inc. Prepared for Helbert Hastert & Fee.

Dye, T.S. and U. Prasad
2000 *Archaeological Update and PASH Rights Interviews for Kona International Airport at Keāhole*. Prepared for Edward K. Noda and Associates, Inc., Honolulu.

Ellis, W.
1963 *The Journal of William Ellis, Narrative of a Tour of Hawaii, or Owhyee.* Honolulu: Advertiser Publishing Co.

1969 *Journal of William Ellis*. Honolulu Advertiser Publishing Co., Ltd, Honolulu.

2004 *A Narrative of an 1823 Tour Through Hawai'i*. Mutual Publishing, Australia.

FR
n.d. Foreign Register of Kuleana Claims Recorded by the Board of Commissioners to Quiet Land Titles in the Hawaiian Islands. Manuscript. Hawaii State Archives.

FT
n.d. Foreign Testimony Recorded by the Board of Commissioners to Quiet Land Titles in the Hawaiian Islands. Manuscript. Hawaii State Archives.

Green, R.C.
1980 *Makaha Before 1880 A.D.: Makaha Valley Historical Project-Summary Report 5. Pacific Anthropological Records*, 31

Hammatt, H., and W. Folk
1980 Archaeological Excavations within the Proposed Keahole Agricultural Park, Kalaoa-Ooma, Kona, Hawaii Island. Prepared for State of Hawaii, Department of Agriculture.

Hammatt, H., D. Borthwick, B. Colin, I. Masterson, J. Robbins, and H. Wong-Smith
1997 Archaeological Inventory Survey and Limited Testing of a 1,540-Acre Parcel in the Ahupua'a of Honuaino, Hokukano, Kanaueue, Haleki'i, Ke'eke'e, 'Ilikahi, Kanakau, Kalukalu, and Onouli, Districts of North and South Kona, Island of Hawaii. Prepared by Cultural Surveys Hawaii for 1250 Oceanside Partners.

Haun, A.E., and D. Henry
2001a Archaeological Inventory Survey, TMK: 03-7-3-05:4, Lot 54A, Land of Ooma 1, North Kona District, Island of Hawaii. Haun & Associates Project 072 prepared for THY Development, Inc.

2001b Archaeological Inventory Survey, TMK: 03-7-3-05:112, Land of Ooma 1, North Kona District, Island of Hawaii. Haun & Associates Project 105 prepared for Mr. Charles Kurtz.

2002a Archaeological Inventory Survey, TMK: 03-7-3-10:03, Land of Ooma 1, North Kona District, Island of Hawaii. Haun & Associates Project 160 prepared for Mr. David Deluz.

2002b Archaeological Inventory Survey, TMK: 03-7-3-10:29, Land of Kalaoa 4th, North Kona District, Island of Hawaii. Haun & Associates Project 211 prepared for Mr. Dennis Young.

2002c Archaeological Data Recovery, Sites 22740, 22741, Feature E and 22749, Land of Ooma 1, North Kona District, Island of Hawaii. Haun & Associates Project 072 prepared for THY Development, Inc.

2003 Archaeological Inventory Survey, TMK: 03-7-3-23:88, Land of Kalaoa 3rd, North Kona District, Island of Hawaii. Haun & Associates Project 243 prepared for Inaba Engineering, Inc., Hilo.

2004 Archaeological Inventory Survey, TMK: 03-7-3-23:88, Land of O'oma 1, North Kona District, Island of Hawaii. Prepared for Mr. James R. Malian c/o Mr. Sidney Fuke, 100 Pauahi Street, Suite 212 Hilo, HI 96720.

Haun , A., D. Henry and D. Berrigan

2003 Archaeological Inventory Survey, TMK: 3-7-9: 12, por. 9, Lands of Hokukano 2 and Kanaueue, North Kona District, Island of Hawaii. Haun & Associates report 235 prepared for 1250 Oceanside Partners, Kailua-Kona.

Head, J., and P. Rosendahl

1993 Archaeological Inventory Survey, Kailua to Keahole Region State Lands LUC Project - 500 acre University Site, Lands of Makaula, Haleohiu, Hamanamana and Kalaoa 1-4, North Kona District, Island of Hawaii. PHRI Report 1298. Prepared for Helber, Hastert & Fee.

Henry, J., and D. Graves

1993 Phased Archaeological Inventory Survey, Phase I - Site Identification, Keahole-Kailua 69kV Transmission Line Project, North Kona District, Island of Hawaii. PHRI Report 1118. Prepared for CH2M Hill.

Henry, J., S. Goodfellow and K. Maly

1993 Archaeological Assessment Study, Kailua to Keahole Region State Lands, LUC Project, Lands of Makaula, Hale'ohi'u, Hamanamana, Kalaoa -14, Kalaoa, Ooma and Ooma 2, North Kona District, Island of Hawaii. (PHRI Report 1275. Prepared for Helber, Hastert & Fee.

Henry, J., T. Wolforth and A. Haun
1998 Archaeological Inventory Survey, 60-Acre Agricultural Zoned QL T 'Parcel, Keahuolu Ahupua'a, North Kona District, Island of Hawaii (TMKL 3-7-4-08:Por 1). PHRI Report 1879. Prepared for Queen Liliuokalani Trust.

Hommon, R.
1976 *The Formation of Primitive States in Pre-Contact Hawaii.* Ph.D. dissertation, Department of Anthropology, University of Arizona.

Indices
1929 *Indices of Awards Made by the Board of Land Commissioners to Quiet Land Titles in the Hawaiian Islands.* Territory of Hawaii, Honolulu.

Jensen, P.M.
1988 *Archaeological Data Recovery and Intensive Survey, Resort Expansion Area and Selected Undeveloped Resort Parcels, Waikoloa Beach Resort, Lands of Waikoloa and Anaehoomalu, South Kohala, Island of Hawaii.* PHRI Report 371-031488. Prepared for Transcontinental Development Company. DLNR. Kapolei.

1989b *Archaeological Inventory Survey, Waikoloa Beach Resort Parcels 20, 21, 22, and 23, Land of Waikoloa, South Kohala District, Island of Hawaii.* PHRI Report 512-022289. Prepared for Prepared for Transcontinental Development Company. DLNR. Kapolei.

1990a *Archaeological Data Recovery and Site Preservation. Undeveloped Portions of Lots 22 and 23 of File Plan 1562 and the Strip Between Lot 23 and Kiholo Puako Trail. Waikoloa Beach Resort. Land of Anaehoomalu, South Kohala District, Island of Hawaii.* PHRI Report. DLNR, Kapolei.

1990b *Archaeological Data Recovery Program. Lots 1, 2, 6, 7, 17, 24, Waikoloa Beach Resort. Land of Anaehoomalu, South Kohala District, Island of Hawaii.* PHRI Report. DLNR, Kapolei.

Kamakau, S.
1992 R*uling Chiefs of Hawaii.* The Kamehameha School Press. Honolulu.

Kirch, P.V.

1975 *Preliminary Report on Phase II Archaeological Investigations at Kalahu`ipua`a, South Kohala, Hawaii Island, Dept.* Of Anthropology, B.P. Bishop Museum. Prepared for Mauna Loa Land, Inc.

1979 *Marine Exploitation in Prehistoric Hawaii: Archaeological Excavations at Kalahuipua'a, Hawaii Island.* Pacific Anthropological Anthropological Records, 29. Department of anthropology, Bishop Museum. Honolulu.

1985 *Feathered Gods and Fishhooks: An Introduction to Hawaiian Archaeology and Prehistory.* University of Hawaii Press, Honolulu.

Kirch, P.V. and M. Sahlins

1992 *Anahulu.* Vol. 1 and 2. University of Chicago Press. Chicago.

Kelly, M.

1971 *Kekaha: 'Aina Malo '0. A Survey of the Background and History of Kaloko and Kukio, North Kona, Hawaii.* Departmental Report Series 71-2. Department of Anthropology, B.P. Bishop Museum, Honolulu.

Macdonald, G., A. Abbott, and F Peterson

1983 *Volcanoes in the Sea. The Geology of Hawaii.* Honolulu: University of Hawaii Press. (2nd edition).

Maly, K.

1992 *An Account of Place Name Histories of Hawai'I as Recorded in – Ka'ao Ho'oniu Pu'uwai No Ka-Miki (The Heart Stirring Story of Ka-Miki).* Translated and prepared for PHRI, Inc., Hilo.

Maly, K. and O. Maly

2002 *He Wahi Mo'olelo No Ka'Āina A Me Nā 'Ohana O Waiki'i Ma Waikōloa (Kalana O Waimea, Kohala), A Me Ka 'Āina Mauna: A Collection of Traditions and Historical Accounts of the Lands and Families of Waiki'i at Waikōloa (Waimea Region, South Kohala), and the Mountain Lands, Island of Hawai'i (TMK Overview Sheet 6-7-01).* Kumu Pono Associates. Hilo.

McEldowney, H.

1979 *Archaeological and Historical Literature Search and Research Design: Lava Flow Control Study, Hilo,* Hawai, Department of Anthropology, Bishop Museum. Prepared for the U.S. Army Engineer District, Pacific Ocean.

McGerty, L., and R. Spear
2000 Addendum to Archaeological Inventory Survey, Kalaoa Manka, North Kona, Island of Hawaii (TMK: 7-3-05:98). Scientific Consultant Services, Inc Project Number 186-3. Prepared for S & R Construction.

Moffat, R.M. and G. L. Fitzpatrick
1995 *Surveying the Māhele*. An Editions Limited Book. Hong Kong.

Moore, J., M. Maigret, and J. Kennedy
1998 Results of an Archaeological Inventory Survey for a Property Located at Ke' ahole Point in Kalaoa 4th Ahupua' a, North Kona District on the Island of Hawaii. Archaeological Consultants of the Pacific, Inc. Prepared for United States Coast Guard, Maintenance & Logistics Command Pacific.

NR
n.d. Native Register of Kuleana Claims Recorded by the Board of Commissioners to Quiet Land Titles in the Hawaiian Islands. Manuscript. Hawaii State Archives.

NT
n.d. Native Testimony Recorded by the Board of Commissioners to Quiet Land Titles in the Hawaiian Islands. Manuscript. Hawaii State Archives.

PHRI (Paul H. Rosendahl, Ph.D., Inc)
2000 Burial Treatment Plan for an Unmarked Native Hawaiian Burial, (SIHP Site 50-10-28-21798) in a Portion of Grant No. 3820, Land of O'oma 1st North Kona District, Island of Hawaii. Prepared by Paul H. Rosendahl, Ph.D., Inc. for Ms. Naomi Laau.

Pukui, M., S. Elbert and E. Mo' okini
1976 *Place Names a fHawaii.* University of Hawaii Press, Honolulu

Roberts, A., and S. Roberts
2000 Archaeological Data Recovery for Sites: 50-10-27-10211,212 and 213, for the Natural Energy Laboratory of Hawaii Authority, Kalaoa 5 Ahupua'a, Ke-ahole Point, North Kona District, Island of Hawaii. Garcia and Associates (GANDA). Prepared for Natural Energy Laboratory of Hawaii Authority.

Rogers-Jourdane, E.
1978 Archaeological Reconnaissance Survey of NELH Proposed Facilities Areas at Keahole Point, North Kona. Dept. of Anthro., B.P. Bishop Museum. Prepared for the Research Corp. of the University of Hawaii.

Rosendahl, M.

1989 Archaeological Inventory Survey, Kohana-iki Resort Water Development Project Area, Land of O'oma 2, District of North Kona, Island of Hawaii. PHRI Report 477.Prepared for M&E Pacific, Inc.

Rosendahl, P.

1973 Archaeological Salvage of the Keahole to Anaehoomalu Section of the Kailua-Kawaihae Road (Queen Kaahumanu Highway), Island of Hawaii. Prepared for Department of Transportation, State of Hawaii.

1980 Intensive Archaeological Survey and Salvage Excavations at the Natural Energy Laboratory Hawaii (NELH) Site, Ke-ahole Point, North Kona, Hawaii Island. PHRI Report 2. Prepared for the Research Corp. of the University of Hawaii.

Rosendahl, P., and P. Kirch

1975 Archaeological Reconnaissance Survey of the Ke-ahole Point Natural Energy Laboratory Site, North Kona, Hawaii Island. Dept. of Anthro. B.P. Bishop Museum. Prepared for R.M. Towill Corp.

Sato, H, W. Ikeda, R. Paeth, R. Smythe, and M. Takehiro

1973 Soil Survey of the Island of Hawaii, United States Department of Agriculture, Soil Conservation Service, In Cooperation with the University of Hawaii Agricultural Experiment Station.

Soehren, L.

1982 Letter Report of an Archaeological and Historical Reconnaissance Survey of TMK: 7-3-05: 13, Kalaoa 4, North Kona, Hawaii. Historic Sites Section (H-282), Division of State Parks, department of Land and Natural Resources, State of Hawaii

1985 Alanui Kauhini, Kalaoa 4, North Kona, Hawaii (TMK: 3-7-3-10:33. Kilo Aina.Prepared for Wes Thomas & Associates, Inc.

Stewart, C.

1970 *Journal of a Residency in the Sandwich Islands, During the Years 1823, 1824, and 1825*. University of Hawai'i Press. Honolulu.

Telea, L., and M. Rosendahl

1987 Archaeological Reconnaissance Survey, Kona Palisades Subdivision Parcel, Land of Kalaoa 4, North Kona, Island of Hawaii (TMK: 3-7-3-05:86). PHRI Report 379. Prepared for Dr. Ernest Sakamoto

Thompson, L. and S. Goodfellow
1992 Archaeological Mitigation Program, Kona Palisades Development Parcel, Phase II Archaeological Data Recovery, Land of Kalaoa 4, North Kona, District, Island of Hawaii (TMK: 3-7-3-05:86). PHRI Report 1094-031792. Prepared for Ken World, Inc.

Waihona' Aina Corporation
2000 The Mahele Database, Waihona.com

Walker, A., and A. Haun
1987 Archaeological Reconnaissance Survey, Kona Palisades Subdivision Parcel, Land of Kalaoa 4, North Kona District, Island of Hawaii (TMK: 3-7-3-05:87). PHRI Report 346. Prepared for Gallup & Van Pemis, Kailua-Kona.

1988 Limited Archaeological Data Recovery, Kona Palisades Subdivision Parcel, Land of Kalaoa 4, North Kona District, Island of Hawaii (TMK: 3-7-3-05:87). PHRI Report 452. Prepared for Gallup & Van Pernis, Kailua-Kona.

Walker, A., and P. Rosendahl
1989 Archaeological Inventory Survey, Pu'uhonua Subdivision Development Parcel, Land of Kalaoa 5, North Kona District, Island of Hawaii (TMK:3-7-3-l0:por 27). PHRI Report 490. Prepared for Haseko (Hawaii), Inc.

1990a Archaeological Inventory Survey, Phase I Site Identification, Ooma 2 Water System Development Project Area (YMK: 7-3-09:5). PHRI Report 802. Prepared for Nansay Hawaii, Inc.

1990b Archaeological Inventory Survey, Kona Palisades Development Parcel, Land of Kalaoa 4th, North Kona District, Island of Hawaii (TMK: 3-7-3-05:86). PHRI Report 806. Prepared for Ken World, Inc.

Walsh, P., and H. Hammatt
1995 An Archaeological Inventory Survey of the New Queen Kaahumanu Highway Right of Way Between Palani Road and Keahole Airport, Within the Ahupua'a of Keahuolu, Kealakehe, Honokohau, Kaloko, Kohanaiki, O'oma 2, Kalaoa-O'oma, and Kalaoa 104, North Kona District, Hawaii Island. Prepared by Cultural Surveys Hawaii for RM. Towill.

Wolfe, E., and J. Morris
2001 Geological Map of the Island of Hawaii. U.S. Department of the Interior. U.S Geological Survey.

APPENDIX B-1.

Cultural Impact Assessment

A CULTURAL IMPACT ASSESSMENT OF A PORTION OF A 3,407.18-ACRE PARCEL LOCATED AT THE KONA INTERNATIONAL AIRPORT IN THE AHUPUA`A OF `O`OMA 1ST, KALALOA 1ST, HAMANAMANA, HALE`OHI`U, MAKAULA, NORTH KONA DISTRICT, ISLAND OF HAWAI`I, HAWAI`I [TMK: (3) 7-3-043:003, 006 THROUGH 035, 037 THROUGH 040 AND 043 THROUGH 047 por.]

Prepared By:
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and
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March 2008

Prepared For:

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Wailuku, HI 96793

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INTRODUCTION

At the request of Munekiyo & Hiraga, Inc., Scientific Consultant Services, Inc. (SCS) conducted a Cultural Impact Assessment, on a portion of a 3,407.18-acre parcel of land (TMK: (3) 7-3-043:003, 006 through 035, 037 through 040, and 043 through 047 por.) located at the Kona International Airport in the Ahupua'a of 'O'oma 1ST, Kalaloa 1ST, Hamanamana, Hale'ohi'u, Maka'ula, North Kona District, Island of Hawai'i (Figures 1 and 2). Documents and exhibits submitted by Munekiyo & Hiraga, Inc., described the proposed development as follows:

1. Interim Commuter Airline Terminal Improvements (CAT)

   The CAT buildings will be located to the south of the existing air passenger terminals. Improvements include construction of two (2) new CAT buildings and gazebo structures for interim Commuter Airlines Terminal. See Figure 3. Related improvements include provision of graded and paved area within driveway, associated site development infrastructure, parking striping, parking lighting and related landscaping. ADA (American With Disabilities Act) compliant passenger walkways, access, exits and parking will also be provided. In addition, modifications to existing airfield fencing and passenger gate access will be carried out in relation to the new interim CAT building improvements.

2. Parking Lot Improvements

   The main parking lot improvements include replacing the existing pavement with 2.5-inch new AC pavement, repaint pavement surface markings, relocating the existing entrance, gate and ticket dispensers, constructing a new entrance lane and building a new gazebo at the new entrance. See Figure 3. The existing landscaping at the main parking lot will be modified to meet the County Code requirements. The improvements at the long-term parking lot include expanding the parking area to the east and south to provide additional parking capacity, repave and restrip expansion area, develop a new entry to the parking lot from the

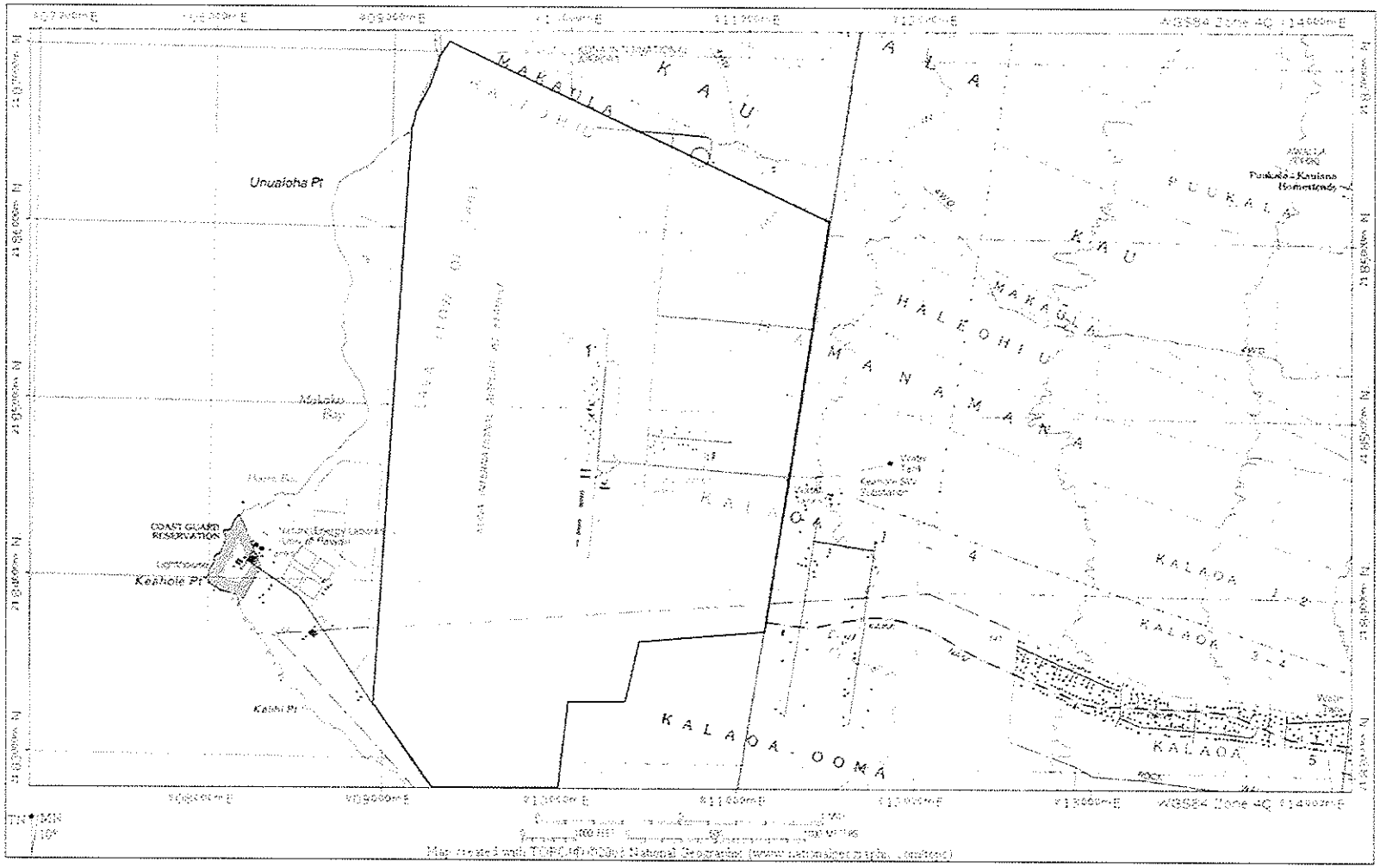


Figure 1: Kona International Airport USGS Quad.

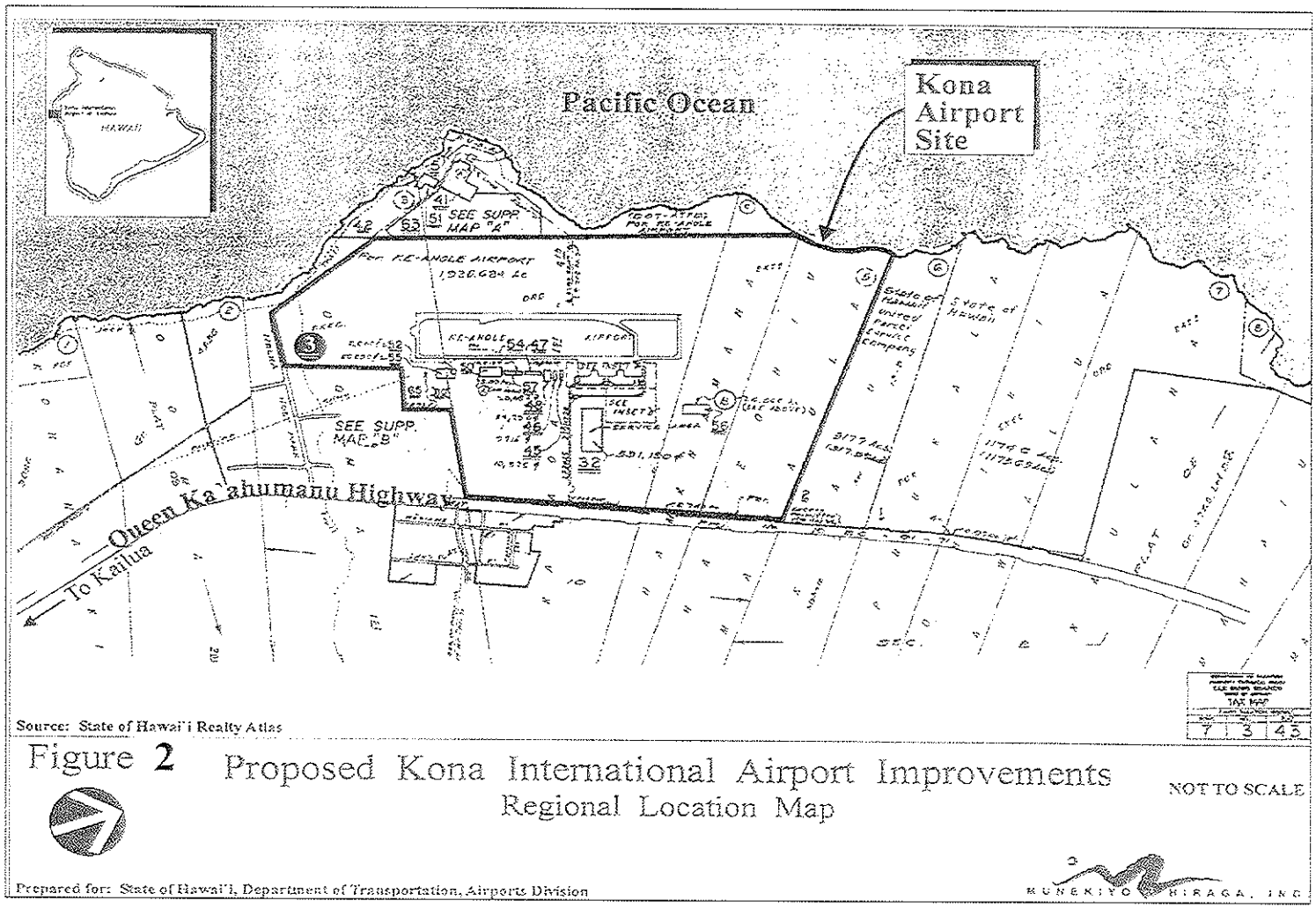


Figure 2: Project Area TMK Map.

existing roadway in the northeast corner and landscaping along the access road and internal airport circulation road to the west. Related improvements include new dry wells for site drainage, landscaping to meet County Code requirements and parking lot lighting and security cameras. The improvements at the over-flow parking lot include expanding the parking area to the north and southwest to provide additional capacity, grade, pave and strip the expansion area, install guardrails as required, landscaping along the access road to meet County Code requirements and install parking lighting and security cameras.

3. Photovoltaic Electrical System Upgrades

The photovoltaic (PV) electrical system upgrades includes the installation of photovoltaic panels at the improved and expanded main, long-term and overflow parking lots and at the tiedown area. Refer to Figure 3. The parking lot PV panels involve construction of trellis structures with the photovoltaic solar panels attached on top of the trellises. The panels will be designed to mechanically track the sun during the day to maximize energy production. In addition to providing renewable energy, the solar panel array will also provide sun shade over the parking lots to protect the vehicles from excessive heat. The shade provided by the solar panels will also extend the life of the asphalt surfaces. The only areas within the parking lot that will not be covered with the solar panels will be the dedicated fire lanes along the main entry points and within the parking lots. Power generated by the system will be fed into the airport electrical grid via a connection at the main Hawaii Electric Company meter.

4. Related Infrastructure and Landscaping Improvements

Related infrastructure improvements including, but not limited to extension of water, sewer and drainage facilities, and electrical and telephone/telecommunication services will be carried out as required. All improvements will be landscaped as required to meet County Code specifications.

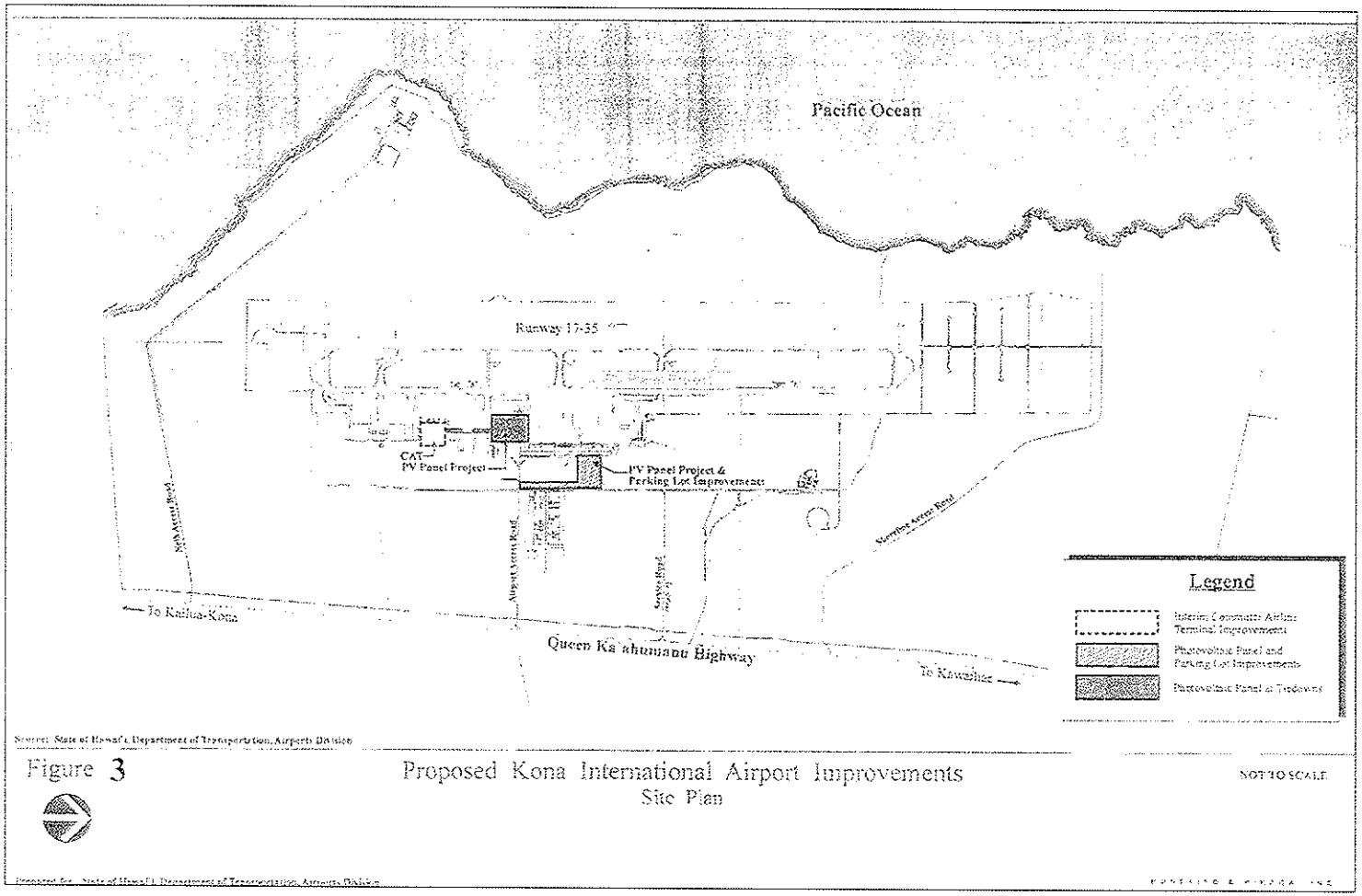


Figure 3: Map of Proposes Improvements At Kona Internatinal Airport.

The Constitution of the State of Hawai`i clearly states the duty of the State and its agencies is to preserve, protect, and prevent interference with the traditional and customary rights of native Hawaiians. Article XII, Section 7 requires the State to "protect all rights, customarily and traditionally exercised for subsistence, cultural and religious purposes and possessed by *ahupua`a* tenants who are descendants of native Hawaiians who inhabited the Hawaiian Islands prior to 1778" (2000). In spite of the establishment of the foreign concept of private ownership and western-style government, Kamehameha III (Kauikeaouli) preserved the peoples traditional right to subsistence. As a result in 1850, the Hawaiian Government confirmed the traditional access rights to native Hawaiian *ahupua`a* tenants to gather specific natural resources for customary uses from undeveloped private property and waterways under the Hawaiian Revised Statutes (HRS) 7-1. In 1992, the State of Hawai`i Supreme Court, reaffirmed HRS 7-1 and expanded it to include, "native Hawaiian rights...may extend beyond the *ahupua`a* in which a native Hawaiian resides where such rights have been customarily and traditionally exercised in this manner" (Pele Defense Fund v. Paty, 73 Haw.578, 1992).

Act 50, enacted by the Legislature of the State of Hawaii (2000) with House Bill 2895, relating to Environmental Impact Statements, proposes that:

> ...there is a need to clarify that the preparation of environmental assessments or environmental impact statements should identify and address effects on Hawaii's culture, and traditional and customary rights... [H.B. NO. 2895].

Act 50 requires state agencies and other developers to assess the effects of proposed land use or shore line developments on the "cultural practices of the community and State" as part of the HRS Chapter 343 environmental review process (2001). Its purpose has broadened, "to promote and protect cultural beliefs, practices and resources of native Hawaiians [and] other ethnic groups, and it also amends the definition of 'significant effect' to be re-defined as "the sum of effects on the quality of the environment including actions that are...contrary to the State's environmental policies...or adversely affect the economic welfare, social welfare, or cultural practices of the community and State" (H.B. 2895, Act 50, 2000).

Thus, Act 50 requires an assessment of cultural practices to be included in the Environmental Assessments and the Environmental Impact Statements, and to be taken into consideration during the planning process. The concept of geographical expansion is

recognized by using, as an example, "the broad geographical area, e.g. district or *ahupua'a*" (OEQC 1997). It was decided that the process should identify 'anthropological' cultural practices, rather than 'social' cultural practices. For example, *limu* (edible seaweed) gathering would be considered an anthropological cultural practice, while a modern-day marathon would be considered a social cultural practice.

> According to the Guidelines for Assessing Cultural Impacts established by the Hawaii State Office of Environmental Quality Control (OEQC 1997): The types of cultural practices and beliefs subject to assessment may include subsistence, commercial, residential, agricultural, access-related, recreational, and religions and spiritual customs. The types of cultural resources subject to assessment may include traditional cultural properties or other types of historic sites, both manmade and natural, which support such cultural beliefs.

This Cultural Impact Assessment involves evaluating the probability of impacts on identified cultural resources, including values, rights, beliefs, objects, records, properties, and stories occurring within the project area and its vicinity cultural values and rights within the project area and its vicinity (H.B. 2895, Act 50, 2000).

METHODOLOGY

This Cultural Impact Assessment was prepared in accordance with the methodology and content protocol provided in the Guidelines for Assessing Cultural Impacts (OEQC 1997). In outlining the "Cultural Impact Assessment Methodology", the OEQC state: ...information may be obtained through scoping, community meetings, ethnographic interviews and oral histories... (1997).

The report contains archival and documentary research, as well as communication with organizations having knowledge of the project area, its cultural resources, and its practices and beliefs. This Cultural Impact Assessment was prepared in accordance with the methodology and content protocol provided in the Guidelines for Assessing Cultural Impacts (OEQC 1997). The assessment concerning cultural impacts should address, but not be limited to, the following matters:

(1) a discussion of the methods applied and results of consultation with individuals and

organizations identified by the preparer as being familiar with cultural practices and features associated with the project area, including any constraints of limitations with might have affected the quality of the information obtained;

(2) a description of methods adopted by the preparer to identify, locate, and select the persons interviewed, including a discussion of the level of effort undertaken;

(3) ethnographic and oral history interview procedures, including the circumstances under which the interviews were conducted, and any constraints or limitations which might have affected the quality of the information obtained;

(4) biographical information concerning the individuals and organizations consulted, their particular expertise, and their historical and genealogical relationship to the project area, as well as information concerning the persons submitting information or interviewed, their particular knowledge and cultural expertise, if any, and their historical and genealogical relationship to the project area;

(5) a discussion concerning historical and cultural source materials consulted, the institutions and repositories searched, and the level of effort undertaken, as well as the particular perspective of the authors, if appropriate, any opposing views, and any other relevant constraints, limitations or biases;

(6) a discussion concerning the cultural resources, practices and beliefs identified, and for the resources and practices, their location within the broad geographical area in which the proposed action is located, as well as their direct or indirect significance or connection to the project site;

(7) a discussion concerning the nature of the cultural practices and beliefs, and the significance of the cultural resources within the project area, affected directly or indirectly by the proposed project;

(8) an explanation of confidential information that has been withheld from public disclosure in the assessment;

(9) a discussion concerning any conflicting information in regard to identified cultural resources, practices and beliefs;

(10) an analysis of the potential effect of any proposed physical alteration on cultural resources, practices or beliefs; the potential of the proposed action to isolate cultural resources, practices or beliefs from their setting; and the potential of the proposed action to introduce elements which may alter the setting in which cultural practices take place, and;

(11) the inclusion of bibliography of references, and attached records of interviews, which were allowed to be disclosed.

Based on the inclusion of the above information, assessments of the potential effects on cultural resources in the project area and recommendations for mitigation of

these effects can be proposed.

ARCHIVAL RESEARCH

Archival research focused on a historical documentary study involving both published and unpublished sources. These included legendary accounts of native and early foreign writers; early historical journals and narratives; historic maps and land records such as Land Commission Awards, Royal Patent Grants, and Boundary Commission records; historic accounts, and previous archaeological project reports.

INTERVIEW METHODOLOGY

Interviews are conducted in accordance with Federal and State laws and guidelines. Individuals and/or groups who have knowledge of traditional practices and beliefs associated with a project area or who know of historical properties within a project area are sought for consultation. Individuals who have particular knowledge of traditions passed down from preceding generations and a personal familiarity with the project area are invited to share their relevant information. Often people are recommended for their expertise, and indeed, organizations, such as Hawaiian Civic Clubs, the Island Branch of Office of Hawaiian Affairs, historical societies, Island Trail clubs, and Planning Commissions are depended upon for their recommendations of suitable informants. These groups are invited to contribute their input, and suggest further avenues of inquiry, as well as specific individuals to interview.

If knowledgeable individuals are identified, personal interviews are sometimes taped and
then transcribed. These draft transcripts are returned to each of the participants for their review and comments. After corrections are made, each individual signs a release form, making the information available for this study. When telephone interviews occur, a summary of the
information is often sent for correction and approval, or dictated by the informant and then incorporated into the document. Key topics discussed with the interviewees vary from project to
project, but usually include: personal association to the *ahupua'a*, land use in the project's vicinity; knowledge of traditional trails, gathering areas, water sources, religious sites; place names and their meanings; stories that were handed down concerning special places or events in the vicinity of the project area; evidence of

previous activities identified while in the project vicinity.

In this case, letters briefly outlining the development plans along with maps of the project area were sent to individuals and organizations whose jurisdiction includes knowledge of the area with an invitation for consultation. Consultation was sought from Kai Markell, the Director of Native Rights, Land and Culture, Office of Hawaiian Affairs on O'ahu; Ruby McDonald, Coordinator of the Hawai'i branch of the Office of Hawaiian Affairs; the Kuakini Civic Club; and the Kona Hawaiian Civic Club. If cultural resources are identified based on the information received from these organizations and/or additional informants, an assessment of the potential effects on the identified cultural resources in the project area and recommendations for mitigation of these effects can be proposed.

PROJECT AREA AND VICINITY

The project area is located at the Kona International Airport in the Ahupua`a of 'O'oma 1ST, Kalaloa 1ST, Hamanamana, Hale'ohi'u, Maka'ula, North Kona District, Island of Hawai'i and consists of four previously disturbed areas to be improved and developed (see Figure 2). The project areas for the proposed improvements/developments consist of previously disturbed areas, including gravel lots, paved lots, bulldozed *pāhoehoe*, and barren *pāhoehoe* with sparse fountain grass.

CULTURAL HISTORICAL CONTEXT

EARLY SETTLEMENT AND EXPANSION

Archaeological evidence suggests Hawai'i was first settled between A.D. 0 and 700 by people sailing from the Marquesas (Cordy 2000). Early settlements on the Island of Hawai'i were founded on the windward shores in likely places such as Waipi'o, Waimanu, and Hilo Bay. The windward, or *ko 'olau* shores receive abundant rainfall and have numerous streams that facilitated agricultural and fishpond production (Maly and Maly 2002). The windward shores also provide rich benthic and pelagic marine resources.

Historical accounts of residential patterns, land-use, and subsistence horticulture are believed to be indicative of traditional practices developed long before contact with Europeans (McEldowney 1979). Early accounts of settlements along the windward shores describe the area as divided into several distinct environmental regions (Ellis

1963: 291-292). At Hilo Bay, from the coast to a distance of five or six miles scattered subsistence agriculture was evident, followed by a region of tall fern and bracken, flanked at higher elevations by a forest region between 10 and 20 miles wide, beyond which was an expanse of grass and lava (Ellis 1963:403).

The American Missionary C.S. Stewart wrote, "the first four miles of the country is open and uneven, and beautifully sprinkled with clumps, groves, and single trees of the bread-fruit, pandanus, and candle tree" (Stewart 1970:361-363). The majority of inhabitants (in 1825) lived within this coastal region (Ellis1969: 253). Taro, plantains, bananas, coconuts, sweet potatoes, and breadfruit were grown individually or in small garden plots. Fish, pig, dog, and birds were also raised and captured for consumption. Wood, such as *ʻōhiʻa* and *koa* for house construction, canoe building, and fires was obtained from the upland agricultural zone (McEldowney 1979:18-19), and from the dense forests above (Ellis 1963:236). Wood products and bird feathers were obtained from upland regions.

The dry leeward shores of Hawaiʻi Island presented a very different environment requiring a modified set of subsistence strategies. Archaeologists and historians are uncertain about the motives that lead to the establishment and spread of settlements on the leeward side of Hawaiʻi, but archaeological evidence suggests the process was underway between the A.D. 900s and 1100s (Cordy 2000). Coastal sites in Kona-

Kailua, South Kohala District, *makai* of Waikōloa, at Kalāhuipuaʻa and ʻAnaehoʻomalu and inland sites in the *ahupuaʻa* of Waimea have been dated to the A.D. 800s to 900s (Kirch 1979: 198, Cordy 2000: 130).

The early coastal settlements are located on or adjacent to the dry rocky shoreline and consist of temporary habitation caves containing midden, fishing tools, and fish remains; and two possibly permanent habitation sites (Barrera 1971, Jenson 1989a, 1989b, 1990a, and 1990b). The earlier phases of occupation were likely temporary habitations used when fishing, and later permanent habitations associated with fishpond production. Cordy suggests people who lived at inland Waimea occasionally frequented the Kalāhuipuaʻa and ʻAnaehoʻomalu area for its anchialine pond and marine resources

(Cordy 2000:131). The implication is that, along the barren leeward coast, inland settlements and agriculture may have developed first, perhaps spreading from nearby Waimanu and Waipi'o. Maly suggests that people living permanently along the dry shoreline shared extended family relations with people inland, allowing for an exchange system that distributed marine resources to inland agriculturalists and brought inland agricultural products to people at the coastal settlements (Maly and Maly 2002).

The fertile plain of Waimea and the area of Kailu-Kona receive roughly 40 to 80 inches of rainfall annually and Waimea is watered by streams from the Kohala Mountains (the Waikōloa, Wai'aka, and Keanu'i'omanō streams). Inhabitants of these areas planted taro and sweet potato for subsistence. Sweet potato was the dominant crop at elevations that received from 30 to 60 inches (Cordy 2000: 135). Leeward expansion away from the coastline, at least on a permanent basis, is believed to have occurred only with the development or improvement of dry-land cultivation methods, possibly spurred by the introduction of sweet potato. Current evidence suggests that significant inland leeward settlement did not occur until 600 to 900 years after initial settlement, *i.e.*, between AD 1100 and 1400 (Green 1980; Hommon 1976; Cordy 2000). At lower elevations in North Kona and South Kohala Districts, especially along the coast, rainfall is less than thirty inches and soils are shallow or nonexistent. It is possible that mulching with rocks or cut plant materials allowed for a limited amount of root crop and arboreal agriculture in pockets of sandy soil.

In South Kona, Waimea, and Kohala, new settlements and agricultural field systems continued to spread and intensify during the A.D. 1200s to 1400s. Permanent communities were developing at Kona, Lapakahi, and along the coastal region from 'Upolu Point to Kawaihae (Cordy 2000: 140). Temporary residences and an agricultural field system were also established in the mid-elevations of Kona-Kailua and the uplands of the Waikōloa-Waimea area (Moffat and Fitzpatrick 1995, Maly and Maly 2002: 4). As communities grew and agriculture intensified during this period, polities began to form, along with competition between polities. Large polities influencing communities within modern district-size boundaries emerged in the 1300s (Cordy 2000: 142). Cordy notes that just north of the project area "two different settlement and political zones seem

to have developed prior to the 1200s and to have lasted until late in prehistory—one focused on Waimea and Kawaihae in the south, and the other in north Kohala up to 'Upolu Point" (Cordy 2000:385, footnote 15). Kona-Kailua also became an important political center south of the current project area.

By the late 1700s extensive permanent field systems were well established in the Kona-Kailua area, North Kohala, Waimea, and Lālāmilo (Clark 1981, Clark and Kirch 1983, Cordy 2000). Lands of the current project area remained barren and unoccupied except for small fishing villages located at some distance along the coast.

TRADITIONAL SETTLEMENT PATTERNS

The Hawaiian economy was based on agricultural production and marine exploitation, as well as raising livestock and collecting wild plants and birds. Extended household groups settled in various *ahupua`a*. During pre-Contact times, there were primarily two types of agriculture, wetland and dry land, both of which were dependent upon geography and physiography. River valleys provided ideal conditions for wetland *kalo* (*Colocasia esculenta*) agriculture that incorporated pond fields and irrigation canals. Other cultigens, such as *kō* (sugar cane, *Saccharum officinaruma*) and *mai`a* (banana, *Musa* sp.), were also grown and, where appropriate, such crops as *`uala* (sweet potato, *Ipomoea batatas*) were produced. This was the typical agricultural pattern seen during traditional times on all the Hawaiian Islands (Kirch and Sahlins 1992, Vol. 1:5, 119; Kirch 1985). Between A.D. 600-1100, sometimes referred to as the Developmental Period, the major focus of permanent settlement continued to be the fertile and well-watered windward valleys.

Current archaeological, linguistic, and ethnological data suggest that Hawaiian social organization initially followed a Polynesian conical clan-pattern in which individual status was based upon genealogical ranking (Green 1980:72). Kinship formed the basis for regional and island-wide societal integration; however, the most important social subsistence unit was the localized, territorial community-based, corporate kin group. Leadership within this group fell to the "highest ranking individual of the locally dominant, socially ranked lineage" (*ibid*:73). This individual acted as the local chief, overseeing the social, political, and economic functioning of the community.

The subsequent development of a uniquely Hawaiian institution, the *ahupua`a*, resulted in a more complex level of social and political integration (Cordy 1978; Hommon 1976; Green 1980; Kirch 1985). The *ahupua`a* was the fundamental land division in late pre-contact Hawai`i. Ideally this land extended from the coast to the mountains--often corresponding with a valley drainage--and thus theoretically crosscut all primary resource zones, allowing each *ahupua`a* relative economic self-sufficiency. With the emergence of the *ahupua`a*, however, production shifted from the kinship-based relationship between chief and community to an incipient state-structured hierarchy. On his succession, the paramount chief chose the best lands for himself, and allocated the rest to his...

> warrior chiefs who had assisted in his conquests...[who], after retaining...land for themselves, reallotted the remaining lands to the inferior chiefs, who in turn reallotted portions of their lands to their own followers [and so on] down the scale to the lowest tenants, the common farmers who actually tilled the soil [Chinen 1961:7].

The chief (*konohiki*) responsible for the *ahupua`a* was now a member of a non-localized ruling elite (*ali`i*) and extracted rents or tribute from the common people (*maka`ainana)* working the land. "All of these allotments to lands, from warrior chiefs down to the commoners, were on a revocable basis," and Chinen wryly notes that, "what the superior gave, he was able to take away at pleasure" (*ibid*).

WAHI PANA (LEGENDARY PLACES)

The most informative *mo`olelo* describing events that took place in the barren lands of North Kona District is The Heart Stirring Story of Ka-Miki (*Ka`ao Ho`oniua Pu`uwai no Ka-Maiki*) recorded and published between 1914 and 1917 in the weekly Hawaiian Newspaper *Ko Hōkū o Hawai`i* and translated by Maly (excerpts cited in Maly 1992). The *mo`olelo* is set in the 1300s, though it is an early 20th Century collection of narratives about local traditions, tales, and family histories. The tales do have some time depth as they have been handed down through generations. They contain a mixture of "ancient" and 20th Century descriptions of the areas through which Ka-Miki and his brother Maka-`iole traveled. Descriptions of tthree places directly related to the current project area, Hale`ohi`u, Kalaoa, and `O`oma, are described in the story.

Hale-ʻohiʻu is translated as "house made with a thatching shuttle". Kalua'ōlapa was the priest of Hale'ohi'u and Kamāhoe, also referred to as Nā-Kalaoa-wai'ole, translated as "the waterless Kalaoa lands" (Maly 1992:220). Kalua'ōlapa dwelt along the *'ilima (Sidafallax)* covered upland plain of Māulukua. Ka'elehuluhulu is the name of the land, Hale'ohi'u is the sub-district, Kanāhāhā is the fishing ground, and Keawehala is the landing (ibid: 220). ʻOʻoma is also only mentioned for its famous fishermen (ibid: 386).

EARLY ACCOUNTS OF PREHISTORIC EVENTS IN NORTH KONA

There is a paucity of prehistoric information pertaining to the lands of the project area and surrounding lands. Cordy notes that the "oral traditions are silent" for the years of early settlement of and expansion along the leeward shores of Hawaiʻi (Cordy 2000: 130). The little information that does exist concerns the activities of *aliʻi* and was collected and published by Fornander, Iʻi, and Kamakau.

Haleʻohiʻu is the only area within the project area to be mentioned in these early accounts. Haleʻohiʻu was a well-known fishing village at the time of ʻUmi-a-liloa (Kamakau 1992:216) and is a well-known place to catch "sweet-tasting *aku* fish" up through the time of Kamehameha (*ibid*:185). During the fourth year of Kamehameha's reign, he was advised by a *kaula* (a seer devoted to Pele) to go to Kekaha to make sacrifices to Pele in order to stop the lava flow threatening his fishponds and the homes of the people in the area. The lava had already flowed through the adjacent lands of Mahaiʻula, Kaʻūpūlehu, and Kīholo. It was believed that Pele desired *awa* from the fishponds of Kaʻūpūlehu, the *'ahi* of Kīholo, and the *aku* from Haleʻohiʻu and Kaʻelehuluhulu. The flow stopped soon after Kamehameha made sacrifices to Pele.

Descriptions of lands both north and south of the project area are brief. ʻŌhiki is a stretch of sand and Kaloko has a large walled fishpond (*ibid*:56). ʻOʻoma is also mentioned by Kamamkau, but only as an out of way place, where the prince Keaweaweʻula was raised until he was five years old. (*ibid*:264).

HISTORIC ERA LAND USE

William Ellis described two trips he made between Kawaihae and Kailua. He traveled by boat during the first trip and only remarked on the coast to say it was "a rugged and barren shore of lava" (Ellis 2004:83). During his second trip, Ellis traveled by canoe from Kawaihae to Kailua. He left the former at six in the morning, stopped at Kapalaoa around 9:00am, and arrived in Kīholo around 4:00pm. He described Kīholo as "a straggling village, inhabited principally by fishermen" (Ellis 2004:418). He also

described the large fishpond created by order of Kamehameha at that village. He left Kīholo just before sunset and arrived at Ka'ūpūlehu between 7:00 and 8:00pm. He records little about the village except that everyone was asleep. When the moon had risen, by 11:00pm, he continued his journey by moonlight, arriving in Kailua an hour before sunrise. In all Ellis makes little description of the coastal area of North Kona Disctrict, perhaps because he was traveling at night.

Isabella Bird, who traveled from Kailua to Kawaihae some fifty years later described the coastal region by writing, "We sailed for some hours along a lava coast, streamless, rainless, verdureless, blazing under the fierce light of a tropical sun and some time after noon anchored in the scorching bay of Kawaihae" (Bird 2007:144).

There were no Land Commission awards granted in the project area or surrounding lands. The area of the project area remained unusable for homesteading, ranching, or farming during the Contact and Historic eras. The only known cultural resources within the Kona International Airport facilities are a pre-Contact era cave habitation site (carbon-dated between A.D.1430-1650), a pre-Contact era temporary habitation feature with several low, circular stone alignments, a short segment of the Mamalahoa trail, and an area with several petroglyphs (Dye and Prasad 2000) (Figure 4). Both habitation areas have been fully documented and are not significant for inclusion on the National Register of Historic Places (NRHP). The Mamalahoa trail segment and the petroglyphs are significant for inclusion for the NRHP. The Mamalahoa trail segment is located in a restricted (fenced-off) area between Alpha and Delta runways, and the collection of petroglyphs is protected by a three foot high rock wall constructed around them. None of the sites are within or in close proximity to the four areas of proposed improvements detailed in this report.

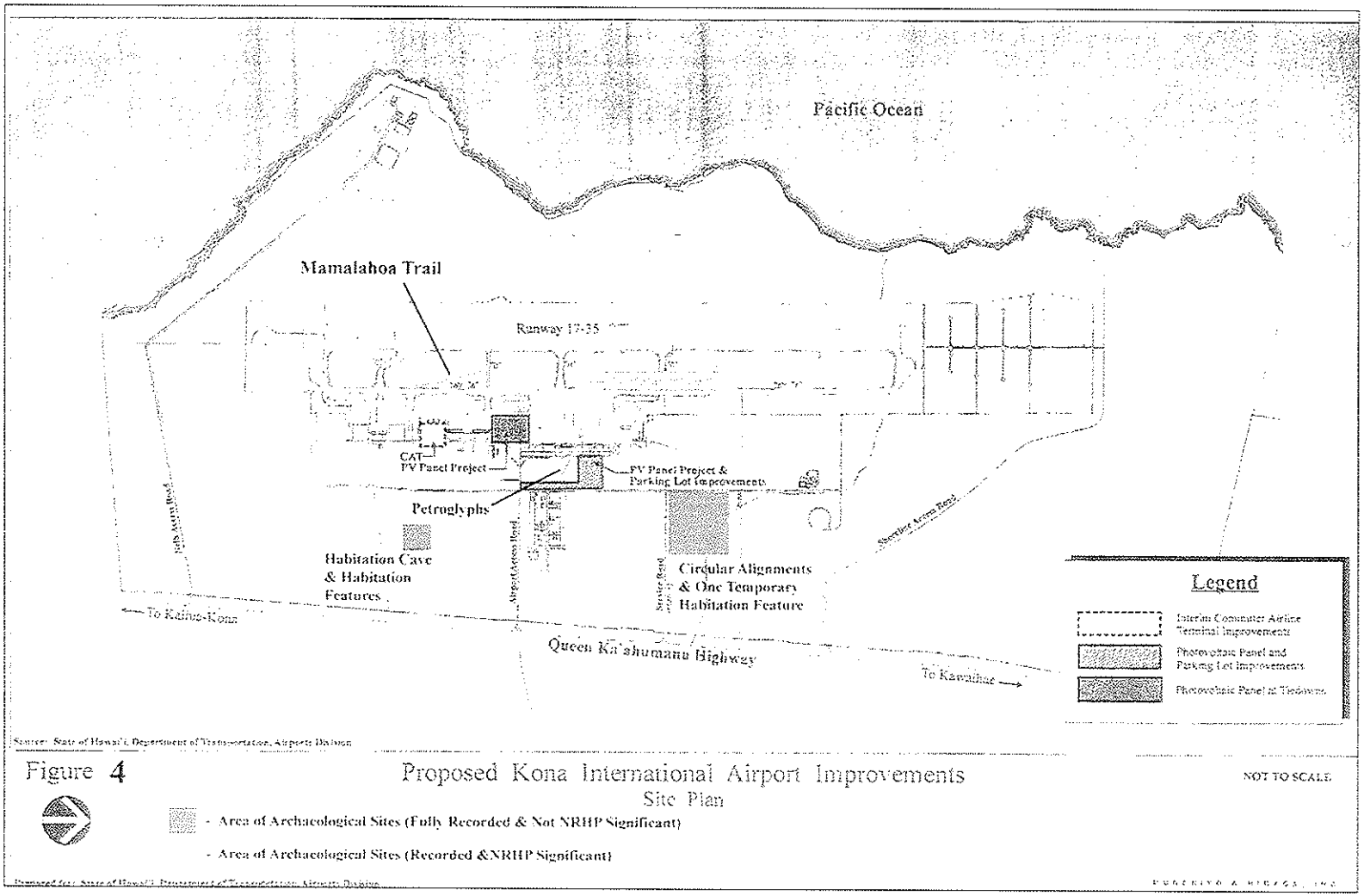


Figure 4: Map of Proposed Improvements and Archaeological Sites.

MODERN LAND USE

The lands of the current project area had limited use from settlement of the leeward side of the Island of Hawai'i until the construction of the Kona International Airport in 1969 and 1970. Land use was restricted to small coastal settlements focused on fishing, and trail systems situated between these coastal villages and larger, socio-politically important populations centered in Kawaihae to the north and Kailua-Kona to the south. The Mamalaho trail and associated features (*ahu* and two habitation sites) are the only cultural resources located on the current project area. None of them is near, or will be impacted by, the proposed improvements documented in this report.

Modern use of the lands associated with the airport facility and the Natural Energy Laboratories Hawaii (NELH) continues to be primarily focused on fishing, and coastal access and activities. A study conducted to address Public Access Shoreline Hawaii (PASH) Rights (Dye and Prasad 2000:23-30) concluded that the primary use and concern for continued use of the area were:

1. Limited access to shoreline within the vicinity of existing airport properties;
2. Compromising of archaeological and historical sites;
3. Access to prime fishing grounds;
4. Loss of native (traditional) plants'
5. Observation of traditional boundaries (need to treat an *ahupua'a* as one unit);
6. Impacts to aquifers and seabeds; and
7. Boundaries compromised and/or seen as inseparable from NELH.

Eight long-time Kona residents with specific knowledge of the lands of the Kona International Airport were interviewed (December 1999 to February 2000) for the PASH study. Concerns were that, while the airport did not appreciably limit vehicle access to camping and fishing areas, the construction of the NELH facility did (Dye and Prasad 2000:25, 26-17). Moreover, those interviewed voiced concern that the NELH operations might have resulted in a reduction in the area fish supply. There was a sense that pollutants from the airport and the NELH could degrade the local aquifers and seabeds. Cultural informants also voiced concern over the possible alteration of ancestral burials, archaeological sites, and native plant habitat.

SUMMARY

The "level of effort undertaken" to identify potential effect by a project to cultural

resources, places or beliefs (OEQC 1997) has not been officially defined and is left up to the investigator. A good faith effort can mean contacting agencies by letter, interviewing people who may be affected by the project or who know its history, research identifying sensitive areas and previous land use, holding meetings in which the public is invited to testify, notifying the community through the media, and other appropriate strategies based on the type of project being proposed and its impact potential. Sending inquiring letters to organizations concerning development of a piece of property that has already been totally impacted by previous activity and is located in an already developed industrial area may be a "good faith effort". However, when many factors need to be considered, such as in coastal or mountain development, a good faith effort might mean an entirely different level of research activity.

In the case of the present parcel, letters of inquiry were sent to organizations whose expertise would include the project area. Consultation was sought from Kai Markell, the Director of Native Rights, Land and Culture, Office of Hawaiian Affairs on O`ahu; Ruby McDonald, Coordinator of the Hawai'i branch of the Office of Hawaiian Affairs; the Kuakini Civic Club; and the Kona Hawaiian Civic Club.

Historical and cultural source materials were extensively used and can be found listed in the References Cited portion of the report. Such scholars as I`i, Kamakau, Beckwith, Chinen, Kame`eleihiwa, Fornander, Kuykendall, Kelly, Handy and Handy, Puku`i and Elbert, Thrum, Sterling, and Cordy have contributed, and continue to contribute to our knowledge and understanding of Hawai`i, past and present. The works of these and other authors were consulted and incorporated in the report where appropriate. Land use document research was supplied by the Waihona `Aina 2007 Data base.

CIA INQUIRY RESPONSE

As suggested in the "Guidelines for Accessing Cultural Impacts" (OEQC 1997), CIAs incorporating personal interviews should include ethnographic and oral history interview procedures, circumstances attending the interviews, as well as the results of this consultation. It is also permissible to include organizations with individuals familiar with cultural practices and features associated with the project area.

As stated above, consultation was sought from the Director of Native Rights, Land and Culture, Office of Hawaiian Affairs on O`ahu; the Hawai'i branch of the

Office of Hawaiian Affairs; the Kuakini Civic Club; and the Kona Hawaiian Civic Club. Except for OHA acknowledging the receipt of our letter, none of the organizations responded with information concerning the potential for cultural resources to occur in the project area, or with additional suggestions for further contacts.

Analysis of the potential effect of the project on cultural resources, practices or beliefs, its potential to isolate cultural resources, practices or beliefs from their setting, and the potential of the project to introduce elements which may alter the setting in which cultural practices take place is a requirement of the OEQC (No. 10, 1997). To our knowledge, the project area has not been used for traditional cultural purposes within recent times. Based on historical research and no response from the above listed contacts, it is reasonable to conclude that Hawaiian rights related to gathering, access or other customary activities within the project area will not be affected and there will be no direct adverse effect upon cultural practices or beliefs. The visual impact of the project from surrounding vantage points, e.g. the highway, mountains, and coast would appear to be minimal.

CULTURAL ASSESSMEMNT

Based on organizational response as well as archival research, it is reasonable to conclude that, pursuant to Act 50, the exercise of native Hawaiian rights, or any ethnic group, related to gathering, access or other customary activities will not be affected by development activities on a Parcel 16. Because there were no cultural activities identified within the project area, there are no adverse effects.

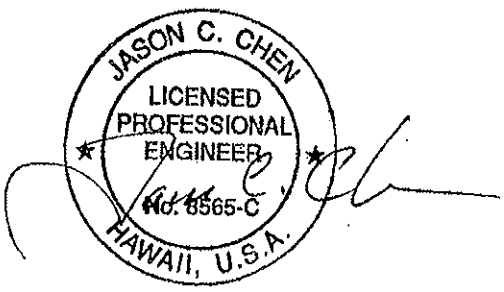
APPENDIX C.

Engineering Design Report

ENGINEERING DESIGN REPORT

Water and Wastewater Systems
for
Interim CAT Terminal Project
Kona International Airport

Prepared by



JC Engineering, LLC

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Engineering Design Report

Specification Sections

Figures

1.0 PORTABLE WATER SUPPLY

1.1 Existing Condition

Portable water supplied to the General Aviation and lease parcel areas is through existing 8-inch and 12-inch water mains installed along the existing service roads. The proposed Interim CAT Terminal site is located at where an 8-inch (ductile-iron, DI, pipe) water main area. The average gage water pressure for the existing 8-inch main is 105 pounds per square inch (psi) for static pressure, and 95 psi for residual pressure tested at fire hydrants.

1.2 Water Demand for Proposed New Terminals

The fixture unit (FU) for the proposed new terminals is as follows:

Fixture	Quantity	FU/Unit	Total FU
Water Closet	6	6.00	36.00
Urinal	2	5.00	10.00
Lavatory	4	0.50	2.00
Mop Sink	2	1.00	2.00
Drinking Fountain	6	0.25	1.50
Hose Bibb	4	1.00	4.00
Total			**55.50**

With a flush valve system and 55.50 FU, the peak flow rate is approximately 56 gallons per minute (gpm), use a total of 60 gpm or 30 gpm for each terminal to determine the supply piping.

1.3 Determine Pipe Size

To minimize the head loss and suspended solid deposit, the pipe flow velocity should be

To minimize the head loss and suspended solid deposit, the pipe flow velocity should be maintain at a range from 3.00 to 7.50 feet per second (fps). Assuming a 2-inch soft copper pipe is used, the flow velocity will be,

For Lateral Line:

$$A = \pi D^2/4$$
$$= 3.1416 \times (2/12)^2/4$$
$$= 0.0218 \text{ sf}$$

$$Q = 60 \text{ gpm}$$
$$= 0.1337 \text{ cfs}$$

$$V = Q/A$$
$$= 6.13 \text{ fps}$$

For Branch Line:

$$A = \pi D^2/4$$
$$= 3.1416 \times (2/12)^2/4$$
$$= 0.0218 \text{ sf}$$

$$Q = 30 \text{ gpm}$$
$$= 0.0668 \text{ cfs}$$

$$V = Q/A$$
$$= 3.07 \text{ fps}$$

Flow velocity for 2-inch soft copper pipe is acceptable.

1.4 Estimate Total Head Losses

The configuration of proposed new water lateral and branch line is shown on **Figure 1** and criteria to estimate head losses are as follows:

- The existing 8-inch pipe elevation is approximately 56.00 feet MSL (top of pavement is approximately 58.50 feet MSL).
- The proposed finished grade elevation in Terminal 2 is 56.35 feet.
- The length of lateral line is approximately 170 linear feet.
- The longest branch line is approximately 90 linear feet.
- A 2-inch meter with valves is to be installed.
- A 2-inch gate valve is to be installed.
- I 45-degree elbow is to be installed in the lateral line.
- 2 90-degree elbows are to be installed.
- Flow velocity, $V_1 = 6.13$ fps for the lateral line.
- Flow velocity, $V_2 = 3.07$ fps for the longest branch line.

Static Head (H_s):

Lateral Line Elevation = 56.00 ft

Discharge Elevation in Terminal 2 = 56.35 + 4.00 = 60.35 ft

$$H_s = 60.35 \text{ ft} - 56.00 \text{ ft}$$
$$= \underline{4.35 \text{ ft}}$$

Pipe Friction Head Loss (H_f):

- Lateral Line

  Reynolds Number, $R_e = (DV/\nu) = (0.1667 \times 6.13/0.0000107639) = 0.95 \times 10^5$

  Relative Roughness, $\varepsilon/D = 0.000005/0.1667 = 0.00003$

  Resistance Coefficient, $f = 0.0180$ (read from Moody Graph base on above data)

  $H_f = f \times (L / D) \times (V^2 / 2g)$
  $= 0.0180 \times (170 / 0.1667) \times (6.13^2 / 64.4)$
  $= 0.0180 \times 1{,}019.7960 \times 0.5835$
  $= \underline{10.71 \text{ ft}}$

- Branch Line

  Resistance Coefficient, $f = 0.0180$, same as lateral line

  $H_f = f \times (L / D) \times (V^2 / 2g)$
  $= 0.0180 \times (90 / 0.1667) \times (3.07^2 / 64.4)$
  $= 0.0180 \times 539.8920 \times 0.1463$
  $= \underline{1.42 \text{ ft}}$

Other Head Losses (H_L):

Pipe Entrance Loss, K = 1.0

$H_E = K \times (V^2 / 2g)$
$= 1.0 \times (6.13^2 / 64.4)$
$= \underline{0.58 \text{ ft}}$

Water meter, K = 35

$H_M = K \times (V^2 / 2g)$
$= 35 \times (6.13^2 / 64.4)$
$= \underline{20.42 \text{ ft}}$

45° Bent = 1 ea

$H_B = K \times (V^2 / 2g)$
$= 1 \times 0.10 \times (6.13^2 / 64.4)$
$= \underline{0.06 \text{ ft}}$

Gate Valve = 1 ea

$H_{GV} = 1 \times 0.14 \times (6.13^2 / 64.4)$
$= \underline{0.08 \text{ ft}}$

90° Bent = 4 ea

$$H_B = K \times (V^2 / 2g)$$
$$= 4 \times 0.51 \times (3.07^2 / 64.4)$$
$$= \underline{0.30 \text{ ft}}$$

Total Head Loss = 0.58 + 4.35 + 10.71 + 1.42 + 20.42 + 0.06 + 0.08 + 0.30
= 37.92 feet
= 16.43 psi

Therefore, the discharge in the terminal is approximately 95.00 – 16.43 -14.70 = 63.87 psi. The discharge pressure is higher than normal discharge pressure, 25 psi or less, the pressure may require to be reduced at regulator valve inside the water meter. The adjustment can be done when the system pressure test is completed.

2.0 WASTEWATER SYSTEM

2.1 Existing Condition

Kona International Airport owns/operates a private wastewater treatment plant to handle the entire domestic wastewater generated within the airport boundaries and wastewater generated from aircrafts. The maximum capacity of the treatment plant is 1.30 million gallons per day (MGD) and current daily average treatment capacity is 0.30 MGD.

The wastewater discharged from the General Aviation and lease parcel areas through gravity sewerage collection systems discharge into the existing lift station. The lift station pumps sewerage into an existing manhole, located at south site of the proposed Interim CAT Terminal site, and then through an existing 8-inch gravity sewer installed along the existing service road to the wastewater treatment plant.

Since the proposed Interim CAT Terminal site is approximately 2.50 feet MSL lower than the service road, a new lift station is required to discharge sewerage to the existing gravity sewer system. Inside the site, sewerage collection system can be the gravity flow. The configuration of the proposed sewer system is shown on **Figure 1**.

2.2 Gravity Flow Sewer System — Inside the Proposed Interim CAT Terminal Site

Criteria:

- Pipe = 4-inch-diameter PVC Pipe.
- Flow Rate = 30 gpm = 0.0668 cfs for each building (assuming flow rate equals to potable water demand).
- Manning Coefficient, n = 0.011.
- Pipe Slope, S = 0.0200.
- Minimum Velocity, V = 2.50 fps minimum.

Analysis:

Assume flow depth in 4-inch pipe, h = 0.104 ft = 1.25 in

Result from pipe hydraulic computer software is as,

- Wet Perimeter, P = 0.394 ft.
- Flow Area, A = 0.023 sf.
- Hydraulic Radius, R = A/P = 0.0584 ft.

Check Flow Velocity

$$
\begin{aligned}
V &= (1.486/n) \times R^{2/3} \times S^{1/2} \\
&= (1.486/0.011) \times 0.0584^{2/3} \times 0.0200^{1/2} \\
&= 135.0909 \times 0.1505 \times 0.1414 \\
&= 2.88 \text{ fps} \qquad \text{O.K.}
\end{aligned}
$$

Determine Invert Elevation:

Control Elevation

Given Data:

- Finish Grade at Lift Station = 54.75 ft (approximately).
- Finish Floor Elevation for Building #1 = 56.45 ft.
- Length of Sewer Line #1 = 136.20 ft, between Building #1 connection and lift station.
- Finish Floor Elevation for Building #2 = 56.35 ft.
- Length of Sewer Line #2 = 49.60 ft, between Building #2 connection and lift station.

Control Elevations for Sewer Line #1

Building Finish Floor Elevation	=	56.45 ft	
Assume Buried Depth	=	2.50 ft	(subtract)
Invert Elevation at Building	=	53.95 ft	
Total Pipe Sloped Vertical Drop	=	2.72 ft	(subtract)
Invert Elevation at Lift Station	=	51.23 ft	

Control Elevations for Sewer Line #2

Building Finish Floor Elevation	=	56.35 ft	
Assume Buried Depth	=	3.50 ft	(subtract)
Invert Elevation at Building	=	52.85 ft	
Total Pipe Sloped Vertical Drop	=	0.99 ft	(subtract)
Invert Elevation at Lift Station	=	51.86 ft	

2.3 Sewer Forced Main and Lift Station — From the Proposed Site to Existing Sewer

The detail configuration for proposed lift station is shown on **Figure 2**.

Criteria:

- Existing Manhole Elevation = 59.23 ft.
- Existing 8" Sewer Line Invert Elevation in the Manhole = 55.30 ft (needs to be verified in field).
- Existing 8" Sewer Line Slope = 0.0088 (needs to be verified in field).
- Distance between Manhole and Proposed Connection Point = 177.80 ft.
- Forced Main Pipe = 3-inch-diameter (D = 0.2500 ft or A = 0.0491 sf) Ductile-Iron Pipe.
- Length of Forced Main, L = 182 ft.
- Buried Depth of Forced Main = 3.00 ft.
- Design Flow Velocity, V = 5.00 fps (maximum).
- Design Flow Rate, Q = V A = 5.00 × 0.0491 = 0.2454 cfs (110.15 gpm, use 110 gpm).
- Water Kinematic Viscosity at 70°, $\nu = 0.0000107639$ ft^2/sec.
- Equivalent Sand Roughness, $\varepsilon = 0.00085$ ft (Ductile-Iron Pipe).
- Pump Efficiency > 40%.

Determine Total Dynamic Head (TDH):

Static Head (H_s)

Lowest Water Surface Elevation in the Lift Station = 49.25 ft

System Highest Elevation = 58.40 – 3.00 = 55.40 ft

H_s = 55.40 ft – 49.25 ft
= 6.15 ft

Pipe Friction Head Loss (H_f):

Reynolds Number, $Re = (DV/\nu) = (0.2500 \times 5.00/0.0000107639) = 1.16 \times 10^5$

Relative Roughness, $\varepsilon / D = 0.00085/0.2500 = 0.0034$

Resistance Coefficient, f = 0.0275 (read from Moody Graph base on above data)

$H_f = f \times (L / D) \times (V^2 / 2g)$
$= 0.0275 \times (182 / 0.2500) \times (5.00^2 / 64.4)$
$= 0.0275 \times 728.0000 \times 0.3882$

= 7.77 ft

Other Head Losses (H_L):

90° Bent = 2 ea

H_B = $K \times (V^2 / 2g)$
= $2 \times 0.51 \times (5.00^2 / 64.4)$
= 0.40 ft

Check Valve = 1

H_{CV} = $1 \times 1.70 \times (5.00^2 / 64.4)$
= 0.66 ft

Gate Valve = 1

H_{GV} = $1 \times 0.14 \times (5.00^2 / 64.4)$
= 0.05 ft

Pipe Exit Loss = 1

H_E = $1 \times 1.00 \times (5.00^2 / 64.4)$
= 0.39 ft

TDH = 6.15 ft + 7.77 ft + 0.40 ft + 0.66 ft + 0.05 ft + 0.39 ft
= 15.42 ft (say 16.00 ft)

Determine Break Horsepower:

HP_B = (gpm × TDH) / (3,960 × 0.40)
= (110 × 16) / (3,960 × 0.40)
= 0.11 (use 1.25 hp)

Typical Motor Characteristics (from Cameron Hydraulic Data):

When horsepower = 1.25 and Single-Phase 60 Hertz

- Approximately Full-Load, rpm = 1,715.
- Typical full load, amperes (208 volt) = 10.4.
- NEMA Locked Rotor (max) = 50.
- NEMA Code = J.
- Approximately Torque, Full-Load = 4.59 lb-ft.
- Approximately Torque, Locked Rotor (min) = 12.5 lb-ft.
- Approximately Torque, Breakdown Full-Load (min) = 10.1 lb-ft.

Control Elevations for Lift Station Sump (60" diameter and 72" deep):

- 54.75 ft Top of Lift Station.
- 51.86 ft Discharge Invert Elevation for Sewer Line #2.
- 51.75 ft Forced Main Invert Elevation at Sump Exit Point.

- 51.73 ft Lag Pump On and High Level Alarm On.
- 51.23 ft Discharge Invert Elevation for Sewer Line #1 at Sump and Lead Pump On.
- 49.75 ft Pump(s) Off.
- 49.25 ft Pump(s) Off and Low Level Alarm On.
- 48.75 ft Bottom of Sump.

System Performance Data:

Forced Main

Size = 3-in-diameter, Cast-Iron

Length = 182 ft

Wet Well (4-ft-diameter and 6-ft-deep)

Volume

Between HWL and LWL	=	$(5^2 \times 3.1416) \times (51.73 - 49.75) / 4$
	=	38.8773 cf
	=	291 gal
Below LWL	=	$(5^2 \times 3.1416) \times (49.75 - 48.75) / 4$
	=	19.6350 cf
	=	147 gal
Total Storage Volume	=	291 + 147
	=	438 gal

Total Dynamic Head

TDH = 16.00 ft

Pump(s)

- Rating = 110 gpm @ 15.00 ft.
- Motor Rating = 1.25 HP @ 1,715 RPM.
- Minimum Efficiency = 40%.
- Minimum Pump Circle = 15 minutes.
- Electrical Characteristics = 208 volt, 60 Hertz, and Single Phase.
- Sphere = 2 inch.
- Discharge Size = 3 inch.

SECTION 02511 - WATER AND FIREWATER LINES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

The General Provisions of the Contract, including General and Special Provisions and General Provisions of the Specifications apply to the work specified in this Section.

1.02 DESCRIPTION OF WORK

A. This Section includes water-distribution piping and specialties outside the building for the following:

1. Water services
2. Water Meter
3. Fire-service

B. Related Work Described elsewhere:

1. Section 01352 – LEED Requirements.
2. Section 03300 – Cast-In-Place Concrete

1.03 SUBMITTALS

A. Product data for the following:

1. Valves and accessories.
2. Water meters and accessories.
3. Fire hydrants.

B. Field quality-control test reports.

C. Operation and maintenance data for the following:

1. Water meters.
2. Valves.
3. Hydrants.

1.04 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Comply with requirements of utility company supplying water.

2. Comply with standards of authorities having jurisdiction for potable-water-service piping, including materials, installation, testing, and disinfection.

3. Comply with standards of authorities having jurisdiction for fire-suppression water-service piping, including materials, hose threads, installation, and testing.

B. Piping materials shall bear label, stamp, or other markings of specified testing agency.

C. NFPA Compliance: Comply with NFPA 24 for materials, installations, tests, flushing, and valve and hydrant supervision for fire-service piping for fire suppression.

D. NSF Compliance:

1. Comply with NSF 14 for plastic potable-water-service piping.

2. Comply with NSF 61 for materials for water-service piping and specialties for domestic water.

1.05 PROJECT CONDITIONS

Existing Utilities: Do not interrupt utilities serving facilities occupied by airport or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Engineer not less than two days in advance of proposed utility interruptions.

2. Do not proceed with utility interruptions without Engineer's written permission.

1.06 COORDINATION

Coordinate connection to water main with utility company.

PART 2 - PRODUCTS

2.01 DUCTILE IRON PIPE, FITTINGS, AND APPURTENANCES

Ductile iron pipe, fittings, and appurtenances for fire water supply shall be in accordance with Section 202 of Water System Standards, Department of Water Supply, County of Hawaii.

2.02 SERVICE LATERALS AND APPURTENANCES

Service laterals and appurtenances shall be in accordance with Section 208 of Water System Standards, Department of Water Supply, County of Hawaii.

2.03 VALVES AND APPURTENANCES

Valves and appurtenances shall be in accordance with Section 205 of Water System Standards, Department of Water Supply, County of Hawaii.

2.04 HYDRANT AND APPURTENANCES

Hydrant and appurtenances shall be in accordance with Section 206 of Water System Standards, Department of Water Supply, County of Hawaii.

2.05 WATER METERS

A. Description: In accordance with Water System Standards, Department of Water Supply, County of Hawaii.

B. Water-Meter Boxes: In accordance with Water System Standards, Department of Water Supply, County of Hawaii.

2.06 MISCELLANEOUS MATERIALS

A. Bar Reinforcement: ASTM A 615, Grade 60, deformed

B. Concrete:

Cast-in-place concrete according to Section 03300, and the following:

Cement: ASTM C 150, Type I, unless otherwise indicated.

Fine Aggregate: ASTM C 33, sand.

Coarse Aggregate: ASTM C 33, crushed gravel.

Water: Potable.

Minimum Compressive Strength at 28th Day: 3,000 psi.

PART 3 - EXECUTION

3.01 PIPING APPLICATIONS

A. Refer to Section 02300 "Earthwork" for excavating, trenching, and backfilling.

B. Underground Water-Service Piping, NPS 3/4 to NPS 2, soft copper tube, Type K; wrought-copper fittings; and soldered joints.

C. Underground Fire-Service Piping, ductile-iron, mechanical-joint pipe; ductile-iron, mechanical-joint fittings; and mechanical joints.

3.02 VALVE APPLICATIONS

A. General Application: Use mechanical-joint-end valves for NPS 3 and larger un-

derground installation. Use corporation valves and curb valves with ends compatible with piping, for NPS 2 and smaller installation.

B. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:

1. Underground Valves, NPS 3 and Larger: AWWA, cast-iron, nonrising-stem, high-pressure, resilient-seated, gate valves with valve box.

3.03 JOINT CONSTRUCTION

Make pipe joints according to the following:

1. Ductile-Iron Piping, Gasketed Joints for Fire-Service-Main Piping: UL 194.

2. Copper Tubing Soldered Joints: ASTM B 828. Use flushable flux and lead-free solder.

3.04 PIPING INSTALLATION

A. Water-Main Connection: Arrange with utility company for tap of size and in location indicated in water main.

B. Water-Main Connection: Tap water main according to requirements of water utility company and of size and in location indicated.

C. Make connections NPS 2 and smaller with drilling machine according to the following:

1. Install service-saddle assemblies and corporation valves in size, quantity, and arrangement required by utility company standards.

2. Install service-saddle assemblies on water-service pipe to be tapped. Position outlets for corporation valves.

3. Use drilling machine compatible with service-saddle assemblies and corporation valves. Drill hole in main. Remove drilling machine and connect water-service piping.

4. Install corporation valves into service-saddle assemblies.

5. Install manifold for multiple taps in water main.

6. Install curb valve in water-service piping with head pointing up and with service box.

D. Comply with NFPA 24 for fire-service-main piping materials and installation.

E. Install ductile-iron, water-service piping according to AWWA C 600 and AWWA M 41.

F. Install copper tube and fittings according to CDA's "Copper Tube Handbook."

G. Bury piping with depth of cover over top at least 30 inches.

H. Extend water-service piping and connect to water-supply source and building water piping systems at outside face of building wall in locations and pipe sizes indicated.

1. Terminate water-service piping at building wall until building water piping systems are installed. Terminate piping with caps, plugs, or flanges as required for piping material. Make connections to building water piping systems when those systems are installed.

I. Install underground piping with restrained joints at horizontal and vertical changes in direction. Use restrained-joint piping, thrust blocks, anchors, tie-rods and clamps, and other supports.

3.05 ANCHORAGE INSTALLATION

Install anchorages for tees, plugs and caps, bends, crosses, valves, and hydrant branches. Include anchorages for the following piping systems:

1. Fire-Service-Main Piping: According to NFPA 24.

2. Apply full coat of asphalt or other acceptable corrosion-resistant material to surfaces of installed ferrous anchorage devices.

3.06 ENCASEMENT INSTALLATION

Install water line encasement as indicated on plans.

3.07 VALVE INSTALLATION

AWWA Gate Valves: Comply with AWWA C 600 and AWWA M 44. Install each underground valve with stem pointing up and with valve box.

3.08 WATER-METER INSTALLATION

A. Install water meters, piping, and specialties according to utility company's written requirements.

B. Water Meters: Install displacement-type water meters, NPS 2 and smaller, in meter boxes with shutoff valves on water-meter inlets. Include valves on water-meter outlets and valved bypass around meters unless prohibited by authorities having jurisdiction.

C. Rough-in piping and specialties for water-meter installation according to utility company's written instructions and requirements.

3.09 FIRE HYDRANT INSTALLATION

A. General: Install each fire hydrant with separate gate valve in supply pipe, anchor with restrained joints or thrust blocks, and support in upright position.

B. UL/FM-Type Fire Hydrants: Comply with NFPA 24.

3.10 CONNECTIONS

A. Connect water-distribution piping to existing water main. Use tapping sleeve and tapping valve.

B. Connect water-distribution piping to interior domestic-water piping.

3.11 FIELD QUALITY CONTROL

A. Piping Tests: Conduct piping tests before joints are covered and after thrust blocks have hardened sufficiently. Fill pipeline 24 hours before testing and apply test pressure to stabilize system. Use only potable water.

B. Hydrostatic Tests: Test at not less than 1-1/2 times working pressure for 2 hours.

1. Increase pressure in 50-psig increments and inspect each joint between increments. Hold at test pressure for 1 hour; decrease to 0 psig. Slowly increase again to test pressure and hold for 1 more hour. Maximum allowable leakage is 2 quarts per hour per 100 joints. Remake leaking joints with new materials and repeat test until leakage is within allowed limits.

3.12 IDENTIFICATION

Install continuous underground warning tape during backfilling of trench for underground water-service piping. Locate below finished grade, directly over piping. See Section 02300 "Earthwork" for underground warning tapes.

3.13 CLEANING

Clean and disinfect water-distribution piping as follows:

1. Purge new water-distribution piping systems and parts of existing systems that have been altered, extended, or repaired before use.

2. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described in NFPA 24 for flushing of piping. Flush piping system with clean, potable water until dirty water does not appear at points of outlet.

3. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described in AWWA C651 or as described below:

a. Fill system or part of system with water/chlorine solution containing at

least 50 ppm of chlorine; isolate and allow to stand for 24 hours.

b. Drain system or part of system of previous solution and refill with water/chlorine solution containing at least 200 ppm of chlorine; isolate and allow to stand for 3 hours.

c. After standing time, flush system with clean, potable water until no chlorine remains in water coming from system.

d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedure if biological examination shows evidence of contamination.

PART 4 - MEASUREMENT AND PAYMENT

4.01 METHOD OF MEASUREMENT

A. The Engineer will measure various buried water piping and encasement to be paid in linear feet on a unit price basis.

B. The Engineer will measure water meter and fire hydrant to be paid in each on a unit price basis.

C. The Engineer will not measure and pay for appurtenances, valves and valve boxes, anchorages, and waterline tie-in to existing water main separately, but shall be considered incidental to various buried piping pay items.

4.02 BASIS OF PAYMENT

This price shall be full compensation for furnishing all materials and for all preparation, erection, and installation of these materials and for all labor, equipment, tools, and necessary incidentals to complete the item.

Payment will be made under:

Item No.	Item	Unit
02511.1	2-inch Copper Pipe	Linear Foot (LF)
02511.2	Water Meter	Each (EA)
02511.3	6-inch Ductile-Iron Pipe	Linear Foot (LF)
02511.4	Fire Hydrant	Each (EA)
02511.5	Waterline Encasement	Linear Foot (LF)

END OF SECTION

SECTION 02531 - SANITARY SEWERAGE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

The General Provisions of the Contract, including General and Special Provisions and General Provisions of the Specifications apply to the work specified in this Section.

1.02 DESCRIPTION OF WORK

A. This Section includes forced main, pressure sanitary sewerage, and gravity-flow, non-pressure sanitary sewerage outside the building, with the following components:

1. Piping
2. Cleanouts.

B. Related Work Described elsewhere:

1. Section 01352 – LEED Requirements.
2. Section 03300 – Cast-In-Place Concrete.

1.03 PERFORMANCE REQUIREMENTS

A. Gravity-Flow, Nonpressure, Drainage-Piping Pressure Rating: 10-foot head of water.

B. Forced Main, Pressure, Piping Pressure Class: 350 psi.

1.04 SUBMITTALS

Coordination Drawings: Show pipe sizes, locations, and elevations.

PART 2 - PRODUCTS

2.01 MATERIALS

All adhesives and sealants used in the building interior shall not exceed the following VOC content limits (in g/L):

1. Plastic Cement Welding Compounds: 350 g/L.
2. ABS Welding Compounds: 400 g/L.
3. CPVC Welding Compounds: 490 g/L.

4. PVC Welding Compounds: 510 g/L.

2.02 DUCTILE IRON PIPE

A. Conform to latest requirements of AWWA C 151.

B. Cement mortar lined in accordance with AWWA C 104 standard thickness.

1. Unless otherwise specified, pipe shall have push-on compression type joint conforming to AWWA C 111 or AWWA C 153 latest Editions.

2. Minimum pressure class shall be 350 psi.

C. Restrained Joints – Ductile Iron Pipe

1. Restrained joints shall be "Fast-Grip Gasket" by ACIPCO, "Field-Lok Gasket" by U. S. Pipe, or approved equal.

2. Joint preparation and installation shall be in accordance with manufacturer's recommendations

D. Retainer Glands for Restraint – Ductile Iron Pipe: Retainer gland restraints shall be "Mega-Lug 1100 Series" by EBBA Iron Sales or approved equal.

2.02 PVC PIPE AND FITTINGS

A. PVC Sewer Pipe and Fittings, NPS 15 and Smaller: ASTM D 3034, SDR 35, with bell-and-spigot ends for gasketed joints with ASTM F 477, elastomeric seals.

B. PCV pipe is not permitted for the installation of sewer forced mains.

2.03 CLEANOUTS

Gray-Iron Cleanouts: ASME A 112.36.2M, round, gray-iron housing with clamping device and round, secured, scoriated, gray-iron cover. Include gray-iron ferrule with inside calk or spigot connection and countersunk, tapered-thread, brass closure plug.

1. Top-Loading Classification: Medium duty.

2. Sewer Pipe Fitting and Riser to Cleanout: ASTM A 74, Service class, cast-iron soil pipe and fittings.

2.04 CONCRETE

A. General: Cast-in-place concrete according to Section 03300, and the following:

1. Cement: ASTM C 150, Type I.

2. Fine Aggregate: ASTM C 33, sand.

3. Coarse Aggregate: ASTM C 33, crushed gravel.

4. Water: Potable.

B. Portland Cement Design Mix: 3,000 psi minimum, with 0.45 maximum water/cementitious materials ratio.

2.05 WARNING TAPE

A. Warning tape shall be installed minimum 12 inches above the pipe.

B. Warning tape shall be in accordance with Section 02300 "Earthwork".

PART 3 - EXECUTION

3.01 PIPING APPLICATIONS

A. Gravity-Flow, Non-pressure Sewer Piping: NPS 4 PVC sewer pipe and fittings, gaskets, and gasketed joints.

B. Forced Main, Pressure Sewer Piping: NPS 3 ductile iron sewer pipe and fitting, push-on compression type joint.

3.02 PIPING INSTALLATION

A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground sanitary sewerage piping. Location and arrangement of piping layout take design considerations into account. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.

B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for using lubricants, cements, and other installation requirements.

C. Install manholes for changes in direction, unless fittings are indicated. Use fittings for branch connections, unless direct tap into existing sewer is indicated.

D. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

E. Install gravity-flow, non-pressure, drainage piping according to the following:

1. Install piping pitched down in direction of flow, at minimum slope of 2 percent, unless otherwise indicated.

2. Install piping with 36-inch minimum cover.

3. Install PVC sewer piping according to ASTM D 2321 and ASTM F 1668.

F. Install forced main, pressure, drainage piping according to the following:

1. Install piping pitched down in direction of flow, at slope indicated.

2. Install piping with 36-inch minimum cover.

G. Clear interior of piping and manholes of dirt and superfluous material as work progresses. Maintain swab or drag in piping, and pull past each joint as it is completed. Place plug in end of incomplete piping at end of day and when work stops.

3.03 PIPE JOINT CONSTRUCTION

A. Join ductile-iron, pressure sewer piping according to AWWA C 600 for push-on joints.

B. Join PVC sewer piping according to ASTM D 2321 and ASTM D 3034 for elastomeric-gasket joints.

3.04 CLEANOUT INSTALLATION

A. Install cleanouts and riser extensions from sewer pipes to cleanouts at grade. Use cast-iron soil pipe fittings in sewer pipes at branches for cleanouts and cast-iron soil pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.

1. Use medium-duty, top-loading classification cleanouts in paved or unpaved foot-traffic areas.

B. Set cleanout frames and covers in earth in cast-in-place-concrete block, 12 by 12 by 6 inches deep. Set with tops 1 inch above surrounding grade.

C. Set cleanout frames and covers in concrete pavement with tops flush with pavement surface.

3.05 CONNECTIONS

A. Connect non-pressure, gravity-flow drainage piping to building's sanitary building drains.

B. Make connections to existing piping and underground manholes.

1. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe; install wye fitting into existing piping; and encase entire wye fitting, plus 6-inch overlap, with not less than 6 inches of concrete with 28-day compressive strength of 3,000 psi.

3.06 FIELD QUALITY CONTROL

A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and

again at completion of Project.

1. Submit separate report for each system inspection.

2. Defects requiring correction include the following:

   a. Alignment: Less than full diameter of inside of pipe is visible between structures.

   b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.

   c. Crushed, broken, cracked, or otherwise damaged piping.

   d. Infiltration: Water leakage into piping.

   e. Exfiltration: Water leakage from or around piping.

3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.

4. Reinspect and repeat procedure until results are satisfactory.

B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.

   1. Do not enclose, cover, or put into service before inspection and approval.

   2. Test completed piping systems according to requirements of authorities having jurisdiction.

   3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.

   4. Hydrostatic Tests: Test sanitary sewerage according to requirements of authorities having jurisdiction and the following:

      a. Allowable leakage is maximum of 50 gallons/inch of nominal pipe size per mile of pipe, during 24-hour period.

      b. Close openings in system and fill with water.

      c. Test and inspect joints for leaks.

C. Leaks and loss in test pressure constitute defects that must be repaired.

D. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

PART 4 - MEASUREMENT AND PAYMENT

4.01 METHOD OF MEASUREMENT

A. The Engineer will measure various buried piping to be paid in linear feet on a unit price basis.

B. The Engineer will not measure and pay for appurtenances, valves and valve boxes, anchorages, and sewer tie-in to existing sewer separately, but shall be considered incidental to various buried piping pay items.

4.02 BASIS OF PAYMENT

This price shall be full compensation for furnishing all materials and for all preparation, erection, and installation of these materials and for all labor, equipment, tools, and necessary incidentals to complete the item.

Payment will be made under:

Item No.	Item	Unit
02531.1	4-inch PVC Pipe	Linear Foot (LF)
02532.2	3-inch Ductile Iron Pipe	Linear Foot (LF)
02533.3	Cleanout	Each (EA)

END OF SECTION

SECTION 02532 - PACKAGED SEWERAGE LIFT STATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

The General Provisions of the Contract, including General and Special Provisions and General Provisions of the Specifications apply to the work specified in this Section.

1.02 DESCRIPTION OF WORK

A. The Manufacturer shall furnish complete factory-built and tested pump units, each consisting of a pump core suitably mounted on an integral stand of stainless steel, electrical quick disconnect (NEMA 6P), pump removal harness, discharge assembly and shut-off valve, anti-siphon valve and check valve assembly, electrical alarm assembly, and all necessary internal wiring and controls. For ease of serviceability, all pump motor units shall be of like type and horsepower throughout the system.

B. Related Work Described elsewhere:

1. Section 01352 – LEED Requirements.

2. Section 03300 – Cast-In-Place Concrete

1.03 PERFORMANCE REQUIREMENTS

A. Pressure Rating of Sewage Pumps and Discharge Piping Components: At least equal to sewage pump discharge pressure, but not less than 125 psig.

B. Pressure Rating of Other Piping Components: At least equal to system operating pressure.

1.04 SUBMITTALS

A. Product Data: Include rated capacities; shipping, installed, and operating weights; furnished specialties; and accessories.

B. Shop Drawings: Show fabrication and installation details for packaged sewerage lift station. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of field connection.

1. Wiring Diagrams: Power, signal, and control wiring.

2. Field located control panel location and details.

3. Field route duct-bank for electrical power wiring from Airport meter to the lift station control panel.

C. Product Certificates: For sewage pumps, signed by product manufacturer.

D. Maintenance Data: For packaged sewerage lift stations to include in maintenance manuals.

E. Warranties: Special warranties specified in this Section.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative of packaged lift station manufacturer for installation and maintenance of units required for this Project.

B. Manufacturer Qualifications: A qualified manufacturer.

C. Testing Agency Qualifications: Testing agency as defined by OSHA in 29 CFR 1910.7.

D. Product Options: Drawings indicate size, profiles, and dimensional requirements of packaged sewerage lift stations and are based on the specific system indicated.

E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by testing agency acceptable to authorities having jurisdiction, and marked for intended use.

F. HI Compliance: Comply with HI 1.1-1.5 for sewage and sump pumps.

G. NEMA Compliance: Comply with NEMA MG 1 for electric motors.

H. UL Compliance: Comply with UL 778 for sewage and sump pumps.

1.06 PROJECT CONDITIONS

Existing Utilities: Do not interrupt utilities serving facilities occupied by airport or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Engineer not less than two days in advance of proposed utility interruptions.

2. Do not proceed with utility interruptions without Engineer's written permission.

3. Obtain electrical power for the proposed lift station of the Airport meter. Meter also services common area lighting and equipment. Service voltage will be 120/208 volts, 3-phase, 4-wire. The Contractor shall provide boost transformer if the required voltage for pumps is more than 208 volts.

1.07 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to

repair or replace components of packaged sewerage lift station that fail in materials or workmanship within specified warranty period.

B. Warranty Period: Five (5) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 WET-WELL, PACKAGED SEWERAGE LIFT STATION WITH WET-WELL-MOUNTING SEWAGE PUMPS

A. Description: Factory fabricated, assembled, and tested with wet well for comminutor, sewage pumps, and collection of sanitary sewage and with suspended sewage pumps and dry equipment chamber for pump motors, controls, and accessories.

1. Available Manufacturers:

a. Dakota Pump Incorporated.

b. Gorman-Rupp Company (The).

c. Hydronix, Inc.

d. Smith & Loveless, Inc.

e. Yeomans Chicage Cotporation

B. Orientation: Shell underground with dry equipment chamber underground with top flush with grade.

C. Shell: Factory fabricated from fiberglass.

1. Entrance Tube: From dry compartment to entrance at grade.

D. Comminutor: Full size of sewage inlet pipe.

E. Sewage Pumps: Two wet-well-mounting-type, nonclog sewage pumps suspended from dry-compartment floor, with controls and piping. Include ASTM A 48, Class 25, nonclog, cast-iron impeller capable of passing solids of 3-inch minimum diameter; grease-lubricated bearings and stuffing-box seal; shaft coupling; and pedestal-mounted motor.

2.02 COMMINUTORS

A. Description: Motor-operated, single- or twin-shaft, cutter- or grinder-design unit with controls; for pipeline installation.

B. Body: Stainless steel or ductile iron with flanged ends and access plate.

C. Cutting Elements: Motor-driven rotor and stationary cutters or grinders of hardened stainless or heat-treated steel.

D. Motor: Explosion proof, directly connected to body.

E. Control Panel: NEMA 250, Type 12 enclosure for installation in dry equipment chamber.

2.03 CONTROLS

A. Control Sequence of Operation: Cycle each sewage pump on and off automatically to maintain wet-well sewage level. Automatic control operates both pumps in parallel if wet-well level rises above starting point of low-level pump, until shutoff level is reached. Automatic alternator, with manual disconnect switch, changes sequence of lead-lag sewage pumps at completion of each pumping cycle.

B. Self-Purging Air-Bubbler System: Senses variations of sewage level in wet well. Include duplex-arrangement oilless air compressors to furnish bubbler air; filters; air-storage reservoir; piping; airflow meter with needle valve adjustment for airflow regulation; sewage depth gage; air-bubbler piping to wet well; and pressure-sensing, dustproof mercury switches.

C. Float-Switch System: Senses variations of sewage level in wet well. Include high and low adjustments capable of operating on 6-inch minimum differential of liquid level.

D. Motor Controllers: Magnetic, full voltage, non-reversing. Include under-voltage release, thermal-overload heaters in each phase, manual reset buttons, and hand-automatic selector switches. Include circuit breakers to provide branch-circuit protection for each controller.

E. 120-V accessory controls with 15-A, single-phase circuit breakers for each item.

F. Control Panel: Enclosure with separate compartments and covers for controllers, circuit breakers, transformers, alternators, and single-phase controls. Include 20-A duplex receptacle in NEMA WD 1, Configuration 5-20R inside control panel.

1. Mounting: Outside, on pedestal, at grade.

2. Enclosure: NEMA 250, Type 1.

G. Install labels on panel face to identify switches and controls.

H. Wiring: Tin-copper wiring.

I. Connection for Portable Generator: Manual transfer switch with plug. Match generator electrical power requirements.

2.04 ACCESSORIES

A. Submersible Sump Pump: For installation in sump. Include 3-inch discharge; cast-iron, pump end bell and motor shell; 16 feet total dynamic heads at 60 gallons per minutes, 1.25-hp, 1750-rpm, hermetically sealed, capacitor-start motor,

with built-in overload protection; ASTM B 584, cast-bronze or ASTM B 36/B 36M, brass impeller; stainless-steel shaft; grease-lubricated, factory-sealed ball bearings; mechanical seal; inlet strainer; and float-switch controls.

B. Dehumidifier: Electric refrigeration system, adjustable humidistat, reverse-acting thermostat for low-temperature cutoff controls, and condensate pump with drain piping to sump.

1. Dehumidification system capacity adequate to remove at least 15 pints of water per day from service area air that is 80 °F with a relative humidity of 60 percent.

C. Ventilation: Electrically powered ventilation system. Include centrifugal blower with 4-inch-round exhaust vent designed to keep out rain, insects, and other foreign matter; limit switch to start blower if entrance door or lid is opened; 0- to 15-minute timer; and separate manual switch.

1. Ventilating system capacity to change air in dry equipment chamber every two minutes.

D. High- and Low-Water Alarms: Horn for indication of station high-and low-water level, energized by separate level-detecting device. Include alarm silencer switch and relay in station.

2.05 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 6, W or HP shapes, or ASTM A 36, plates or beams.

B. Bar Reinforcement: ASTM A 615, Grade 60, deformed

C. Grout: ASTM C 1107, Grade B, non-shrink cement grout, 5,000 psi, 28-day compressive strength.

D. Precast Reinforced Concrete Manhole: When precast reinforced concrete manhole sections are used, material shall meet ASTM C 478 requirements.

E. Concrete:

General: Cast-in-place concrete according to Section 03300, and the following:

Cement: ASTM C 150, Type I, unless otherwise indicated.

Fine Aggregate: ASTM C 33, sand.

Coarse Aggregate: ASTM C 33, crushed gravel.

Water: Potable.

Minimum Compressive Strength at 28th Day: 3,000 psi.

2.06 PACKAGED SEWERAGE LIFT STATION FABRICATION

A. Fabricate shell from fiberglass with structural-steel reinforcement.

1. Attach reinforcing structural steel to top and bottom heads.

2. Fabricate shell with continuous joints to make watertight and gastight construction.

3. Attach air vent to pump chamber.

4. Ladder: Fiberglass.

B. Install sump in dry-chamber floor, 18 inches in diameter by 10 inches deep. Slope floor toward sump and fasten rubber mat to floor walkway with cement.

C. Entrance tube may be furnished separately for field installation.

D. Entrance Cover: Waterproof and corrosion resistant, with lock. Include way to open cover from inside tube if cover is locked.

E. Air Vent: Duct fabricated from corrosion-resistant material, extended to above grade, outlet turned down, and with insect screen in outlet.

F. Factory fabricate piping between unit components.

1. Use galvanized steel pipe and cast-iron fittings or ductile-iron pipe and fittings.

2. Use fittings for changes in direction and branch connections.

3. Flanged and union joints may be used instead of joints specified.

4. Use dielectric fittings for connections between ferrous- and copper-alloy piping.

G. Piping Connections: Unless otherwise indicated, make the following piping connections:

1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment having NPS 2 or smaller threaded pipe connection.

2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment having flanged pipe connection.

H. Valves: Ferrous alloy.

1. Sewage Pump Piping: Include gate valve on each pump inlet and gate and check valves on each discharge pipe.

2. Sump Pump Piping: Include ball or gate and check valves on discharge pipe.

3. Compressed-Air Piping: Include ball and check valves on discharge pipe from each air compressor.

4. Vacuum Piping: Include ball and check valves on inlet pipe to each vacuum pump.

I. Wiring: Tin-coated copper.

2.07 SOURCE QUALITY CONTROL

A. Test and inspect sewage pumps according to HI 1.6, "Centrifugal Pump Tests." Include test recordings that substantiate correct performance of pumps at design head, capacity, suction lift, speed, and horsepower.

B. Test accessories and controls through complete cycle. Include test recordings that substantiate correct performance.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Examine roughing-in of sewerage piping systems to verify actual locations of piping connections before packaged lift station installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 EARTHWORK

Excavation, trenching, and backfilling are specified in Section 02300, Earthwork.

3.03 IDENTIFICATION

A. Install identifying labels permanently attached to equipment.

B. Install operating instruction signs permanently attached to equipment or on lift station wall near equipment.

C. Arrange for installing green detectable warning tape over outside edges of underground packaged sewerage lift stations.

3.04 PACKAGED SEWERAGE LIFT STATION INSTALLATION

A. Install packaged sewerage lift station components where indicated, according to

specific equipment and piping arrangement indicated.

B. Shell Base Supports: Form from structural-steel beams, of number and lengths required to support bottom of shell and to anchor beams to concrete foundation.

1. Use elevator blocks attached to bottom of shell to slope station floor 1 inch in 10 feet down toward sump.

C. Grout under and around shell. Ensure that there are no voids between foundation slab and underslab of lift station.

D. Fill voids between shell sidewalls, sleeves, and piping and make watertight seal with grout.

E. Connect anode conductors to grounding lugs on steel housing.

F. Join separate sections of housing by field welding.

G. Field weld entrance tube to housing.

3.05 CONNECTIONS

A. Sanitary sewer piping installation requirements are specified in Section 02531, Sanitary Sewerage. Drawings indicate general arrangement of piping.

B. The Contractor is responsible connecting and testing electrical power and wiring from the Airport meter to packaged sewerage lift station.

3.06 PAINTING

A. Prepare and paint ferrous piping in wet wells, structural-steel supports, and anchor devices with coal-tar epoxy-polyamide paint according to SSPC-Paint 16.

B. Paint field-welded areas to match factory coating.

3.07 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing and inspecting agency to perform the following field tests and inspections and prepare test reports:

B. Perform the following field quality-control tests and inspections and prepare test reports:

1. After installing packaged sewerage lift stations and after electrical circuitry has been energized, test for compliance with requirements. Furnish water required for pump tests.

2. Leak Test: After installation, charge systems and test for leaks. Repair leaks and retest until no leaks exist.

3. Operational Test: After electrical circuitry has been energized, start units to

confirm proper motor rotation and unit operation.

4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Remove malfunctioning units, replace with new units, and retest as specified above.

3.08 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

B. Complete installation and startup checks according to manufacturer's written instructions and do the following:

1. Adjust pump, accessory, and control settings, and safety and alarm devices.

3.09 CLEANING

A. Clean dirt and debris from wet wells, pumps, and piping.

B. After completing equipment installation, inspect unit components. Remove paint splatters and other spots, dirt, and debris. Repair damaged finishes to match original finishes.

C. After completing system installation, including outlet fitting and devices, inspect exposed finish. Remove dirt and construction debris and repair damaged finishes.

3.10 DEMONSTRATION

Engage a factory-authorized service representative to train airport's maintenance personnel to adjust, operate, and maintain packaged sewerage lift stations.

PART 4 - MEASUREMENT AND PAYMENT

4.01 METHOD OF MEASUREMENT

The Engineer will not measure all works under this Section, but works under this Section will be paid on a lump sum basis.

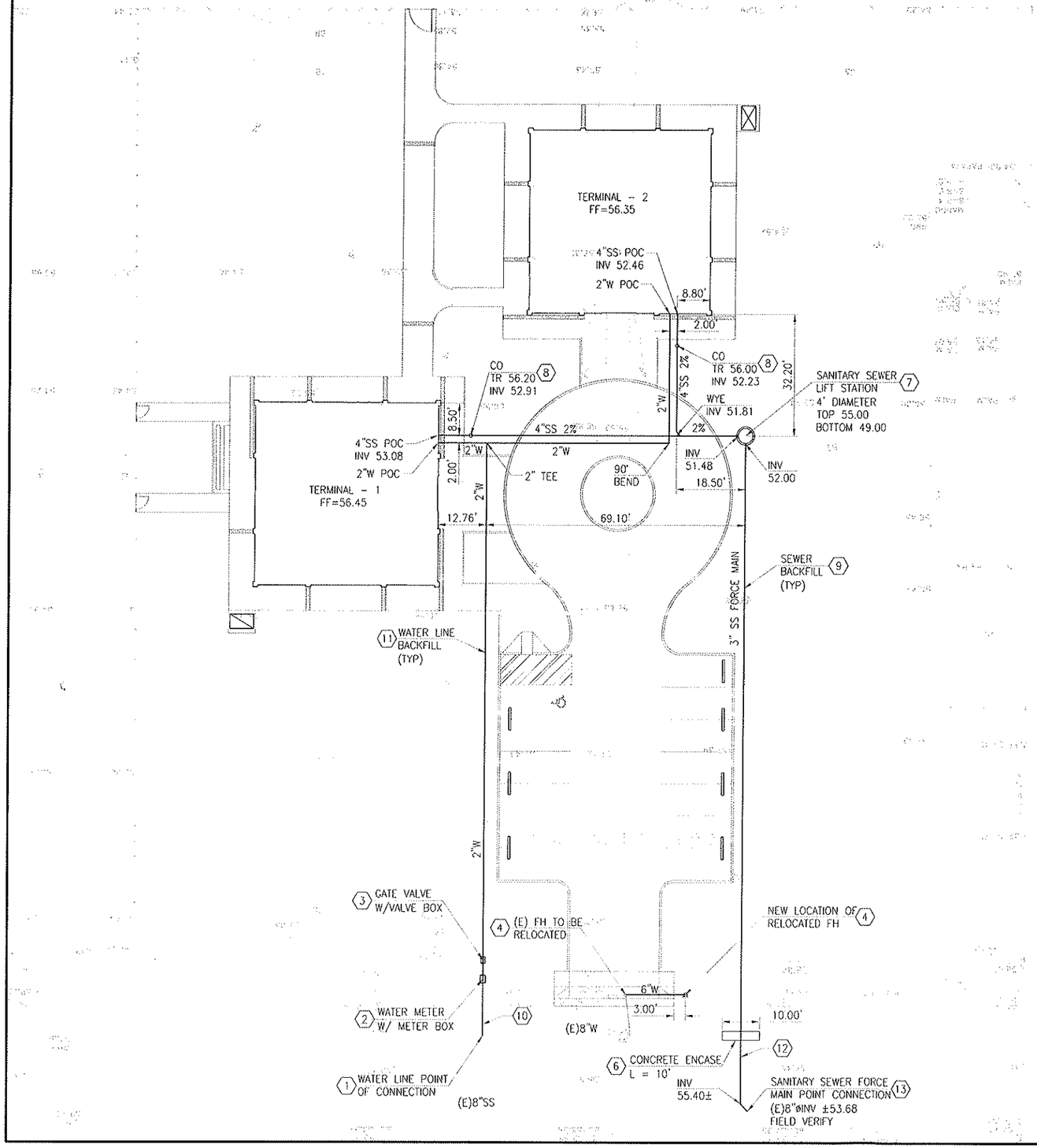
4.02 BASIS OF PAYMENT

All payments shall be full compensations for all work described under this Section, and all materials, labors, tools, equipments, and incidentals needed to complete the Contract.

Payment will be made under:

Item No.	Item	Unit
02532	Packaged Sewerage Lift Station	Lump Sum (LS)

END OF SECTION



NOTES

1. SEE DRAWING C-1 FOR GENERAL NOTES, GRADING NOTES, LEGEND AND ABBREVIATIONS.
2. SEE DRAWINGS M-1, M2 & M-3 FOR CONTINUATION OF 4"SS & 2"W INSIDE BUILDINGS.
3. HORIZONTAL CONCRETE THRUST BLOCK PER STANDARD DETAILS B2 & B3 OF "WATER SYSTEM STANDARD" DEPARTMENT OF WATER SUPPLY, COUNTY OF HAWAII, "F" TYPE OF SOIL CONDITION (SOFT ROCK).
4. VERTICAL CONCRETE THRUST BLOCK PER STANDARD DETAILS B6 & B7 OF "WATER SYSTEM STANDARD" DEPARTMENT OF WATER SUPPLY, COUNTY OF HAWAII.

CONSTRUCTION NOTES

(1) 2" COOPER SERVICE LATERAL PER STANDARD DETAIL L15 OF "WATER SYSTEM STANDARD" DEPARTMENT OF WATER SUPPLY, COUNTY OF HAWAII.

(2) 1-1/2" WATER METER AND METER BOX PER HAWAII COUNTY "WATER SYSTEM STANDARDS" STANDARD DETAILS L9, L10, M1 AND M13.

(3) GATE VALVE WITH VALVE BOX. VALVE BOX PER HAWAII COUNTY "WATER SYSTEM STANDARDS" STANDARD DETAILS V13.

(4) RELOCATE EXISTING FIRE HYDRANT. EXTEND 6" FIRE WATER LINE TO THE NEW LOCATION OF FIRE HYDRANT W/ 90° ELBOW. SEE STANDARD DETAIL FH2 OF "WATER SYSTEM STANDARD" DEPARTMENT OF WATER SUPPLY, COUNTY OF HAWAII.

(5) NOT USED

(6) CONCRETE ENCASE EXISTING 8" WATER LINE PER HAWAII COUNTY "WATER SYSTEM STANDARDS" STANDARD DETAIL B1.

(7) PACKAGED SEWERAGE SEWER LIFT STATION, SEE DWG C-7 DET 1.

(8) SEWER CLEAN OUT, SEE DWG C-6 DET 3.

(9) SANITARY SEWER BACKFILL, SEE DWG C-6 DET 4.

(10) PAVED AREA COOPER SERVICE TRENCH, PER STANDARD DETAIL P12 OF "WATER SYSTEM STANDARD" DEPARTMENT OF WATER SUPPLY, COUNTY OF HAWAII.

(11) COOPER SERVICE TRENCH PER STANDARD DETAIL P13 OF "WATER SYSTEM STANDARD" DEPARTMENT OF WATER SUPPLY, COUNTY OF HAWAII.

(12) RESTORE EXISTING AC PAVEMENT SEE DWG C-5 DET 1 (SIMILAR).

(13) CONNECT TO EXISTING 8" SANITARY SEWER LINE, SEE DWG C-6 DET 6.

TRUE NORTH

GRAPHIC SCALE

16' 8' 0 16' 32'

Airports Division
DEPARTMENT OF TRANSPORTATION
STATE OF HAWAII

JASON C. CHEN
LICENSED PROFESSIONAL ENGINEER
No. 8565-C
HAWAII, U.S.A.

This work was prepared by me or under my supervision and construction of this project will be under my observation.

signature 4/30/08 expiration date of the license

DSGN.	DRWN.	CHKD.	APPD.

KEY PLAN / NOTES:

NO.	DATE	REVISIONS

PROJECT TITLE:

INTERIM CAT IMPROVEMENTS
KONA INTERNATIONAL AIRPORT
KAILUA-KONA, HAWAII

PROJECT NO.:

STATE PROJECT NO. AH2046-18

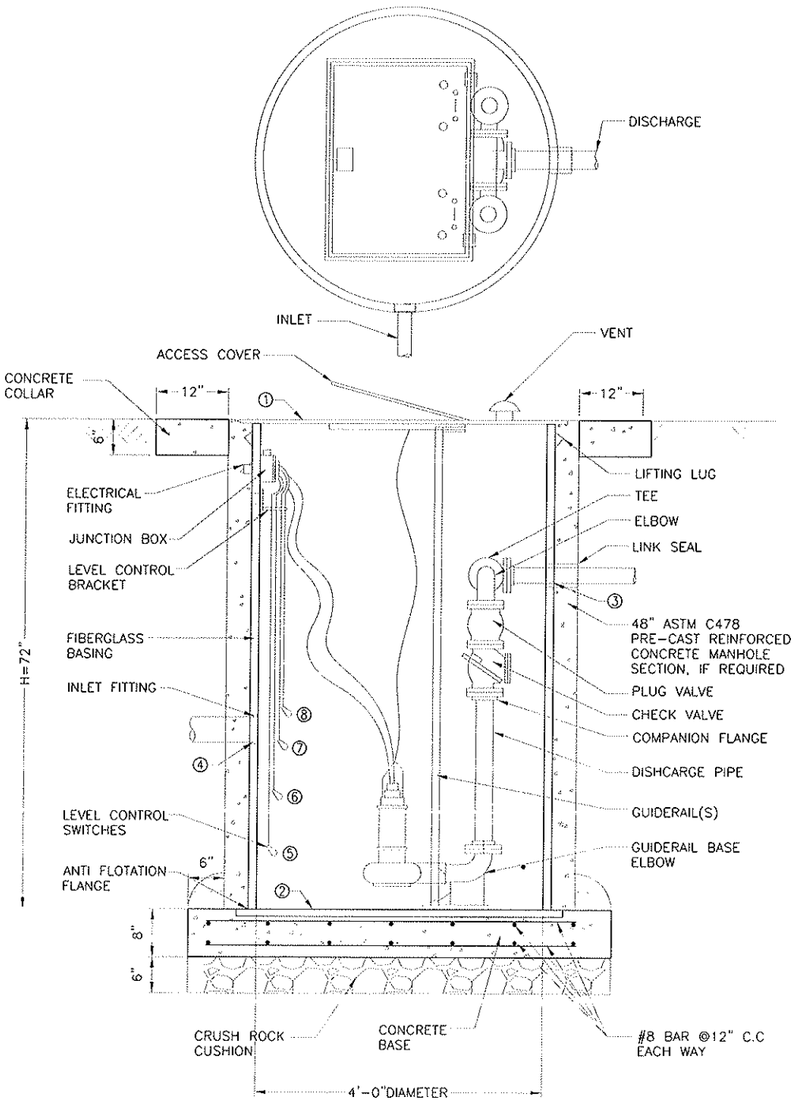
SHEET TITLE:

SITE UTILITY PLAN

DATE:
JAN. 2008

DWG. NO.:

Figure 1



#	ELEV	DESCRIPTION
①	55.00'	TOP OF SUMP
②	49.00	BOTTOM OF SUMP
③	52.00'	FORCE MAIN ELEV @ EXIT POINT
④	51.48'	INVERT ELEV FOR SEWER INLET
⑤	49.50'	PUMP(S) OFF AND LOW LEVEL ALARM ON
⑥	50.00'	PUMP(S) OFF
⑦	51.48	LEAD PUMP ON
⑧	51.98	LAG PUMP ON & HIGH LEVEL ALARM ON

PACKAGE SEWERAGE LIFT STATION

NOT TO SCALE

1 C-4|C-7

Airports Division
DEPARTMENT OF TRANSPORTATION
STATE OF HAWAII

JASON C. CHEN
LICENSED PROFESSIONAL ENGINEER
No. 6565-C
HAWAII, U.S.A.

This work was prepared by me or under my supervision and construction of this project will be under my observation.

signature 4/30/08 expiration date of the license

DSGN.	DRWN.	CHKD.	APPD.

KEY PLAN / NOTES:

NO.	DATE	REVISIONS

PROJECT TITLE:

INTERIM CAT IMPROVEMENTS
KONA INTERNATIONAL AIRPORT
KAILUA-KONA, HAWAII

PROJECT NO.:

STATE PROJECT NO. AH2046-18

SHEET TITLE:

MISCELLANEOUS DETAILS

DATE: JAN. 2008

DWG. NO.:

Figure 2