

# **Meleana Place Drainage Improvements Draft Environmental Assessment**

Nuʻuanu, Honolulu District, Oʻahu, HI

**December 2009**

## **PREPARED FOR:**

City and County of Honolulu  
Department of Design and Construction



**Gray • Hong • Nojima & Associates, Inc.**

*CONSULTING ENGINEERS*

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- Appendix B *Biological survey for a small flood abatement project on Meleana Place, Nu'uaniu, O'ahu, prepared by AECOS, Inc., dated September 8, 2009.*
- Appendix C *An Archaeological Monitoring Plan for the Proposed Meleana Place Drainage Improvements Located at TMK: (1) 1-9-03 in Nu'uaniu Ahupua'a, Kona District, Island of O'ahu, prepared by Archaeological Consultants of the Pacific, Inc., dated June 2009.*
- Appendix D *A Cultural Impact Assessment for the Proposed Meleana Place Drainage Improvements Located at TMK: (1) 1-9-03 in Nu'uaniu Ahupua'a, Kona District, Island of O'ahu, prepared by Archaeological Consultants of the Pacific, Inc., dated September 2009.*

## I. Project Profile

Project:	Meleana Place Drainage Improvements Honolulu, O'ahu, Hawaii
Proposing Agency:	Department of Design and Construction City and County of Honolulu 650 South King Street Honolulu, Hawaii 96813
Determining Agency:	Department of Design and Construction For Mayor, City and County of Honolulu
Location:	Nu'uuanu, Honolulu District, O'ahu
Tax Map Key:	Right-of-Way surrounded by 1-9-003:002-010, 026-031, 037, and 038
Landowner:	City and County of Honolulu
Existing Use:	Roadway and On-street Parking
State Land Use:	Urban District
Land Use Ordinance:	R-10 Residential District
Estimated Construction Cost:	\$411,000
Estimated Construction Time:	6 to 9 months
Need for Environmental Assessment:	Use of county land and funds Hawaii Administrative Rules §Chapter 11-200-5(c)
Anticipated Determination:	Finding of No Significant Impact
Contact Person:	Scott Nakamatsu, P.E. Department of Design and Construction Civil Design Division City and County of Honolulu 650 South King Street Honolulu, Hawaii 96813 Phone: 768-8812

## II. General Description of the Proposed Action

### A. Location

The Meleana Place project site is located in a residential area towards the northwest end of Nuʻuanu Valley on the slope of the Koolau Range (refer to Figures 1 & 2). It is bordered by Waokanaka Street to the south and an undeveloped hillside to the north. The City-owned Meleana Place is a short access, dead-end road off the State-owned Waokanaka Street. It is approximately 400 feet in length and serves several private residential lots on both sides of the road (refer to Figure 3). At the present time, the only means of storm water conveyance within the roadway is via small 12-inch square inlets connected by 6-inch diameter perforated pipe and concrete gutters on both sides of the right-of-way (ROW).

### B. Need and Purpose

The need for the proposed project stems from complaints reported by property owners on the downhill side of the Meleana Place ROW. It appears that surface runoff generated from the hillside above is not adequately intercepted by the existing drainage infrastructure. Property owners on the downhill side of the road have indicated that during periods of heavy rainfall, storm water traverses across the roadway (gutter to gutter) and ends up in their lots.

The Department of Design and Construction (DDC), City and County of Honolulu, proposes to construct drainage improvements along the entire length of Meleana Place starting from Waokanaka Street to the cul-de-sac at the end of the road. The purpose of the project is to alleviate flooding of the lots on the downhill side of the road section during heavy rains.

### C. Technical Characteristics

The proposed improvements for Meleana Place were developed as part of the project's 2006 drainage study by Gray, Hong, Nojima & Associates, Inc. (refer to Appendix A). The proposed system will include installation of reinforced concrete pipe, box culverts, manholes, and catch basins (refer to Figures 4 & 5 proposed plan and profile):

- 130 LF 12-inch diameter reinforced concrete pipe
- 60 LF of 18-inch diameter reinforced concrete pipe
- 270 LF of 24-inch diameter reinforced concrete pipe
- 160 LF of 36-inch diameter reinforced concrete pipe
- 9 catch basins (including replacement of one existing catch basin)
- 5 storm drain manholes
- 100 LF of trench drains
- 10 LF of 2' x 4' box culvert and connection to existing drainage ditch

Existing curbs and gutters will collect and convey storm water to the new trench drains and catch basins installed on both sides of the roadway. The storm water will then be conveyed to the main drain lines (24-inch and 36-inch). A 2' high x 4' wide box culvert will connect the reconstructed catch basin to the existing concrete drainage ditch at the intersection of Meleana Place and Waokanaka Street. The box culvert will replace an existing 24-inch diameter pipe

connection to the ditch. The system will be designed for a total flow of 51 cubic feet/second (CFS) covering a drainage area of 12.2 acres (Gray, Hong, Nojima & Assoc., 2006).

The affected areas along Meleana Place will be restored to original condition, including (a) resurfacing of pavements, (b) reconstruction of driveways, curbs and gutters, and (c) replanting of pre-construction vegetation.

## **D. Economic Characteristics**

### **D.1 Property Damage**

The proposed underground drainage system will have significantly greater capacity than the existing perforated pipe system. This should reduce the amount of runoff on the roadways and alleviate flooding during storm events. In turn, there should be less damage to private property and inconvenience to residents who are currently being flooded every time there is a major storm.

### **D.2 Construction Cost and Phasing**

The cost of the project is estimated at \$411,000 and will be funded by the City and County of Honolulu (Gray, Hong, Nojima & Assoc., 2006). The project will be constructed in one phase and is expected to be completed within 6 to 9 months.

## **E. Social Characteristics**

### **E.1 Public Safety**

The proposed project is aimed at reducing inconvenience to property owners and enhancing safety for motorists during period of heavy rains. The proposed underground drainage system will more effectively convey runoff into an underground drainage system connecting to the existing concrete ditch along Waokanaka Street.

### **E.2 Land Use Plans and Controls**

#### **E.2.1 Zoning**

The proposed project site is designated Residential (R-10) based on the City and County of Honolulu Land Use Ordinance.

#### **E.2.2 Land Use**

The proposed project site is designated Urban on the State land use map.

#### **E.2.3 Public Infrastructure Map**

There is no "symbol" for drainage improvements along Meleana Place shown on the Public Infrastructure Map for the Primary Urban Center (October 13, 2004).

#### **E.2.4 General Plan**

O'ahu's *General Plan* establishes policies and objectives of a comprehensive planning process addressing physical, social, economic and environmental concerns for future growth of Honolulu's metropolitan area (Department of Planning and Permitting, 2002). The proposed project is consistent with the following objectives and policies:

- Natural Environment Objective A, Policy 6 – Design surface drainage and flood control in a manner which will help preserve their natural setting
- Transportation and Utilities Objective C, Policy 2 – Provide improvements to utilities in existing neighborhoods to reduce substandard conditions.
- Transportation and Utilities Objective D, Policy 1 – Give primary emphasis in the capital-improvement program to the maintenance and improvement of existing roads and utilities.

#### **E.2.5 Primary Urban Center Development Plan (PUCDP)**

The development plan provides the framework for land use policy and budgetary decision-making for the City and County of Honolulu. The PUCDP recognizes that while the secondary urban center in Ewa will have the greatest growth, the role of the primary urban center will continue to be a central focus as home to almost half of O‘ahu’s population and three-fourths of its jobs. Thus, the focus of planning goals for this mature urban center will be to “enhance its livability and accommodating a moderate amount of growth” (Department of Planning and Permitting, 2004, page 1-1). The PUCDP acknowledges that infrastructure deficiencies occur most frequently within the older, in-town neighborhoods (Department of Planning and Permitting, 2004).

#### **E.3 Other Social Activities**

No existing commercial, meeting facility or residential activity will be directly displaced by the proposed project.

### **III. Description of the Affected Environment**

#### **A. Existing Project Area and Drainage Infrastructure**

Meleana Place is a developed, dead-end road used for access to single-family residential lots. The right-of-way is under the jurisdiction of the City and County of Honolulu. The residential lots on the uphill side of the road are zoned R-10 (residential) and P-1 (preservation), while the downhill lots are entirely R-10. The roadway is located within a 32-foot right-of-way including asphalt concrete (AC) pavement with curbs and gutters as shown on the typical roadway section (refer to Figure 5). This typical section is obtained from as-built drawings entitled “Hacienda Estates” designed by Associated Engineers and approved by the City and County of Honolulu in 1959. The AC pavement width is approximately 20 feet, and there are no existing sidewalks. The steeper portion of Meleana Place consists of a 6-inch thick concrete base under the AC pavement overlay.

Other available records indicate that an 18-inch drain line traverses Meleana Place directing some of the hillside flow into an existing concrete ditch running along Waokanaka Street. However, as-built record drawings of the actual drainline profile could not be found, and the existence of the drainage inlet in the hillside could not be confirmed during field investigation. Several 12-inch square inlets were observed on the north side, mauka of the roadway, connected by 6-inch perforated pipe which appears to handle minor flows and groundwater. Several of the inlets are plugged, and the connecting pipes may also be blocked. In addition,

there is an existing catch basin at the intersection of Meleana Place and Waokanaka Street, which connects to a 24-inch pipe that discharges into an existing 4-foot wide concrete ditch (27 inch± deep) running along Waokanaka Street. The ditch is under the jurisdiction of the State of Hawaii. It eventually discharges into Niniko Stream via a 36-inch diameter concrete pipe crossing Pali Highway.

## **B. Climate**

The National Oceanic and Atmospheric Association (NOAA) Western Regional Climate Center provides historical climatological information for Hawaii. The observation site closest to the project site is rain gage station 516933-2, Nu'uuanu Reservoir 5 775. This station is located at the Honolulu Board of Water Supply Nu'uuanu Reservoir 640 on Pali Highway. Monthly rainfall data has been recorded at this station since October 1949 with an annual average of 108 inches through June 2009. The highest monthly averages occur in November, December, and March ranging from 10.6 to 11.7 inches, while June is the driest and only month averaging less than 7 inches (NOAA, 2009).

## **C. Topography**

The upper portion of Meleana Place is fairly flat with a 0.4% slope from the cul-de-sac (refer to Figure 5), which continues for approximately 230 feet. The road grade then steepens dramatically to 19% and slopes downward to Waokanaka Street.

The majority of the hillside above Meleana Place is steep and forested, with slopes typically ranging from 1.3H:1V to 6H:1V.

## **D. Soils**

The U.S. Soil Conservation Service (SCS) Soil Survey (1972) has designated that the project area consists of both Lolekaa silty clay (LoD, LoF) and Rock land (rRK) with slopes that vary greatly from the roadway to the adjacent hillside (refer to Figure 6).

The SCS describes the Lolekaa series as well-drained soil on fans and terraces, which was developed from gravelly colluvium and alluvium. The slopes vary from nearly level to severe. Runoff can vary from medium to rapid and the erosion hazard can be moderate to severe. The SCS describes Rock land as areas where exposed rock, developed mainly from basalt and andesite, covers 25 to 90 percent of the surface. Slopes can vary from being nearly level to steep.

## **E. Tributary Area**

The drainage basin is delineated from the ridgeline on the hillside above Meleana Place and consists of approximately 12.25 acres (refer to Figure 7). The basin was determined through existing topographical data from the City and County of Honolulu Geographic Information System (2006).

## **F. Flood Hazard**

The project site is located in an area designated as Zone X on the Flood Insurance Rate Map (FIRM No. 15003C0360F, revised September 30, 2004), which is outside the 500-year floodplain (refer to Figure 8).

## **G. Hydrology**

### **G.1 Surface Water**

There are no freshwater streams, rivers, ponds or open bodies of water within the proposed project site.

Runoff generated from the project site will be conveyed to an existing concrete ditch along Waokanaka Street. As mentioned previously, the ditch is under jurisdiction of the State of Hawaii Department of Transportation. It eventually discharges into Niniko Stream via a 36-inch diameter concrete pipe crossing Pali Highway. Niniko Stream is a tributary to Waiolani Stream, which joins Nuʻuanu Stream downstream towards the H-1 Freeway in the vicinity of the Liliuokalani Botanical Gardens (refer to Figure 1). All three streams are designated perennial streams by the U.S. Geological Survey and Inland Class 2 on the Water Quality Standards Map for the Island of Oʻahu (Department of Health, 1987).

The storm runoff itself is not expected to contain any hazardous pollutants.

### **G.2 Ground Water**

The Commission on Water Resource Management of the Department of Land and Natural Resources (DLNR) has established Ground-Water Hydrologic Units to provide a consistent basis for managing ground water resources. The proposed project site is situated within the Nuʻuanu Subsector of the Honolulu Ground-Water Hydrologic Unit; however, there are no known wells within the site (S. Swanson, DLNR, e-mail communication, August 28, 2009).

### **G.3 Wetlands**

There are no wetlands within the proposed project site (AECOS, 2009).

## **H. Flora & Fauna**

A biological field survey of the project area was conducted by AECOS, Inc. on July 27, 2009 (refer to Appendix B for report). The area investigated included the residential neighborhood along Meleana Place and the slope between Meleana Place and Waokanaka Street. As expected in an established residential area, vegetation consisted primarily of ornamental plants and lawn grasses. The following summarizes the findings of the survey (AECOS, 2009, pp. 6-7):

“No botanical resources of concern are located in the area of Meleana Pl. potentially to be disturbed or the verge and slopes close to Waokanaka St. in the same general area. Native plants are sparse in and surrounding the project area; only hau (*Hibiscus tiliaceus*), a possibly indigenous (or aboriginal introduction) was observed. Thus, there are no plant species present that would be of particular concern.

No streams, relatively permanent or non-relatively permanent waterways, or wetlands occur in the project area. Although a survey to develop a faunal listed for the project area was not undertaken, no animals of special concern were encountered... No habitats other than those supporting common lowland birds and introduced wild and feral mammals were [present. No federally endangered or threatened species (Federal Register, 2005; USFWS, 2005) were encountered during the survey, and none is anticipated to utilize habitats in the project area.”

## **I. Archaeological Features**

An archaeological monitoring plan has been prepared by Archaeological Consultants of the Pacific (ACP) for the proposed drainage improvement project (refer to Appendix C for plan). The plan identified Nuʻuanu Valley as an area of significance during both pre-Contact and Post Contact Eras of Hawaii (ACP, June 2009). Although there have been no archeological investigations conducted on the proposed project site, several studies have taken place in the Nuʻuanu Ahupuaʻa including investigations at buildings associated with Hawaiian royalty including Queen Emma's Summer Place, the Royal Mausoleum, and Kamehameha III's Summer Place (ACP, June 2009). In addition, several petroglyph and heiau sites have been found within Nuʻuanu Valley and along Nuuanu Stream (ACP, June 2009).

## **J. Cultural Resources**

A cultural impact assessment was conducted by Archaeological Consultants of the Pacific (ACP) in order to gather information about cultural practices and features that may be affected by the proposed drainage improvement project (refer to Appendix D for assessment). Two informants who were interviewed as part of the assessment are considered active community members who reside in the valley:

- Dr. Charles Burrows does not believe that the proposed drainage improvement project would affect a place or access to a place of cultural or historic significance (ACP, September 2009).
- Dr. Kekuni Blaisdell supports the project with the understanding that it would prevent "flooding and destruction" but declined to speak on behalf of the residents of Meleana Place. Although he could not state what type of affect the proposed activities might have on any cultural or historical sites of significance, he believes that 'iwi associated with the Battle of Nuʻuanu are likely to be encountered during construction due to the "sacred" nature of the Nuʻuanu area (ACP, September 2009).

## **K. Public Facilities and Services**

### **K.1 Roadway**

The roadway is located within a 32-foot right-of-way including asphalt concrete (AC) pavement with curbs and gutters as shown on the typical roadway section (refer to Figure 9). This typical section is obtained from as-built drawings entitled "Hacienda Estates" designed by Associated Engineers and approved by the City and County of Honolulu in 1959. The AC pavement width is approximately 20 feet, and there are no existing sidewalks. The steeper portion of Meleana Place consists of a 6-inch thick concrete base under AC pavement overlay. Meleana Place is under jurisdiction of the City and County of Honolulu.

### **K.2 Water Systems**

The public water service in the area is provided by the Board of Water Supply including an existing 4-inch and 8-inch water lines (refer to Figure 3). No additional services will be required, although some infrastructure, such as fire hydrants, may be relocated.

### **K.3 Wastewater Collection Systems**

The properties along Meleana Place are serviced by an existing 8-inch sewer (refer to Figure 3). The proposed project will not require additional sewer service nor is it expected to require relocation of existing sewers and sewer manholes.

### **K.4 Drainage Systems**

The existing drainage system consists of several 12-inch square inlets on the north side, mauka of the roadway, connected by 6-inch perforated pipe which appears to handle minor flows and groundwater (refer to Figure 3). Several of the inlets are plugged, and the connecting pipes may also be blocked. In addition, there is an existing catch basin at the intersection of Meleana Place and Waokanaka Street, which connects to a 24-inch pipe that discharges into an existing 4-foot wide concrete ditch (27 inch± deep) running along Waokanaka Street. The ditch is under the jurisdiction of the State of Hawaii. It eventually discharges into Niniko Stream via a 36-inch diameter concrete pipe crossing Pali Highway.

The proposed underground drainage system shown in Figures 4 & 5 will provide additional hydraulic capacity which will alleviate flooding from the road right-of-way into private property. A new 2' x 4' box culvert connection will be constructed replacing the existing 24-inch diameter connection to the State's 4-foot wide concrete ditch running along Waokanaka Street.

### **K.5 Electric/Cable Utilities**

The project area is currently served by aerial facilities. There are no anticipated conflicts; however, construction plans will be submitted for review and approval by affected agencies. Additional electrical, telephone or cable service will not be required for this project.

### **K.6 Gas Utilities**

There are no gas lines within project site, although The Gas Company does maintain a 124-gallon tank and 5/8-inch diameter gas line in one of the private driveways off Meleana Place. This isolated system serves a residential property on the hillside above Meleana Place. Additional service will not be required for the proposed project.

## **IV. Summary of Potential Environmental Impacts and Measures to Mitigate Adverse Effects**

### **A. Short-Term**

The actual construction phase of the project will cause disruption of every day routine activities in the area. This could affect access to properties, increase traffic congestion and construction-related nuisances including increased sediment runoff during storm runoff events and increased noise levels. In addition, the visual appearance of construction barriers and scarred pavement including metal plates is aesthetically unappealing. However, these impacts by definition are short-term as described below.

#### **A.1 Traffic and Roads**

Traffic along Meleana Place and Waokanaka Street will be of temporary inconvenience to motorists and pedestrians due to construction-related activities. The contractor will be

required to coordinate with residents and property owners in the vicinity of the project site at least two weeks prior to the start of construction. The O'ahu Transit Services, TheBus, and The Handi-Van will also be notified of any construction activities affecting their respective services prior to the start of construction.

Traffic control plans will be developed by a registered civil engineer and submitted to the Department of Planning and Permitting, Traffic Review Branch for review and approval. Access to all affected residences will be maintained throughout the duration of the proposed project construction.

## **A.2 Air Quality**

Air quality can be impacted by traffic volumes and temporary construction-related impacts. Since traffic volumes will remain essentially identical to current levels, no significant effects are anticipated.

With respect to construction-related impacts, licensed contractors are required to maintain construction equipment in proper working order to ensure no violations and are subject to enforcement actions if found in non-compliance. Activities associated with the construction phase of the project will comply with Chapter 60 of Title 11, Hawaii Administrative Rules, Air Pollution Control.

## **A.3 Noise**

Noise levels in this developed residential area are anticipated to be identical prior to and after project implementation. Noise related to construction activities are primarily controlled by hours of operation. All construction will be limited to daytime hours. Activities associated with the construction phase of the project will comply with Chapter 46 of Title 11, Hawaii Administrative Rules, Community Noise Control.

## **A.4 Archaeological Features**

The proposed project activities are not expected to affect a place or access to places of cultural or historic significance (ACP, June 2009). However, due to the significance of Nu'uuanu Valley during both pre-Contact and Post-Contact eras and the presence of a variety of traditional and historic artifacts and human remains in the vicinity of the proposed project site, it is possible that artifacts and human remains may be encountered during construction activities (ACP, June 2009). An archaeological monitoring plan will be prepared and submitted to the State Historic Preservation Division for review and approval prior to the start of construction. The following are anticipated components of the monitoring plan (ACP, June 2009):

- The monitoring archaeologist will conduct a pre-construction meeting with City and County of Honolulu officials and the contractor to brief the team on the expected finds and plans for monitoring.
- During construction, the archaeological field monitor will visually inspect all excavations and rake through excavated materials in order to identify any possible cultural materials. Profiles of the stratigraphy encountered and soil samples from each strata identified will be taken.

- Laboratory work will include, but not be limited, to identification of vertebrate faunal remains, invertebrate faunal remains, culturally derived remains and artifacts.
- In the event that a significant historic site is encountered, the monitoring archeologist shall have the authority to stop construction in the immediate vicinity of the find until proper authorities have been notified and/or proper mitigation measures are undertaken. Construction activities may shift to other areas that are not impacted by the find.

#### **A.5 Construction Activities**

During construction, normal requirements for mitigation of construction impacts will be utilized. These requirements include traffic control, compliance with best management practices (BMP), compliance with hours prescribed for construction to minimize noise impacts, and compliance with businesses and their normal hours of operation through direct contact. Proposed BMPs are as follows:

- (1) All loose material and small tools and equipment will be removed from the construction site after each work day is completed.
- (2) City-approved area(s) away from the stream bed to store or stockpile construction related materials and equipment will be designated prior to the start of construction.
- (3) Removed vegetation, debris and unsuitable excavated materials will be properly disposed at a site approved by the City.
- (4) All hazardous or toxic waste will be disposed of in the manner specified by federal, state or local regulations or the manufacturer.
- (5) All sanitary waste from portables will be collected and disposed of properly.
- (6) All solid waste from the site will be stored in a securely lidded dumpster within or adjacent to the project site. The dumpster will be emptied as needed at least on a daily basis, and the trash will be hauled to a City-approved site.
- (7) Any debris and other deleterious material will be contained and prevented from entering State waters.
- (8) Materials to be placed in State waters will be free of waste metal products, organic materials, objectionable debris and any other pollutants at concentrations toxic or potentially hazardous to aquatic life.
- (9) Temporary berms consisting of sand bags will be used to divert any stream flow from the working area.
- (10) Visual monitoring will be performed by the contractor on a daily basis or following any storm event of 0.5" or greater. The contractor will inspect all control measures including silt curtains and berms to ensure that they are maintained in good

working condition. Necessary repairs will be initiated by the contractor within 24 hours of notification or observation.

- (11) Rocks, soil or debris will not be allowed to fall, slide or flow onto adjoining properties.
- (12) Graded areas and exposed surfaces will be kept well watered whenever feasible. At the end of each work day, the project site will be sufficiently dampened so as to remain moist overnight.
- (13) To the extent possible, construction will be done during dry weather so that there is low or no construction-related runoff. The contractor will be required to temporarily suspend work during periods of heavy rain. All erosion control measures will be inspected following any storm event of 0.5" or greater.
- (14) Equipment shall be inspected daily to ensure that oil leaks do not occur. Equipment shall be stored away from the ditch or stream bed. Fueling and lubricating of equipment and motor vehicles will be conducted away from the stream bed and in a manner to protect against spills and evaporation. Lubricants and excess oils will be disposed of in accordance with applicable federal, state and local regulations.

In addition, utility services should not be disrupted during construction activities. The contractor will be required to verify locations, protect utilities during construction and ensure no interruption of services on all utilities in the vicinity of the project site during construction. Access to fire apparatus will be maintained throughout the construction site and any interruption to the existing fire hydrant system during construction will be reported to the Fire Communication Center (phone 523-4411) by the contractor.

## **B. Long-Term**

The only identifiable long-term impact is considered to be related to the benefits of the project which will reduce flooding in the vicinity of Meleana Place. Similar to the current situation, during periods of prolonged and/or intense rainfall, the proposed drainage system will continue to convey runoff to the existing concrete ditch which eventually discharges into Niniko Stream. The existing roads to be affected by construction of the drainage improvements will be restored to original condition.

## **V. Alternatives Considered**

In order to resolve the flooding problems at Meleana Place, three alternatives are considered as described below. The engineering staff at the State Department of Transportation has indicated that the drainage systems downstream of Pali Highway are already known to overflow during heavy rains and any additional flows will not be permitted into the system. However, storm water from Meleana Place currently enters the State's ditch along Waokanaka Street as surface runoff. It should be noted that the proposed alternatives will not involve generation of additional flows, since there will not be further development of the site. Except for Alternative 1 - No Action, runoff is merely redirected in a more controlled manner to different parts of the ditch so as to prevent flooding of private property.

### **A. Alternative 1 – No Action**

Excessive surface runoff generated from the hillside above is resulting in the submergence of the roadway during heavy rains, particularly towards the upper portion of Meleana Place. In addition, existing drainage infrastructure is not adequately collecting the runoff, which causes flooding and potential property damage along the southern edge of the roadway. Under the No Action alternative, there would be continued inconvenience to residents on the downhill side of the road when storm water from the roadway ends up in their property instead of being conveyed through gutters during heavy rains. This alternative is not an acceptable course of action, because it continues to place undue burden on the downhill property owners.

### **B. Alternative 2 – Diversion Ditch**

Available records indicate that an 18-inch drain line traverses Meleana Place directing some of the hillside flow into an existing concrete ditch running along Waokanaka Street. Although it has been field verified that an 18-inch outlet connection to the ditch along Waokanaka Street exists, as-built drawings of the actual drainline profile could not be found, and the existence of the drainage inlet in the hillside could not be confirmed during field investigation.

During design, a topographic survey will be performed to verify the existence of the inlet and drainline. If the inlet does exist, the 18-inch drainline could be considered for diversion of some of the hillside drainage basins to the ditch along Waokanaka Street. A diversion ditch would be constructed above the homes in the uphill lots, which could intercept about 16 CFS of runoff from the hillside into the 18-inch drain line. This alternative will still require the construction of various catch basins, trench drains and underground piping within Meleana Place; however, pipe sizes would be reduced, less catch basins may be needed and the box culvert may not be required. In addition, construction and designation of easements within private property would require permission from multiple property owners.

### **C. Alternative 3 – Underground Drainage System**

This alternative would involve the construction of an underground drainage system to divert the runoff currently entering Meleana Place down along the roadway to the ditch along Waokanaka Street. Due to the inability to confirm the existence of the existing 18-inch drainline running across Meleana Place, this alternative is based on the assumption that the existing drainline does not exist or is inactive. Therefore, the proposed drainage system must be capable of accommodating the entire hillside flow above Meleana Place.

Figures 4 & 5 depict the proposed underground drainage system, which consists of catch basins, trench drains, drainage pipes, and a section of 2-foot high by 4-foot wide box culvert. This system will serve to divert storm water from the hillside above Meleana Place, as well as runoff generated on the roadway itself down to the existing ditch at the intersection of Meleana Place and Waokanaka Street. In this manner, the flows will enter the ditch at a controlled point instead of flooding the southern lots of Meleana Place before entering the ditch.

## VI. Potential Permits and Approval Required for Project

### A. City and County of Honolulu

Grubbing, Grading, and Stockpiling Permit	Dept. of Planning and Permitting
Permit to Excavate Public Right-of-Way (Trenching)	Dept. of Planning and Permitting
Street Usage Permit	Dept. of Transportation Services

### B. State of Hawaii

Community Noise Control Permit	Dept. of Health
Connection to Storm Drain System	Dept. of Transportation

### C. Federal

Federal permits are not anticipated for the proposed project.

## VII. Findings and Reasons to Support the Determination

It is anticipated that the proposed project will not significantly impact the environment, and therefore a Finding of No Significant Impact (FONSI) is anticipated. It is not anticipated that the preparation and processing of an Environmental Impact Statement will be required for this project. This statement of findings is based on an evaluation of the significance criteria listed in Chapter 200-12b of Title 11, Hawaii Administrative Rules, described as follows:

**(1) *The project will not involve an irrevocable commitment to loss or destruction of any natural or cultural resources.***

The site is already fully developed and no significant natural or cultural resources are expected to be encountered since the project scope calls for modification of existing man-made infrastructure with no disturbance of lands which were previously undisturbed.

**(2) *The project will not curtail the range of beneficial uses of the environment.***

The proposed project is solely intended to enhance the existing beneficial uses of the urban center.

**(3) *The project will not conflict with the State's long-term environmental policies or goals and guidelines as expressed in Chapter 344, Hawaii Revised Statutes, and any revisions thereof and amendments thereto, court decisions or executive orders.***

The project will not conflict with the environmental policies as set forth in the State Plan and Chapter 344, Hawaii Revised Statutes (HRS) in that the project will not damage sensitive natural resources nor emit contaminants.

**(4) *The project will not substantially affect the economic or social welfare of the community or State.***

There may be some negative short-term economic and social impacts as related to construction (traffic congestion, blockage of street frontage and noise, etc.). However, the

long-term benefit is the protection of private property and safety of motorists and pedestrians along Meleana Place.

**(5) The project will not substantially affect public health.**

No impact on public health is anticipated. Increased safety is considered positive.

**(6) The project will not involve substantial secondary impacts, such as population change or effects on public facilities.**

The project will not influence population change or impact on existing infrastructure.

**(7) The project will not involve a substantial degradation of environmental quality.**

Environmental quality will be essentially the same as that which exists prior to project implementation. The project consists of underground improvements within an existing roadway with discharge of storm runoff into an intermittent stream.

**(8) The project is individually limited and will not cumulatively have a considerable effect upon the environment nor involves a commitment for larger actions.**

The proposed drainage system is limited to Meleana Place and Waokanaka Street and will not result in the requirement of other actions. Existing roads to be affected by construction of the drainage improvements will be restored to original condition.

**(9) The project will not substantially affect a rare, threatened or endangered species, or its habitat.**

The project area is limited to an existing roadway which is not known to sustain any habitats of threatened or endangered species.

**(10) The project will not detrimentally affect air quality, water quality or ambient noise levels.**

Short-term impacts may occur during the construction of the project. However, the contractor must comply with current Department of Health regulations and must adhere to and provide Best Management Practices (BMP) practices.

**(11) The project will not affect an environmentally sensitive area such as a flood plain, tsunami zone, erosion-prone area, geologically hazardous land, estuary, fresh water, or coastal waters.**

The project site is not located in any sensitive area.

**(12) The project will not substantially affect scenic vistas or view lanes as identified in County or State plans or studies.**

The proposed drainage improvements will be constructed underground within an existing roadway and will not have any effect on scenic vistas or view planes.

**(13) The proposed project will not require substantial energy consumption.**

The only energy consumption involved with this project is that related to construction activities. After construction completion, energy consumption will essentially return to that which existed prior to construction.

## VIII. Summary of Unresolved Issues

There are no known unresolved issues.

## IX. List of Agencies, Organizations or Private Individuals Notified of the Public Comment Period

The following is a list of government agencies, organizations or individuals that were notified regarding the 30-day public comment period for the Draft Environmental Assessment (EA).

### Federal Government

Department of the Army, Corps of Engineers, Pacific Ocean Division

### State Government

Department of Business, Economic Development and Tourism  
Office of Planning

Department of Health  
Environmental Health Administration  
Office of Environmental Quality Control

Department of Land and Natural Resources  
Commission on Water Resource Management  
Historic Preservation Division  
Land Division

Department of Transportation

Office of Hawaiian Affairs

State Representative  
District 27 – Nu‘uanu, Puunui, Liliha, and Alewa Heights

State Senator  
District 13 – Sand Island, Kalihi, Liliha, Nu‘uanu, Pauoa, and Puunui

### City and County Government

Board of Water Supply  
Department of Environmental Services  
Department of Facility Maintenance  
Department of Parks and Recreation  
Department of Planning and Permitting  
Department of Transportation Services  
Fire Department

Honolulu City Council  
District 6 - Portion of Makiki, Downtown Honolulu, Punchbowl, Liliha,  
Pauoa Valley, Nuuanu, Alewa Heights, Papakolea, Kalihi Valley, and Portion of Kalihi  
Police Department

**Other Organizations**

Nu‘uanu/Punchbowl Neighborhood Board No. 12  
The Gas Company  
Hawaiian Electric Company  
Hawaiian Telcom  
Oceanic Time Warner Cable

**Residents along Meleana Place and Waokanaka Street**

**X. List of Persons, Firms or Agencies that Prepared the Statement**

The following list identifies the persons, firms, and government agency involved with the preparation of the environmental assessment for the proposed action.

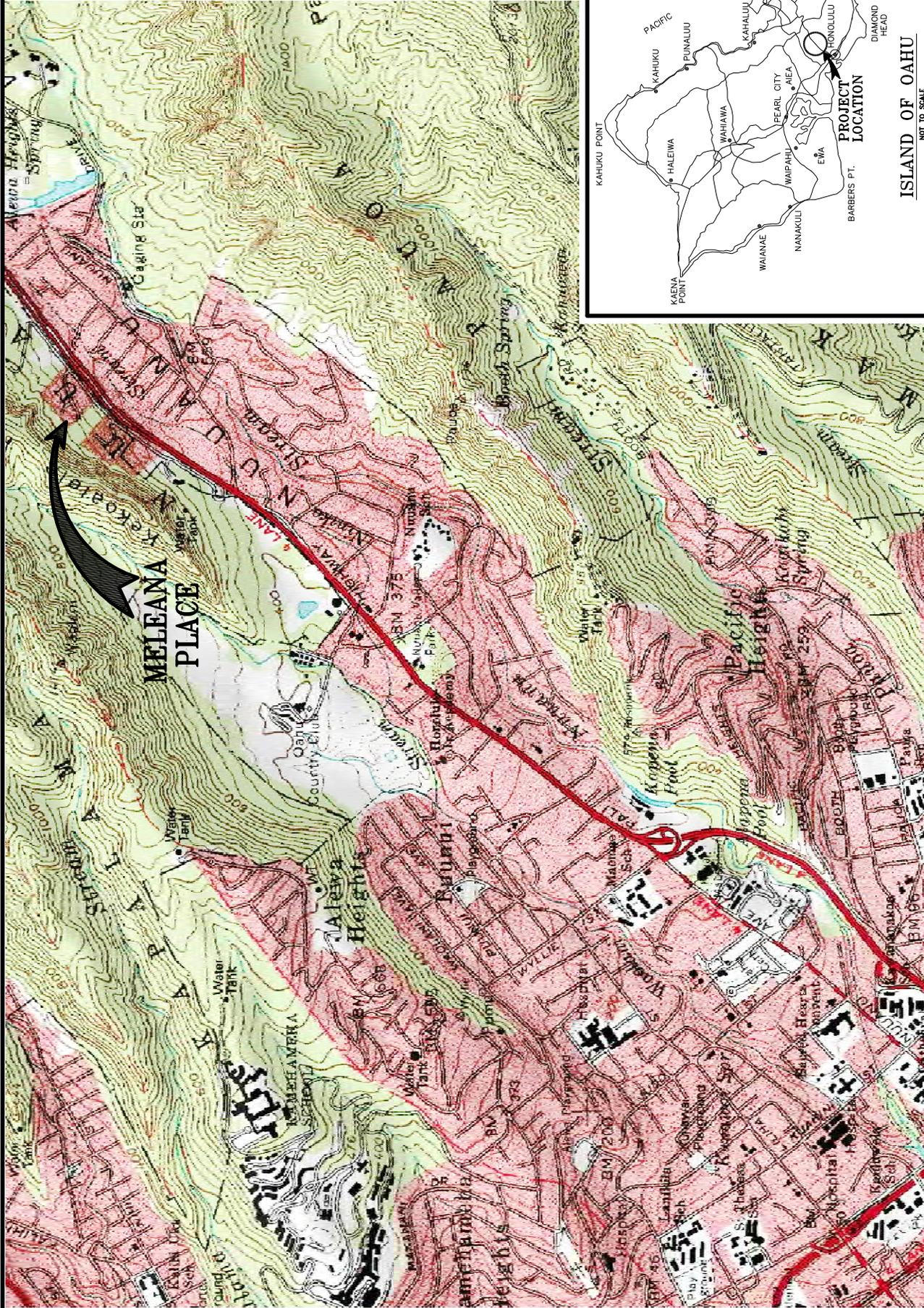
- |    |  |   |
|----|--|---|
| 1. | Sheryl Nojima<br>Gray, Hong, Nojima & Associates, Inc.   | EA Project Manager  |
| 2. | Joseph Kennedy<br>Archaeological Consultants of the Pacific, Inc.  | Cultural Assessment and<br>Archaeological Monitoring Plan |
| 3. | Eric Guinther<br>AECOS, Inc.   | Flora/Fauna Survey  |
| 3. | Scott Nakamatsu, Civil Engineer<br>Civil Design and Engineering Division<br>Department of Design and Construction<br>City and County of Honolulu | Project Coordinator                                       |

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Figure 5	Preliminary Profile
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Figure 7	Proposed Hydrologic Map
Figure 8	Flood Insurance Rate Map
Figure 9	Meleana Place Typical Roadway Section

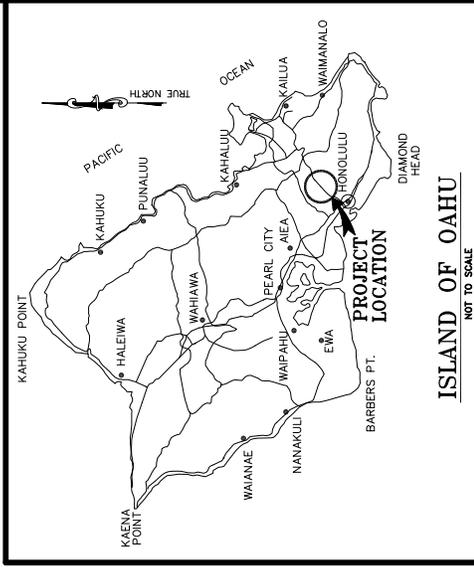


MELEANA PLACE DRAINAGE IMPROVEMENTS  
 HONOLULU, OAHU, HAWAII  
 PROJECT VICINITY MAP

SCALE:  
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 CAD DRAWING:  
 2949-EA-VICINITY  
 DATE:  
 AUG 12, 2009

FIGURE

1



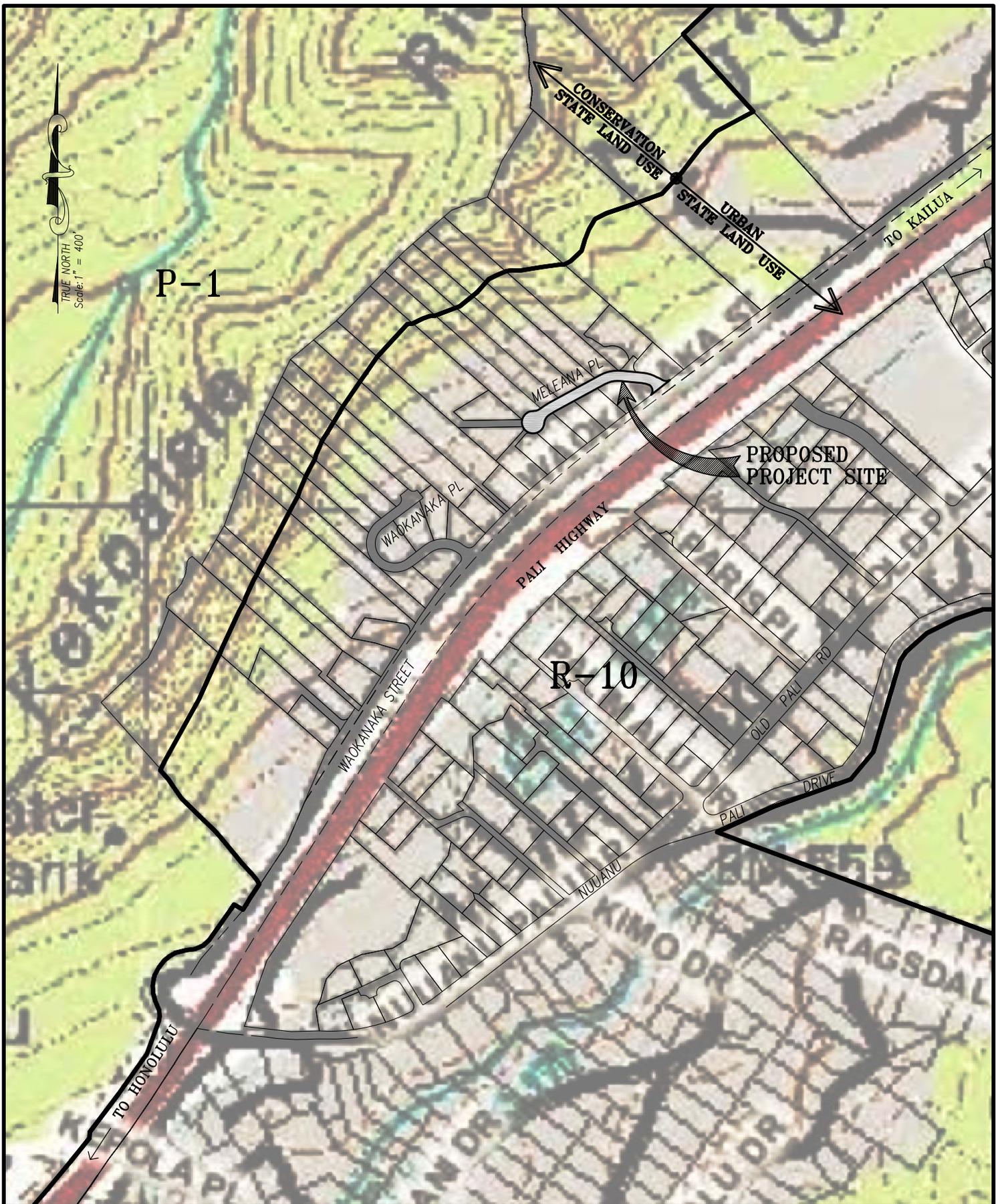
ISLAND OF OAHU  
 NOT TO SCALE



Gray-Hong, Nojima & Associates, Inc  
 CONSULTING ENGINEERS

841 Bishop Street

Suite 1100



SCALE:  
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CAD DRAWING:  
2949-01 EA-LOC

DATE:  
AUG 13, 2009

MELEANA PLACE DRAINAGE IMPROV.  
HONOLULU, OAHU, HAWAII

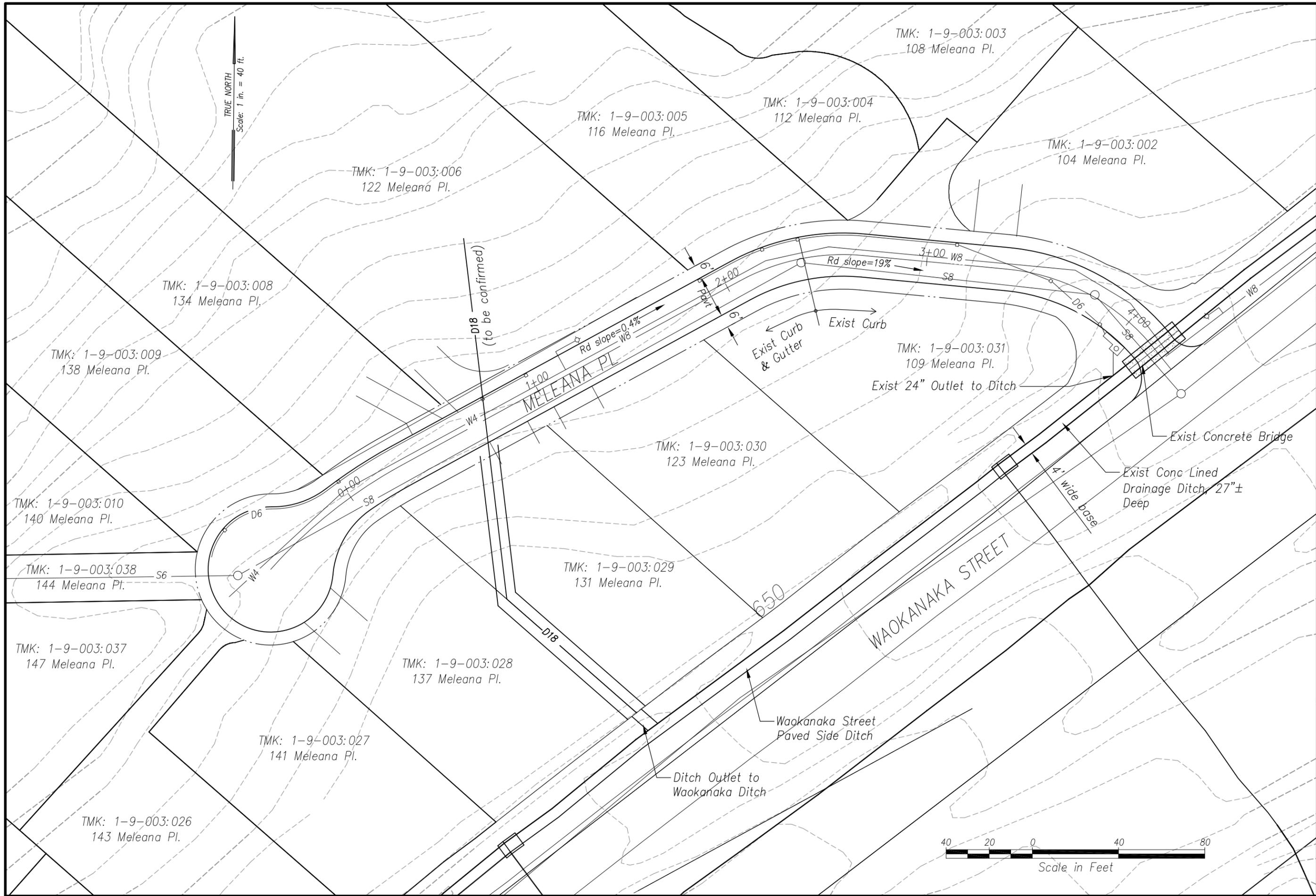
**SITE MAP**



Gray-Hong-Nojima & Associates, Inc  
CONSULTING ENGINEERS

841 Bishop Street Suite 1100

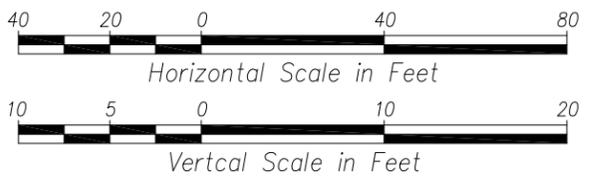
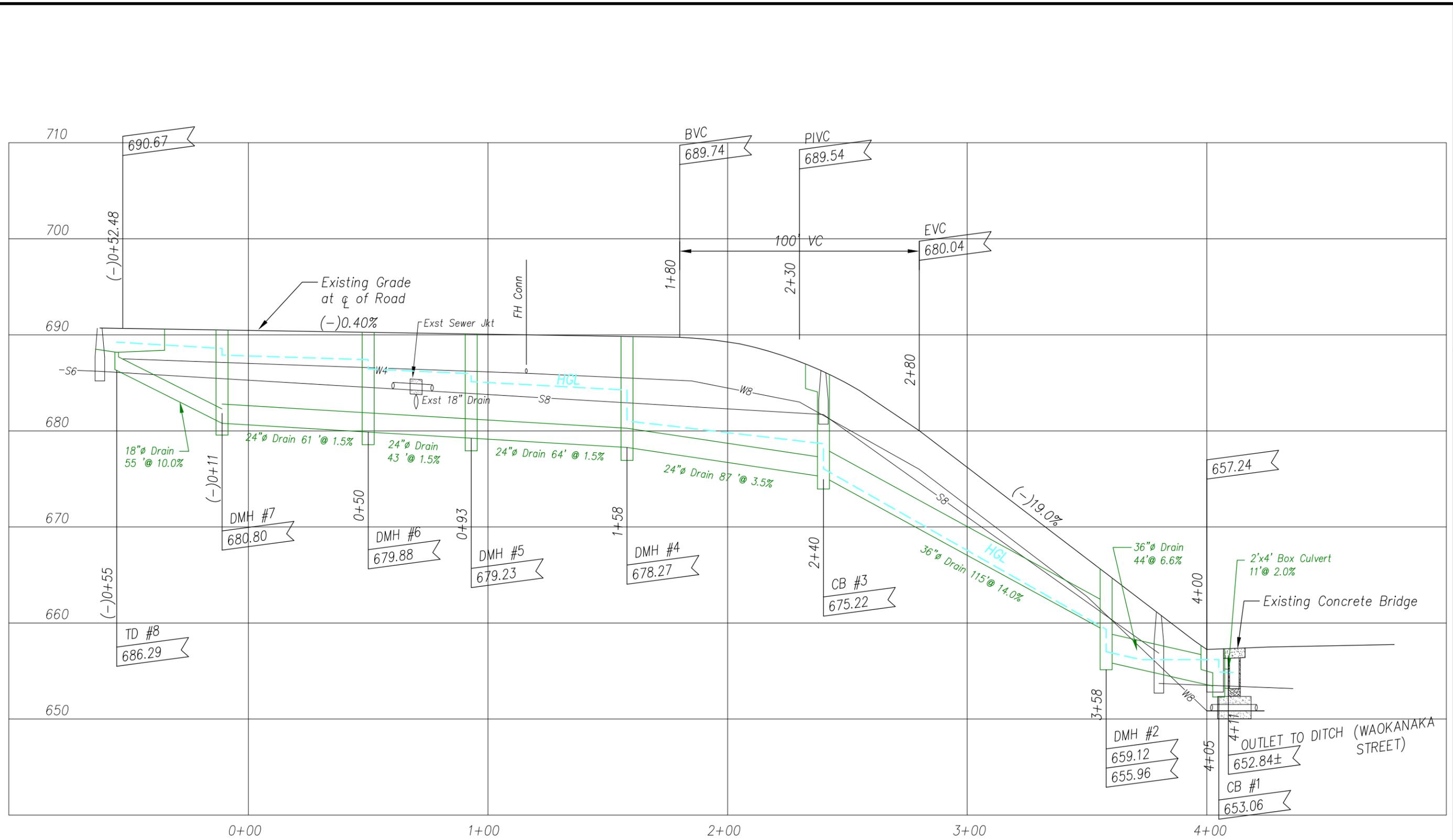
FIGURE  
**2**



**MELEANA PLACE DRAINAGE IMPROVEMENTS**  
**EXISTING CONDITIONS**

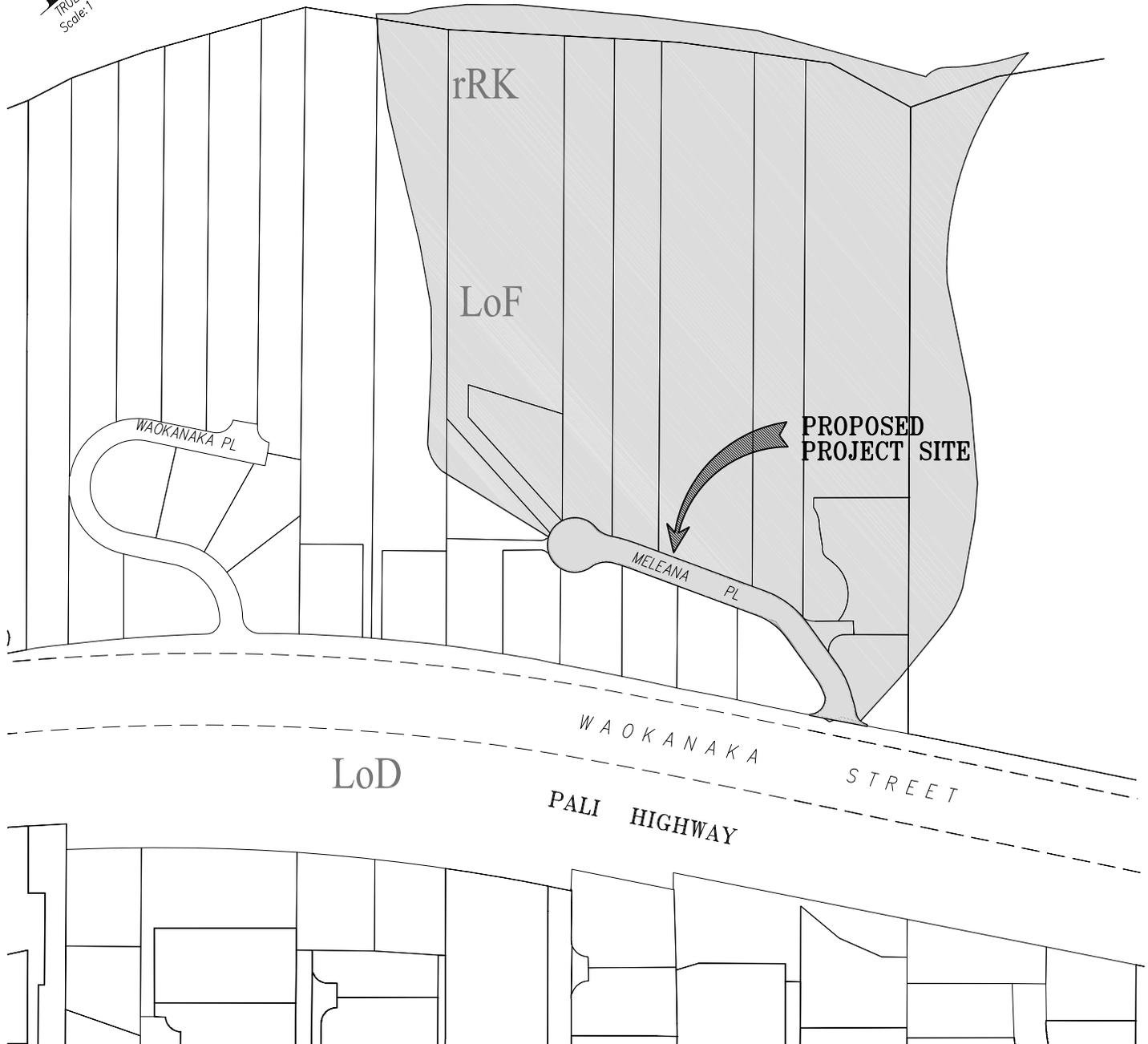
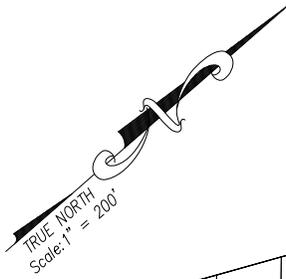
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CAD DRAWING: 2949 EX COND
DATE: SEPT 18, 2009





MELEANA PLACE DRAINAGE IMPROVEMENTS  
PRELIMINARY PROFILE

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CAD DRAWING:	2949-MELEANA
DATE:	SEPT 18, 2009

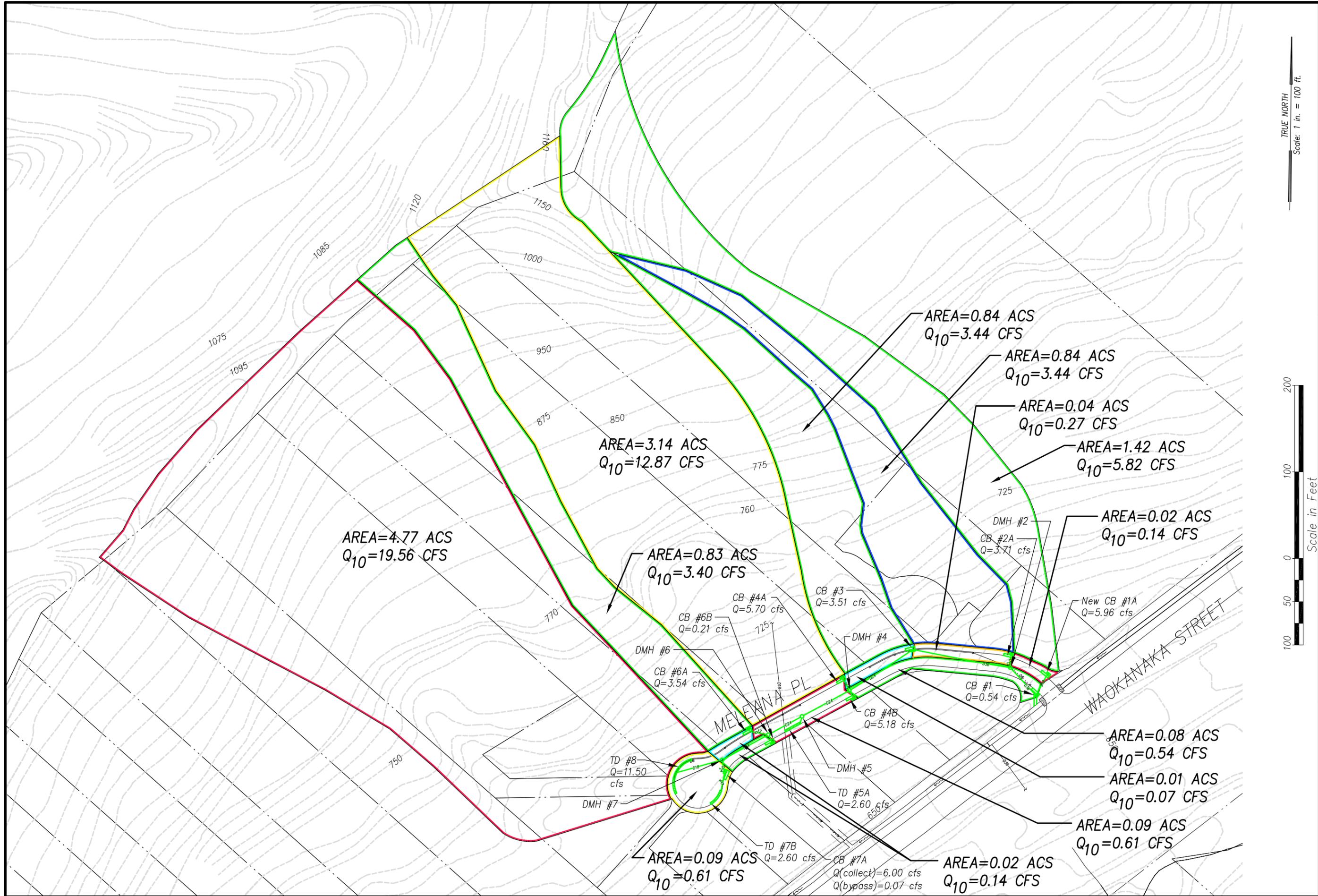


**LEGEND**

- LoD = Lolekaa Silty Clay
- LoF = Lolekaa Silty Clay
- rRK = Rock Land

Source: U. S. Department of Agriculture  
Soil Conservation Service (1972)

<p>SCALE: 1" = 200'</p> <p>CAD DRAWING: 2949-01 SOIL</p> <p>DATE: SEPT 18, 2009</p>	<p>MELEANA PLACE DRAINAGE IMPROV. HONOLULU, OAHU, HAWAII</p> <p><b>SOIL CLASSIFICATION MAP</b></p>	 <p>Gray-Hong-Nojima &amp; Associates, Inc CONSULTING ENGINEERS</p> <p>841 Bishop Street Suite 1100</p>	<p>FIGURE</p> <p><b>6</b></p>
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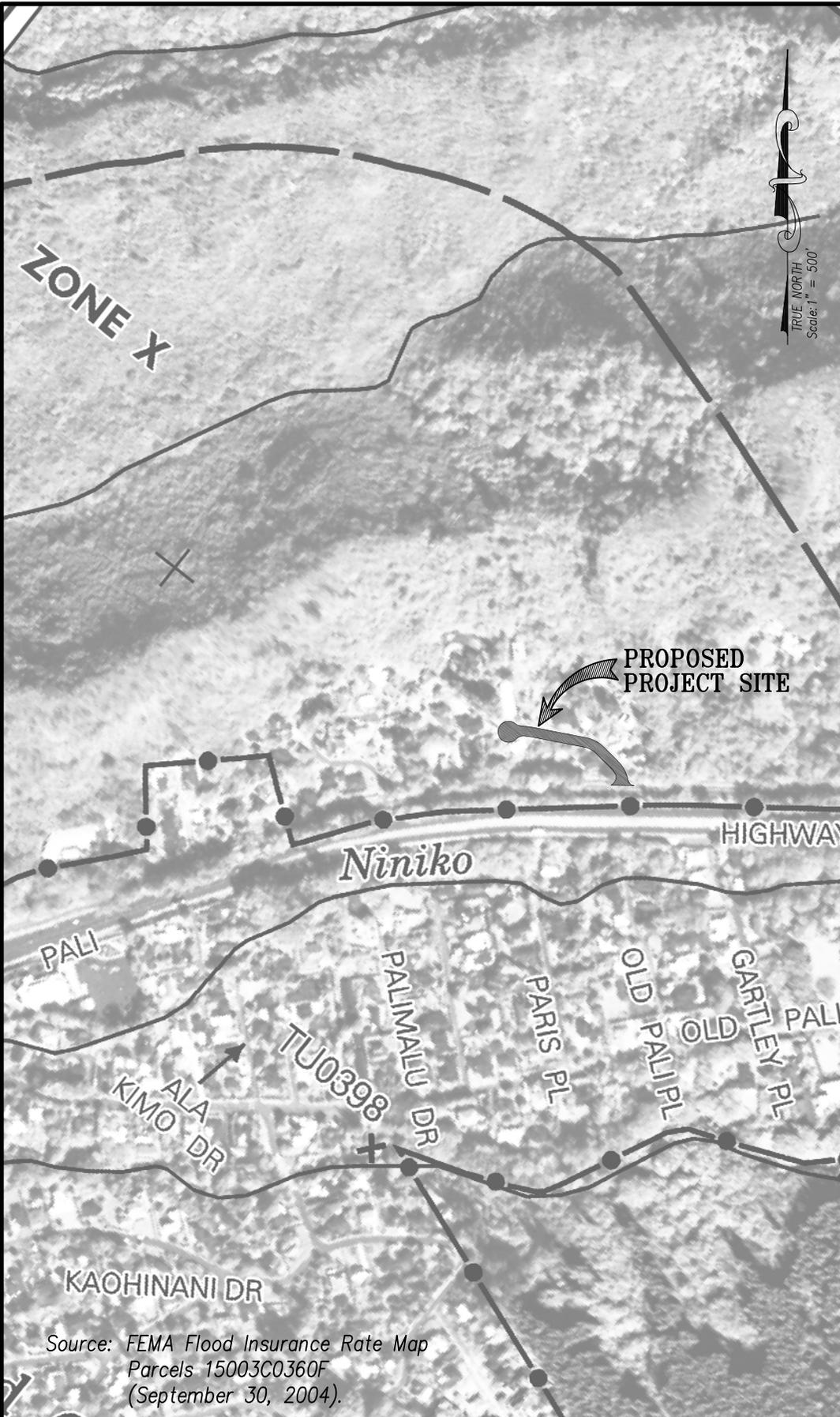
TRUE NORTH  
Scale: 1 in. = 100 ft.



MELEANA PLACE DRAINAGE IMPROVEMENTS  
PROPOSED HYDROLOGIC MAP

SCALE: 1" = 100'	CAD DRAWING: 2949-MELEANA	DATE: SEPT 18, 2009
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FIGURE  
7



**NFIP** PANEL 0360F

**FIRM**  
**FLOOD INSURANCE RATE MAP**  
 CITY AND COUNTY  
 OF HONOLULU,  
 HAWAII

**PANEL 360 OF 395**  
 (SEE MAP INDEX FOR FIRM PANEL LAYOUT)

**CONTAINS:**

COMMUNITY	NUMBER	PANEL	SUFFIX
HONOLULU CITY AND COUNTY OF	150001	0360	F

Notice to User: The Map Number shown below should be used when placing new orders. The Community Number shown above should be used on insurance applications for the subject community.

**MAP NUMBER**  
 15003C0360F  
**MAP REVISED**  
 SEPTEMBER 30, 2004

Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-M-I (Inc) Inc. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at [www.msc.fema.gov](http://www.msc.fema.gov)

Source: FEMA Flood Insurance Rate Map  
 Parcels 15003C0360F  
 (September 30, 2004).

SCALE:  
 1" = 500'

CAD DRAWING:  
 2949-01 EA-FIRM

DATE:  
 SEPT 18, 2009

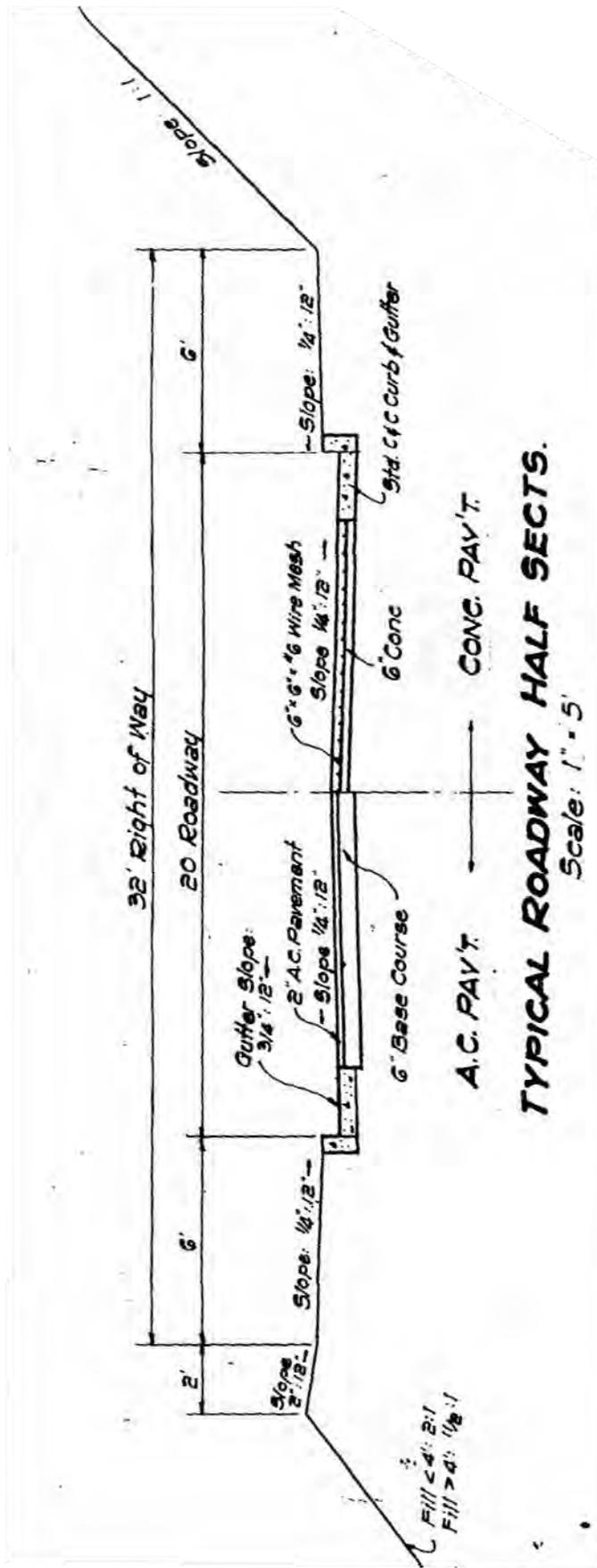
MELEANA PLACE DRAINAGE IMPROV.  
 HONOLULU, OAHU, HAWAII

**FLOOD INSURANCE RATE MAP**

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 CONSULTING ENGINEERS

841 Bishop Street Suite 1100

FIGURE  
 8



Source: As-built construction drawings entitled "Hacienda Estates", by Associated Engineers dated 3/19/59. C&C of Honolulu DPP reference #J-09466.

SCALE:  
1" = 500'

CAD DRAWING:  
2949-01 Rd Sect

DATE:  
SEPT 18, 2009

MELEANA PLACE DRAINAGE IMPROV.  
HONOLULU, OAHU, HAWAII

MELEANA PLACE  
TYPICAL ROADWAY SECTION



Gray-Hong-Nojima & Associates, Inc  
CONSULTING ENGINEERS

841 Bishop Street Suite 1100

FIGURE  
9

## Appendices

- Appendix A *Drainage Study for Meleana Place, Honolulu, Oahu, Hawaii, TMK: 1-9-03, prepared by Gray, Hong, Nojima & Associates Inc., dated November 9, 2006.*
- Appendix B *Biological survey for a small flood abatement project on Meleana Place, Nu'uuanu, O'ahu, prepared by AECOS, Inc., dated September 8, 2009.*
- Appendix C *An Archaeological Monitoring Plan for the Proposed Meleana Place Drainage Improvements Located at TMK: (1) 1-9-03 in Nu'uuanu Ahupua'a, Kona District, Island of O'ahu, prepared by Archaeological Consultants of the Pacific, Inc., dated June 2009.*
- Appendix D *A Cultural Impact Assessment for the Proposed Meleana Place Drainage Improvements Located at TMK: (1) 1-9-03 in Nu'uuanu Ahupua'a, Kona District, Island of O'ahu, prepared by Archaeological Consultants of the Pacific, Inc., dated September 2009.*

## **Appendix A**

**DRAINAGE STUDY  
FOR  
MELEANA PLACE  
HONOLULU, OAHU, HAWAII  
TMK: 1-9-03**

**November 9, 2006**

**(100% FINAL SUBMITTAL)**

**PREPARED FOR:**

**Department of Design and Construction  
City and County of Honolulu**

**PREPARED BY:**



**Gray • Hong • Nojima & Associates, Inc.**

**CONSULTING ENGINEERS**

**841 Bishop Street, Suite 1100**

**Honolulu, Hawaii 96813**

**Phone: (808) 521-0306**

**Fax: (808) 531-8018**

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Appendix A	Site Photos
Appendix B	Meleana Place Roadway Flow Capacity
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Appendix D	Hydraulic Calculations
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Appendix F	Preliminary Construction Cost Estimate

## **INTRODUCTION**

### **Overview**

This study focuses on alleviating flooding problems along Meleana Place as reported by property owners to the Department of Design and Construction (DDC). The project site covers the entire length of Meleana Place in Nuuanu, and the surrounding area (refer to Figure 1). It is bordered by Waokanaka Street to the south and an undeveloped hillside to the north. The area is located in a residential neighborhood consisting of single family residences constructed in the 1960s.

This study presents a viable drainage improvement alternative based on existing conditions and available as-built or record drawings and data. Topographical information was obtained from the Department of Planning and Permitting's Geographical Information System (GIS).

### **Background**

The project site is located in a residential area towards the northwest end of Nuuanu Valley on the slope of the Koolau Range. The City-owned Meleana Place is a short access, dead-end road off State-owned Waokanaka Street. It is approximately 400 feet in length and serves several private lots located on both sides of the street.

Excessive surface runoff generated from the hillside above is resulting in the submergence of the roadway during heavy rains, particularly towards the upper portion of Meleana Place. In addition, existing drainage infrastructure is not adequately collecting the runoff, which causes flooding in the lots along the southern edge of the road.

## **PROJECT AREA CHARACTERISTICS**

### **Soil Analysis**

The U.S. Soil Conservation Service (SCS) Soil Survey (1972) has designated that the project area consists of both Lolekaa silty clay (LoD, LoF) and Rock land (rRK) with slopes that vary greatly from the roadway to the adjacent hillside (refer to Figure 2).

The SCS describes the Lolekaa series as well-drained soil on fans and terraces, which was developed from gravelly colluvium and alluvium. The slopes vary from nearly level to severe. Runoff can vary from medium to rapid and the erosion hazard can be moderate to severe. The SCS describes Rock land as areas where exposed rock, developed mainly from basalt and andesite, covers 25 to 90 percent of the surface. Slopes can vary from being nearly level to steep.

### **Flood Hazard**

The project site is located in an area designated as Zone X on the Flood Insurance Rate Map (FIRM No. 15003C0360F, revised September 30, 2004), which is outside the 500-year floodplain (Refer to Figure 3).

## **Topography**

The upper portion of Meleana Place is fairly flat with a 0.4% slope from the cul-de-sac (refer to Figure 4), which continues for approximately 230 feet. The road grade then steepens dramatically to 19% and slopes downward to Waokanaka Street.

The majority of the hillside above Meleana Place is steep and forested, with slopes typically ranging from 1.3H:1V to 6H:1V.

## **Existing Development and Infrastructure**

Meleana Place is a developed, dead-end road used for access to single-family residential lots. The right-of-way is under the jurisdiction of the City and County of Honolulu. The residential lots on the uphill side of the road are zoned R-10 (residential) and P-1(preservation), while the downhill lots are entirely R-10. The roadway is located within a 32-foot right-of-way including asphalt concrete (AC) pavement with curbs and gutters as shown on the typical roadway section (refer to Figure 5). This typical section is obtained from as-built drawings entitled "Hacienda Estates" designed by Associated Engineers and approved by the City and County of Honolulu in 1959. The asphalt concrete (AC) pavement width is approximately 20 feet, and there are no existing sidewalks. The steeper portion of Meleana Place consists of a 6-inch thick concrete base under the AC pavement overlay.

Utilities along the road include a 4-inch water line, 8-inch water line, 8-inch sewer line, an existing drainage system, and overhead electric, telephone, and cable lines.

Other available records indicate that an 18-inch drain line traverses Meleana Place directing some of the hillside flow into an existing concrete ditch running along Waokanaka Street. However, as-built drawings of the actual drainline profile could not be found, and the existence of the drainage inlet in the hillside could not be confirmed during field investigation. Several 12-inch square inlets were observed on the north side, mauka of the roadway, connected by 6-inch perforated pipe which appears to handle minor flows and groundwater. Several of the inlets are plugged, and the connecting pipes may also be blocked. In addition, there is an existing catch basin at the intersection of Meleana Place and Waokanaka Street, which connects to a 24-inch pipe that discharges into an existing 4-foot wide concrete ditch (27 inch± deep) running along Waokanaka Street. The ditch is under the jurisdiction of the State of Hawaii.

## **Tributary Area**

The drainage basin is delineated from the ridgeline on the hillside above Meleana Place and consists of approximately 12.25 acres (refer to Figure 6). The basin was determined through existing topographical data from the GIS.

## **Existing Site Hydrology**

Despite the existing drainage system, the project site is still prone to flooding. Runoff from the undeveloped hillside above Meleana Place flows down the hill towards the roadway, but cannot be properly drained by the existing drainage system. Large flows from the hillside cannot be adequately conveyed by an 8-foot wide gutter flow as required by the storm drainage standards. This results in submergence of the entire roadway during heavy rains. As-built drawings for the roadway indicate that the curb on

the south side of the street is lower than the north side. Storm water, therefore, sheetflows across the roadway, jumps the curb, and enters the properties running along the south side of Meleana Place. On-site runoff from the roadway and developed areas, though relatively smaller, adds to the flooding. Runoff generated south of Meleana Place flows to the existing ditch along Waokanaka Street and is not within the scope of this study.

Because the physical delineation between the developed and open (preservation) areas is unknown at this time, the hydrologic analysis is based on an open area condition for the entire hillside above the roadway. This will be confirmed after a topographic survey is performed prior to the design phase. The hydrologic calculations for the roadway itself are based on a developed (built-up) condition.

#### 1. Q/A for Developed Condition within Meleana Place Right-of-Way

Hydrologic calculations for the existing conditions within the Meleana Place right-of-way are based on the Rational Method,  $Q=CIA$ . Design values have been obtained from various design charts in the City and County of Honolulu's *Rules Relating to Storm Drainage Standards* (January 2000).

Q = runoff, cubic feet per second (CFS)  
C = runoff coefficient  
I = rainfall intensity, inches/hour  
A = drainage area, acres

##### Runoff coefficient, C:

Table 2, City and County of Honolulu Storm Drainage Standards  
Residential Areas  
C = 0.90

##### Time of Concentration, T<sub>c</sub>:

Plate 3, City and County of Honolulu Storm Drainage Standards  
170' @ 0.40%, Paved Surface  
T<sub>c</sub> = 7.0 minutes

##### 1-Hour Rainfall Intensity, i:

City and County of Honolulu Storm Drainage Standards  
Plate 1 (T<sub>m</sub> = 10 yr) and Plate 2 (T<sub>m</sub> = 50 yr)  
i<sub>10</sub> = 2.9 inches/hour  
i<sub>50</sub> = 3.9 inches/hour

##### Correction Factor, CF:

Plate 4, City and County of Honolulu Storm Drainage Standards  
CF = 2.6

##### Rainfall Intensity, I:

I<sub>10</sub> = 2.9 x 2.6 = 7.54 inches/hour  
I<sub>50</sub> = 3.9 x 2.6 = 10.14 inches/hour

Flow per Acre, Q/A (On-site)

$$Q/A = CI$$

$$Q_{10} = 0.90 \times 7.54 = 6.8 \text{ CFS /acre}$$

$$Q_{50} = 0.90 \times 10.14 = 9.10 \text{ CFS/acre}$$

2. Q/A for Hillside Area within Private Lots

The Rational Method was also used to perform the following hydrologic calculations to determine the runoff rates from the hillside north of Meleana Place. Design values have been obtained from various design charts in the City and County of Honolulu's *Rules Relating to Storm Drainage Standards* (January 2000).

Q = runoff, cubic feet per second (CFS)

C = runoff coefficient

I = rainfall intensity, inches/hour

A = drainage area, acres

Runoff coefficient, C:

Table 1, City and County of Honolulu Storm Drainage Standards  
Agricultural and Open Areas

C = 0.50 (Steep forested areas)

Time of Concentration, Tc:

Plate 5, City and County of Honolulu Storm Drainage Standards  
Small Agricultural Areas

470' @ 75% slope

$$K = L/S^{1/2} = 470/0.75^{1/2} = 542.71$$

$$T_c = 0.0136K^{0.77} = 1.7 \text{ min}$$

220' @ 32% slope

$$K = L/S^{1/2} = 220/0.32^{1/2} = 388.91$$

$$T_c = 0.0136K^{0.77} = 1.3 \text{ min}$$

Total Tc = 3.1 minutes; use Tc = 5.0 minutes

1-Hour Rainfall Intensity, i:

City and County of Honolulu Storm Drainage Standards

Plate 1 (Tm = 10 yr) and Plate 2 (Tm = 50 yr)

i<sub>10</sub> = 2.9 inches/hour

i<sub>50</sub> = 3.9 inches/hour

Correction Factor, CF:

Plate 4, City and County of Honolulu Storm Drainage Standards

CF = 2.8

Rainfall Intensity, I:

$$I_{10} = 2.9 \times 2.8 = 8.1 \text{ inches/hour}$$

$$I_{50} = 3.9 \times 2.8 = 10.9 \text{ inches/hour}$$

Flow per Acre, Q/A (Off-site)

$$Q/A = CI$$

$$Q_{10} = 0.50 \times 8.1 = 4.10 \text{ CFS/acre}$$

$$Q_{50} = 0.50 \times 10.9 = 5.50 \text{ CFS/acre}$$

**PROPOSED ALTERNATIVES**

In order to resolve the flooding problems at Meleana Place, three alternatives are considered as described below. The engineering staff at the State Department of Transportation has indicated that the drainage systems downstream of Pali Highway are already known to overflow during heavy rains and any additional flows will not be permitted into the system. However, storm water from Meleana Place currently enters the State's ditch along Waokanaka Street as surface runoff. It should be noted that the proposed alternatives will not involve generation of additional flows, since there will not be further development of the site. Instead, runoff is merely redirected in a more controlled manner to different parts of the ditch so as to prevent flooding of private property.

**Alternative 1 – Diversion Ditch**

Although it has been field verified that an outlet connection to the ditch along Waokanaka Street exists (refer to Figure 4 and Appendix A photo sheet 3 of 3), the 18-inch drainline and inlet on the hillside above Meleana Place shown on as-built drawings has not been confirmed at this time. During design, a topographic survey will be performed to verify the existence of the inlet and drainline. If the inlet does exist, the 18-inch drainline could be considered for diversion of some of the hillside drainage basins to the ditch along Waokanaka Street. This would help decrease runoff onto Meleana Place. In addition, a diversion ditch would have to be constructed above the homes in the uphill lots, which would intercept about 16.20 CFS of runoff from the hillside into the 18-inch drain line. Assuming the drain line is sloped at the same grade as the existing ground, the pipe would be capable of conveying about 47 CFS of flow to the Waokanaka Street drainage ditch. However, the velocity in the 18-inch drain line would be extremely high at 26.6 feet per second (FPS), and modifications to the existing Waokanaka Street ditch may be necessary.

This alternative will still require the construction of various catch basins, trench drains and underground piping within Meleana Place; however, pipe sizes would be reduced, less catch basins may be needed and the box culvert may not be required.

**Alternative 2 – Channels/Pipes through Lower Lots**

Another possible method of conveying runoff to the ditch along Waokanaka Street would be to direct controlled flows to multiple channels or pipes, which would run through the lots on the south side of Meleana Place and connect at various points to the ditch along Waokanaka Street. In this manner, instead of uncontrolled sheetflow entering properties and causing damage and mud collection in private garages, the runoff could be diverted through the properties via lined channels and/or pipes along the edges of the properties.

### **Alternative 3 – Underground Drainage System**

This alternative would involve the construction of an underground drainage system to divert the runoff currently entering Meleana Place down along the roadway to the ditch along Waokanaka Street. Due to the inability to confirm the existence of the existing 18-inch drainline running across Meleana Place, this alternative is based on the assumption that the existing drainline does not exist or is inactive. Therefore, the proposed drainage system must be capable of accommodating the entire hillside flow above Meleana Place.

Figure 7 depicts the proposed underground drainage system, which consists of catch basins, trench drains, drainage pipes, and a section of 2-foot high by 4-foot wide box culvert. This system will serve to divert stormwater from the hillside above Meleana Place, as well as runoff generated on the roadway itself down to the existing ditch at the intersection of Meleana Place and Waokanaka Street. In this manner, the flows will enter the ditch at a controlled point instead of flooding the southern lots of Meleana Place before entering the ditch.

## **EVALUATION OF ALTERNATIVES**

### **Alternative 1 – Diversion Ditch**

The construction of a diversion ditch across a portion of the hillside in conjunction with an underground drainage system within Meleana Place was considered as a potential option but deemed unviable, since construction and designation of easements within private property would require permission from multiple property owners. In addition, the City and County of Honolulu will not accept runoff generated on private property. Since the diversion ditch would be utilized to divert water generated on private lots, it is unlikely that the City and County of Honolulu would approve of this alternative.

### **Alternative 2 – Channels/Pipes through Lower Lots**

Directing controlled flows through the lots on the south side of Meleana Place with channels and/or pipes was considered impractical due to the many potential conflicts within the Meleana Place right-of-way near the property lines such as existing water meters, power poles and telephone boxes. Within the lots themselves, existing structures and landscaping would also require relocation and/or demolition. Furthermore, similar to the case in Alternative 1 above, this alternative would involve construction and designation of easements within privately-owned properties requiring approval of landowners, which may be difficult to obtain.

### **Alternative 3 – Underground Drainage System**

Alternative 3 involves the construction of an underground drainage system to divert runoff along Meleana Place to the ditch at Waokanaka Street. This alternative is deemed to be the most viable, since it would involve minimal work in private properties. Therefore, Alternative 3 will be referred to hereafter as the "Proposed Project".

## **PROPOSED PROJECT HYDROLOGY AND HYDRAULIC ANALYSES**

### **Proposed Project Hydrology**

The drainage basins for the proposed project have been delineated as shown in Figure 6. Since there is no change in road profiles, site grading, and topography, the runoff rates (Q/A values for the right-of-way section and the hillside – pages 3-5) of the Existing Site Hydrology may be used for the proposed drainage improvements.

The roadway hydraulic capacity analysis is provided in Appendix B. This analysis is based on a cross-section consisting of half the roadway. The capacity computed for the Meleana Place half section is 5.70 CFS. In the case where the projected runoff exceeds the capacity of the roadway half-section, it is assumed that the inlet structure on the north side of the roadway will collect this amount (5.70 CFS). The remaining excess flow is to be served by corresponding catch basins on the south side of the roadway which will sheetflow over the roadway crown.

The drainage area entering the cul-de-sac bulb area generates the largest flow. Due to space limitations and conflicts with existing utilities (power poles, driveways, water meter, HTel boxes, etc.), it is not feasible to add more catch basins. In order to direct as much of this flow to the underground drainage system, it is proposed that a continuous trench drain be provided spanning the driveway aprons of 140 and 144 Meleana Place. The trench drain will convey much of the water from the hillside to the proposed drainage system.

Preliminary research indicates that a 50-foot long trench drain (TD #8) with curved vane grates approximately 23-inches wide will be able to accommodate 11.50 CFS of flow based on open grate areas. This design flow does not exceed the grate's interception capacity due to the velocity of the flow coming down the steep driveways (see Appendix C for calculations). Another trench drain (TD #7B) at the driveway of 137 Meleana Place estimated to be approximately 20-feet long and 14-inches wide will serve to capture approximately 2.60 CFS of flow. This drain is expected to prevent runoff from entering the property and flooding the garage, which is the present problem as described by the property owner. During the design phase, the drainage area will be better defined based on a topographic survey. The hydraulic calculations will be verified at that time. If necessary, some re-grading may be necessary to modify the cul-de-sac pavement areas.

Based on the 6 CFS maximum flow capacity of a catch basin established by the City and County of Honolulu storm drainage standards, 6 CFS of the remaining 6.07 CFS of flow from the drainage area entering the cul-de-sac can be accommodated by Catch Basin (CB) #7A as shown on Figures 6 and 7. The remaining 0.07 CFS will bypass CB #7A and be served by CB #6B.

CB #4A, CB #4B and TD #5A will need to serve two drainage areas generating a total of 13.48 CFS of flow (12.87 CFS from the hillside and 0.61 CFS from the roadway). CB #4A is anticipated to serve about 5.70 CFS of this flow, which is based on the calculated capacity of half the road section mentioned above. The remaining runoff (7.78 CFS) will sheetflow over the crown and will be served by TD #5A (2.60 CFS) and CB #4B (5.18 CFS).

According to the homeowner at 131 Meleana Place, during heavy storms, water flows down the steep driveways of the homes across the street and some of the flow traverses the roadway and enters their driveway. The proposed TD #5A will be approximately 14-inches wide and 20-feet long can accommodate about 2.60 CFS of this flow based on open grate areas. The remainder of the stormwater generated by the drainage areas will flow over the roadway crown as it exceeds the half-road section capacity. The remaining overflow (5.70 CFS) will be served by CB #4B.

CB #1A will serve a flow of approximately 5.96 CFS. Record drawings show, however, that the curb on the north side of the road is approximately 1 foot higher than the curb on the south side of the roadway; therefore, some of this runoff may sheetflow across the roadway to the existing catch basin. In the event of any overflow of either catch basin, the runoff will eventually sheetflow into the ditch bypassing private properties. A lined swale or concrete lining along the shoulders and banks of the roadways can be provided in the 10 foot +/- gap between the catch basin and the ditch to reduce the potential for erosion by any catch basin overflow.

### **Proposed Project Hydraulic Gradeline (HGL)**

The hydraulic calculations provided in Appendix D are based on a starting HGL at the ditch outlet top of pipe elevation (2' above the pipe invert elevation). This is conservative in comparison to the computed normal depth of 0.71 feet in the ditch (refer to calculations in Appendix E).

In order to meet the 1-foot freeboard requirement of the City and County of Honolulu storm drainage standards, a box culvert is proposed to replace the existing 24-inch pipe, which connects the existing catch basin to the ditch at the intersection of Waokanaka Street and Meleana Place. The box culvert will be 24 inches high so as not to exceed the height of the existing ditch at the connection point. Hydraulic calculations provided in Appendix C show that the box will need to be at least 4-feet wide. Replacement of the existing catch basin at the Waokanaka Street and Meleana Place intersection will be required to accommodate the box culvert. In any event, it is recommended that the catch basin be replaced, since it shows signs of damage with spalling concrete and exposed rebar.

The HGL shown in Figure 8 and the calculations included in Appendix D demonstrate that the use of the culvert and drainlines ranging in size from 8-inches to 36-inches will adequately transmit the project flows to the Waokanaka ditch and still meet the 1-foot freeboard requirement at the proposed structures.

It should be noted that replacement of the existing 24-inch pipe would entail construction at the ditch, which is under State of Hawaii jurisdiction. Additional permitting/approvals would be involved and State acceptance of this project would be necessary.

## RECOMMENDATION

Due to space limitations as well as restrictions and complications, which would arise from construction within private properties, Alternative 3 is deemed to be the most viable alternative to alleviate the flooding problems at Meleana Place. A preliminary construction cost estimate for the proposed project is approximately \$411,000 (refer to Appendix F).

As indicated above, there are potential substandard existing systems downstream of the proposed drainage improvement location. In particular, the State Department of Transportation will need to be consulted, since their engineering staff has already expressed concern about the inadequacy of the downstream Pali Highway drainage system, which currently overflows during heavy rains.

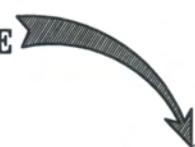
If the proposed drainage improvement project does proceed, a full topographical survey will have to be completed. The proposed alignment and profile of the system will then be reviewed and confirmed for compliance with the current *Rules Relating to Storm Drainage Standards* (Department of Planning and Permitting, 2000).

## **FIGURES**

Figure 1	Location Map
Figure 2	Soil Classification Map
Figure 3	Flood Insurance Rate Map
Figure 4	Existing Conditions
Figure 5	Meleana Place Typical Roadway Section
Figure 6	Proposed Hydrologic Map
Figure 7	Proposed Drainage Plan
Figure 8	Preliminary Profile

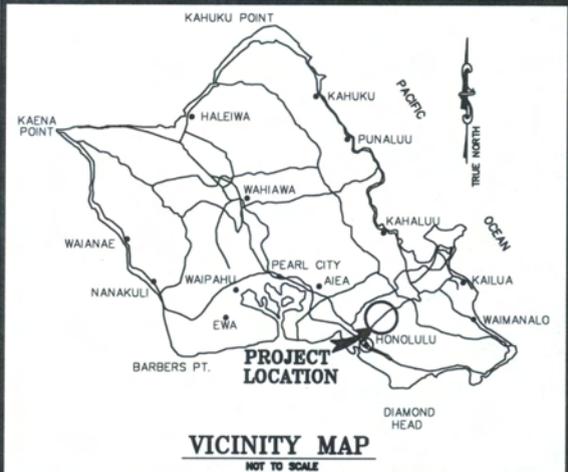
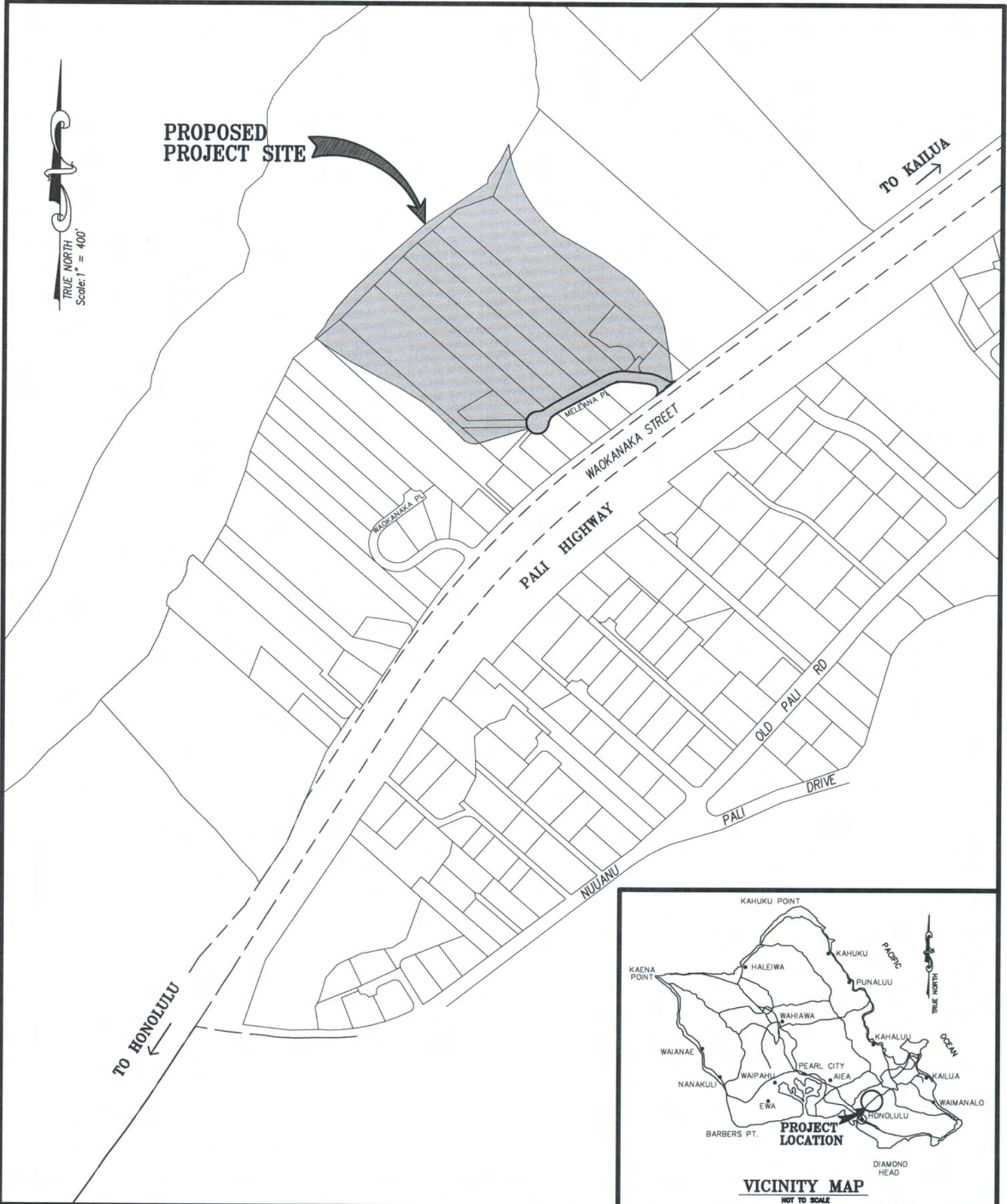


**PROPOSED  
PROJECT SITE**



TO KAILUA

TO HONOLULU



SCALE:  
1" = 400'  
CAD DRAWING:  
2949-01 LOC  
DATE:  
OCT. 20, 2006

MELEANA PLACE DRAINAGE STUDY  
HONOLULU, OAHU, HAWAII  
  
**LOCATION MAP**

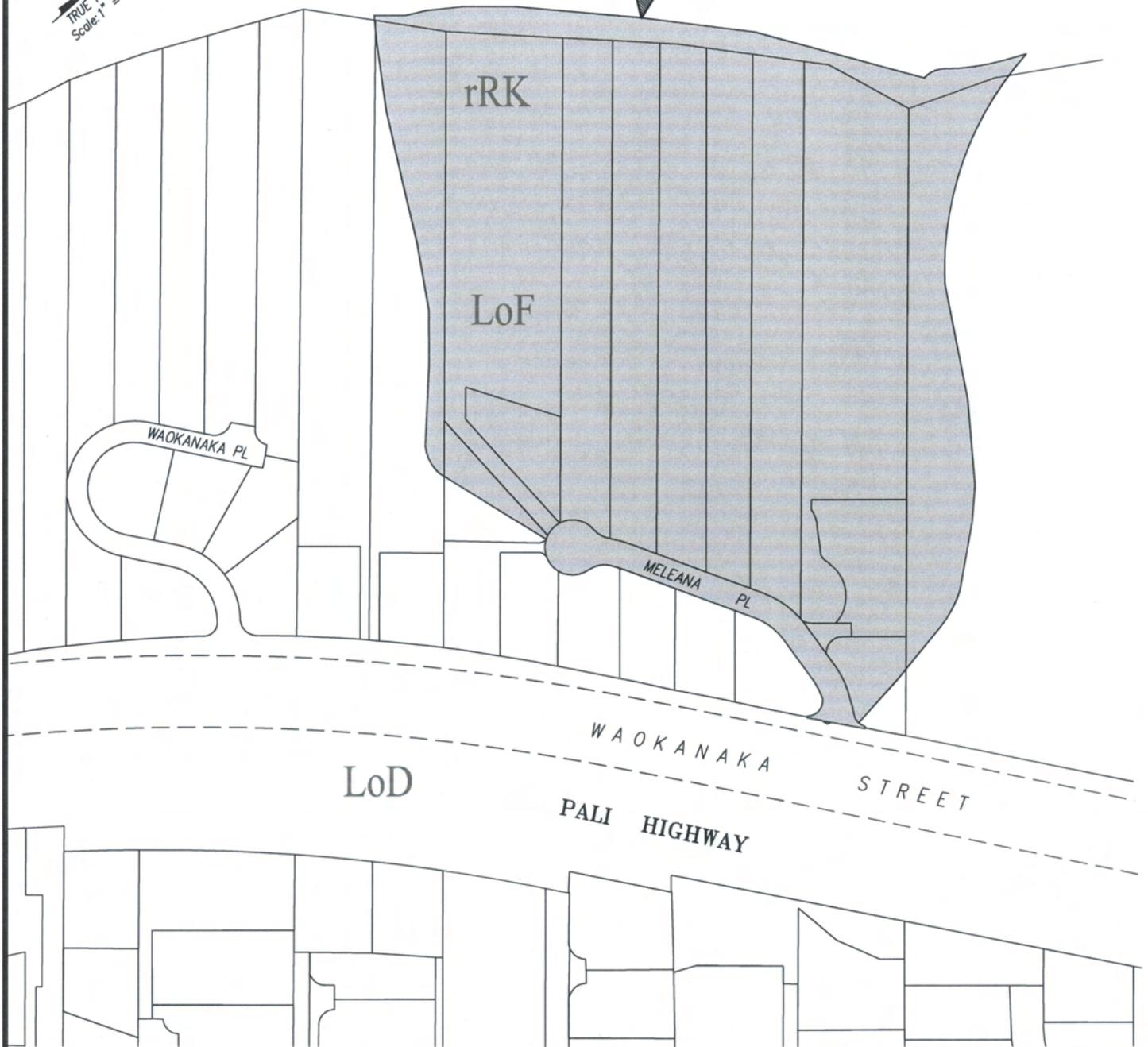


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**FIGURE**  
  
**1**



**PROPOSED  
PROJECT SITE**



**LEGEND**

- LoD = Lolekaa Silty Clay
- LoF = Lolekaa Silty Clay
- rRK = Rock Land

Source: U. S. Department of Agriculture  
Soil Conservation Service (1972)

SCALE:  
1" = 200'

CAD DRAWING:  
2949-01 SOIL

DATE:  
OCT. 20, 2006

MELEANA PLACE DRAINAGE STUDY  
HONOLULU, OAHU, HAWAII

**SOIL CLASSIFICATION MAP**



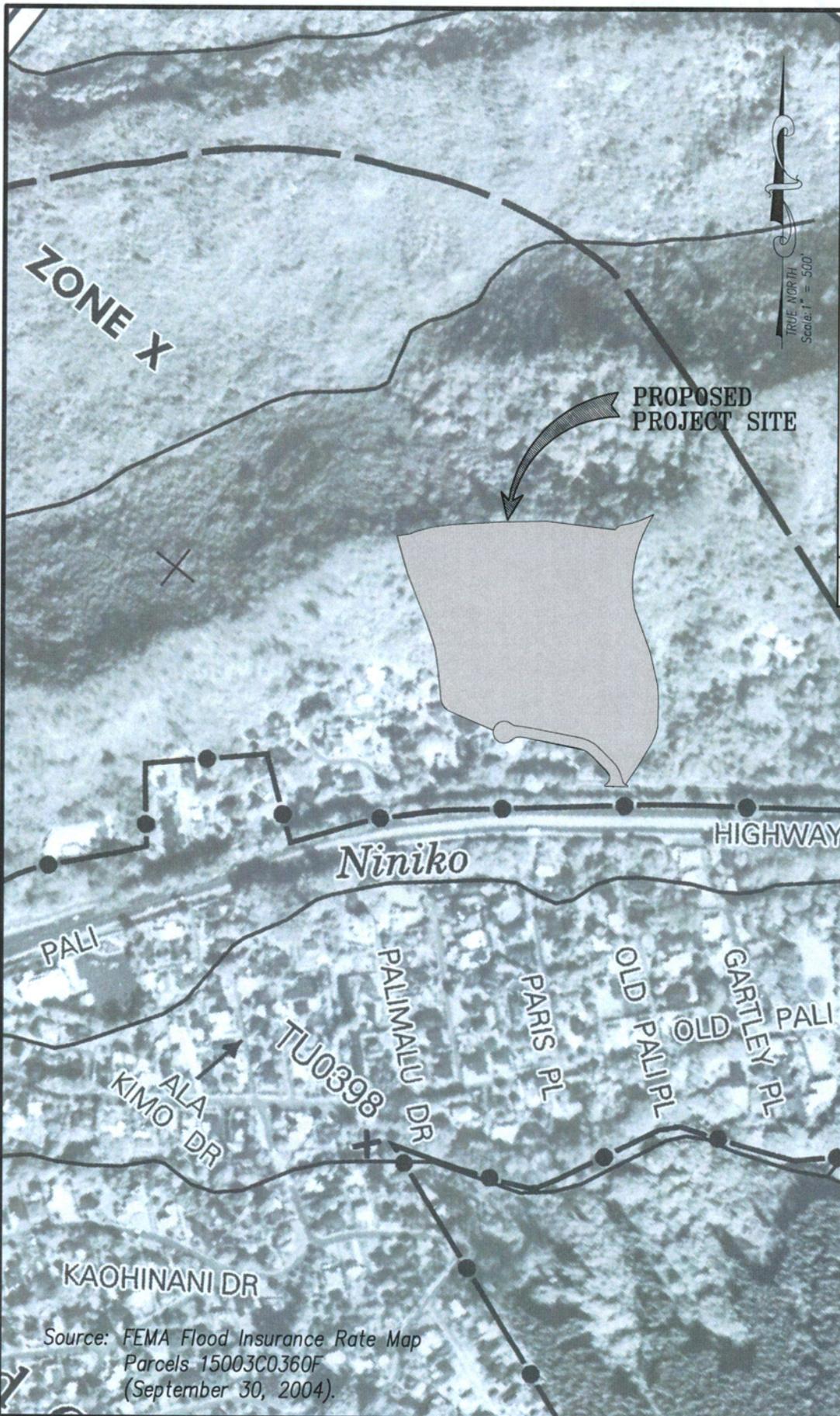
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Suite 1100

FIGURE

2



**NFIP** PANEL 0360F

**FIRM**  
**FLOOD INSURANCE RATE MAP**  
 CITY AND COUNTY  
 OF HONOLULU,  
 HAWAII

PANEL 360 OF 395  
 (SEE MAP INDEX FOR FIRM PANEL LAYOUT)

**CONTAINS:**

COMMUNITY	NUMBER	PANEL	SUFFIX
HONOLULU, CITY AND COUNTY OF	150001	0360	F

Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.

 **MAP NUMBER**  
 15003C0360F  
**MAP REVISED**  
 SEPTEMBER 30, 2004

Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at [www.msc.fema.gov](http://www.msc.fema.gov)

Source: FEMA Flood Insurance Rate Map  
 Parcels 15003C0360F  
 (September 30, 2004).

SCALE:  
 1" = 500'

CAD DRAWING:  
 2949-01 FIRM

DATE:  
 OCT. 20, 2006

MELEANA PLACE DRAINAGE STUDY  
 HONOLULU, OAHU, HAWAII

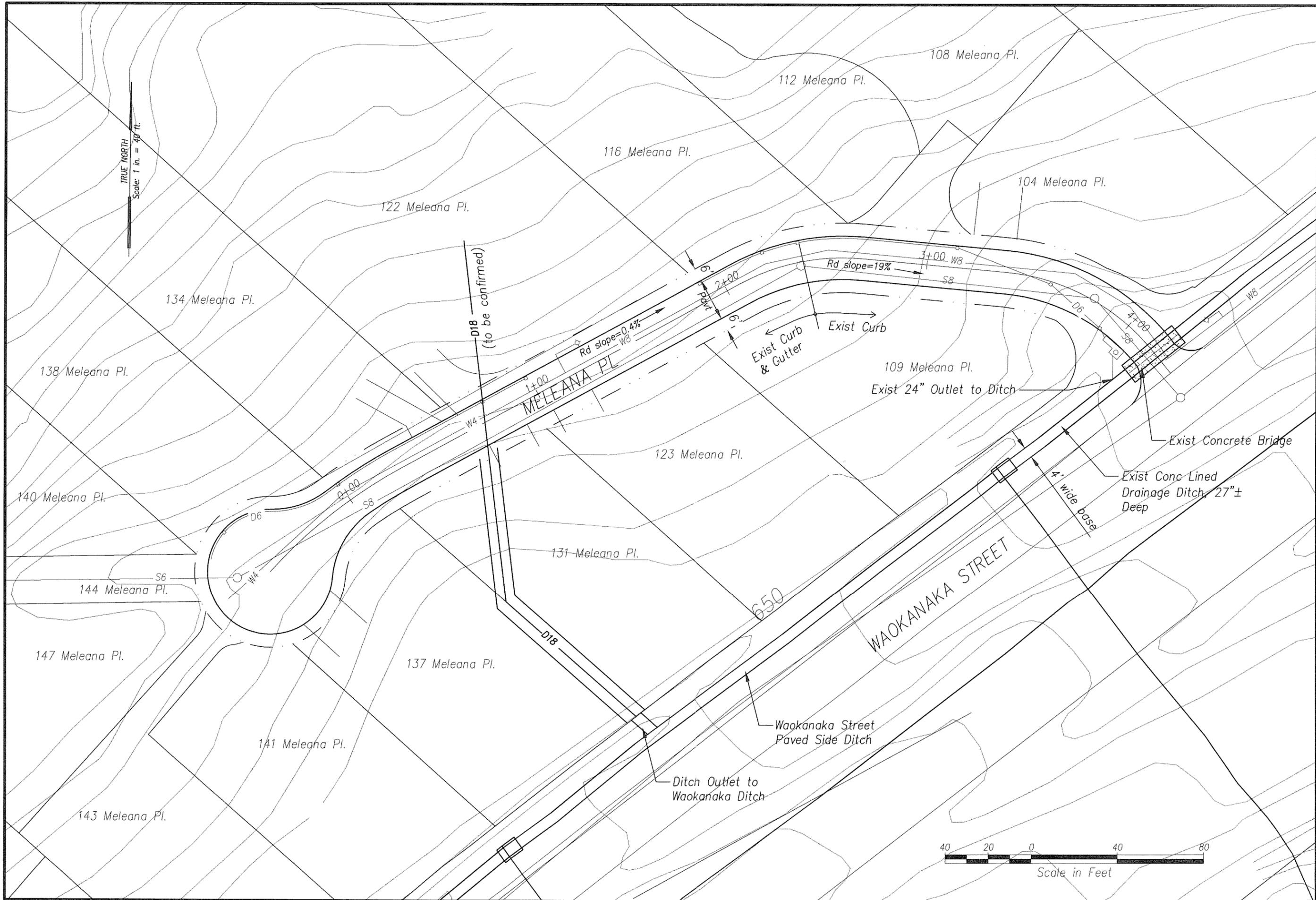
**FLOOD INSURANCE RATE MAP**



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FIGURE  
 3



TRUE NORTH  
Scale: 1 in. = 40 ft.

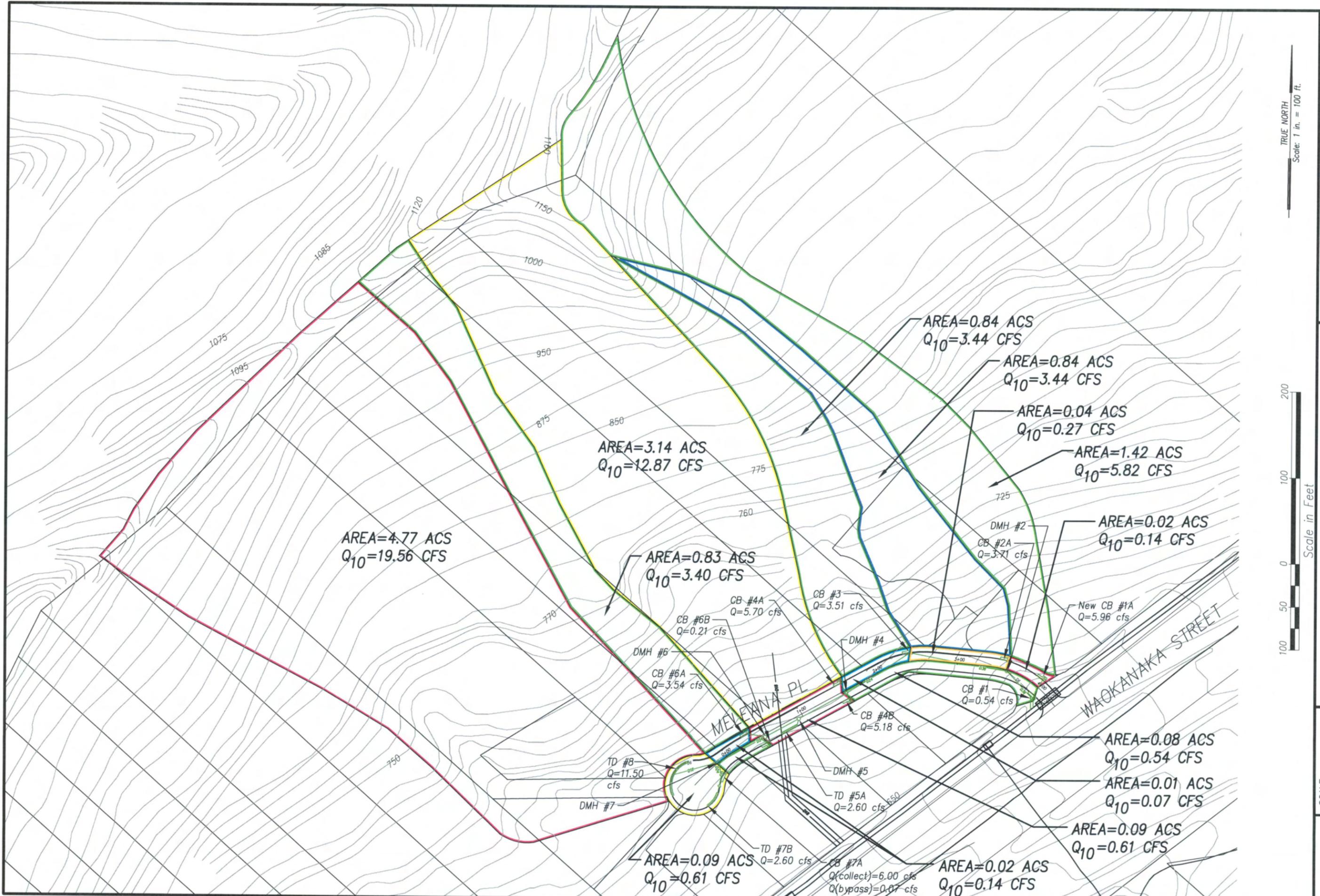
MELEANA PLACE DRAINAGE STUDY  
EXISTING CONDITIONS

SCALE:	1" = 40'
CAD DRAWING:	2949 EX COND
DATE:	OCT. 20, 2006

FIGURE  
4





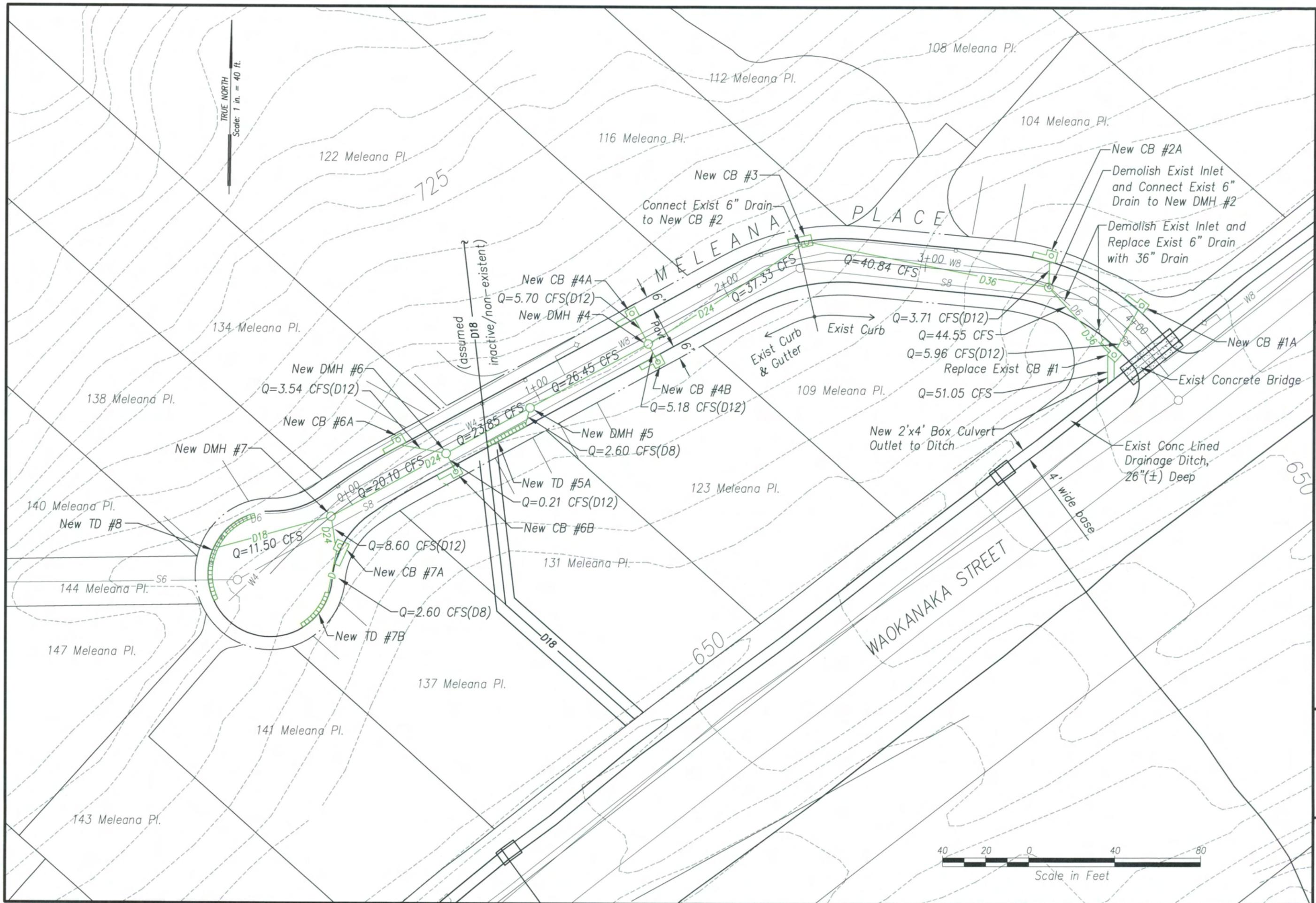


TRUE NORTH  
Scale: 1 in. = 100 ft.



**MELEANA PLACE DRAINAGE STUDY  
PROPOSED HYDROLOGIC MAP**

SCALE: 1" = 100'  
CAD DRAWING: 2949-MELEANA  
DATE: OCT 20, 2006



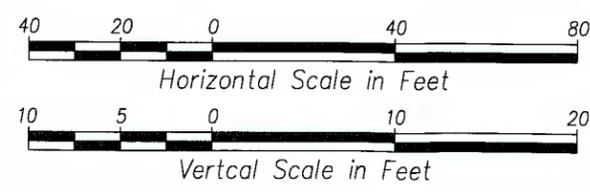
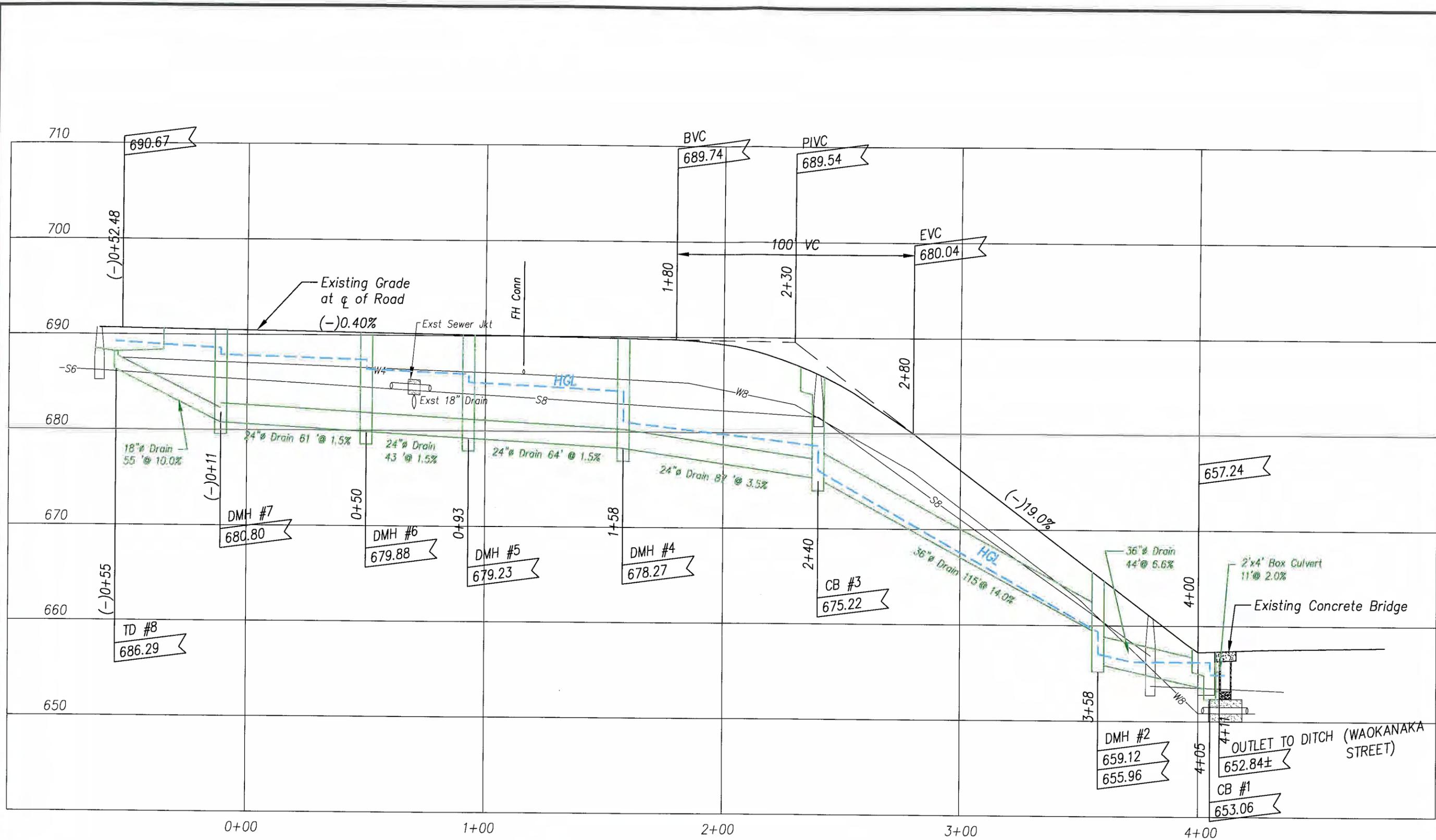
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841 Bishop Street  
Suite 1100

**MELEANA PLACE DRAINAGE STUDY  
PROPOSED DRAINAGE PLAN**

SCALE: 1" = 40'  
CAD DRAWING: 2949-MELEANA  
DATE: NOV. 9, 2006

FIGURE

7



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MELEANA PLACE DRAINAGE STUDY  
PRELIMINARY PROFILE

SCALE:	H: 1"=40', V: 1"=10'
CAD DRAWING:	2949-MELEANA
DATE:	OCT. 20, 2006

FIGURE  
8

## **APPENDIX**

- Appendix A Site Photos
- Appendix B Meleana Place Roadway Flow Capacity
- Appendix C Grated Trench Drain Interception Capacity
- Appendix D Hydraulic Calculations
- Appendix E Sheet 1 – Hydrologic Calculations – Estimated Flow  
Depth at Existing Waokanaka Ditch  
Sheet 2 – Hydrologic Map – Existing Waokanaka Ditch Flow
- Appendix F Preliminary Construction Cost Estimate

# Meleana Place Photos



Typical existing drain inlets along Meleana Place.



Standing on the Cul-de-sac at the end of Meleana Place facing Mauka.



Standing in Cul-de-sac looking at flag lot driveway.



Middle of flag lot driveway facing Ewa.



Top of Flag log driveway notice water percolation.



Existing drain inlet at the bottom of the flag lot driveway.



Driveway at 144 Meleana Place.



Driveway at 138 Meleana Place.



137 Meleana Place.



Meleana Place cul-de-sac.



Runoff from the mountain entering the street through 122 Meleana Place.



Standing in 122 Meleana Place facing Ewa. Notice swale in 116 Meleana Place.



Looking toward Waokanaka. 104 Meleana Place home shown on left.



Standing in 122 Meleana Place facing Diamond Head. Notice swale exit onto road in 116 Meleana Place.



Swale exit from 116 Meleana Place which drains directly into Meleana Place



Existing ditch on Waokanaka Street. Standing at the intersection of Waokanaka Street and Meleana Place facing Makai.



Existing catch-basin near the intersection of Meleana Place and Waokanaka Street.



Close-up of the existing catch-basin near the intersection of Meleana Place and Waokanaka Street.



Exist 24" pipe connects the existing ditch on Waokanaka to the existing catch basin on Meleana Place.



Inlet which connects the drainage ditch to the existing state drainage system.



Standing near the Meleana Street outlet facing Mauka.



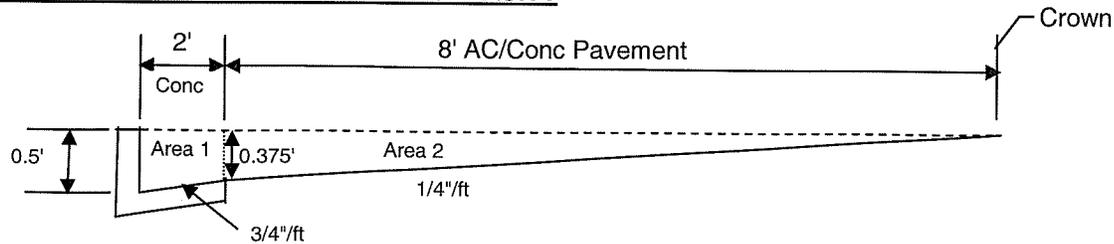
Drainage outlet from the Meleana Subdivision entering the existing ditch on Waokanaka Street.



Close-up of the drainage outlet from Meleana Subdivision.

MELEANA PLACE DRAINAGE STUDY  
 GHN PROJ NO. 2949  
 ROADWAY FLOW CAPACITY

**MELEANA PLACE ROADWAY FLOW CAPACITY**



n value

concrete n = 0.013  
 asphalt n = 0.015

Areas, A

Area 1 = 0.875 sf  
 Area 2 = 1.5 sf  
 Total Area = 2.375 sf

Wetted Perimeter, Pw

Pw Curb and Gutter = 2.50 ft  
 Pw Pavement = 8.01 ft  
 Pw Total = 10.51

Weighted n

n (weighted) =  $[(0.013)(2.50) + (0.015)(8.01)] / (2.5 + 8.01) = 0.0145$

Hydraulic Radius

$R = A/Pw = (2.375/10.51) = 0.226$

Velocity, V

$V = 1.486R^{2/3}S^{1/2}/n$

For Road Slope = 0.40%:

V = 2.4 fps

For Road Slope = 19%:

V = 16.5 fps

Flow Capacity, Q

$Q = AV$

At S=0.40%, half road section flow capacity Q = 5.701 cfs

At S=19.0%, half road section flow capacity Q = 39.288 cfs

MELEANA PLACE DRAINAGE STUDY  
 GHN PROJ NO. 2949  
 GRATED TRENCH DRAIN INTERCEPTION CAPACITY

**INTERCEPTION CAPACITY OF TD #8**

**Driveway of 144 Meleana Place**

Slope = 0.13  
 Grate Width = 23 IN  
 Dwy Width = 20 FT  
  
 Q actual= 15.33  
 n= 0.015  
 Flow Depth = 0.1 FT  
 AREA= 2.00 SF  
 Wp= 20.2 FT  
 SLOPE= 0.13  
 Width = 20 FT  
 R = A/Wp 0.10  
 V = Q/A 7.665 FPS

Q over 1' section of trench drain = 15.33 cfs/20 ft = 0.77 cfs

Frontal Flow Efficiency (Flow from Dwy side)

L = 23"

Rf = 0.85 (see Chart 5B of US DOT Federal Highway Admin, Hydraulic Engineering Circular No. 22, August 2001)

Side Flow Efficiency

L = 12"

Assume V = 1 FPS (low velocity and low flow from side, cul-de-sac sloping < 0.4%)

$$R_s = 1/[1+(K_U V^{1.8}/S_x L^{2.3})]$$

where  $K_U = 0.15$

$S_x = 0.004$

$$R_s = 1/[1+((0.15)(1)^{1.8}/(0.004)(1)^{2.3})]$$

$R_s = 0.026$

Intercepted Q,  $Q_i$

$$Q_i = Q_{TOTAL}[R_f E_o + R_s(1-E_o)]$$

where  $E_o$  = ratio of frontal flow to flow area over drain

$E_o = 1$

$$Q_i = 0.77[(0.85)(1)+(0.026)(1-1)]$$

Note that Side Flow is negligible

$Q_i = 0.65$  cfs

$0.65/0.77 = 0.84$  ==> 84% of flow over trench drain is intercepted

$0.84 \times 15.33$  cfs = 12.88 cfs > 11.50 cfs design--OK.

Remainder goes to TD #7B and CB #7A.

App C Grate Capacity 110706.xls  
 11/7/2006

**APPENDIX C**

**Driveway of 138 Meleana Place**

Slope = 0.3  
 Grate Width = 23 IN  
 Dwy Width = 16 FT

Q actual= 3.61  
 n= 0.015  
 Flow Depth = 0.037 FT  
 AREA= 0.59 SF  
 Wp= 16.074 FT  
 SLOPE= 0.3  
 Width = 16 FT  
 R = A/Wp 0.04  
 V = Q/A 6.098 FPS

Q over 1' section of trench drain = 3.61 cfs/16 ft = 0.23 cfs

Frontal Flow Efficiency (Flow from Dwy side)

L = 23"

Rf = 1.0 (see Chart 5B of US DOT Federal Highway Admin, Hydraulic Engineering Circular No. 22, August 2001)

Side Flow Efficiency

L = 12"

Assume V = 1 FPS (low velocity and low flow from side, cul-de-sac sloping < 0.4%)

$$R_s = 1/[1+(K_U V^{1.8}/S_x L^{2.3})]$$

where  $K_U = 0.15$

$S_x = 0.004$

$$R_s = 1/[1+((0.15)(1)^{1.8}/(0.004)(1)^{2.3})]$$

$R_s = 0.026$

Intercepted Q,  $Q_i$

$$Q_i = Q_{TOTAL}[R_f E_o + R_s(1-E_o)]$$

where  $E_o$  = ratio of frontal flow to flow area over drain

$E_o = 1$

$$Q_i = 0.23[(1.0)(1)+(0.026)(1-1)]$$

Note that Side Flow is negligible

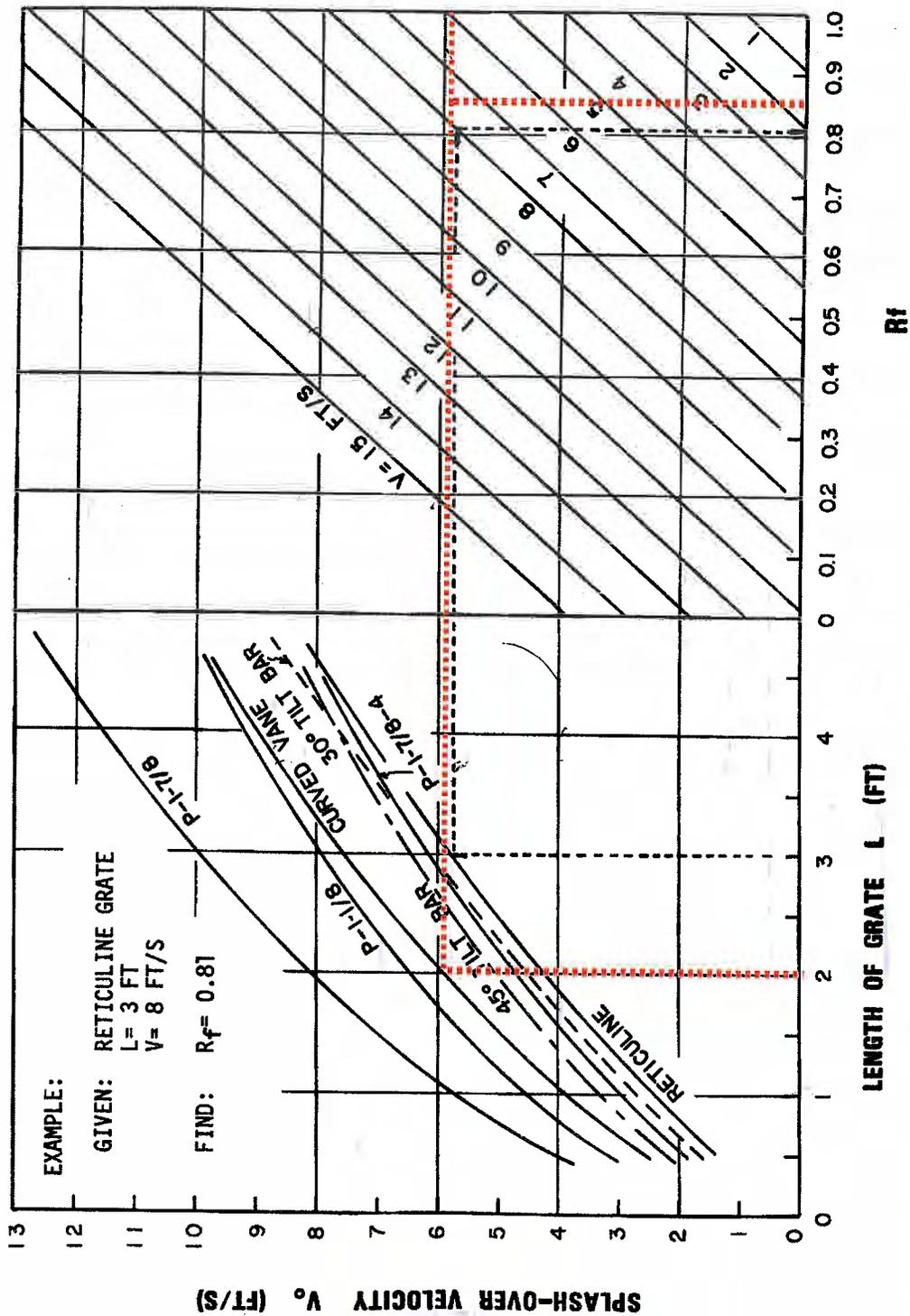
$Q_i = 0.23$  cfs

$0.23/0.23 = 1.0$  =====> 100% of flow over trench drain is intercepted

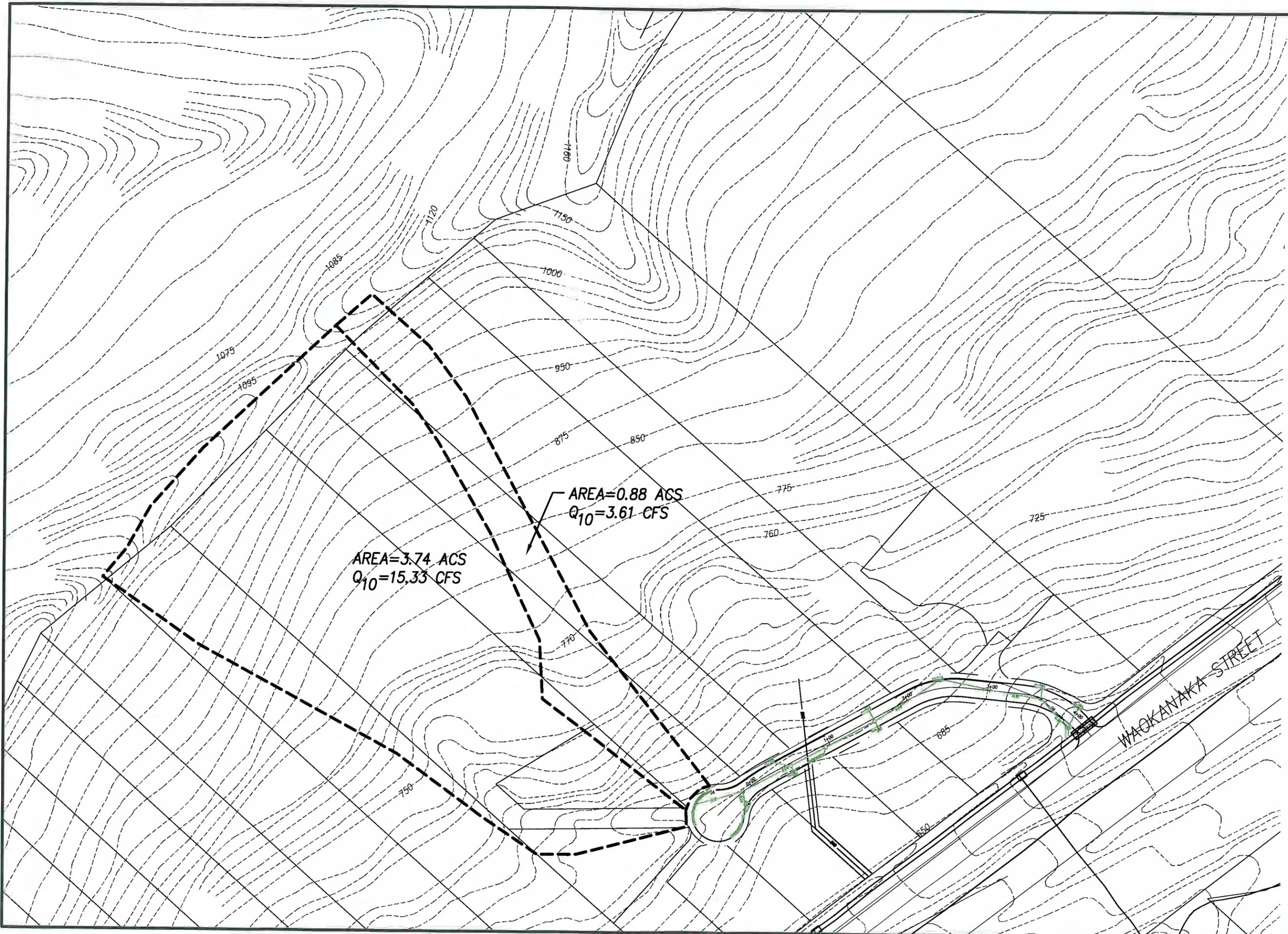
Velocity does not exceed splash over Velocity

Q intercepted = 3.61 cfs

CHART 5B



Grate Inlet Frontal Flow Interception Efficiency



AREA=3.74 ACS  
 $Q_{10}=15.33$  CFS

AREA=0.88 ACS  
 $Q_{10}=3.61$  CFS

WACKANAKA STREET



SCALE:  
 1" = 100'

CAD DRAWING:  
 APP E SHT 4 OF 4  
 DATE:  
 NOV. 8, 2006

APPENDIX C

Sht 4 of 4



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2949 MELEANA PRELIM HYDRAULICS		PROPOSED DRAINAGE SYSTEM										N= 0.013										
DRAINLINE DATE		NOV 7, 2006																				
INLET	INCOM AREA	ACCUM AREA	INCOM Q	ACCUM Q	Dn	V FULL	PIPE DIA	L	FRICT SLOPE	S	INVERT	FRICT LOSS	A	B	C	D	EC	HYDRAULIC GRADE DOWN	UP	FG (PAVT)	FB	
DRAINLINE 1																						
DITCH OUTLET																						
CB #1	1.52	12.20	6.50	51.05	1.00	6.4	2x4	10	0.0054	0.0200	652.84	0.05							654.84	654.95		
DMH #2	0.88	10.68	3.71	44.55	1.05	6.3	36	44	0.0045	0.0660	653.06	0.20	0.23	0.02	0.12	0.10	2.90	654.89	656.18	657.24	1.06	
CB #3	0.84	9.80	3.51	40.84	0.84	5.8	36	115	0.0037	0.1400	659.12/655.96	0.43	0.11	0.10	0.11	0.02	3.24	657.01	659.33	665.22	5.89	
DMH #4	2.60	8.96	10.88	37.33	1.46	11.9	24	87	0.0272	0.0350	675.22	2.37	0.44	0.00	0.44	0.00	3.00	676.06	678.66	685.90	7.24	
DMH #5	0.63	6.36	2.60	26.45	1.58	8.4	24	64	0.0137	0.0150	678.27	0.87	0.72	1.09	0.88	0.30	5.20	681.03	684.65	689.83	5.19	
DMH #6	0.88	5.73	3.75	23.85	1.44	7.6	24	43	0.0111	0.0150	679.23	0.48	0.37	0.21	0.19	0.08	3.20	685.52	686.36	690.00	3.64	
DMH #7	2.05	4.85	8.60	20.10	1.28	6.4	24	61	0.0079	0.0150	679.88	0.48	0.29	0.26	0.32	0.10	3.00	686.84	687.81	690.25	2.44	
TD #8	2.80	2.80	11.50	11.50	0.62	6.5	18	55	0.0120	0.1000	680.80	0.66	0.23	0.00	0.24	0.22	2.54	688.29	688.98	690.50	1.52	
											686.30						2.10	689.64	689.64	690.70	1.06	



**ESTIMATED FLOW DEPTH AT EXISTING WAOKANAKA DITCH**

DITCH CALCS BETWEEN INLET #1 & INLET #2 (see Sht 2 of 2)

CHANNEL DIMENSIONS:

Base width = 4 feet  
 Wall Slopes: 1/2H:1V  
 Longitudinal Slope = 8.8 %

$Q(10) = 47.6 \text{ cfs} + 51.1 \text{ cfs} = 98.7 \text{ cfs}$   
 $n = 0.015$

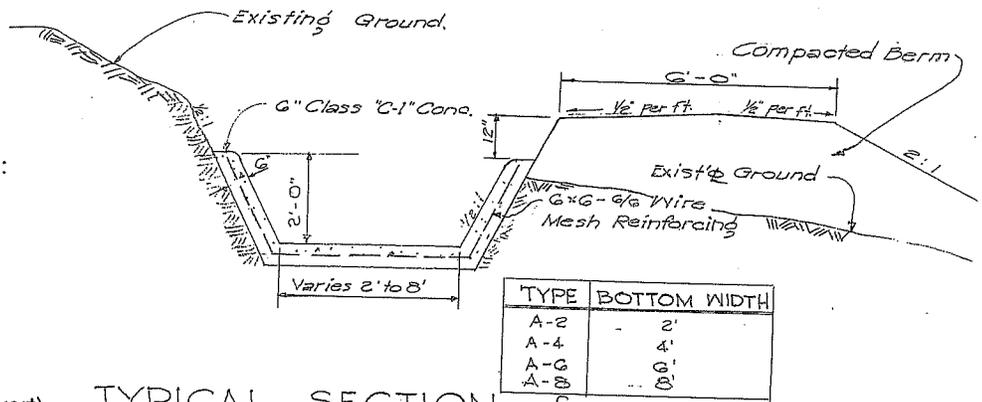
$Q=AV$   
 $V=1.486R_h^{2/3}S^{1/2}/n$

Based on King and Braters Table 7-11:

$K' = Qn/b^{8/3}S^{1/2}$   
 $K' = (98.7)(0.015)/(4)^{8/3}(0.088)^{1/2}$   
 $K' = 0.1238$

$\Rightarrow D/b = 0.239$   
 $D = (0.239)(4') = 0.96'$

Invert Pipe=652.84  
 Invert Ditch = 652.59 (3" below pipe invert)  
 Water Surface = 652.59 + 0.96 = 653.55  
 Ditch water is 0.71' above invert of pipe  
 $\Rightarrow$  For conservative purposes, use crown of pipe at Beginning HGL



TYPICAL SECTION of PAVED SIDE DITCH \*

DITCH CALCS BETWEEN INLET #2 & INLET #3 (see Sht 2 of 2)

CHANNEL DIMENSIONS:

Base width = 4 feet  
 Wall Slopes: 1/2H:1V  
 Longitudinal Slope = 7.7 %

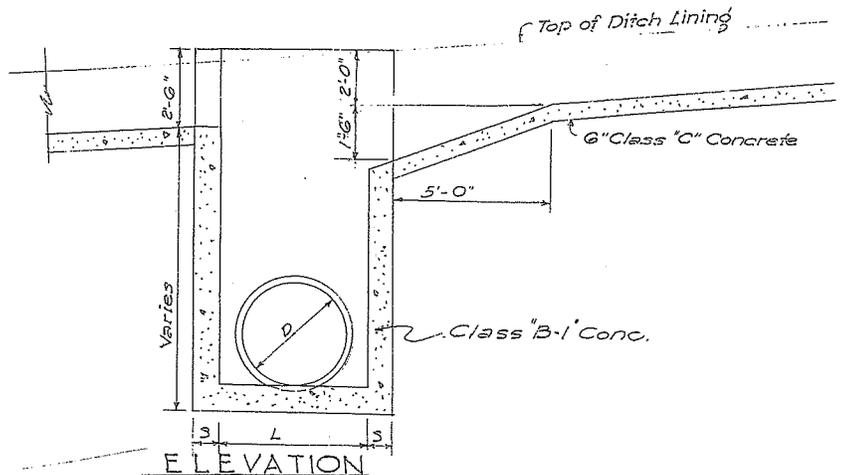
$Q(10) = 51.3 \text{ cfs}$   
 $n = 0.015$

$Q=AV$   
 $V=1.486R_h^{2/3}S^{1/2}/n$

Based on King and Braters Table 7-11:

$K' = Qn/b^{8/3}S^{1/2}$   
 $K' = (51.3)(0.015)/(4)^{8/3}(0.077)^{1/2}$   
 $K' = 0.0688$

$\Rightarrow D/b = 0.166$   
 $D = (0.166)(4') = 0.66'$



TYPE "A" CONC. DROP INTAKE for SIDE DITCH \*

Normal depth of flow in ditch = 0.66'  
 Ditch Depth = 2.0'  
 All  $Q(10)$  of 51.3 cfs will enter concrete drop intake (inlet)

\* Details from "As-Built Plans of Pali Road."  
 Federal Aid Project No BF-BU-061-1(2), Nov 1956.



**MELEANA PLACE DRAINAGE STUDY  
PRELIMINARY CONSTRUCTION COST ESTIMATE**

ITEM NO.	ESTIMATED QUANTITY	DESCRIPTION	UNIT PRICE	TOTAL
<p>The prices bid herein for the following items shall include all materials, labor, tools, equipment, machinery, and all incidentals necessary to install or construct these items, in place complete, all in accordance with the plans and specifications.</p>				
<b><u>A. DEMOLITION WORK</u></b>				
1	LUMP SUM	Demolition of existing curb and pavement, in place complete.	LUMP SUM	\$ <u>7,500</u>
2	85	Sq. Yds., Demolition of existing 6" thick concrete pavement, in place complete.	60	\$ <u>5,100</u>
<b>TOTAL FOR DEMOLITION (Items 1 to 2, inclusive)</b>				<b>\$ <u>12,600</u></b>
<b><u>B. ROADWAY WORK</u></b>				
3	310	Sq. Yds., 2" thick asphalt pavement, in place complete.	20	\$ <u>6,200</u>
4	250	Sq. Yds., Base course, 6" thick, in place complete.	15	\$ <u>3,750</u>
5	92	Sq. Yds., 6" thick concrete with 6x6/6 WWF, in place complete.	100	\$ <u>9,200</u>
6	90	Lin. Ft., Standard driveway drop curb and gutter, in place complete.	35	\$ <u>3,150</u>
7	220	Lin. Ft., Standard concrete curb and gutter, in place complete.	45	\$ <u>9,900</u>
8	15	Lin. Ft., Misc. grading and short retaining wall for construction of CB #2A.	350	\$ <u>5,250</u>
9	1	Construction stakeout for grading, roadways and utilities, in place complete.	5,000	\$ <u>5,000</u>
10	LUMP SUM	Erosion control including drain inlet sediment traps, dust control, in place complete.	LUMP SUM	\$ <u>5,000</u>
11	LUMP SUM	Traffic control, in place complete.	LUMP SUM	\$ <u>6,000</u>
12	LUMP SUM	Miscellaneous roadway and utility adjustments, in place complete.	LUMP SUM	\$ <u>10,000</u>
<b>TOTAL FOR GRADING &amp; ROADWAY CONSTRUCTION (Items 3 to 12, inclusive)</b>				<b>\$ <u>63,450</u></b>

ITEM NO.	ESTIMATED QUANTITY	DESCRIPTION	UNIT PRICE	TOTAL
<b><u>C. STORM DRAIN SYSTEM</u></b>				
13	159	Lin. Ft., 36" Standard reinforced concrete drain pipe, Class III, for public drainage system including excavation, backfill and pipe cushion, in place complete.	240	\$ <u>38,160</u>
14	270	Lin. Ft., 24" Standard reinforced concrete drain pipe, Class III, for public drainage system including excavation, backfill and pipe cushion, in place complete.	200	\$ <u>54,000</u>
15	55	Lin. Ft., 18" Standard reinforced concrete drain pipe, Class III, for public drainage system including excavation, backfill and pipe cushion, in place complete.	190	\$ <u>10,450</u>
16	117	Lin. Ft., 12" Standard reinforced concrete drain pipe, Class III, for public drainage system including excavation, backfill and pipe cushion, in place complete.	150	\$ <u>17,550</u>
17	8	Lin. Ft., 8" Standard reinforced concrete drain pipe, Class III, for public drainage system including excavation, backfill and pipe cushion, in place complete.	120	\$ <u>960</u>
18	11	Lin. Ft., 2' x 4' box culvert, in place complete.	1,100	\$ <u>12,100</u>
19	2	Ea., Standard storm drain manhole per Std. Detail D-22, from top to invert 10.00' to 11.99' deep, including excavation and backfill, in place complete.	8,500	\$ <u>17,000</u>
20	3	Ea., Standard storm drain manhole per Std. Detail D-22, from top to invert 6.00' to 7.99' deep, including excavation and backfill, in place complete.	6,300	\$ <u>18,900</u>
21	2	Ea., Standard City & County type "A" catch basin, from top to invert 8.00' to 9.99', including excavation and backfill, in place complete.	9,400	\$ <u>18,800</u>
22	4	Ea., Standard City & County type "A" catch basin, from top to invert 6.00' to 7.99', including excavation and backfill, in place complete.	9,000	\$ <u>36,000</u>
23	1	Ea., Standard City & County type "B" catch basin, from top to invert 10.00' to 11.99', including excavation and backfill, in place complete.	10,700	\$ <u>10,700</u>
24	1	Ea., Standard City & County type "B" catch basin, from top to invert 8.00' to 9.99', including excavation and backfill, in place complete.	10,200	\$ <u>10,200</u>
25	1	Ea., Special catch basin, 4.00' to 5.99' deep, including excavation and backfill, in place complete..	15,000	\$ <u>15,000</u>
26	50	Lin. Ft., Trench drain, 2' wide grate, in place complete.	180	\$ <u>9,000</u>

ITEM NO.	ESTIMATED QUANTITY	DESCRIPTION	UNIT PRICE	TOTAL
27	40	Lin. Ft., Trench drain, 14" wide grate, in place complete.	120	\$ 4,800
28	1	Ea., Ditch Connection, in place complete.	4,000	\$ 4,000
29	1	Ea., Demolish and remove existing catch basin, in place complete.	2,000	\$ 2,000
<b>TOTAL FOR STORM DRAIN SYSTEM (Items 13 to 29, inclusive)</b>				<b>\$ 279,620</b>

### SUMMARY

<b>A. DEMOLITION WORK (Items 1 to 2, inclusive)</b>	<b>\$ 13,000</b>
<b>B. ROADWAY WORK (Items 3 to 12, inclusive)</b>	<b>\$ 64,000</b>
<b>C. STORM DRAIN SYSTEM (Items 13 to 29, inclusive)</b>	<b>\$ 280,000</b>
<b>SUBTOTAL</b>	<b>\$ 357,000</b>
<b>CONTINGENCY (15%)</b>	<b>\$ 54,000</b>
<b>TOTAL</b>	<b>\$ 411,000</b>

## **Appendix B**

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# Biological survey for a small flood abatement project on Meleana Place, Nu‘uanu, O‘ahu.

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September 8, 2009

*AECOS* No. 1206

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## Introduction

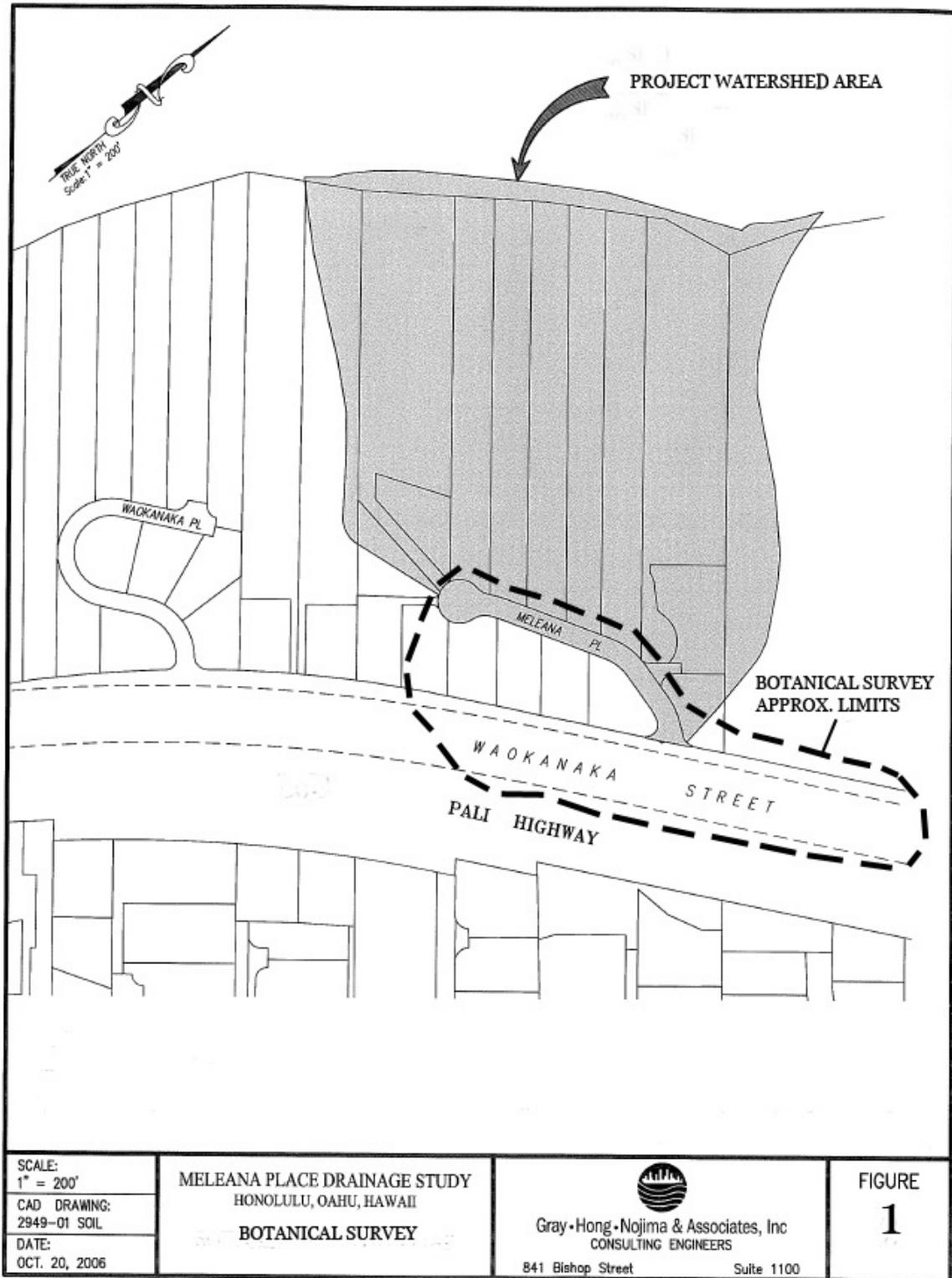
This report presents results of a biological survey—essentially a botanical survey—for a drainage improvements project at Meleana Place on O‘ahu. Meleana Pl. is located in upper Nu‘uanu Valley, a curved street off the upslope (northwest) side of Waokanaka Street; the latter parallels a portion of the Pali Highway (State Rte. 61). This report is part of the environmental due diligence for a proposed flood abatement project by the City and County of Honolulu (C & C) under the direction of Gray Hong Nojima & Assoc., Inc.<sup>1</sup> The project is described in a report by Gray, Hong, Nojima, and Assoc. (2009) as designed to alleviate flooding problems along Meleana Pl., and covers the length of Meleana Pl., bordered on the southeast by Waokanaka St. and an undeveloped hillside to the northwest.

## Methods

A visit to the project area was made on July 27, 2009. The survey area encompassed both Meleana Pl. and Waokanaka St. a short distance up and down from the intersection with Meleana Pl. (Fig. 1). Waokanaka St. and Meleana Pl. were traversed on foot, encompassing the area of the proposed project (see Fig. 1) and a search made for vegetation that might be of interest or concern.

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<sup>1</sup> This report will become part of the public record for the project environmental assessment.



## Results

The project area is a residential neighborhood along the full length of Meleana Pl. (see Fig. 2). Within the project area and vicinity, Waokanaka St. is bordered on the upslope (northwest side) by a drainage ditch and the properties of residences accessed from Meleana Pl. A steep slope separates the backyards of these properties from the road and ditch. Further up the street and along the southeast side of Waokanaka, no developments are present. However, the southeast side of Waokanaka is separated from the Pali Hwy. by a relatively narrow, steep area of tree and shrub growth. Trees in this area are all introduced species, mostly padang cassia (*Cinnamomum burmanni*), ironwood (*Casuarina equisetifolia*), gunpowder (*Trema orientalis*), and an unidentified Fabaceae (juvenile *albizia*?).



Figure 2. View up Meleana Pl. showing upper half of street. Street is bordered entirely by landscaped house lots.

A partial listing of the vegetation observed during the survey is presented as Table 1. This list is not a complete list of the flora present for the reason that most of the area is landscaped yards (Fig. 2) and the wet climate is very

conducive to growing a large number of ornamental plants, as well as a diversity of lawn grasses. These are not plants that would be of concern since all are non-native, and most are not naturalized (that is, their growth is limited to managed and maintained areas). Consequently, the survey focused on naturalized plants in the area and whether any native species were present.

Table 1. Partial flora listing for a small flood abatement project on Meleana Place, O‘ahu, Hawai‘i.

Species listed by family	Common name	Status	Notes
<i>CONIFERS</i>			
<b>PINACEAE</b>			
<i>Pinus cf. patula</i> Schiede & Deppe	jelecote pine	Orn	<3,4>
<i>FERNS</i>			
<b>THELYPTERIDACEAE</b>			
<i>Christella</i> sp.	wood fern	Nat	<3>
<i>FLOWERING PLANTS</i>			
<b>DICOTYLEDONES</b>			
<b>ARALIACEAE</b>			
<i>Schefflera actinophylla</i> (Endl.) Harms	octopus tree	Nat	<3>
<b>ASTERACEAE (COMPOSITAE)</b>			
<i>Ageratum conyzoides</i> L.	<i>maile hohono</i>	Nat	<2>
<i>Bidens alba</i> (L.) DC	beggar’s tick	Nat	<1>
<i>Sphagneticola trilobata</i> (L.) Pruski	wedelia	Nat	<1,2>
<b>CASUARINACEAE</b>			
<i>Casuarina equisetifolia</i> L	common ironwood	Nat	<2>
<b>EUPHORBIACEAE</b>			
<i>Codiaeum variegatum</i> (L.) Blume	croton	Orn	<3>
<b>FABACEAE</b>			
unidentified tree	---	Nat	<3,4>
<b>LAURACEAE</b>			
<i>Cinnamomum burmanni</i> (Nees) Blume.	padang cassia	Nat	<3>
<b>MALVACEAE</b>			
<i>Hibiscus tiliaceus</i> L.	<i>hau</i>	<b>Ind</b>	<3>
<b>MORACEAE</b>			
<i>Ficus microcarpa</i> L.	Chinese banyan	Nat	<2,3>
<b>MYRTACEAE</b>			
<i>Eucalyptis robusta</i> Sm.	swamp mahogany	Nat	<3>
<b>ULMACEAE</b>			
<i>Trema orientalis</i> (L.) Blume	gunpowder tree	Nat	<3>

Table 1 (continued).

Species listed by family	Common name	Status	Notes
<b>VERBENACEAE</b>			
<i>Citharexylum</i> sp.	fiddlewood	Nat	<3,4>
<b>MONOCOTYLEDONES</b>			
<b>AGAVACEAE</b>			
<i>Cordyline fruticosa</i> (L.) A. Chev.	ki, ti	<b>Pol</b>	<2,3>
<b>ARACEAE</b>			
<i>Epipremnum pinnatum</i> (L.) Engler	pothos	Nat	<3>
<i>Monstera deliciosa</i> Liebmann	monstera	Orn.	<3>
<b>COMMELINACEAE</b>			
<i>Commelina diffusa</i> N. L. Burm.	day flower, <i>honohono</i>	Orn	<1>
<b>CYPERACEAE</b>			
<i>Kyllinga nemoralis</i> (J.R. Forster & G. Forster) Dandy ex Hutchinson & Dalziel	<i>kili‘o‘opu</i>	Nat	<1>
<b>HELICONIACEAE</b>			
<i>Heliconia latispatha</i> Bentham	latispath heliconia	Orn	<3>
<b>POACEAE</b>			
<i>Axonopus compressus</i> (Swartz) P. Beauv.	carpetgrass	Nat	<2>
<i>Digitaria</i> sp.	crabgrass	Nat	<1>
<i>Eleusine indica</i> (L.) Gaertn.	wiregrass	Nat	<2>
<i>Paspalum conjugatum</i> Bergius	Hilo grass	Nat	<1>
<i>Paspalum dilatatum</i> Poir.	Dallis grass	Nat	<1>
<i>Sacciolepis indica</i> (L.) Chase	Glenwood grass	Nat	<2>
<i>Setaria parviflora</i> (Poir.) Kerguelen	yellow foxtail	Nat.	<2>
<i>Setaria palmifolia</i> (J. König) Stapf	palmgrass	Mat	<1>
<i>Sporobolus africanus</i> (Poir.) Robyns & Tourmay	African dropseed	Nat	<1>
<i>Sporobolus</i> sp.	dropseed	Nat.	<2>
<i>Urochloa maxima</i> (Jacq.) Webster	Guinea grass	Nat	<3>

## Legend to Table 1

STATUS = distributional status for the Hawaiian Islands:

- Ind** = Indigenous; native to Hawaii, but not unique to the Hawaiian Islands.  
**Nat** = Naturalized, exotic, plant introduced to the Hawaiian Islands since the arrival of Cook Expedition in 1778, and well-established outside of cultivation.  
**Orn** = Ornamentals; plants that are maintained as part of the landscaping .  
**Pol** = Aboriginal (Polynesian) introduction; “canoe plants.”

- NOTES: <1> – Plants observed around drainage ditch on Waokanaka St..  
 <2> – Plants observed on Meleana Pl.  
 <3> – Plant observed along Waokanaka St.  
 <4> - Plant lacking fruits or flowers needed to identify.

## Discussion

The slopes above Meleana Pl. are steep and rocky, but support a mixed forest of mostly non-native trees. Alternatives proposed to handle excess stormwater runoff entail improvements or additions to floodwater conveyances from Meleana Pl. to the existing ditch along the north side of Waokanaka Street (Fig. 3). These would either be built through the lots on the south side of Meleana Pl. or as an underground drainage system along Meleana Pl. These alternatives would have impacts only on the vegetation growing on private lots (landscaped with mostly ornamentals) or (for work within the C & C R-o-W of Meleana Pl.) minimal impacts to landscaping along the roadway (mostly maintained lawns).



Figure 3. View downslope along Waokanaka Street (vehicle is just past intersection with Meleana Pl.) showing existing drainage ditch and maintained verge.

No botanical resources of concern are located in the area of Meleana Pl. potentially to be disturbed or the verge and slopes close to Waokanaka St. in the same general area. Native plants are sparse in and surrounding the project area; only hau (*Hibiscus tiliaceus*), a possibly indigenous (or aboriginal

introduction) was observed. Thus, there are no plant species present that would be of particular concern.

No streams, relatively permanent or non-relatively permanent waterways, or wetlands occur in the project area. Although a survey to develop a faunal listing for the project area was not undertaken, no animals of special concern were encountered by the biologist on July 27. No habitats other than those supporting common lowland birds and introduced wild and feral mammals are present. No federally endangered or threatened species (Federal Register, 2005; USFWS, 2005) were encountered during the survey, and none is anticipated to utilize habitats in the project area.

In conclusion, no rare, unusual, or protected biological resources would be lost or adversely impact by the proposed flood abatement project.

## References

- Federal Register. 2005. Department of the Interior, Fish and Wildlife Service, 50 CFR 17. Endangered and Threatened Wildlife and Plants. Review of Species That Are Candidates or Proposed for Listing as Endangered or Threatened; Annual Notice of Findings on Resubmitted Petition; Annual Description of Progress on Listing Actions. *Federal Register*, 70 No. 90 (Wednesday, May 11, 2005): 24870-24934.
- Gray, Hong, Nojima & Assoc., Inc. 2009. Drainage study for Meleana Place, Honolulu, Oahu, Hawaii. TMK: 1-9-03. Prep. for Dept. of Design & Construction, City & County of Honolulu. 38 pp.
- U.S. Fish & Wildlife Service (USFWS). 2005. Endangered and Threatened Wildlife and Plants. 50 CFR 17:11 and 17:12.
- \_\_\_\_\_. 2008. USFWS Threatened and Endangered Species System (TESS), online at [http://ecos.fws.gov/tess\\_public/StartTESS.do](http://ecos.fws.gov/tess_public/StartTESS.do).

## **Appendix C**

DRAFT

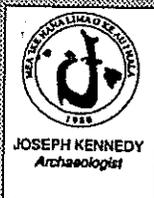
NOT FOR DISTRIBUTION

**AN ARCHAEOLOGICAL MONITORING PLAN  
FOR THE PROPOSED MELEANA PLACE  
DRAINAGE IMPROVEMENTS LOCATED AT  
TMK: (1) 1-9-03 IN NU'UANU AHUPUA'A,  
KONA DISTRICT, ISLAND OF O'AHU**

**JUNE 2009**

**Prepared for: Ms. Sheryl Nejima  
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**An Archaeological Monitoring Plan for the  
Proposed Meleana Place Drainage Improvements Project  
Located at TMK: 1-9-03  
in Nu‘uanu Ahupua‘a, Kona District,  
Island of O‘ahu**

**Section 1: Introduction**

At the request of Ms. Sheryl Nojima of Gray, Hong, Nojima & Assoc., Inc. Archaeological Consultants of the Pacific, Inc. (ACP) has prepared this plan for the archaeological monitoring of subsurface construction activities associated with the City and County of Honolulu’s Meleana Place Drainage Improvements Plan. The subject property is owned by the City and County of Honolulu.

The Meleana Place Drainage Improvements Plan is intended to alleviate flooding problems along Meleana Place. The subject property covers the entire length of Meleana Place. The drainage plan involves the construction of an underground drainage system to divert runoff along Meleana Place south to the ditch at Waokanaka Street.

As Nu‘uanu Valley was an area of significance during both pre-Contact and post-Contact eras and due to the presence of a variety of traditional and historic artifacts and human remains in the vicinity of the subject property, it is possible that artifacts and human remains may be encountered during construction activities. Recommendations are made regarding the treatment of significant historic properties and/or cultural deposits that may be encountered during archaeological monitoring.

This monitoring plan also briefly summarizes previous archaeology conducted within the near vicinity of Meleana Place, the physical setting of the subject property and the proposed improvements involved with the drainage plan. In addition, the methodology of archaeological monitoring is described.

## Section 2: Physical Setting

The subject property, Meleana Place, located at TMK: 1-9-03 is situated between the leeward and windward sides of the island of O‘ahu, on the foot of Kekoalele Ridge in the valley of Nu‘uanu, in the *ahupua‘a* of Nu‘uanu, district of Kona (see Figures 1, 2 & 3). The subject property is approximately 5 kilometers inland from the coast at an elevation ranging from a minimum of 650ft. to a maximum of 700ft above mean sea level (AMSL). The subject property is the entire paved road of Meleana Place, which extends southeast to Waokanaka Street, which runs along side of Pali Hwy in northwestern direction. The road measures approximately 500 ft in length by 40ft in width covering an area of 1.43 acres.

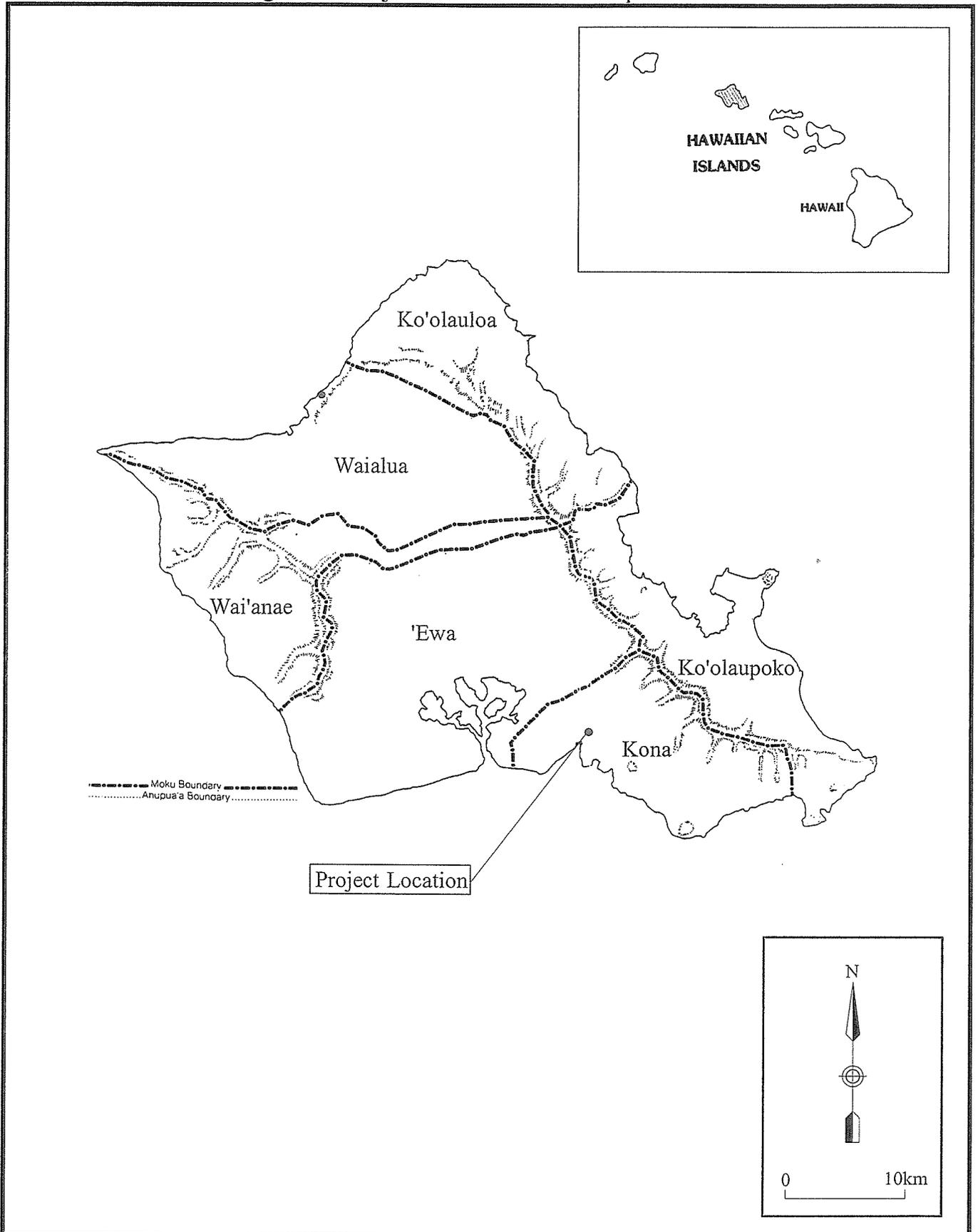
According to Foote *et al.* (1972), the soils on the subject property should consist of the Lolekaa series of silty clays. The Lolekaa (LoC,D) soils occur “on side slopes of terraces and along drainageways. Runoff is slow to medium and erosion hazard is slight to moderate. Workability is slightly difficult because of slope (Foote *et al.* 1972:84). Because no subsurface testing was conducted previously at the subject property, ACP has no detailed information concerning the stratigraphy within the property. Annual rainfall averages approximately 30 to 40 inches, with the majority of rainfall occurring between November and April (Armstrong 1973). The upper portion of Meleana Place is relatively flat with a 0.4% slope continuing from the cul-de-sac for roughly 230 feet. At this point the slope steepens to 19% to slope downward to Waokanaka Street. The hillside above Meleana Place homes is steep and forested (Gray, Hong, Nojima & Associates, Inc. 2006).

## Section 3: Previous Archaeology and Expected Finds

Although there have been no archaeological investigations conducted on the current subject property, a significant number of studies have taken place in Nu‘uanu Ahupua‘a. In 2006, ACP conducted an inventory survey on a 45.883 acre parcel (TMK: 2-2-047: 005) which is located approximately 650m southwest of the subject property (Moor, Elison, Guerriero, Gregg, and Kennedy 2006). A thorough review of the previous archaeology conducted in the *ahupua‘a* has been presented in this inventory survey report and the reader is referred to that document for additional information. Those studies conducted in the upper portions of Nu‘uanu Ahupua‘a will be reviewed below.

The earliest archaeological survey of portions of Nu‘uanu Valley was undertaken by McAllister in 1930 as part of his island wide survey of O‘ahu (McAllister 1985:80-88). The locations of several of the sites in Nu‘uanu Valley were identified by

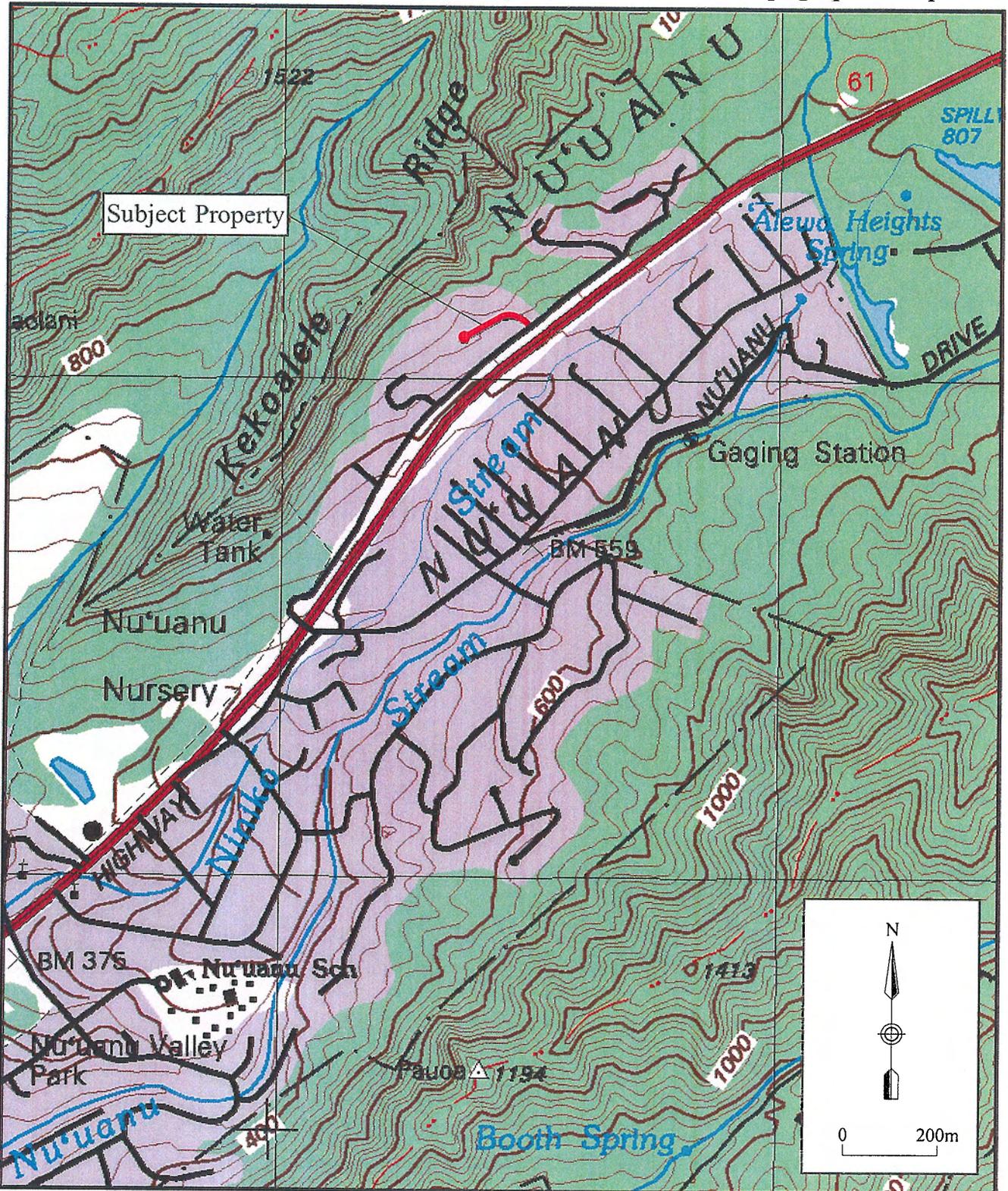
Figure 1: Project Location on a Map of O'ahu



Meleana Place TMK: (1) 1-9-003

source: Adapted from Nogelmeier in Snakenberg 1990

Figure 2: Location of the Subject Property on a U.S.G.S. Topographic Map



Meleana Place TMK: (1) 1-9-003

source: U.S.G.S. 7.5 Minute Series (Topographic)  
Honolulu Quadrangle 1998



McAllister including three petroglyph sites found along Nu‘uanu Stream (Sites 50-80-14-67, -68 & -69). In addition, the entire upper valley was designated as a site (Site 50-80-14-70) within which many significant properties were believed to exist. Using local informants and their knowledge of the history of the area, McAllister was able to briefly describe a number of significant archaeological sites, although at the time of his survey it was reported that a number of them had already been destroyed.

Elsewhere in Nu‘uanu Valley, McAllister used literary and ethnographic sources to infer both the present and former locations of sites. These include a number of *heiau*, a breadfruit tree known as the deity Kamehaikana, a place where *kilu* was played, and disturbed burial caves along the walls of the valley. In addition, a *holua* slide, sacred stones and a trail were said to have existed in the upper valley. He also used literary sources to describe events associated with Kawaluna and Makuku Heiau in upper Nu‘uanu Valley, although he was unable to locate them.

There was an absence of formal archaeological studies within the *ahupua‘a* until the 1970’s, although throughout the 1950’s and 1960’s steps were taken to preserve the petroglyphs near Kapena Falls. In addition to the three sets of petroglyphs reported by McAllister, a fourth set has been identified by the SHPD. The SHPD also reports a site across Nu‘uanu Stream from the petroglyph site:

... a 4 terrace agricultural system, stacked stone structures, a possible house site, trail and an auwai facing still in place at the head of the uppermost taro terrace (SHPD n.d.).

In upper Nu‘uanu Valley archaeological investigations have occurred at three buildings associated with the Hawaiian royalty; Queen Emma’s summer palace, Kamehameha III’s summer palace and the Royal Mausoleum. Each will be briefly discussed below.

### ***Queen Emma’s Summer Palace***

Located in Middle Nu‘uanu Valley is Queen Emma’s summer palace, or Hanaiakamalama (State Site #50-80-14-9904), at which a minimal amount of archaeological investigation has taken place. As a field class, Gould at the University of Hawaii excavated a trench in the vicinity of the former kitchen and bathhouse of the residence (Gould 1972). His excavations encountered historic features and artifacts, as well as traditional type artifacts such as an adze and five volcanic glass flakes. Also, in 1990, Smith examined three features which had been revealed by construction crews during grading activities at the Fern House (Smith 1990). All three features were historic in origin.

### ***Kamehameha III's Summer Palace***

Another notable royal residence in Nu'uaniu Valley is Kaniakapupu (State Site #50-80-14-409), or the summer palace of Kamehameha III and Queen Kalama. This building was finished in 1845 and was the location of a large *luau* hosted by Kamehameha III on Restoration Day, 1847 (Sterling & Summers 1978:308-309). This now derelict site was described by Neller in 1984 following field trips to the site (please refer to that document for the complete description of the site). Kaniakapupu had previously been believed to have been built on top of an "old *heiau*" (Neller 1984:1, Hammatt 1988:5-7), however, in their discussion of the Waolani Religious Complex, Dixon, Klieger, Lebo, Lennstrom & Major demonstrate that there is some question as to whether this is in fact the case (1994:17-20).

### ***Royal Mausoleum***

The Royal Mausoleum (Site #50-80-14-9909, see Figure 4) was constructed in Nu'uaniu Valley between 1863 and 1864, following the death of Kamehameha IV (Ota 1980:3). A number of human remains were interred here during the nineteenth century, although during the twentieth century all the remains were removed and interred at a variety of sites elsewhere. Construction activities at the Mausoleum have been monitored as they occur.

In 1977, Beggerly monitored the excavation of 12 pits to reveal wall footings and foundations; she collected a number of historic artifacts (Beggerly 1977). In 1980, Ota monitored excavations associated with stabilization of the chapel walls and foundations (Ota 1980). Ota encountered a variety of indigenous and historic artifacts as well as human remains. Ota noted that the documented history of construction at the Mausoleum conflicted with his archaeological evidence. In 1985, Yent monitored the excavation of two trenches at the Mausoleum, although the stratigraphy she encountered had been previously disturbed (Yent 1985).

In addition to these studies, several other archaeological surveys and excavations have occurred in the mid-to upper portions of Nu'uaniu Valley. Firstly, Leidmann (1989) conducted a surface survey on three parcels followed by excavations on one of those parcels (Leidmann 1991). During the initial survey, 8 features were identified including Lapalapakea Auwai, a foundation, a C-shaped structure, a boulder alignment, walls, a cobble facing and stacked boulders with cobbles. During the excavations on one of the properties (TMK: 2-2-31: 11) it was determined that the *auwai* and a previously unidentified terrace facing (Site #50-80-14-4195) were probably constructed during the mid-to late nineteenth century, whereas a foundation (Site #50-80-14-4196) and cobble facing (Site #50-80-14-4201) were probably built during the twentieth century.

In another work, Yent documents a reconnaissance survey conducted at Clent Heath or Lanihuli, the Waldron residence (State Site #50-80-14-9916; Yent 1983). She describes a number of features associated with the residence, all of which were inferred to have been built between 1928 and 1931.

Another archaeological survey within the upper valley was conducted by Cultural Surveys Hawaii, Inc. (CSH) on a property just south of Kamehameha III's Summer Palace (Hammatt 1988). Two terraces with an alignment were identified, but after subsurface excavation it was determined that they were a product of twentieth century earth moving. In 1993, Bishop Museum conducted an inventory survey of a parcel (TMK: 2-2-31: 32) located on the eastern bank of Nu'uaniu Stream (Flood & Dixon 1993). Twenty-three historic features and one possible pre-Contact structure were recorded and designated State Site #50-80-14-2464. Features included agricultural terracing, one cobble lined depression, twenty oval to circular alignments, one 'ili wall and one historic bridge. A nineteenth century house platform and a twentieth century refuse deposit related to plant nursery activities were also identified. Cultural material recovered consisted of charcoal fragments from a buried agricultural soil layer in one terrace and basalt debitage from atop another terrace. The site was interpreted as having been part of the extensive taro farms of Kamehameha I, which may pre-date his arrival in 1795, and later was transformed into a late historic period residence associated with exotic plant gardens (Flood & Dixon 1993:vii).

Around the same time, Bishop Museum conducted an inventory survey on the Midkiff property (Dixon *et al.* 1994). Those investigations identified one site of historic significance consisting of nineteenth and twentieth century residential and landscaping features. No evidence of pre-Contact occupation of the site was identified although a radiocarbon date obtained from the base of a wall was attributed to the possible pre-Contact or early post-Contact utilization of the area.

In 1999, ACP conducted an inventory survey of a proposed waterline corridor located at TMK: 2-2-54: 1. Two historic sites were identified including a stacked stone wall (Site 50-80-14-5969) and a linear stone and earthen berm containing an abandoned water pipeline (Moore & Kennedy 1999). Based upon Neller's report concerning Kaniakapupu (Site 50-80-14-409) which presents an unnumbered figure (following Figure 10 in that document) of a map depicting Luakaha in which what appears to be a wall is shown in approximately the same location as Site 50-80-14-5969, it was hypothesized that this site may have been associated with Kaniakapupu.

Finally, in February 2006, ACP conducted an inventory survey of a property on Dowsett Highlands (TMK: 2-2-047). One site of significance to the interests of historic preservation (Site 50-80-14-6767) was identified during the surface survey. Site 50-80-14-6767 consists of a pair of boundary walls located along the crests of narrow finger ridges descending from the summit of an unnamed ridgeline that separates upper Nu'uaniu and Pauoa Valleys. Both walls of Site 50-80-14-6767 were measured, described and their locations plotted. In addition, a single shovel test pit was placed alongside the structural components of Feature 6767:B. While no culturally deposited materials were recovered, it was observed that the basal structural components were embedded no more than 2 to 3cm below the ground surface (Moor *et al.* 2006). Following this inventory survey, ACP prepared an archaeological preservation plan for Site 50-80-14-6767 which suggests the landowner to passively preserve this site in its entirety (Kouneski, Moore, Kennedy 2006).

Based upon the information summarized above, potential finds that could occur during the monitoring of subsurface construction activities on the subject property can be briefly surmised. As Nu‘uanu Valley was an area of significance during both pre-Contact and post-Contact eras and due to the presence of a variety of traditional and historic artifacts and human remains in the vicinity of the subject property, it is possible that artifacts and human remains may be encountered during construction activities.

#### **Section 4: Proposed Drainage Improvements**

Meleana Place Drainage Improvements will consist of the construction of an underground drainage system to divert the runoff currently entering Meleana Place down along the roadway to an existing ditch along Waokanaka Street (see Figure 4). The proposed underground drainage system consists of the construction of new catch basins, trench drains, drainage pipes, and a section a box culvert measuring approximately two feet in height and four feet in width. The system will serve to divert stormwater from the hillside above Meleana Place in addition to runoff generated on the roadway itself down to the existing ditch at the intersection of Meleana Place and Waokanaka Street. This will allow the flows to enter the ditch at a controlled point instead of flooding the southern lots of Meleana Place before entering the ditch. (Gray *et al.* 2006)

#### **Section 5: Methodology of Archaeological Monitoring**

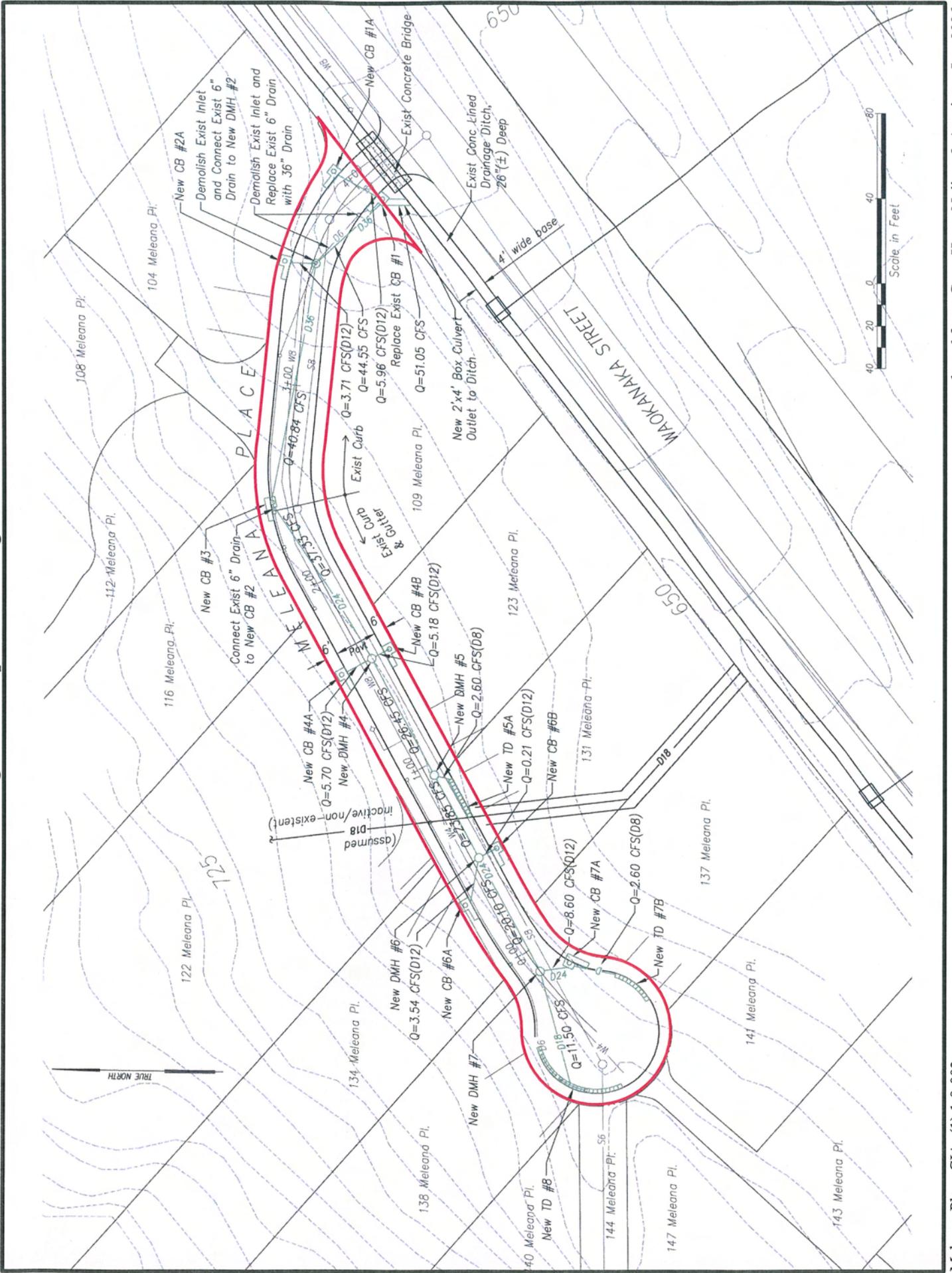
Archaeological monitoring of the subject property will be under the supervision of the Principle Investigator Joseph Kennedy, M.A.. Field work is expected to commence in upon acceptance of this monitoring plan by DLNR-SHPD.

Prior to the commencement of subsurface construction activities, the monitoring archaeologist will conduct a coordination meeting with the construction crew in order to brief the team on the expected finds and plans for monitoring.

In the event that significant historic sites are encountered, the monitoring archaeologist has the authority to halt construction in the immediate vicinity of the find until the proper authorities are notified and/or proper mitigation measures are undertaken. Construction activities may shift to other areas of the subject property in this event.

The treatment of possible sites encountered is dependent upon the feature type. If human burials are encountered they will be considered inadvertent finds and will be treated in accordance with Chapter 6E-43.6, Hawaii Revised Statutes. The proper personnel at the Department of Land and Natural Resources, State Historic Preservation Division and State Burials Program will be notified and their recommendations

**Figure 4: Proposed Drainage Plan**



implemented. In the event that significant archaeological deposits are encountered, archaeological salvage operations are recommended.

During archaeological monitoring, the field monitor will visually inspect all excavations and rake through excavated materials in order to identify any possible cultural materials. Profiles of the stratigraphy encountered and soil samples from each strata identified will be taken. All cultural materials of possible significance will be collected, bagged and labeled with the appropriate excavation information. All samples and field notes will be on file at ACP's office located at 59-624 Pupukea Road, Haleiwa, Hawai'i.

Laboratory work will include the identification of vertebrate faunal remains, invertebrate faunal remains, culturally derived floral remains and artifacts. The results of these identifications will be tabulated for presentation and a complete report concerning the monitoring activities, including possible finds, will be prepared. All materials collected will be curated at ACP's offices located at the address stated above.

## **Conclusion**

Previous archaeological investigations conducted in the vicinity of the subject property identified significant pre-Contact and post-Contact properties. Based on the findings of the previous archaeological studies and the potential for encountering artifacts and burials it was determined that archaeological monitoring would be necessary for all subsurface construction activities associated with the Meleana Place Drainage Improvements. This monitoring plan has briefly summarized the currently planned drainage improvements to Meleana Place, reviewed information concerning the archaeological sites known to exist within the near vicinity of the subject property and provided details concerning the methodology of archaeological monitoring for subsurface construction activities.

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## **Appendix D**

**A CULTURAL IMPACT ASSESSMENT  
FOR THE PROPOSED MELEANA PLACE  
DRAINAGE IMPROVEMENTS PROJECT LOCATED AT  
TMK: (1) 1-9-03 IN NU'UANU AHUPUA'A,  
KONA DISTRICT, ISLAND OF O'AHU  
SEPTEMBER 2009**

**Prepared for: Ms. Sheryl Nojima  
841 Bishop Street, Suite 1100  
Honolulu, HI 96813**

**Prepared by: Archaeological Consultants of the Pacific, Inc.  
Mina Elison, M.A.  
Joseph Kennedy, M.A.  
59-624 Pupukea Road  
Haleiwa, Hawai'i 96712**



*Inventory Reports \* Data Recovery Reports \* Research Design Documents \* Monitoring \* Due Diligence Work \* Historical Studies \* Cultural Studies \* Burial Treatment Plans \* Preservation Plans \* Interpretive Reconstructions \* Restorations \* Qualified Expert Witness Testimony*

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website: [ACPHawaii.org](http://ACPHawaii.org)

## Abstract

A Cultural Impact Assessment has been conducted for TMK: (1) 1-9-03, located in the *ahupua'a* of Nu'uaniu on the Island of O'ahu. The subject property is scheduled for drainage improvements. The purpose of these investigations was to gather information about cultural practices and cultural features that may be affected by actions subject to Chapter 343, HRS, and to promote responsible decision-making.

The current study took the form of a historic background study and community consultations. The historic background research addresses traditional accounts and land use for Nu'uaniu Ahupua'a while community consultations address concerns of community members regarding the affect of the proposed construction on places of cultural or traditional importance.

As a result of the current study, recommendations regarding the impact of proposed development on cultural practices and features associated with the project area have been made. Community consultations were conducted with Dr. Charles Burrows and Dr. Kekuni Blaisdell. Both residents of Nu'uaniu and active leaders of the community, Dr. Burrows and Dr. Blaisdell are knowledgeable of the cultural and historical significance of Nu'uaniu Valley. Discussing significant historical events such as the Battle of Nu'uaniu and the presence of various *heiau* and important historical structures in the valley today, Dr. Burrows does not believe that the proposed drainage improvement project would affect a place or access to a place of cultural or historic significance. While Dr. Blaisdell discussed the fact that the purpose of the drainage improvements project is to ensure the adequate flow of water in order to prevent flooding and destruction, he also expressed his belief that, because he does not personally know the residents of Meleana Place, he could not state what type of affect the proposed activities might have on any cultural or historical sites of significance. Dr. Blaisdell stated that he believes *'iwi* would likely be encountered during the current construction activities due to the "sacred" nature of the Nu'uaniu area. Dr. Blaisdell also reported that *'iwi* encountered may also be associated with the Battle of Nu'uaniu.

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**A Cultural Impact Assessment  
for the Proposed Meleana Place Drainage Improvements Project  
Located at TMK: 1-9-03 in Nu‘uanu Ahupua‘a, Kona District,  
Island of O‘ahu**

**Section 1: Introduction**

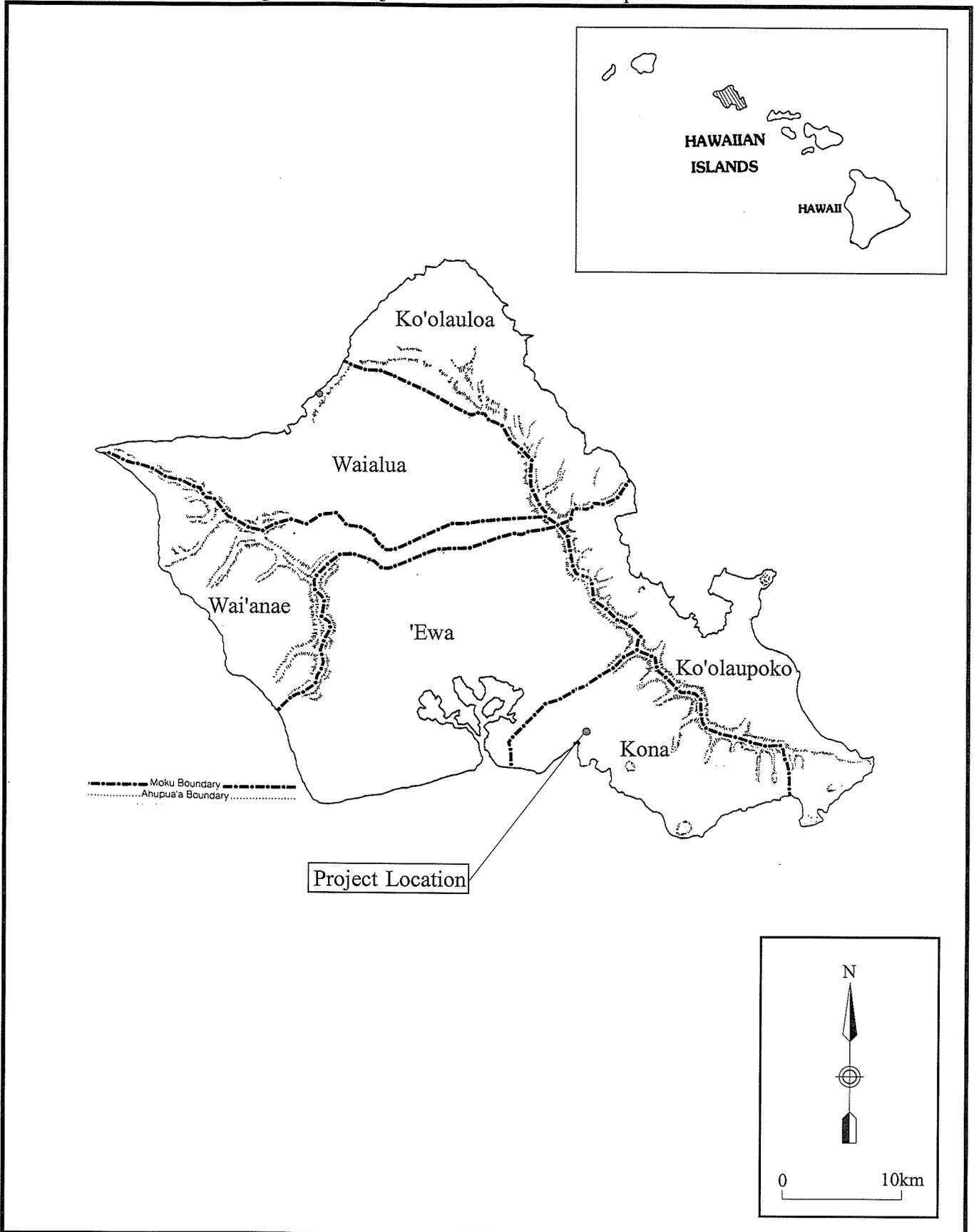
At the request of the request of Ms. Sheryl Nojima of Gray, Hong, Nojima & Assoc., Inc., Archaeological Consultants of the Pacific, Inc. (ACP) has conducted a Cultural Impact Assessment for the proposed Meleana Place Drainage Improvements Project located at TMK: (1) 1-9-03 located in the *ahupua‘a* of Nu‘uanu, Kona District, Island of O‘ahu (see Figure 1). The subject property is owned by the City and County of Honolulu.

The Meleana Place Drainage Improvements Plan is intended to alleviate flooding problems along Meleana Place. The subject property covers the entire length of Meleana Place and the drainage plan involves the construction of an underground drainage system to divert runoff along Meleana Place south to a ditch at Waokanaka Street.

The purpose of this document is to comply with the requirements of Chapter 343, HRS, as administered by the office of Environmental Quality Control as part of the Environmental Assessment process which requires that environmental assessments (EA) and impact assessments (EIS) identify and assess the potential effects of “a proposed action on cultural practices and features associated with the project area.” These investigations were conducted in an effort to promote and preserve cultural beliefs, practices, and resources of native Hawaiians and other ethnic groups.

An archaeological monitoring plan requiring the presence of a qualified archaeologist on-site during all subsurface activities associated with the drainage improvement project has been written for the current subject property (Takahashi, Leibhart & Kennedy 2008) and is currently awaiting approval by the Department of Land and Natural Resources, Historic Preservation Division.

Figure 1: Project Location on a Map of O'ahu

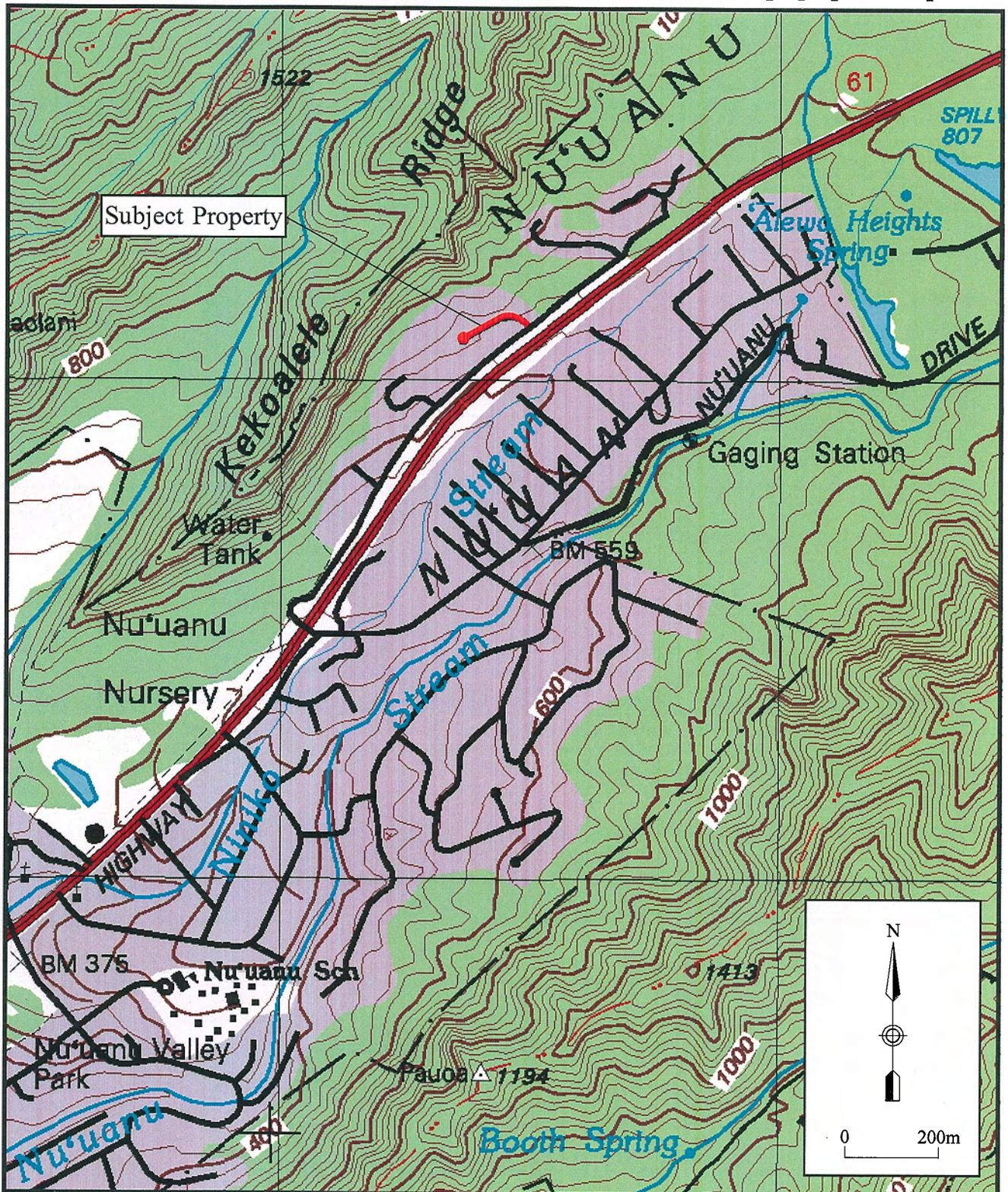


## Section 2: Physical Setting

The subject property, Meleana Place, located at TMK: (1) 1-9-03 is situated between the leeward and windward sides of the island of O‘ahu, on the foot of Kekoalele Ridge in the valley of Nu‘uanu, in the *ahupua‘a* of Nu‘uanu, traditional district of Kona, current district of Honolulu (see Figure 2). Because the project area consists of the Right-of-Way (ROW) of a dead end cul-de-sac, it does not have a TMK parcel number assigned to it and will simply be referred to as Meleana Place (see Figure 3). The subject property is approximately 5 kilometers inland from the coast at an elevation ranging from a minimum of 650 feet (ft) to a maximum of 700ft above mean sea level (AMSL). The subject property is the entire paved ROW of Meleana Place, which extends from northwest to southeast to Waokanaka Street, which runs along northwestern side of Pali Hwy.. The road measures approximately 500ft in length by 40ft in width covering an area of approximately 0.46 acres (see Figure 4).

According to Foote, Hill, Nakamura and Stephens (1972), the soils on the subject property should consist of the Lolekaa series of silty clays. The Lolekaa (LoC, D) soils occur “on side slopes of terraces and along drainageways. Runoff is slow to medium and erosion hazard is slight to moderate. Workability is slightly difficult because of slope (Foote *et al.* 1972:84). Because no subsurface testing was conducted previously at the subject property, ACP has no detailed information concerning the stratigraphy within the property. Annual rainfall averages approximately 30 to 40 inches, with the majority of rainfall occurring between November and April (Armstrong 1973). The upper portion of Meleana Place is relatively flat with a 0.4% slope continuing from the cul-de-sac for roughly 230 feet. At this point the slope steepens to 19% to slope downward to Waokanaka Street. The hillside above Meleana Place is steep and forested (Gray, Hong, Nojima & Associates, Inc. 2006).

Figure 2: Location of the Subject Property on a U.S.G.S. Topographic Map

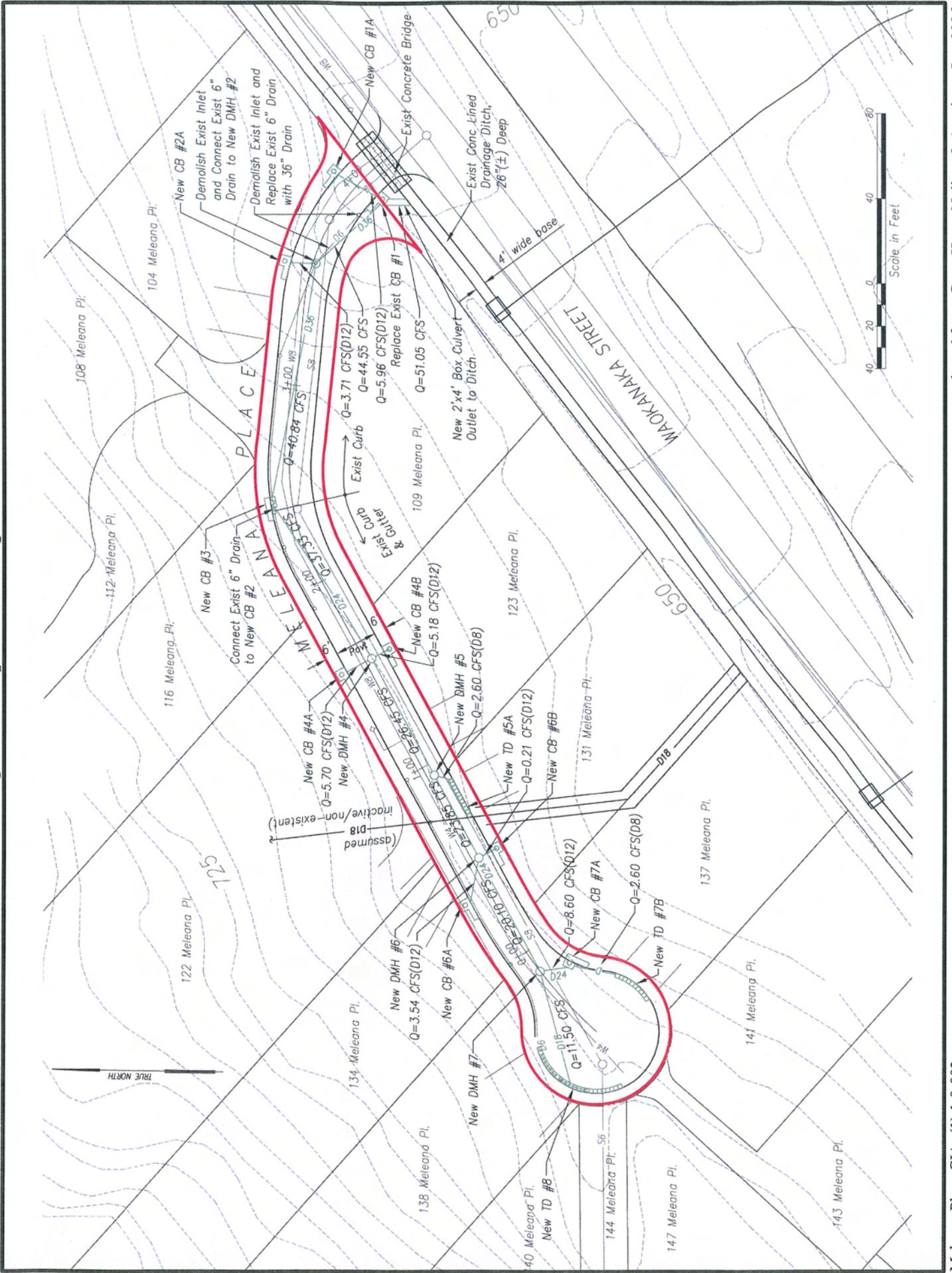


Meleana Place CIA TMK: (1) 1-9-03

source: U.S.G.S. 7.5 Minute Series (Topographic)  
Honolulu Quadrangle 1998



**Figure 4: Proposed Drainage Plan**



### Section 3: Method of Evaluation

The current assessment was conducted in August and September of 2009. The project was conducted under the direction of the Principal Investigator, Joseph Kennedy, M.A.. Community consultations were conducted by Mina Elison, M.A.. Report preparation was completed by Mina Elison, M.A., and Joseph Kennedy, M.A..

The current study includes the entire *ahupua'a* of Nu'uaniu. Research of the historic background of this area was conducted including an examination of traditional accounts, land use from earliest occupation to present day, archaeological investigations and a summary of settlement patterns. This research was conducted by means of researching historical texts and documents, such as (but not limited to) *Sites of O'ahu* (Sterling & Summers 1978), Beckwith's *Hawaiian Mythology* (1970), "Heiau and Heiau Sites Throughout the Hawaiian Islands" (Thrum 1907), Handy's *The Hawaiian Planter* (1940), *Native Planters on Old Hawaii* (Handy & Handy 1972), *Archaeology of O'ahu* (McAllister 1933) and *Place Names of Hawaii* (Pukui, Elbert & Mookini 1974). An examination of Land Commission Awards was completed by researching the Board of Commissioners to Quiet Land Titles (1846-1855) Native and Foreign Registers and Testimonies Award Books at the Archives of Hawai'i in Honolulu. Research relating to previous archaeological investigations was conducted at the Department of Land and Natural Resources, State Historic Preservation Division (DLNR-SHPD) library in Kapolei.

Individuals and organizations with expertise concerning cultural resources, practices and beliefs in Nu'uaniu, as well as those knowledgeable of the area potentially affected by the proposed drainage improvement project were identified and contacted and willing individuals were consulted. Dr. Charles "Chuck" Burrows and Dr. Kekuni Blaisdell, both active community leaders and long-time residents of Nu'uaniu, were interviewed on August 10, 2009 and September 4, 2009, respectively.

A list of interview questions was compiled for the cultural consultations. These included the informant's full name, address, birth date, birthplace, ethnicity, historical and geographical associations with the place in question, and finally, how the proposed drainage improvements would affect or physically alter any place of cultural/traditional importance, or access to any such place. Cultural consultations were conducted in person and the interviews were recorded by audio-cassette. This report provides complete transcriptions of all cultural consultations.

## Section 4: Historical Background of Nu‘uanu Ahupua‘a

Nu‘uanu Valley has been the subject of a significant number of archaeological investigations over the past thirty years. A thorough discussion of the environmental setting and history of the *ahupua‘a* as well as a review of previous archaeological investigations conducted in Nu‘uanu has been compiled by Archaeological Consultants of Hawaii (ACH)(Kennedy, Brennan, Denham, Ireland, Moore & Riley 1994) and Sterling and Summers (1978). The reader is referred to those documents for detailed information concerning Nu‘uanu. What follows will be a brief summary of the historic background of the *ahupua‘a* of Nu‘uanu.

### *Section 4.1: Legends and Traditional Accounts*

The name Nu‘uanu literally translates as “cool height” in Hawaiian and reportedly refers to the chilling winds that blow over the *pali* from the windward side of O‘ahu into Nu‘uanu Valley (Pukui, Elbert & Mookini 1974:251). Although there are many legendary accounts that relate to Nu‘uanu Valley, a summary of several of the more well known accounts follows.

Kane and Kanaloa, the legendary gods of agriculture, fresh water and land were said to have lived with the *menehune* in Nu‘uanu at a place known as Pu‘iwa. The *menehune* are the legendary race of small people who worked at night, building fishponds, roads and temples (Pukui, Elbert & Mookini 1974). Numerous traditional accounts from around the islands relate to the legendary figures, Kane and Kanaloa.

At the top portion of Nu‘uanu Valley were once two stones, known as Hapu‘u and Kalaihauola, the supernatural grandmothers of Pi‘ikea. Parents would place *piko* (infant’s naval cords) here so that their babies would survive infancy. Other accounts state that parents would bury the umbilical cords under the rocks so that they would be protected from evil (Sterling & Summers 1978:313).

One of the well known landmarks of Nu‘uanu is the hill/crater now known as Punchbowl but called Puowaina in Hawaiian. According to legend, Puowaina, the contracted form of Pu‘u o waiho ana, means “the hill of offering” which was utilized for human sacrifice.

Formerly there was an *imu ahi*, a fire oven for burning men on this hill. Chiefs and common people were burned as sacrifices in that noted place. Men were brought for sacrifice from Kauai, Oahu, and Maui, but not from Hawaii. People could be burned in this place for violating the tabus of the divine chiefs (McAllister; as cited in Sinoto & Pantaleo 1993:4).

Hundreds of years ago, a man was taken as a sacrifice for the gods. When he was about to be killed, his wife used magical powers to thrust him into a giant breadfruit tree located on the banks of Nu‘uanu Stream. He then became one of the most powerful wooden gods of Hawai‘i, being preserved to the time of Kamehameha I (Westervelt 1915:30).

Ku‘ilio‘loa, or Ku, was a great man-dog who could change his shape at his will. In an effort to marry a beautiful princess, he first won her affection by assuming his dog form. Having compassion for the oddly intelligent animal, the princess took him home, where her husband, a

great chief of O‘ahu, noticed the dog’s peculiarity. After slyly studying the animal and listening to his soothsayers, the chief realized that the dog was actually the great cannibalistic man-dog, Ku. The chief devised a plan to kill the animal, but Ku was strong and fast and was easily able to flee to the woods for safety. The chief’s people were slowly being devoured by Ku, as the man-dog attempted to evoke a battle. After hiding the princess and the rest of his family, the chief and his men set out to destroy Ku‘ilio‘loa. Though the battle was difficult, ultimately the chief was able to slay Ku. His body was cut into two pieces, and the power of the priests was evoked, turning the flesh into two great stones that rest in Nu‘uanu (Westervelt 1915:83-85).

Above Kapena Falls and near the Nu‘uanu Trail lived a couple that was new to the area. The couple had five loyal dogs who would never leave the premises of the house and would only allow strangers to enter once the couple welcomed them in. Though the dogs had a strong bark and a loud howl, they were gentle and would never attack. Eventually, friends of the couple came to know the dogs well and noticed that they were peculiar. It was speculated that they were actually *kupua* in dog form. One day, two friends of the couple crossed the property to get to the Nu‘uanu Trail, and up to Kapena Falls. The dogs began wildly howling and lay in the middle of the trail so that the two friends could not continue. One of the two retreated to Waikiki, but the other petted the dogs and continued on his way. When he came closer to the falls he was killed by robbers. It is now customary to leave offerings or *leis* at the falls to say “Thank you” to the *kupua* (Sterling & Summers 1978:298).

#### ***Section 4.2: Land Use History***

Nu‘uanu Valley is well known not only for its legendary and mythical stories, but also for its political associations, battles and agricultural uses (Kennedy *et al.* 1994). Handy and Handy (1972) describe the rich land of this *ahupua‘a* as ideal for agriculture, “Nu‘uanu was a bountiful valley of ever-flowing streams, with taro lands extending from seaward back into extensive terraced areas at least half-way to the upper end of the valley.” Individual habitation and religious structures would have been located throughout the valley with larger clusters of homes and villages concentrated near the coast.

Late in the prehistoric and early in the post-Contact period, the village of Kou is known to have existed along the coastline of Nu‘uanu Ahupua‘a over 7km *makai* of the current subject property. A thorough review of historic accounts and LCA testimony related to the village Kou and lower Nu‘uanu Valley was prepared by Archaeological Consultants of Hawaii (ACH) for the Kekaulike Revitalization Project and the reader is referred to that document for further information on the *makai* portions of the *ahupua‘a* (Moore & Kennedy 1999).

Post-Contact wars were mostly the result of political strife associated with competing rulers as high chiefs attempted to acquire additional lands. In 1783, a battle began between Kahahana, the *mo‘i* of O‘ahu, and Kahekili, the *mo‘i* of Maui. Legend states that the Kaheiki Stream, which bordered the battleground, turned red with blood as the stream became dammed with the corpses. The O‘ahu king, Kahahana fell at the hands of Kahekili, the Maui king (Sterling & Summers 1978:297).

Late in the 1700's, in an effort to rule the entire Hawaiian archipelago, Kamehameha I set his focus on O'ahu instigating the "Battle of Nu'uaniu." In 1795, at Kanelaaui Heiau, the war commenced, raging along an alignment of *heiau* including Mana and Kahehuna (Nakuina; as cited in Sterling & Summers 1978:317). The O'ahu army split in two and the main section began to retreat toward Pauoa. The O'ahu king, Kalanikupule, ordered his men to retreat to Ahipuu and Pu'iwa Heiau so that they could have the advantages of being at a higher elevation. While marching *mauka*, Kalanikupule was mortally wounded and carried to Mua Heiau where he died. As the battle neared its end, wives and children of the weakened army joined their husbands and fathers at Kahuaianawai. Over 300 warriors were driven off the *pali* to their deaths. Additional lives were lost as warriors threw themselves off the cliff rather than face defeat and surrender (Flood & Dixon 1993:5-6). Thus, the Battle of Nu'uaniu is commonly referred to as Kalelekaanae, "the leap of the anae or mullet, in derision of the poor wretches who were driven over the Pali ..." (Alexander; as cited in Sterling & Summers 1978:318).

After winning O'ahu, Kamehameha I kept the lands of Nu'uaniu, Pu'upueo, Waikiki, Kapalama and Keone'ula for himself. In these areas he "established magnificent farms" (Kame'eleihiwa 1991:59). From the beginning of the 19<sup>th</sup> century, Nu'uaniu Valley was a favorite place for Kamehameha and his fellow chiefs. Here they built many residences and agricultural plots.

"The importance of Nu'uaniu as an area of cultivation is illustrated by the fact that Kamehameha the Great personally tended crops in Nu'uaniu Valley and after his death, Boki, the governor of O'ahu, continued to cultivate the lands of Nu'uaniu as far into the valley as Luakaha" (Silva; as cited in Anderson & Williams 1993:1).

Early in 1829, Governor Boki started work on a government road...

The Keanini road began at the mouth of Nu'uaniu [Valley] and ran down to the hau grove of Kahaukomo. Here the trees grew thick and overarched the way with their shade, leaving it in old days muddy like a taro patch. It is said that in old days from Kahapa'akai clear to Hapu'u, it was a beautiful highway through charming villages with manienie grass on either side of the road and garden patches where grew taro, potatoes, bananas, 'awa, wauke, sugarcane, olona, and all the fat things of the land. Between Kahapa'akai clear to the mouth of the valley were situated many celebrated heiaus (luakini waihau) where people went to worship. [These had been] erected in ancient days as war heiaus or heiaus for purifying the land; for Nu'uaniu had been a magnificent battleground in those old times. Here Pele-io-holani fought against Alapa'i-nui, ruling chief of Hawaii, and so fought chiefs before and after his day. But when the hau trees grew so thick as to cover the road, the lovely place became a swamp where thieves and robbers took refuge (Kamakau 1992:291).

"The importance of cultivation of taro in Nu'uaniu Valley is also attested to by the numerous 'auwai located in the valley. The most famous 'auwai in Nu'uaniu Valley was that which was built by Abner Paki, father of Bernice Puahi Bishop" (Anderson & Williams 1993:1).

The Paki 'auwai was a system of watercourses for irrigational purposes designed by the ali'i Paki to convey water from the area above Luakaha to the vicinity of the present Judd Street. Record preserves that 700 men of the area were employed in this labor and that three days were taken to complete their task (Silva; as cited in Anderson & Williams 1993:1).

The first actual censuses of the population for Hawaii conducted by an American missionary group were in 1831-1832 and 1835-1836. The missionary census conducted for the Island of O'ahu in 1832 was 29,775 and 27,809 in 1836. The first census law was enacted in 1839, but it was not until 1850 that the Hawaiian government was able to conduct a complete and accurate headcount. Census count for the Island of O'ahu in 1850 was 25,440 (Schmitt 1977:4, 11). It was during this time period, between 1830 and 1850, that the Native Hawaiian population began to decline due to repeated epidemics of measles, whooping cough, diarrhea, influenza and smallpox (Barrere 1975:56).

Nu'uauu is also the location of the summer palaces several *ali'i* including Kamehameha III and Queen Emma. One of the most important of these is Kamehameha III's summer palace known as Kaniakapupu in the upper part of the valley in the *'ili* Luakaha. Luakaha is an area to the southwest of the current subject parcel. This area has a significant history for the island of O'ahu being instrumental in the two major battles described above.

From the old records it would seem that the lands of Luakaha at one time extended from the pali to approximately the Dowsett Highlands Tract on the Waikiki side of the valley and the Afong property on the other side. This land from time immemorial was set aside for the use of the chiefs of Oahu as a playground where they could escape the heat of the plains of Honolulu (Cooke; cited in Anderson & Williams 1993:9).

Another site of historic interest is where another "major part of the battle occurred just above the present Queen Emma Museum on the land of Pu'iwa, which is now called Lanakila in memory of Kamehameha's victory" (McAllister 1985:86). Queen Emma's summer palace, named Hale-aniani is located southwest of the current subject parcel in Pu'iwa. The land was originally designated as "fort lands", which were Government Lands consisting only of *'ili* that were set aside for a specific purpose. Fifty-two *'ili* were set aside for soldiers on O'ahu and all were located in Kona District.

This particular *ili* was sold to a merchant named John G. Lewis who built the first house on the property. Subsequently it was sold to John Young II (Keoni Ana 'Opio) in 1851 and given the name Hanai-a-ka-malama in honor of an *ali'i* ancestor and memory of his home on the island of Hawai'i. Upon his death in 1857, he gave the land to his niece Queen Emma. Shortly thereafter, Queen Emma and King Kamehameha IV built on to their summer home and surrounded it in large gardens. Queen Emma died in 1885 and her estate was sold to the Hawaiian government in 1890.

The home was leased to James Spencer up until 1911. Under the jurisdiction of Parks and Recreation, the estate fell way to neglect and eventually her mansion began to decay. Queen Emma's home was saved from demolition by the Daughters of Hawaii, who took over the house for restoration in 1915 and maintain it to this day as a museum (Sterling & Summers 1978).

The place name "Pu'iwa" also belongs to a large pond that is located at the foot of Nu'uauu on the east side of the valley, a few miles inland from Honolulu Harbor. It is also a place name mentioned in the Battle of Nu'uauu in the year 1795.

It is said that above that stream there stood a long and thick stonewall. On the day this battle started at Nu‘uanu, many soldiers of Kalanikupule hid together behind it with their shoulder guns. The cannon of Kamehameha fired at this stonewall; six times perhaps the gun fired, and the stones of the wall flew into little bits. At this doing, the wall fell. At the noise of the cannon at this place, the men were startled. This startling (pu‘iwa) of the men gave the name Pu‘iwa to this place of the apana of Honolulu, which name has come up to this time (Ka Na‘i ‘Aupuni, Aug. 27, 1906 quoted in Sterling & Summers 1978:302).

Pu‘iwa is also mentioned in Edgar Henriques notes in Sterling and Summers (1978:318) as a place name; “At the base of the hills to the left was the Hawaiian temple, Pu‘iwa, where the forces of Kamehameha rested during the Nu‘uanu Battle”.

Another landmark in Nu‘uanu Valley is the Royal Mausoleum, built between 1863 and 1864, after the death of Kamehameha IV. Throughout the nineteenth century human remains were interred at this site. At the mouth of the valley near Honolulu Harbor a number of other significant sites can be found such as Kamehameha’s compound, the main residence, the mission houses, the Kaka‘ako smallpox cemetery, and the Iolani Palace and grounds (Kennedy *et al.* 1994). Archaeology has been conducted at most of these sites and further information can be found in Kennedy *et al.* (1994).

By the mid-1800’s, foreign demand for land was so great and the political power of chiefs so weak that the government privatized land ownership in “The Mahele” (the division of land) of 1848, first by distributing large tracts of lands to chiefs and smaller parcels to *maka‘ainana* as Land Commission Awards (LCA’s).

After the Mahele, all lands in Hawai‘i were divided roughly into thirds: 24% (1 million acres) went to King Kamehameha III (these were crown lands); 39% (1.6 million acres) was divided among 251 chiefs; and 36% (1.5 million acres) were set apart as government lands. Under the Kuleana Act of 1850, land awards to commoners, or *maka‘ainana*, totaled less than 1 percent (28,000 acres). These lands were granted to approximately 8,755 individuals who represented less than 30% of the eligible population. “Land in Nu‘uanu was initially awarded in small segments within ‘ili, in part because Nu‘uanu was considered very valuable agriculturally, and was therefore the seat of many Royal landholdings” (Flood & Dixon 1993:8).

Royal Patent Grants, which originated after the Mahele, were sales of government lands to individual applicants, with no restrictions on the buyer’s identity. “Government Lands were sold as a means of obtaining revenue to meet the increasing costs of the Government” (Chinen 1978:27). Beginning in 1855, Hawaiians began to acquire Royal Patent Grants, either individually or as a cooperative group, or *hui*. Private ownership made available Hawaiian lands to foreigners as well. Within a short time, large tracts of land were turned over to commercial agriculture, primarily sugarcane cultivation.

Countless native Hawaiians lost their land use rights as a result of the Great Mahele of 1848 with the establishment of a system of private land ownership. Many landless Hawaiians signed on as laborers in the emerging sugar and pineapple industries, which began on O‘ahu in the 1820’s. By the latter half of the 1800’s, sugar and pineapple were the dominant economic pursuits on O‘ahu.

Taro *lo'i* (irrigated fields) were found at all elevations of Nu'uanu. House sites, pastures, 'awa, banana, rice, sugarcane patches, small gardens and fishponds are also noted. No Land Commission Awards were recorded for the subject property but, based on prior reviews of LCA's in the vicinity of the current subject parcel, it is evident that Nu'uanu was a thriving community with vast taro *lo'i*. The parcel is located within the previous lands of the Dowsett Highlands Land Trust, the State of Hawaii Land Court Application 198 and within the City and County of Honolulu Watershed area Grant 3522 and Grant 2589.

By the twentieth century, land use in Nu'uanu had eventually changed. Rice and other agricultural crops began to replace taro cultivation. Agricultural developments in subsistence farming intensified into cash crops. Ultimately, farming was eventually phased out with increasing numbers of residential developments extending up the valley.

### ***Section 4.3: Previous Archaeology***

Although there have been no archaeological investigations conducted on the current subject property, a significant number of studies have taken place in Nu'uanu Ahupua'a. A thorough review of the previous archaeology conducted in the *ahupua'a* has been presented by ACH for the Kekaulike Revitalization Project and the reader is referred to that document for additional information (Kennedy *et al.* 1994). Those studies conducted in the upper portions of Nu'uanu Ahupua'a will be reviewed below.

The earliest archaeological survey of portions of Nu'uanu Valley was undertaken by McAllister in 1930 as part of his island wide survey of O'ahu (McAllister 1985:80-88). The locations of several of the sites in Nu'uanu Valley were identified by McAllister including three petroglyph sites found along Nu'uanu Stream (Sites 67-69, 1985:83). In addition, the entire upper valley was designated as a site (Site 70, 1985:84) within which many significant properties were believed to exist. Using local informants and their knowledge of the history of the area, McAllister was able to briefly describe a number of significant archaeological sites, although at the time of his survey it was reported that a number of them had already been destroyed.

Elsewhere in Nu'uanu Valley, McAllister used literary and ethnographic sources to infer both the presence and former locations of sites. These include a number of *heiau*, a breadfruit tree known as the deity Kamehaikana, a place where *kilu* was played and disturbed burial caves along the walls of the valley. In addition, a *holua* slide, sacred stones and a trail were said to have existed in the upper valley. He also used literary sources to describe events associated with Kawaluna and Makuku Heiau in upper Nu'uanu Valley, although he was unable to locate them.

There was an absence of formal archaeological studies within the *ahupua'a* until the 1970's although, throughout the 1950's and 1960's, steps were taken to preserve the petroglyphs near Kapena Falls. In addition to the three sets of petroglyphs reported by McAllister, a fourth set has been identified by the SHPD who have also described, across Nu'uanu Stream from the petroglyph site:

... a 4 terrace agricultural system, stacked stone structures, a possible house site, trail and an auwai facing still in place at the head of the uppermost taro terrace (SHPD n.d.).

In upper Nu'uauu Valley archaeological investigations have occurred at three buildings associated with the Hawaiian royalty; Queen Emma's summer palace, Kamehameha III's summer palace and the Royal Mausoleum. Each will be briefly discussed below.

### ***Queen Emma's Summer Palace***

Located in Middle Nu'uauu Valley is Queen Emma's summer palace, or Hanaiakamalama (State Site #50-80-14-9904), at which a minimal amount of archaeological investigation has taken place. As a field class, Gould at the University of Hawaii excavated a trench in the vicinity of the former kitchen and bathhouse at the residence (Gould 1972). His excavations encountered historic features and artifacts, as well as indigenous type artifacts such as an adze and five volcanic glass flakes. Also, in 1990, Smith examined three features which had been revealed by construction crews during grading activities at the Fern House (Smith 1990). All these features were historic in origin.

### ***Kamehameha III's Summer Palace***

Another notable royal residence in Nu'uauu Valley is Kaniakapupu (State Site #50-80-14-409), or the summer palace of Kauikeaouli (or Kamehameha III) and Queen Kalama. This building was finished in 1845 and was the location of a large *luau* hosted by Kamehameha III on Restoration Day, 1847 (Sterling & Summers 1978:308-309). This now derelict site was described by Neller in 1984 following field trips to the site (please refer to that document for the complete description of the site). Kaniakapupu had previously been believed to have been built on top of an "old *heiau*" (Neller 1984:1, Hammatt 1988:5-7), however, in their discussion of the Waolani Religious Complex, Dixon *et al.* demonstrate that there is some question as to whether this is in fact the case (1994:17-20).

### ***Royal Mausoleum***

The Royal Mausoleum (Site #50-80-14-9909) was constructed in Nu'uauu Valley between 1863 and 1864, following the death of Kamehameha IV (Ota 1980:3). A number of human remains were interred here during the nineteenth century, although during the twentieth century all the remains were removed and interred at a variety of sites elsewhere. Construction activities at the Mausoleum have been monitored as they occur.

In 1977, Beggerly monitored the excavation of 12 pits to reveal wall footings and foundations; she collected a number of historic artifacts (Beggerly 1977). In 1980, Ota monitored excavations associated with stabilization of the chapel walls and foundations (Ota 1980). Ota encountered a variety of indigenous and historic artifacts as well as human remains. Ota noted that the documented history of construction at the Mausoleum conflicted with his archaeological evidence. In 1985, Yent monitored the excavation of two trenches at the Mausoleum, although the stratigraphy she encountered had been previously disturbed (Yent 1985).

In addition to these studies, several other archaeological surveys and excavations have occurred in the mid-to upper portions of Nu‘uanu Valley. Firstly, Leidmann (1989) conducted a surface survey on three parcels followed by excavations on one of those parcels (Leidmann 1991). During the initial survey, 8 features were identified including Lapalapakea Auwai, a foundation, a C-shaped structure, a boulder alignment, walls, a cobble facing and stacked boulders with cobbles. During the excavations on one of the properties (TMK: 2-2-31: 11) it was determined that the *auwai* and a previously unidentified terrace facing (Site #4195) were probably constructed during the mid-to late nineteenth century, whereas a foundation (Site #4196) and cobble facing (Site #4201) were probably built during the twentieth century.

In another work, Yent documents a reconnaissance survey conducted at Clent Heath or Lanihuli, the Waldron residence (State Site #50-80-14-9916; Yent 1983). She describes a number of features associated with the residence, all of which were inferred to have been built between 1928 and 1931.

Another archaeological survey within the upper valley was conducted by Hammatt on a property just south of Kamehameha III’s Summer Palace (Hammatt 1988). He identified two terraces with an alignment but after subsurface excavation he determined that they were a product of twentieth century earth moving.

In 1993, Bishop Museum conducted an inventory survey of a parcel (TMK: 2-2-31: 32) located on the eastern bank of Nu‘uanu Stream (Flood & Dixon 1993). Twenty-three historic features and one possible pre-Contact structure were recorded and designated State Site #50-80-14-2464. Features included agricultural terracing, one cobble lined depression, twenty oval to circular alignments, one *‘ili* wall and one historic bridge. A nineteenth century house platform and a twentieth century refuse deposit related to plant nursery activities were identified. Cultural material recovered consisted of charcoal fragments from a buried agricultural soil layer in one terrace and basalt debitage from atop another terrace. The site was interpreted as having been part of the extensive taro farms of Kamehameha I, which may pre-date his arrival in 1795, and later was transformed into a late historic period residence associated with exotic plant gardens (Flood & Dixon 1993:vii).

Around the same time, Bishop Museum conducted an inventory survey on the Midkiff property (Dixon, Klieger, Lebo, Lennstrom & Major 1994). Those investigations identified one site of historic significance consisting of nineteenth and twentieth century residential and landscaping features. No evidence of pre-Contact occupation of the site was identified although a radiocarbon date obtained from the base of a wall was attributed to the possible pre-Contact or early post-Contact utilization of the area.

Finally, in 1999, ACP conducted an inventory survey of a proposed waterline corridor located at TMK: 2-2-54: 1. Two historic sites were identified including a stacked stone wall (Site 5969) and a linear stone and earthen berm containing an abandoned water pipeline (Moore & Kennedy 1999). Based upon Neller’s report concerning Kaniakapupu (Site 409) which presents an unnumbered figure (following Figure 10 in that document) of a map depicting Luakaha in which what appears to be a wall is shown in approximately the same location as Site 5696, it was hypothesized that this site may have been associated with Kaniakapupu.

#### Section 4.4: Settlement Pattern

Based upon the information concerning previous land uses and archaeological work conducted in the vicinity of the subject property, the pre-Contact settlement pattern in Nu‘uanu Ahupua‘a can be summarized. The Kona District was the focal point of a great deal of pre- and post-Contact activity.

Much of the interpretation of pre-Contact land uses in Hawaii has been based on LCA records and a general knowledge of the environment. Following this approach for Nu‘uanu Ahupua‘a, the general pattern would be one of relatively dense settlement and agricultural use. Nucleated settlements would have been located along the coast, such as the village of Kou near the mouth of Nu‘uanu Stream, and scattered settlements may have been located inland interspersed among the horticultural plots.

Along the river and streambeds, irrigated taro cultivation would probably have occurred, whereas areas away from either permanently or ephemerally flowing water were probably used for less intensive, dryland agriculture. Some of the areas around Mamala Bay and Honolulu Harbor, in particular, were modified into fishponds. The emergence of Nu‘uanu Stream into the shallow bay provides a brackish water environment suitable for the construction of fishponds.

The intensive use of this valley, even if the above land uses were not present in the environmental areas they would be expected, can also be inferred from the political importance of this area. The trail across the Nu‘uanu Pali was an important pass for crossing between the districts of Kona and Ko‘olaupoko. *Heiau* which played important roles in Hawaiian cosmology are known to have been distributed along the sides of the Nu‘uanu Valley. Stories relate how battles were fought between the chiefs of Kona and Ko‘olaupoko over ceremonies which took place at these *heiau* and which ultimately led to the supremacy of certain *Mo‘i* (Sterling & Summers 1978:304). These facts suggest that the *ahupua‘a* was important in the socio-political structure of O‘ahu both before and after the conquest of Kamehameha I.

During the nineteenth century, urban Honolulu came into being following the use of the harbor by ships and the subsequent shift of chiefly residences from lower Manoa to coastal Nu‘uanu. With the transformation from village to city, the urban area rapidly grew. Nu‘uanu Valley continued to be utilized for agricultural pursuits and scattered across the valley were the summer residences of the royalty.

In the late nineteenth and early twentieth century, urban Honolulu and its suburbs, with their associated land uses, began to extend up Nu‘uanu Valley. Concurrently, the area of land used for agricultural purposes began to decline. Modern land uses, primarily residential, have, for the most part, erased pre-Contact surface features from both the upper and lower valley.

## Section 5: Community Consultations

Several individuals were consulted regarding their knowledge and concerns about the affect of the proposed construction on cultural practices and features associated with the project area. Interviews with these individuals were conducted in person. Maps were presented to the informants depicting the limits of the project area. Information gathered from each individual along with their concerns is discussed below.

### *Section 5.1: Dr. Charles Pe‘ape‘a Makawalu Kekuewa Burrows*

Dr. Charles Pe‘ape‘a Makawalu Kekuewa Burrows was consulted at his Nu‘uanu residence on August 10, 2009 as a knowledgeable community informant. Of Hawaiian, Chinese and German descent, Burrows was born in Honolulu on July 28, 1933 and has resided in Nu‘uanu since 1954. As graduate of and teacher at Kamehameha Schools, Burrows is a member of the Office of Hawaiian Affairs Native Hawaiian Historic Preservation Council, an active member of the Kailua Hawaiian Civic Club, ‘Ahahui Malama I Ka Lokahi, Kailua Historical Society, the Nu‘uanu Community Association and has dedicated much of his life to the preservation and perpetuation of Hawaiian culture through education of Hawai‘i’s unique environment, culture and history.

As the main thoroughfare for Hawaiians to the windward side of O‘ahu, Burrows expressed the cultural and historic importance of the entire *ahupua‘a* which at one time was heavily populated. He is familiar with many of the significant sites found within Nu‘uanu Ahupua‘a through his own personal research and taking his science classes and hiking club groups on excursions in Nu‘uanu and recalled working with and learning from archaeologist Buddy Neller who is knowledgeable of many sites within Nu‘uanu Ahupua‘a. Burrows was able to discuss sites several of the many significant sites within Nu‘uanu such as Kaniakapupu Heiau, petroglyphs and also mentioned Waulani Peak on the Alewa Trail which is associated with legendary Papa and Wākea.

While Dr. Blaisdell confirmed that drainage improvements should be made in order to prevent “flooding and destruction,” when asked whether the proposed construction activities would affect a place, or access to a place of cultural or historic significance, Dr. Blaisdell expressed concern that because he does not personally know the residents of Meleana Place and how it would affect them, he declined to speak on their behalf. Dr. Blaisdell also discussed the potential likelihood that *‘iwi* will be found during subsurface activities due to the sacred nature of the entire Nu‘uanu Valley and this area being the site of the Battle of Nu‘uanu.

## *Interview with Dr. Charles Burrows*

Name: Dr. Charles “Chuck” Pe‘ape‘a Makawalu Kekuewa Burrows  
Address: 3366 Ka‘ohinani Drive  
Date of Birth: July 28, 1933  
Birthplace: Honolulu, Hawai‘i  
Ethnicity: Hawaiian, Chinese, German

*Mina Ellison [ME]: “Can you describe your personal and family connection with Nu‘uanu Valley?”*

Dr. Chuck Burrows [CB]: “Well, my Hawaiian family had the residence situated on School Street and that’s where they lived. And they also had *kuleana* property in Kailua and so as a young child—in fact, I was *hanai’d* by my Hawaiian grandfolks and so, we would travel, you know, down Nu‘uanu over to Kailua and back again. And I’ve always, in a sense, always lived here in the Nu‘uanu area, Nu‘uanu-Pauoa area. When my Grandmother died, when I was about ten years, we were living in Kailua at that time, and I was adopted by my foster parents whose names were David and Harriet Burrows and the—at that time lived between Pauoa and Pacific Heights and we had a residence there. So, you know, I’ve been familiar with this location here all my life.

“My parents, David and Harriet Burrows, sold the residence in Pauoa and purchased the property here in the Dowsett area at 3366 Ka‘ohinani Drive and they built the residence here and when my Mother passed away, we took over the house and renovated the house at the same residence, the same address. I also had lived in Kailua, too, in Olomana. So between that area and this place in Nu‘uanu, I’m most familiar with.”

*ME: “Could you share any legends, traditions or chants associated with the area?”*

CB: “I used to take my students on hiking trips just above Nu‘uanu on the Kapalama-Alewa Ridge trail and always look down on into Nu‘uanu Valley. That Kualele Ridge is that adjoining ridge to the Alewa Ridge trail and that continues all the way up to Lanihuli Trail. Down in the Valley, also, supposedly was located Waolani, which is a *heiau*. Also, on top of the summit of Waolani and this was said to be the place where Papa and Wakea gave birth to the first descendants of the Hawaiian race, situated at Waolani—that’s one of the legends. ‘Cause down in the Valley, we’ll have to go back and look at the legends associated with it, there’s rocks there—supposedly similar to the *menehune*, but not quite the same, they were more dwarf-looking in size and appearance—and they’re the ones that said when the fish-attracting wood that was brought to Kailua, it was going to be brought up towards Nu‘uanu Pali and so they came towards the edge and shouted and then it fell back into Maunawili and into Kawainui, so that’s one of the legends of the dwarf-looking people ...

“There’s other rock formations involved in many other legends, but I think of all, not too far, but it’s above, would be the Kaniakapupu Heiau. It was once a *heiau* that—in historic times, I’m not sure if it was Kamehameha III or IV built his summer palace, or we know it as his summer house rather than summer palace up there at Kaniakapupu and that was where the

celebration of the Restoration of the Hawaiian Nation back in 1843-44 occurred and that was the biggest feast that occurred at that particular site there. But there are other legends. I would suggest looking at Sites of O‘ahu that pertains to Nu‘uanu.

“But of course, you know, Kamehameha I’s battle with the high-chief of O‘ahu started—his forces came from Hawai‘i to Maui to Moloka‘i and then Lana‘i and then finally to O‘ahu—his armada of canoes and even Western-built type of vessels were anchored or beached from Kahala all the way up to Waikiki and there were squirmishes that ensued and so the famous battles would be at Kapena Falls which is right below, there in the crater side, the other near the Queen Emma’s summer palace called Ku‘iwa and another also at Kaniakapupu where the forces of the O‘ahu chief were driven back all the way to the *pali*.”

*ME: “How did you learn about the legends and history of Nu‘uanu?”*

CB: “From my own research, and I knew a friend who’s name was Buddy Neller, he was an archaeologist. And from all of the archaeologists I know, he was not a despot archaeologist. He was an archaeologist who was interested in finding out Hawaiian and cultural historic sites—on any island, wherever he went to and any of the other places we went to, hiking and places where most archaeologists don’t go because most archaeologists would only go to places where they have a job for, contracted to—but his interests were wide-spread. So he had been to several of the sites that were in here in Nu‘uanu, throughout the sites and lots of stone formations there.

“From a family, I was, of course, quite young at the time and did not learn the *mo‘olelo*, the stories, you know, from my Hawaiian grandfather because he died when I was about six years old and my grandma died when I was ten years old and she knew the stories—mainly of Kailua—but not, well I was too young to know about the stories, the *mo‘olelo*, at that time.”

... *Pause* ...

*ME: “...do you think that the proposed project would affect a place, or access to a place of cultural significance?”*

CB: “No, I don’t think so, because I that particular area—I’m not acquainted with archaeological sites or features that’s there and really that’s the—and you know if the installation of the pipes, or materials, I don’t think any affects on Hawaiian archaeological sites will be disturbed.

“It would be kind of interesting—if there is digging to be done—to see what artifacts that may be uncovered. I think this looks higher up. If the belt was in a lower area, that’s where there are *lo‘i kalo* because that is still exists as far as remnants of *auwai* and *lo‘i* terraces, I think one would find more archaeological features and artifacts—but that’s [the subject property] the upper area so I think there will be few, if any artifacts that will be found. And it’s restricted just to the digging, not much will be found.”

## ***Section 5.2: Dr. Kekuni Blaisdell***

Dr. Richard Kekuni Akana Blaisdell was born in Honolulu in 1925. While growing up in Kaimuki, Dr. Blaisdell recalled traveling through Nu‘uanu Valley as a child, admiring the many large houses that he would see and being told by his *tutu* that only rich people lived there. After leaving the islands for 24 years, during which time he earned his degree as a physician, served in the Korean War, studied in Japan and married his wife, he was able to return to O‘ahu as the first Professor of Medicine at the University of Hawai‘i’s Medical School. He currently is a Consultant for the Department of Native Hawaiian Health and Professor Emeritus of Medicine at the John A. Burns School of Medicine at the University.

Dr. Blaisdell expressed the importance of Nu‘uanu, not only as a beautiful “cool” place as the name, Nu‘uanu suggests, but also the Valley’s significance having the lowest point on the Ko‘olau mountain range. Because of this attribute, Nu‘uanu played a very significant role in connecting, with a winding and narrow trail, Honolulu and the windward side of the island. Dr. Blaisdell discussed the increased presence of *heiau* in the Valley resulting from the existence of this important passageway.

As the location of the summer palace of Kamehameha II and III, Kaniakapupu, Dr. Blaisdell described the palace to be a place where the royalty could escape the heat of Honolulu and hold court as well as large celebrations and feasts such as the large *lu‘au* held after the first Ka Lā Ho‘iho‘i in 1843. Built upon the Luakaha Heiau, Kaniakapupu remains a sacred place for Hawaiians today. A Nu‘uanu resident since 1966, Dr. Blaisdell has been very active in preserving and protecting historical and sacred sites in Nu‘uanu.

## ***Interview with Dr. Kekuni Blaisdell***

Name: Richard Kekuni Akana Blaisdell, M.D.

Address: 3333 Ka‘ohinani Drive

Birthdate: March 11, 1925

Birthplace: Honolulu, Hawai‘i

Ethnicity: Hawaiian, Chinese, Caucasian

Dr. Kekuni Blaisdell [KB]: [looking at a poster printed by Kamehameha Schools titled “The Battle of Nu‘uanu, May 1795”] “...1795, April, isn’t that something? So Kamehameha’s troops—warriors—landed in two places, right in Waikiki, came around here and went up this ridge up here. And the main body came up and went this way [through the Valley floor], isn’t that something? And you can read the steps right here.”

ME: “Where did you get this poster?”

KB: “Kamehameha Schools. Do you know who Jerry Walker is?”

ME: “No.”

KB: “He’s the expert ... He’s retired hospital administrator, Department of Health. He also co-authored this book ... [Kamehameha’s Children Today]. So, for example, he did the chronology of Kamehameha. And, Kamehameha had a total of 41 wives. Isn’t that something? Had 35 children and there are Kamehameha’s descendants—many of them, and Jerry Walker is one.”

ME: “*That’s fascinating.*”

KB: “And then there’s Catherine Summers, *Sites of O’ahu*. I think I have a copy here ... Kaniakapupu, Luakaha, Malulani, Pu’iwa, Pu’iwa’s right down there.”

ME: “*And these are all heiau?*”

KB: “Yeah, let’s see if we can find a map ... Queen Emma’s Summer Palace ... Waolani’s right across the highway, see [reading] ‘right across from the O’ahu Country Club.’ ... So you ought to be able to get some information from here [referring to Sites of O’ahu book].”

... *Pause* ...

ME: “*So could you please describe your personal and family connection with Nu’uanu Valley?*”

KB: “Yes. I bought this property in 1986—I’m sorry—1966.”

ME: “*And before that, you lived where?*”

KB: “Before that I lived in Chicago with my family. And I left the islands in 1942, after I graduated from Kamehameha Schools. The war was on.”

ME: “*And why did you want to live in Nu’uanu?*”

KB: “When I came back, I had been away for 24 years. So I left in 1942 when I graduated from Kamehameha and I went away. I was in the Korean War. I did research in Japan. Then went back to the University of Chicago where I had graduated from medicine and there I married my wife. And that’s where my daughter was born, in Chicago. But before that, I *hanai*’d my son. My son was a Japanese orphan, so I *hanai*’d him when I was in Japan, when I was in Nagasaki and Hiroshima. So he was a Japanese orphan, so he’s number one son and that was before I was married. So, I brought him back to America in 1959 and then I married my wife in 1961 in Chicago and my daughter was born in 1962, in Chicago. ... So when I came back—I came back because I was invited to be the first Professor of Medicine and Chair of the Department of Medicine in the new medical school. So we helped to start the new medical school. So when I left, I didn’t have anything and when I came back, then I was hired to be a professor, so I had sufficient income to buy a home. But when I was a boy, I lived in Kaimuki and my *tutu*, my grandmother on my mother’s side, had a home in Lilipuna in Kaneohe, so, in the summers, we would go up there and drive through Nu’uanu, the Pali, and I looked up here and I always admired this area up here. Dowsett had just been developed and I looked at the homes up here and I would ask my parents and my *tutu*, ‘who lives up there?’, ‘only rich people live up there’ and I’d never been here until I came back and was looking for a home and this property was on

sale and as soon as I walked up the driveway and I saw this house and I saw this mountain, coming up the drive, I saw that mountain and I thought the mountain was part of my house, so I decided this is where I'm going to live. And the woman living here, was a widow, had lost her husband and her children had gone back to the Continent and she was going to join them, so she was selling her house, so when she had found out I was going to come back and be a professor at the medical school she gave me a very good price, so I was fortunate. So was only \$80,000, isn't that something? ... So that's how I happen to live here because it's cool and it's rainy, and the view is magnificent. You can see the ocean, right out here. Got mountains there, got mountains there, got mountains here ... and our neighbors are very gracious. So that's why I live here."

*ME: "Do you know of any legends, traditions or chants associated with Nu'uaniu?"*

KB: "Only what I see here [referring to book *Sites of O'ahu*]."

*ME: "So mostly the sites, yeah? ... I remember last time we talked a little about the Papa and Wakea Creation story."*

KB: "So you know about that?"

*ME: "Well, you explained it to me pretty well."*

KB: "I did. That comes from E Kumulipo, you know that. That's the Creation Chant, and that's over 2,000 lines long and it was finally recorded at the time of Kalakaua and wasn't translated into English until 1895 when the Queen was imprisoned and she translated it into English for the first time. Have you ever seen it?"

*ME: "You showed it to me the last time."*

KB: "So this is her translation of it ... and it was thought to have been composed in the early 1700's to honor this particular chief who was an ancestor of Lili'uokalani. So, it begins with the mating of Wakea, Sky Father, with Papa, Earth Mother, and then ends with genealogy, including the genealogy of the Queen. So, but it begins with the earliest forms of life and the gradually more complicated forms of life. And do you know Rubellite Kawena Johnson? She published this book [*Kumulipo: Hawaiian Hymn of Creation*]. It's pictures of these various forms of life—from the earliest forms to more complicated forms. Do you know John Charlot? He teaches religion at the University. So he's also written ... So, Kumulipo beginning with the mating of Wakea—was our most important body of literature. And all of this committed to memory and passed from generation to generation and recited at the coming of Captain Cook."

*ME: "Really?"*

KB: "When he was honored as the returning god Lono it was chanted because here is thought to be Lono, the returning god Lono. And the chant was so long that he remembered some of the words—or some of the sounds. He didn't know what they meant, but he wrote them down. He wrote the sounds down and so when one looks at the sounds, one can see the words from the Kumulipo, so it's a very important document.

“And then there’s Kaniakapupu. Did we talk about that?”

*ME: “A little bit, you mentioned it. And that’s on the other side of—is it on this side?”*

KB: “Yeah, it’s right up here, where the Midkiff home is. Do you know where that is?”

*ME: “I think I might have gone there.”*

KB: “Luakaha, there’s a little pumping station there and a little reservoir, right by the side of the road, it’s right up this road and there’s some big holes up there. And then in the bush, there’s the remains, the ruins, of Kaniakapupu, which is Kamehameha III’s Summer Palace, a very famous place. So some of us belong to an organization that’s trying to preserve that site and eventually restore it. But we don’t want too many people to go over there because we don’t want it further destroyed.”

*... Pause ...*

*ME: “So, how did you obtain most of this knowledge, from you own research or did people tell you, talk story with you about this area?”*

KB: “My close friends are people who are into this. For example Doc Burrows and do you know Dr. Barron Ching?”

*ME: “Sounds familiar.”*

KB: “He’s also—he heads the clean-up every, first Sunday of every month he’s up there—he and Lynette Cruz. Have you ever heard of Lynette Cruz?”

*ME: “Yeah. I love Lynette.”*

KB: “She’s an anthropologist... and she and Melvin Kalahiki and Barron Ching are committed to Kaniakapupu.

*... Pause ...*

“... Barron Ching is also very devoted to protecting and preserving that site, that’s in Pauoa.”

*ME: “What is the name?”*

KB: “Uluhaimalama.”

*ME: “And the heiau that’s right up the road that’s called—”*

KB: “There’s several up there.”

*ME: "Luakaha—is that the closest one?"*

KB: "Luakaha is the site there and the—just the part of it is Kaniakapupu which was Kamehameha III's Summer Palace—it's at the site of a previous, very famous *heiau*."

*... Pause ...*

*ME: "So, would you ever go walking into the Valley with your friends who are interested in the Valley?"*

KB: "And I used to do a lot of it, yeah."

*ME: "So you could visit sites that were off-the-beaten path?"*

KB: "Yeah."

*ME: "Nice. Do you think the proposed drainage project would affect a place, or access to a place of cultural or historical significance?"*

KB: "Well, it's a matter of drainage, isn't it?"

*ME: "Yeah."*

KB: "And drainage is to make sure that its adequate flow of water so that there isn't flooding and destruction. But I don't know enough about the specific plans and I don't know the people there and I don't know how they feel about it and how it will affect them. So I really can't say."

*ME: "I do believe they are going to have a monitor, an archaeologist on-site, so if they find any 'iwi."*

KB: "They're required to by law, right?"

*ME: "Yeah, so that will be good."*

KB: "Well, they're very likely to find 'iwi."

*ME: "Really, associated with the Battle?"*

KB: "Not only the Battle, but this whole area is one, very sacred site and I think there are references to that, in this book. But I really don't know personally."

*... Pause ...*

*ME: "Is there anything else you'd like to share about Nu'uanu?"*

KB: "Do you know what Nu'uanu means?"

ME: "No, I don't."

KB: "You don't know what the word means? Well, *anu* means cool and *anuanu* means cold, so if you say it once you mean cool, and if you say it twice it means cold. And *nu'u* refers to an elevation and it's because as one ascends the Valley and goes up, one feels this cool breeze, you know you come from downtown Honolulu and it's warm and when you reach a certain point and you feel that cool breeze, and it's moist and it frequently rains, and occasionally, there's a rainbow. So, it's a very special feeling and place, so that's why it's given that name—presumably—that's why it's given that name. And it's also a special valley because it has a low-point in the Ko'olau mountains and that is why it was the site for traveling between this side of the island and the other side of the island. So that's why there was a narrower trail that was formed there, long before there was a tunnel and a highway. So there's old sketches of the old, narrow trail going down the cliffs, down the pali and it was such an important site connecting this side of the island with the other side of the island and that's why there's so many *heiau* in this Valley and that's why Kamehameha II was the first to begin to have a summer palace up there, but ...

[end of Side 1 of tape]

"...and that's where he held court, when he wanted to get away from downtown Honolulu and the foreigners who were giving him such trouble during his long reign. And you've probably read about the big *lu'au* that was held there after the first Ka Lā Ho'ihō'i in 1843."

ME: "Yeah, that sounded like a good time, wish we could've been there."

KB: "Nu'uaniu is a very special place ... there's supposed to be a school, a *hale ola*, have you ever heard of a *hale ola*?"

ME: "A healing school?"

KB: "I don't know whether it's in this book [referring to book *Sites of O'ahu*]."

ME: "Do you know where that was believed to be?"

KB: "It's said to be just *mauka* of where the summer palace is right now. That's such a gorgeous site. At one time, the state was going to put a park up there and was going to make it a tourist spot, but me and others protested, so they backed down."

ME: "To make a park at the summer palace at the site of the *heiau*?"

KB: "Yeah."

## Section 6: Summary and Recommendations

From the mythological, traditional and historical accounts of the Nu‘uanu area, it can be seen that the area contains a rich background. During the course of interviewing ethnographic consultants, information regarding areas of cultural and traditional importance in the vicinity of the project area and in Nu‘uanu Ahupua‘a was obtained from two Hawaiian individuals. Both informants are current residents of Nu‘uanu and also active members of the community and knowledgeable of Nu‘uanu Ahupua‘a.

Dr. Burrows is very knowledgeable on the legendary, cultural and historical importance of Nu‘uanu Valley. Discussing significant historical events such as the Battle of Nu‘uanu and the presence of various *heiau* and important historical structures in the Valley today, Dr. Burrows does not believe that the proposed drainage improvement project would affect a place or access to a place of cultural or historic significance.

Dr. Kekuni Blaisdell offered valuable information concerning Nu‘uanu Valley and its significance as the location of the Battle of Nu‘uanu and the summer residence of Hawaiian monarchs such as Kamehameha II and III. He also discussed the importance of Nu‘uanu Valley as it contains the lowest point on the Ko‘olau Mountain range and therefore served an important purpose connecting Honolulu and the windward side of O‘ahu. According to Dr. Blaisdell, this sacred nature of Nu‘uanu is evidenced by the presence of the many *heiau*, several of which are present today. Dr. Blaisdell supports the drainage project with the understanding that it would prevent “flooding and destruction” and declined to speak on behalf of the residents of Meleana Place when asked whether the proposed construction would affect a place, or access to a place of cultural or historic significance. Dr. Blaisdell also stated that he believed that *‘iwi* may possibly be encountered during subsurface activities.

### ***Recommendations and Conclusions***

As a result of the current study, recommendations regarding the impact of proposed development on cultural practices and features associated with the project area have been made. Community consultations were conducted with Dr. Charles Burrows and Dr. Kekuni Blaisdell. Both residents of Nu‘uanu and active leaders of the community, Dr. Burrows and Dr. Blaisdell are knowledgeable of the cultural and historical significance of Nu‘uanu Valley. Discussing significant historic events such as the Battle of Nu‘uanu and the presence of various *heiau* and important historical structures in the Valley today, Dr. Burrows does not believe that the proposed drainage improvement project would affect a place or access to a place of cultural or historic significance.

While Dr. Blaisdell discussed the fact that the purpose of the drainage improvements project is to ensure the adequate flow of water in order to prevent flooding and destruction, he also expressed his belief that, because he does not personally know the residents of Meleana Place, he could not state what type of affect the proposed activities might have on any cultural or historical sites of significance. Dr. Blaisdell stated that *‘iwi* are likely to be encountered during the current construction activities due to the “sacred” nature of the Nu‘uanu area. Dr. Blaisdell also reported that *‘iwi* encountered may also be associated with the Battle of Nu‘uanu.

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