

WAIAKEA-PALAI STREAMS

Hilo, Island of Hawaii, Hawaii

CONTINUING AUTHORITIES PROGRAM SECTION 205
FLOOD RISK MANAGEMENT

FINAL INTEGRATED FEASIBILITY REPORT
AND ENVIRONMENTAL ASSESSMENT



MARCH 2021



**US Army Corps
of Engineers®**
Honolulu District

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Executive Summary

This integrated feasibility report and environmental assessment presents the results of a U.S. Army Corps of Engineers (Corps) study undertaken to identify and evaluate flood risk management (FRM) problems and opportunities on the Waiakea and Palai Streams near Hilo, Hawaii. The study is authorized under Section 205 of the Flood Control Act of 1948, as amended. The non-Federal sponsor for the study is the County of Hawaii Department of Public Works. This report provides documentation of the plan formulation process to select a recommended flood risk management plan, along with environmental, engineering, and cost details of the recommended plan, which will allow additional design and construction to proceed following approval of this report. This Integrated Feasibility Report and Environmental Assessment was developed under the NEPA rules of 1978. All analysis, coordination, consultations, as well as outreach was complete prior to the implementation of the new NEPA rules effective September 14, 2020. This Integrated Feasibility Report and Environmental Assessment is intended to be consistent with the State of Hawaii Chapter 343, Hawai'i Revised Statutes.

The study area encompasses the Palai Stream watershed and the Waiakea Stream watershed near the town of Hilo, Hawaii, located on the northeastern coast of the island of Hawaii. The purpose of the study is to address the risks to life, structures, property, and public infrastructure from periodic flooding in certain locations within the vicinity of Waiakea and Palai Streams. A high risk of flooding exists within the watershed due to the magnitude and intensity of rain events, the limited capacity within stream channels, and the tendency of flood flows to disperse broadly as sheet flow within developed areas once streambanks overtop. The risk of flooding is exacerbated by the flashy nature of the streams in the watershed, with heavy rains flowing downstream extremely quickly due to steep topography and debris accumulation.

The plan formulation process identified several structural and non-structural measures to address flood risk in the study area. An initial array of eight alternatives underwent early rounds of qualitative screening. Additional evaluation, comparison, and optimization of alternatives assisted the study team in identifying and evaluating the final array of four action alternatives.

The Tentatively Selected Plan presented in the Draft FR/EA has been modified following agency, technical, and public review of the report as well as completion of feasibility-level design refinements including site visits. While the Draft FR/EA presented the Corps' tentative proposal for a selected plan, this Final FR/EA presents the Corps' recommended plan. Based on subsequent coordination efforts between the Corps, the non-Federal sponsor, and local landowners in the study area, the alternative including Kupulau Ditch Levee/Floodwall with Detention and Hilo Golf Course Detention is presented as the recommended plan. This plan does not include the Ainalako Diversion feature.

The National Economic Development (NED) Plan is the alternative that reasonably maximizes net benefits while remaining consistent with the Federal objective of protecting the environment. The alternative with the highest net benefits is the combination plan that includes a detention basin and levees at Kupulau Ditch, and a detention basin at the Hilo Golf Course. This plan maximizes annualized net benefits at \$1.6

million. At the FY 2020 discount rate of 2.75 percent, the total project first cost of the NED Plan and Recommended Plan is \$10.8 million with a benefit cost ratio of 3.5.

No compensatory mitigation is proposed for the Recommended Plan as no loss of wetlands or other special aquatic sites, no significant adverse effects to protected species, and no significant impacts to commercially important species or protected marine mammals are anticipated to occur based on the analyses in this document. Several avoidance and minimization measures are proposed to ensure there will be minimal and insignificant effects to environmental resources.

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Acronyms and Abbreviations

| | | | |
|-----------------|--|-----------------|---|
| AEP | Annual Exceedance Probability | HTRW | Hazardous, Toxic and Radioactive Waste |
| ASYA | Aquifer System Area | LERRD | Lands, Easements, Right-of-Ways, Relocations, and Disposals |
| BMP | Best Management Practice | mgd | Million Gallons Per Day |
| CAP | Continuing Authorities Program | NEPA | National Environmental Policy Act |
| CERCLA | Comprehensive Environmental Response, Compensation and Liability Act | NED | National Economic Development |
| cfs | Cubic Feet Per Second | NHPA | National Historic Preservation Act |
| CIS | Cultural Impact Survey | NO ₂ | Nitrite |
| CO ₂ | Carbon Dioxide | NO ₃ | Nitrate |
| Corps | U.S. Army Corps of Engineers | NPL | National Priority List |
| DOH | Hawaii State Department of Health | NWI | National Wetlands Inventory |
| CWA | Clean Water Act | NRCS | National Resources Conservation Service |
| EAB | Expected Annual Benefits | OMRR&R | Operations, Maintenance, Repair, Replacement and Rehabilitation |
| EAC | Expected Annual Costs | RCRA | Resource Conservation and Recovery Act |
| EFH | Essential Fish Habitat | TMDL | Total Maximum Daily Load |
| EO | Executive Order | TN | Total Nitrogen |
| EPA | U.S. Environmental Protection Agency | TP | Total Phosphorous |
| ER | Engineer Regulation | TSP | Tentatively Selected Plan |
| ESA | Endangered Species Act | USFWS | U.S. Fish and Wildlife Service |
| FDA | Flood Damage Analysis | USGS | U.S. Geological Survey |
| FPPA | Farmland Protection Policy Act | USACE | U.S. Army Corps of Engineers |
| FRM | Flood Risk Management | UST | Underground Storage Tank |
| FWOPC | Future Without-Project Condition | WRDA | Water Resources Development Act |
| FY | Fiscal Year | | |
| GHG | Greenhouse Gas | | |
| HEC | Hydrologic Engineering Center | | |

1 Introduction

The U.S. Army Corps of Engineers, Honolulu District (Corps) is evaluating flood risk management (FRM) problems and opportunities on the Waiakea and Palai Streams near Hilo, Hawaii. This report documents the planning process for evaluating potential flood risk management alternatives to demonstrate consistency with Corps planning policy and to meet the regulations that implement the National Environmental Policy Act (NEPA). The following sections provide background information regarding the basis for this study. The sections required for NEPA compliance are denoted with an asterisk (*). This Integrated Feasibility Report and Environmental Assessment was developed under the NEPA rules of 1978. All analysis, coordination, consultations, as well as outreach was complete prior to the implementation of the new NEPA rules effective September 14, 2020. This Integrated Feasibility Report and Environmental Assessment is intended to be consistent with the State of Hawaii Chapter 343, Hawai'i Revised Statutes.

1.1 Study Purpose and Scope

The study will analyze alternatives to reduce flood risk within the Waiakea-Palai Watersheds including the Waiakea and Palai Streams as well as a portion of Four Mile Creek near Hilo, Hawaii. The study will evaluate and compare the benefits, costs, and impacts (positive or negative) of alternatives including the No Action Alternative (Figure 1-1).

1.2 Study Authority*

The study is authorized under Section 205 of the Flood Control Act of 1948, as amended. The Corps' Continuing Authorities Program (CAP) is a group of nine legislative authorities under which the Corps of Engineers can plan, design, and implement certain types of water resources projects without additional project specific congressional authorization. The purpose of the CAP is to plan and implement projects of limited size, cost, scope and complexity. The maximum federal expenditure per project is \$10 million, including feasibility study, design and construction costs.

1.3 Lead Federal Agency and Non-Federal Sponsor*

The Corps is the lead Federal agency conducting this study. The non-Federal sponsor for the study is the County of Hawaii Department of Public Works. A Feasibility Cost Sharing Agreement for the current CAP 205 Integrated Feasibility Study with Environmental Assessment was signed in October 2018.

1.4 Location and Description of the Study Area*

The study area encompasses the Palai Stream watershed and the Waiakea Stream watershed near the town of Hilo, Hawaii, located on the northeastern coast of the island of Hawaii (Figure 1-1). Waiakea Stream, Palai Stream, and Four Mile Creek are three of the five tributaries within the principal Wailoa River system, which drains a total of about 100 square miles and empties into Hilo Bay. The other tributaries are Kawili and Alenaio Streams; both of these tributaries have existing flood risk management projects (described below and in Section 1.6) and are not being further evaluated for flood risk management improvements as part of this study.

Waiakea Stream has a drainage area of about 35.6 square miles and is classified as an intermittent stream and is dry most of the year. Its basin is linear in shape, approximately 25 miles in length and about 2 miles

in width at its widest point. The Waiakea Stream basin originates along the slopes of Mauna Loa volcano and flows northeast through the residential community of upper Waiakea-Uka Homesteads before entering the city of Hilo and ultimately emptying into Wailoa Pond and Hilo Bay.

Portions of Waiakea Stream within the proposed study area have previously been altered to reduce flood risk in the Hilo area. In 1965, the Corps built a flood control project that extends from the lower reaches of Waiakea Stream to Wailoa Pond (Figure 1-1). This project, called Wailoa Stream Flood Control Project, consists of channel improvements and levees to provide flood protection for the area of Hilo downstream of the University of Hawaii at Hilo. The project includes channels and levees to divert the Kawili Stream flows into the Waiakea Stream, plus additional channels and levees to divert the combined flows of the Waiakea and Kawila Streams into Waiakea Pond. The project was designed for a discharge of 6,500 cubic feet per second (cfs) which at that time had a recurrence interval of 125 years. Upstream, the County of Hawaii constructed the Waiakea-Uka channel in 1984. This channel consists of 3,460 feet of concrete lined and unlined trapezoidal channel improvements extending from Kawaihine Street to the intersection of Komohana and Puainako Streets. These improvements were designed for a discharge of 4,460 cfs. Further upstream, the County of Hawaii replaced the Kawaihine Street Bridge with a new bridge having a larger opening and improved the channel upstream and downstream of the bridge. These bridge and channel improvements were completed after severe storm damage occurred in November 2000.

The Alenaio Stream Flood Control project includes levees, concrete-lined channels, floodwalls, bridges, and an earthen channel that connects the concrete channel to the existing floodplain, allowing remaining flows to enter the Waiolama Canal and ultimately Hilo Bay. To date, the project has prevented more than \$48.2 million in projected damages within the Alenaio Stream project area.

Palai Stream has a drainage area of about 7.7 square miles and is classified as intermittent and is dry most of the year. Its basin is linear in shape, approximately 11 miles in length and about two miles in width at its widest point. Palai Stream originates down slope of the broad saddle formed between the Mauna Loa and Mauna Kea volcanoes and flows for about seven miles through the Waiakea Forest Reserve with elevations ranging from 2,100 feet to 1,500 feet. The basin is largely developed below the 1,500 foot elevation. It flows an additional four miles through the City of Hilo before emptying into Wailoa Pond and Hilo Bay.

There are no federal flood risk management projects located on Palai Stream within the study area. In 1971, the County of Hawaii constructed Kupulau Ditch. This ditch diverted storm water runoff from the Palai Stream basin to Waiakea Stream upstream of Kupulau Road. The ditch consists of a trapezoidal channel about 3,500 feet long with a 12-foot bottom width and 2:1 side slopes.

Four Mile Creek is an intermittent stream that drains into undeveloped low lands near the Hilo Drag Strip south of Hilo International Airport. The creek flows away from Hilo through an unlined flood control channel that was constructed by the County of Hawaii. This 10,000-foot-long channel begins at the Kanoiehua St. Bridge and empties into an old quarry on the east side of Hilo. Upstream of this point the stream flows mainly through open land with some scattered pocket of mixed residential structures and farmland.

Engineer Regulation 1105-2-100, 3-3, b., (2), (6), minimum flows, limits Federal participation in flood risk management projects to waterways with a minimum flow of 800 cubic feet per second (cfs) at the 10 percent annual exceedance probability (AEP) event that drain watersheds with an area of at least 1.5 square miles. The Waiakea and Palai Streams as well as Four Mile Creek meet these parameters within the project area.

1.5 Proposal for Federal Action*

The purpose of the proposed Federal action is to reduce flood risks to structures, property, and critical infrastructure in the Palai Stream watershed and the Waiakea Stream watershed. The Recommended Plan includes construction of detention basins, a diversion channel, levees, and floodwalls to reduce flood risk in the study area.

1.6 Prior Studies, Reports, and Existing Water Projects

A number of prior studies and reports were completed to support evaluation of flood risk management alternatives in the study area. The Waiakea Stream and Palai Stream each had individual studies initiated under the CAP 205 authority; however, when it was determined that the two streams were interdependent in the study area the two individual draft studies were combined into a single study authorized as a general investigation study. In 2015, the study team determined the scope, objective, and recommended array of alternatives were more appropriate to pursue under the CAP 205 program authority and initiated a new study under the current FCSEA. A list of existing studies and reports used to inform the formulation, evaluation, and selection of flood risk management alternatives are referenced throughout this report and included in Chapter 9. Pertinent reports include the following:

- Waiakea Stream Flood Control Reconnaissance Study, U.S. Army Corps of Engineers, Honolulu District, September 2001, revised December 2001.
- Biological Survey for the Palai Stream Flood Control Project, U.S. Army Corps of Engineers, Honolulu District, March 2005.
- Cultural Impact Study (CIS) for the Palai Stream Flood Control Project, U.S. Army Corps of Engineers, Honolulu District, May 2005.
- Hazardous, Toxic, and Radioactive Waste Assessment, Palai Stream Flood Control Project, U.S. Army Corps of Engineers, Honolulu District, August 2005.
- Socioeconomic Impact Assessment Study for the Proposed Waiakea Stream Flood Control Project, U.S. Army Corps of Engineers, Honolulu District, 2009, Usha K. Prasad.
- Flora and Fauna Surveys for the Waiakea Flood Control Project, U.S. Army Corps of Engineers, Honolulu District, March 2010.
- Stream Biological and Water Quality Surveys for the Waiakea Flood Control Project, U.S. Army Corps of Engineers, Honolulu District, March 2010.
- Draft Environmental Assessment for the Proposed Waiakea Stream Flood Control Project, U.S. Army Corps of Engineers, Honolulu District, 2011.

As described in Section 1.4, existing water projects in the study area include the following:

- Wailoa Stream Flood Control Project (Federal)
- Alenaio Stream Flood Control Project (Federal)

- Waiakea-Uka Flood Control Project (Non-Federal)
- Kupulau Ditch (Non-Federal)
- Four Mile Creek Unlined Flood Control Channel (Non-Federal)

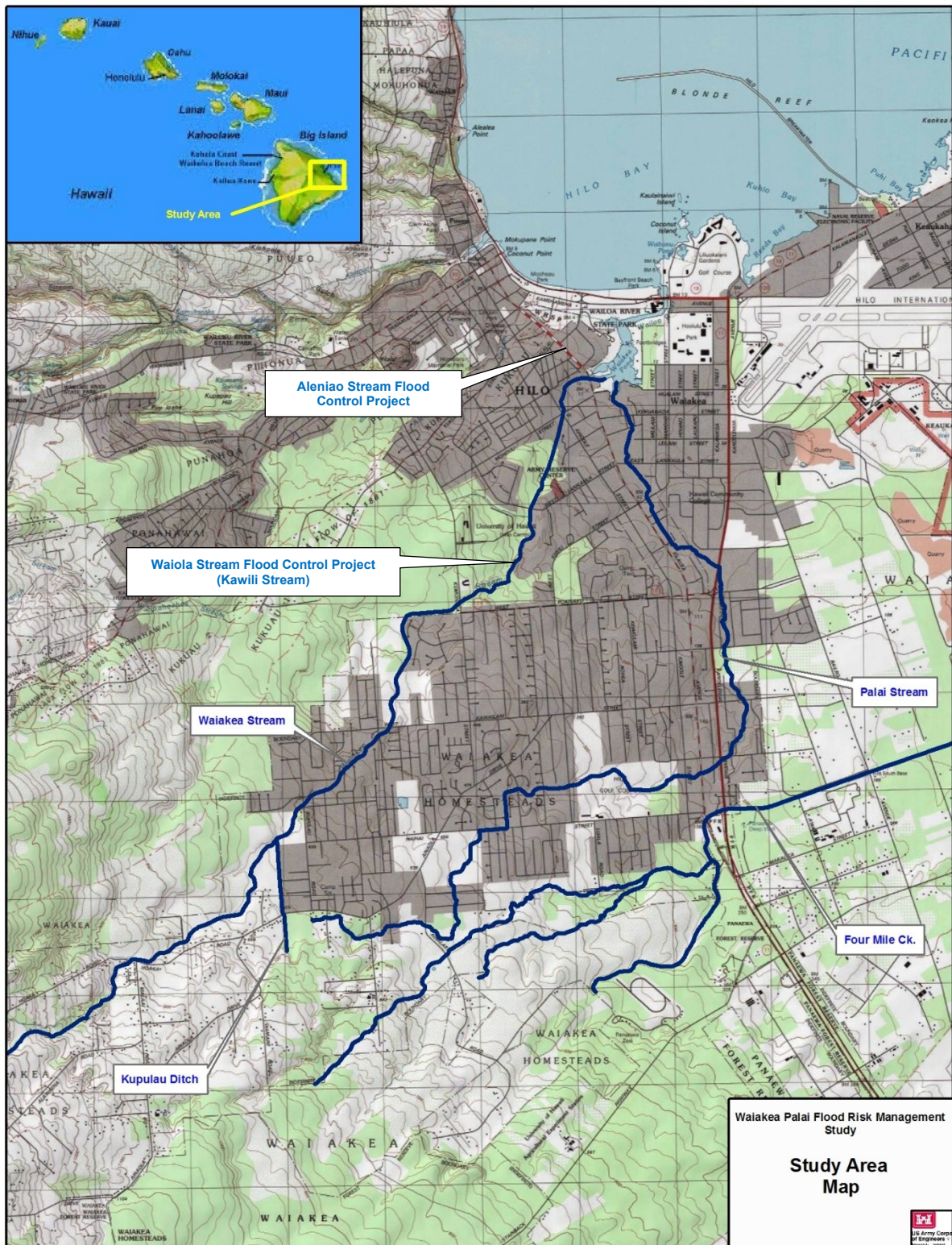


Figure 1-1. Study Area

2 Need for and Objectives of Action

This chapter presents results of the first step of the planning process, the specification of water and related land resources problems and opportunities in the study area. The chapter also establishes the planning objectives and planning constraints, which are the basis for formulation of alternative plans.

2.1 Purpose and Need for Action*

The purpose of the study is to address the risks to life, structures, property, and public infrastructure from periodic flooding in certain locations within the vicinity of Waiakea and Palai Streams. A high risk of flooding exists within the watershed due to the magnitude and intensity of rain events, the limited capacity within stream channels, and the tendency of flood flows to disperse broadly as sheet flow within developed areas once streambanks overtop. The risk of flooding is exacerbated by the flashy nature of the streams in the watershed, with heavy rains flowing downstream extremely quickly due to steep topography and debris accumulation.

2.2 Problems and Opportunities

The Waiakea and the Palai Streams are susceptible to flash flooding events where peak discharges typically occur within two hours of heavy rainfall. Local storm events can produce flood conditions in a matter of hours. Significant rainfall events result in overland flow of water throughout the watershed, flowing towards the streams (Figure 2-1). The existing stream channels have limited capacity to transport flood waters, which has led to water overtopping the channel and flooding downstream areas. As described in Chapter 4, Waiakea Stream above Kupulau Ditch is characterized by poorly-defined channels. It has a channel capacity of less than 1,020 cfs, which is comparable to a 50% AEP storm event. Excess water leaves the Waiakea Stream by overtopping the right bank at the 50% AEP event and flows overland eastward toward Kupulau Ditch. Between Kupulau Ditch and the Kupulau Rd Bridge, Waiakea Stream has an average channel capacity of about 1,630 cfs, which is comparable to a 20% AEP storm event. Flows greater than the 20% AEP event flood the right and left overbanks.



Figure 2-1. Floodwater at Kupulau Ditch (2008)

In addition, the City of Hilo has experienced significant growth over recent decades. In addition to some of Hilo's busiest intersections, thoroughfares and shopping areas, the project area floodplain also contains about 100 businesses, several schools, a university and other critical infrastructure. With this surge in urbanization, flooding problems have intensified for homes and businesses built close to the city's streams. Property losses, road and bridge closures, and life-threatening situations caused by flooding have become a risk that the people of Hilo must cope with. Major flood damages occurred in February 2008, November 2000, August 1994, March 1980, February 1979, July 1966, and March 1939, in the Hilo area (Figure 2-2). A summary of impacts from recent events is described below:

- August 2018: Approximately 58 inches of rain was recorded in a 55-day period resulting from Hurricane Lane. The Waiakea-Uka Flood Control Project (described in Section 1.4) functioned as designed and prevented approximately \$15 million in damages to the local community (USACE 2019). However, damages to Hawaii County infrastructure were estimated to be approximately \$20 million. The peak flow was 3,560 cfs, which is characterized as a 2.8% AEP event. The storm was uncharacteristically slow delivering precipitation to the same area for essentially four straight days until the storm weakened to a tropical storm on day 5.
- February 2008: Approximately 16 inches of rain was recorded in a 24-hour period. Approximately 150 homes were damaged by floodwaters rising up to 4 feet deep in Hilo.
- November 2000: Approximately 29 inches of rain was recorded in a 24-hour period and rainfall intensities of 2.57-3.24 inches per hour were recorded over a four-hour period. A U.S. Geological

Survey (USGS) stream gauge on Waiakea Stream recorded a peak flow of 5760 cfs, estimated at a 70-year discharge recurrence interval. In the Waiakea Stream area, bridge crossings at Kawaihine Street and Kupulau Road were washed away. Entire neighborhoods were isolated and cut off from the rest of Hilo for several days. Emergency services could only reach these residents by boat or helicopter. Damages totaled approximately \$70 million on the island of Hawaii, including approximately \$6.3 million in damages in the Waiakea/Palai floodplain. In addition, an estimated \$12.4 million in municipal property damages, clean up costs, and emergency costs within the Waiakea/Palai watershed were incurred by the County of Hawaii.

- August 1994: Approximately 4 inches of rain was recorded with damages estimated at \$1 million. A USGS stream gauge on Waiakea stream recorded a peak flow of 3670 cfs, estimated at a 10-15 year discharge recurrence interval.
- March 1980: Approximately 25 inches of rain was recorded in a 72-hour period with damages estimated at \$3.8 million.



Figure 2-2. Residential flooding along Hoolaulea Street in 2008

A summary of problems in the study area include the following:

- The Waiakea and Palai Streams as well as Four Mile Creek are susceptible to flash flooding events resulting in peak discharges occurring soon after heavy rainfall events.

- The natural stream channels have limited capacity to transport flood waters, resulting in water overtopping the channels and inundating downstream areas. Water disperses broadly as sheet flow within developed areas once streambanks overtop.
- Roads and bridges are overtopped during flood events, resulting in increased hazards to motorists and delays associated with road closure.

Opportunities for the study include the following:

- Increase community resiliency to flood events.
- Decrease emergency response and recovery costs for floods.
- Improve system capacity for flood conveyance to attenuate flow.
- Provide recreation enhancements to the watershed.
- Reduce the frequency and cost of repairs to Federal and non-Federal projects located downstream of the study area including the Wailoa Stream Flood Control Project and Waiakea-Uka channel.

2.3 Planning Objectives

Over the 50-year period of analysis (beginning in 2023), the objective of the study includes:

- Reduce flood risks to property and critical infrastructure in the Palai Stream watershed and the Waiakea Stream watershed for the 50-year period of analysis.

2.4 Planning Constraints

A constraint is a restriction that limits the extent of the planning process. Constraints for the study include:

- Alternatives will not transfer risk from one section of the population without fully mitigating for the increase in risk to those negatively affected by the project.
- Alternatives will seek to minimize impacts to private residences wherever possible. Given the study area's proximity to the ocean, acquisition of multiple residences would likely be met with large public outcry and acquisition costs could likely be sufficiently high as to make an alternative that requires a great deal of acquisition economically uncompetitive.
- Alternatives will seek to minimize environmental impacts, particularly to those pristine, undisturbed lands or habitats that are more likely to contain species of concern. While avoidance and minimization will be employed, there is a relative lack of opportunities to perform compensatory mitigation at costs that can be incrementally justified due to the highly urbanized nature of the study area. In cases where alternatives are of similar cost and provide similar levels of flood risk management, the alternative with greater environmental impacts will be screened out.

3 Plan Formulation

The guidance for conducting civil works planning studies, Engineer Regulation (ER) 1105-2-100, Planning Guidance Notebook, requires the systematic formulation of alternative plans that contribute to the Federal objective. This chapter presents the results of the plan formulation process. Alternatives were developed in consideration of study area problems and opportunities as well as study objectives and constraints with respect to the four evaluation criteria described in the Principles and Guidelines (completeness, effectiveness, efficiency, and acceptability).

3.1 Management Measures

A management measure is a feature or activity that can be implemented at a specific geographic site to address one or more planning objectives. A preliminary list of structural and non-structural management measures is included below.

Structural Measures

- **Detention basins (surface and sub-surface):** Create surface and/or subsurface temporary storage facilities to collect flood flows during larger storm events; operate to control storm flow.
- **Dams / reservoirs:** Create larger storage facilities than detention basins to collect and store flood flows during larger storm events; operate to control storm flow.
- **Diversion / bypass structures (surface and sub-surface):** Create sub-surface diversions to divert flows from constricted channel areas; create surface diversions to divert high flows to less densely populated areas.
- **Pump system:** Install pump system to pump peak flows out of streams.
- **Widen / deepen / channelize stream channel:** Widen or deepen stream channels to increase flow capacities.
- **Levees and floodwalls:** Construct levees and floodwalls to reduce flood risk.
- **Grade control structure:** Install concrete filled trenches at changes in slope to control bed erosion.
- **Ring Walls or Berms:** Construct small ring wall or berm around the exterior of a single structure or small group of structures.

Non-Structural Measures

- **Flood Warning Systems:** Alert the community or key officials of imminent hazardous flooding conditions. This measure also includes Emergency Action Plan implementation by key officials, development of risk communication plans, and improving evacuation awareness in the community.
- **Property Buyouts:** Acquire lands and structures either by purchase or through the powers of eminent domain.
- **Flood Proofing:** Seal structures from water damage by waterproofing walls and floors and installing floodgates at entry points.
- **Elevating Structures:** Lift the building from its foundation and raise it above the flood level.

3.2 Screening of Measures

Screening is the process of eliminating, based on planning criteria, those measures that will not be carried forward for consideration. Criteria are derived for the specific planning study, based on the planning objectives, constraints, and the opportunities and problems of the study/project area. Criteria used to screen measures as well as qualitative metrics associated with each criteria included:

- Does the measure meet the planning objective? (YES/NO); measure is screened if response is “no”)
- Based on site-specific conditions, is the measure technically feasible or applicable as a flood risk management measure? (YES/NO); measure is screened if response is “no”)
- Would the measure avoid or minimize significant adverse environmental impacts? (YES/NO); measure is screened if response is “no”)
- Is the measure anticipated to be a cost effective solution to reduce flood risk in the study area? (YES/NO; measure is screened if response is “no”)

Table 3-1 below displays the measures screening outcomes. Rows highlighted in red indicate measures that were screened out.

Table 3-1. Measures Screening Summary

| Measure | Screening Criteria | | | |
|-------------------------|---------------------------|----------------------|------------------------------|----------------|
| | Meets Planning Objectives | Technically Feasible | Avoids Environmental Impacts | Cost Effective |
| Detention Basin | Yes | Yes | Yes | Yes |
| Dams / Reservoirs | Yes | Yes | No | No |
| Diversion Channel | Yes | Yes | Yes | Yes |
| Pump System | Yes | Yes | Yes | Yes |
| Widen / Deepen Channels | Yes | Yes | Yes | Yes |
| Levees / Floodwalls | Yes | Yes | Yes | Yes |
| Grade Control Structure | Yes | Yes | Yes | Yes |
| Ring Walls or Berms | Partially | Yes | Yes | Yes |
| Flood Warning System | Partially | Yes | Yes | Yes |
| Property Buyouts | Partially | Yes | Yes | Yes |
| Flood Proofing | Partially | Yes | Yes | Yes |
| Elevate Structures | Partially | Yes | Yes | Yes |

Based on the results of the screening process summarized above, all measures were carried forward with the exception of the dam/reservoir measure. Construction of a new dam would have significant environmental impacts in more pristine, environmentally sensitive upstream areas and would also be cost prohibitive due to the magnitude of construction costs for this type of feature. As such, this measure was not carried forward for further evaluation.

Although the non-structural measures would only partially address planning objectives, they were carried forward for further consideration. These measures would reduce flood risk to property and critical infrastructure but would not directly reduce the frequency and cost of repairs to Federal and non-Federal projects located downstream of the study area. It is anticipated that one or more of these measures can function as a viable component of an integrated system of flood risk management in place of or in combination with structural measures.

3.3 Formulation of Alternatives

Alternative plans are a set of one or more management measures functioning together to address one or more planning objectives. An initial array of alternative plans has been formulated through combinations of management measures. A summary of the initial array of seven action alternatives is presented below:

No Action Alternative

The No-Action Alternative is synonymous with no Federal Action. This alternative is analyzed as the future without-project conditions for comparison with the action alternatives. The No Action Alternative would result in continued flood risk along Waiakea and Palai Streams.

Alternative 1: Kupulau Ditch Levee/Floodwall with Detention

Alternative 1 includes construction of a detention basin on property located to the north of the New Hope Church and adjacent to the right bank of Kupulau Ditch (located east of the confluence of Kupulau Ditch and Waiakea Stream). Impounding of the runoff would be accomplished by constructing a series of three levees and one floodwall to enclose the landscape by utilizing the natural topography of the area.

Alternative 2: Waiakea Stream Channelization

Alternative 2 includes various in-channel improvements of Waiakea Stream combined with levees and floodwalls. Waiakea Stream would be excavated to increase channel capacity. In addition, levees or floodwalls would be constructed along both banks of the stream near excavated areas. This alternative also includes grade control structures consisting of concrete filled trenches to be installed in areas where stream slope changes. The grade control structures would help to control bed erosion.

Alternative 3: Hilo Municipal Golf Course Diversion

This alternative includes construction of a diversion channel beginning in the Hilo Municipal Golf Course and traveling around the perimeter of the Catholic Church property down to HaiHai St., where it enters an underground conduit before emptying into Four Mile Creek. A 2.5 acre-foot detention pond would be constructed in the Hilo Municipal Golf Course to capture flood flows with an outlet weir leading to a diversion channel. In addition, a 2,840-foot long diversion channel from Hilo Golf Course would be constructed for flows to empty into Four Mile Creek. The channel would be comprised of both an open cut for the first 1,000 feet and then would enter a concrete box culvert for the remainder of the length. The box culvert would travel east under HaiHai Street to the Paneawa bridge located at the crossing of Four Mile Creek and Kanoiehua Avenue.

Alternative 4: Hilo Municipal Golf Course Detention

This alternative includes construction of a detention basin in the Hilo Municipal Golf Course to attenuate flow and reduce damage to properties in the downstream reaches of Palai Stream. A 21 acre-foot

detention pond would be constructed at the Hilo Municipal Golf Course to capture flood flows with an outlet structure designed to release flow to minimize flood damage to downstream property.

Alternative 5: HaiHai Street Detention

Alternative 5 includes construction of a 28 acre-foot detention basin on Palai Stream upstream of HaiHai Street. The proposed detention basin would be located on a 69-acre vacant parcel surrounded by existing or planned residential developments. In order to comply with State of Hawaii dam safety regulations, the basin would be designed to have a maximum water depth of 6 feet, requiring a maximum area of about 35 acres. The embankment constructed to create the detention basin would have a maximum height of about 10 feet from the existing channel bottom.

Alternative 6: Ainalako Diversion

The main component of Alternative 6 is the construction of a diversion structure to divert excess flows into Four Mile Creek. This diversion structure is located just downstream of Ainalako Road on Palai Stream. It takes advantage of the natural topography along the right overbank of Palai Stream and the natural drainage pattern of the immediate area.

Alternative 7: Non-Structural Alternative

Alternative 7 includes non-structural measures that can also function as a viable component of an integrated system of flood risk management in place of, or in combination with, structural measures. This alternative includes some combination of flood proofing, elevating or buying out selective structures, or constructing short ring walls around small groups of structures.

An initial screening-level analysis suggests that there are 121 homes and businesses in the Palai Stream flood plain and 17 in the Waiakea Stream flood plain (138 total) with sufficient expected annual flood damages to justify an expenditure of the magnitude it would take to present them with an individual non-structural flood prevention option. These structures that passed this initial screening process will be screened again on an individual basis to ensure they are indeed viable candidates for some form of cost-effective non-structural alteration.

Figure 3-1 shows the initial array of alternatives in the study area.

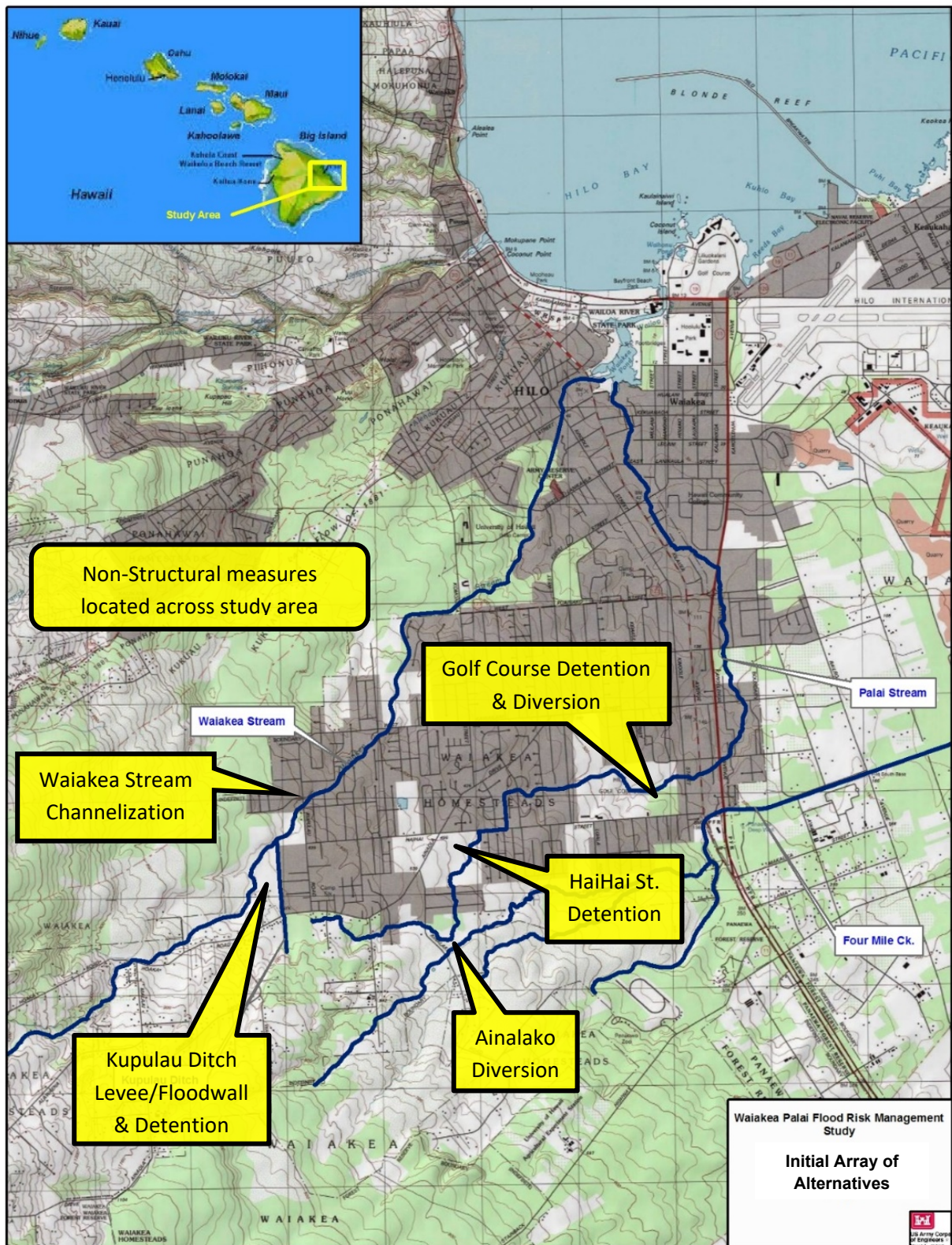


Figure 3-1. Initial Array of Alternatives

3.4 Evaluation of Alternatives

Completeness, effectiveness, efficiency, and acceptability are the four evaluation criteria specified in the Council for Environmental Quality Principles and Guidelines (Paragraph 1.6.2(c)) in the evaluation and screening of alternative plans. Alternatives considered in any planning study should meet minimum subjective standards of these criteria to qualify for further consideration and comparison with other plans.

Completeness is the extent to which a given alternative plan provides and accounts for all necessary investments or other actions to ensure the realization of the planned effects.

Effectiveness is the extent to which an alternative plan alleviates the specified problems and achieves the specified opportunities.

Efficiency is the extent to which an alternative plan is a cost effective means of alleviating the specified problems and realizing the specified opportunities, consistent with protecting the nation's environment.

Acceptability is the workability and viability of an alternative plan with respect to acceptance by State and local entities, tribes, and the public and compatibility with existing laws, regulations, and public policies.

Table 3-2 evaluates compares the final array of alternatives as well as optimized scales of the final array against these criteria.

Table 3-2. Evaluation of Alternatives using Principles and Guidelines Criteria

| Alternative | Complete | Effective | Efficient | Acceptable |
|--------------------------------------|----------|-----------|-----------|------------|
| Kupulau Ditch Detention | Yes | Yes | Yes | Yes |
| Waiakea Stream Channelization | Yes | No | No | Yes |
| Hilo Municipal Golf Course Diversion | Yes | No | No | Yes |
| Hilo Municipal Golf Course Detention | Yes | Yes | Yes | Yes |
| HaiHai Street Detention | Yes | No | No | Yes |
| Ainalako Diversion | Yes | Yes | Yes | Yes |
| Non-Structural | No | No | No | Yes |

Based on the results of the screening process summarized above, the following alternatives were not carried forward into the final array:

Alternative 2: Waiakea Stream Channelization

The Waiakea Stream Channelization alternative is not considered effective or efficient. As currently formulated, it is anticipated that there will be significant induced flooding or tailwater effects as a result of the channelization and large-scale levee system proposed for implementation. Costs for additional features required to mitigate for induced flooding are anticipated to be substantial. A smaller-scale alternative that does not involve channelization or significant levee improvements is anticipated to have similar flood risk management benefits without substantial induced flooding.

Alternative 3: Hilo Municipal Golf Course Diversion

The diversion at the Hilo Municipal Golf Course is not considered complete or efficient. Construction of nearly 2,000 feet of an underground box culvert through a residential channel would have a significant cost associated with construction work required under the roadway to install the culvert. It is anticipated that another alternative will be a more cost effective solution to addressing study objectives.

Alternative 5: HaiHai Street Detention

The HaiHai Street Detention alternative is not considered effective or efficient. Based on preliminary qualitative cost estimates, the HaiHai Detention is expected to cost more than similarly sized structures located in other areas of the watershed while providing similar levels of flood risk management. In addition, there are likely substantial induced flooding impacts to the residential areas located directly adjacent to the proposed site as water pools in the detention basin. As such, it is anticipated that another alternative will be a more cost effective solution to addressing study objectives.

Alternative 7: Non-Structural Alternative

After closer inspection of ground, floor, and flood elevations, square footage and construction type, and applicability of the generalized cost figures used in the screening, there are 74 prospective structures that could be eligible for non-structural improvements. However, this alternative is not considered complete, effective, or efficient. Implementation of a stand-alone non-structural alternative would not provide comprehensive flood risk management solutions in the study area. A more likely application of non-structural and flood proofing techniques to reduce flood risks could be implemented for individual buildings that still exhibit substantial residual flood damages after the Recommended Plan is constructed.

3.5 Final Array of Alternatives

Based on the evaluation and screening of alternatives described in Section 3.4, a final array of four alternatives was carried forward for further evaluation. The final array of alternatives includes the following:

- No Action Alternative
- Kupulau Ditch Levee/Floodwall with Detention
- Hilo Municipal Golf Course Detention
- Ainalako Diversion
- Combination Plan (details below)

The three action alternatives can be implemented individually or combined with each other. They are not dependent on each other and are not mutually exclusive. As such, evaluation and comparison of the final array of alternatives included evaluation of various combinations of these alternatives (e.g., Kupulau Ditch plus Golf Course Detention) to identify the optimized plan that reasonably maximizes net benefits.

3.6 Evaluation and Comparison of Final Array of Alternatives*

The Hydrologic Engineering Center Flood Damage Analysis (HEC-FDA) Version 1.4 Corps-certified model was used to calculate expected annual damages and benefits over the period of analysis. The economic and engineering inputs necessary for the model to calculate damages include structure inventory, content-to-structure value ratios, vehicles, first-floor elevations, depth-damage relationships, ground elevations, and stage-probability relationships. More information about these economic and engineering inputs are described in Appendix A (Economics).

Evaluation and comparison of the final array of alternatives included an assessment of costs and benefits for the each of the alternatives included in the final array as well as an evaluation of various combinations

of these alternatives to identify the optimized plan that reasonably maximizes net benefits. The breakdown of costs and benefits for each of the three alternatives is presented in Table 3-3.

The Kupulau Ditch feature is the costliest feature at \$7.8 million and expected annual cost (EAC) of \$446,000, but it also yields the highest expected annual benefits (EAB) of \$1,953,000. During the period of completing this feasibility study there was a change in conditions in the Ainalako Diversion project footprint. The change in condition had significant impacts on real estate footprint, design criteria, as well as scope due to a new subdivision constructed adjacent to the project area. The project team qualitatively screened the Ainalako Diversion out of the array carried forward due to the aforementioned change in conditions. Finally, the Hilo Golf Course Detention measure is less expensive than the Ainalako Diversion at \$3.4 million and EAC of \$203,000, but also produces the least amount of expected annual benefits of \$286,000. While all three measures could be added as pairs as shown in Table 3-3, the net benefits are maximized when Hilo Golf Course Detention and Kupulau Ditch are combined.

Table 3-3. Costs and Benefits of Alternatives
\$1000s; FY 2020 Discount Rate (2.75%)

| | Kupulau Ditch Levee/Floodwall with Detention | Ainalako Diversion** | Hilo Golf Course Detention |
|--------------------------------|---|---------------------------------|---------------------------------------|
| Plans & Specs | \$1,492 | \$556 | \$593 |
| Construction Management | \$711 | \$264 | \$281 |
| Lands | \$458 | \$129 | \$501 |
| Construction Contract | \$4,855 | \$1,800 | \$1,925 |
| Total First Cost | \$7,516 | \$2,749 | \$3,300 |
| Interest During Construction | \$275 | \$80 | \$80 |
| Total Investment | \$7,791 | \$2,829 | \$3,380 |
| Equivalent Annual Cost | \$296 | \$107 | \$128 |
| Annual O&M | \$150 | \$25 | \$75 |
| Expected Annual Cost (EAC) | \$446 | \$132 | \$203 |
| Expected Annual Benefits (EAB) | \$1,953 | \$358 | \$286 |
| Incremental Net Benefits | \$1,508 | \$226 | \$83 |
| Inc. Benefit/Cost Ratio | 4.4 | 2.7 | 1.4 |

* The interest during construction for the TSP is spread over a longer period than that of its individual measures; therefore, these columns are not additive.

** Updated Costs based on change in condition, not included; Ainalako Diversion was qualitatively screened out based on the change in condition.

As described above, the three action alternatives can be implemented individually or combined with each other. As such, evaluation and comparison of the final array of alternatives included evaluation of various combinations of these alternatives (e.g., Kupulau Ditch plus Golf Course Detention) to identify the optimized plan that reasonably maximizes net benefits. The expected annual cost, net benefits, and benefit-to-cost ratio for possible combinations of alternatives is displayed in Table 3-4.

Table 3-4. Net Benefits of Possible Alternative Combinations
 \$1,000s; FY 2020 Price Level; FY 2020 Federal Discount Rate (2.75%)

| Project Alternatives - Possible Combinations | Expected Annual Benefits | Expected Annual Cost | Net Benefits | Benefit-to-Cost Ratio | Remarks |
|--|--------------------------|----------------------|--------------|-----------------------|---|
| Kupulau Ditch Levee/Floodwall with Detention | \$1,953 | \$446 | \$1,508 | 4.4 | |
| Ainalako Diversion* | \$358 | \$132 | \$226 | 2.7 | Costs due to change in conditions not included. |
| Hilo Golf Course Detention | \$286 | \$203 | \$83 | 1.4 | |
| Kupulau Ditch + Ainalako Diversion* | \$2,312 | \$578 | \$1,734 | 4.0 | Costs due to change in conditions not included. |
| Kupulau Ditch + Hilo Golf Course Detention | \$2,239 | \$649 | \$1,591 | 3.5 | |
| Ainalako Diversion + Hilo Golf Course Detention | \$645 | \$336 | \$309 | 1.9 | Costs due to change in conditions not included. |
| Kupulau Ditch + Ainalako Diversion* + Hilo Golf Course Detention | \$2,598 | \$781 | \$1,880 | 3.3 | Costs due to change in conditions not included. |

* Change in conditions would require additional real estate and materials costs not included in this calculation.

3.7 Summary of the Tentatively Selected Plan

The alternative with the highest net benefits is the combination plan that includes Kupulau Ditch, Ainalako Diversion, and the Hilo Golf Course Detention, which maximizes annualized net benefits at \$1.8 million. This plan was selected as the Tentatively Selected Plan (TSP). At the FY 2020 discount rate of 2.75 percent, the total project first cost of the TSP is \$14 million with expected annual costs of \$781,000, expected annual benefits of \$2.6 billion, and a benefit cost ratio of 3.3. The TSP identified for the Draft FEIS and published for concurrent review in June, 2019 was considered complete, effective, efficient, and acceptable.

3.8 Plan Adjustments – Recommended Plan

The TSP presented in the Draft FR/EA has been modified following agency, technical, and public review of the report as well as completion of feasibility-level design refinements including site visits. While the Draft FR/EA presented the Corps' tentative proposal for a selected plan, this Final FR/EA presents the Corps' recommended plan. Based on subsequent coordination efforts between the Corps, the non-Federal sponsor, and local landowners in the study area, the alternative including Kupulau Ditch Levee/Floodwall with Detention and Hilo Golf Course Detention is presented as the recommended plan (Figure 3-2). This plan does not include the Ainalako Diversion feature. Based on public input and site visits conducted by the study team, it was determined that the Ainalako Diversion would require substantial design

modifications and additional real estate requirements in order to be implemented successfully to reduce flood risk, avoid transferring of flood risk to Four Mile Creek, and minimize impacts of induced flooding. Ultimately, the cost to redesign and construct the Ainalako Diversion feature would reduce overall cost effectiveness for this feature and the NED plan. As such, a risk-informed decision was made to remove the Ainalako Diversion from the array of alternatives for consideration.

Once removed from the array of alternatives, the study team reassessed costs, benefits, and net benefits for the final array of alternatives. The combination plan including Kupulau Ditch Levee/Floodwall and Hilo Golf Course Detention is now the alternative that reasonably maximizes net benefits. This alternative is still considered complete, acceptable, efficient, and effective, and it reduces flood risk in the study area. As the plan that reasonably maximizes net benefits, this alternative was identified as the NED Plan and Recommended Plan.

At the FY 2020 discount rate of 2.75 percent, the total project first cost of the Recommended Plan is \$10.8 million with expected annual costs of \$649,000, expected annual benefits of \$2.2 million, and a benefit cost ratio is 3.5.

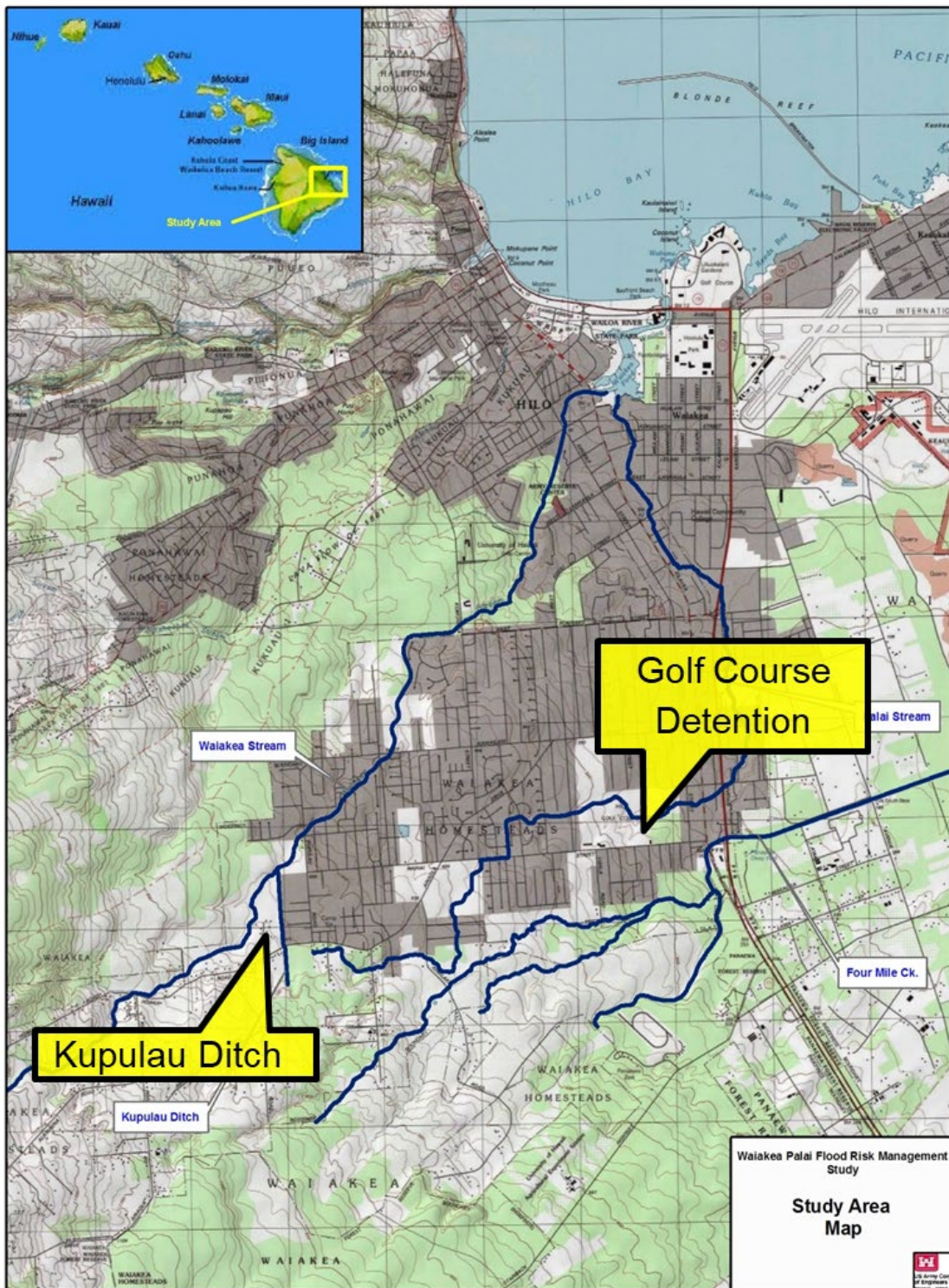


Figure 3-2. Recommended Plan

4 Affected Environment and Environmental Consequences of the Alternatives*

This chapter provides the existing conditions and regulatory setting for each of the resources that could be affected by the No Action Plan or by implementing the Recommended Plan as identified in Chapter 4. The assessment of environmental effects is based on a comparison of conditions with and without implementation of the proposed plan and a reasonable range of alternatives and are compared to the No-Action Alternative. Each resource in sections 4.2 through 4.8 is analyzed for direct and indirect effects and whether these would accrue a significant cumulative effect. The time scale for analysis is a 50-year period beginning in 2023 and extending to 2073.

4.1 Alternatives Analyzed for Environmental Effects

Chapter 3 outlines the formulation, evaluation, and comparison of alternatives. This chapter provides a comparison of potential environmental effects of the No Action Alternative as well as the Recommended Plan. The Recommended Plan presented in this chapter represents the largest combined footprint of the two sites included in the final array: Kupulau Ditch and the Hilo Golf Course. This chapter only presents the results of the evaluation of the Recommended Plan (both sites) in order to disclose the greatest possible environmental effects associated with the alternatives evaluated in this study. Therefore, the action alternatives analyzed in this chapter represent a greater potential environmental impact that what is now proposed as the Recommended Plan. Appendix C presents a more detailed evaluation of the effects of each individual site included in the Recommended Plan as standalone alternatives (e.g., Kupulau Ditch Alternative and Hilo Golf Course Alternative) as well as the Recommended Plan that combines both sites. A summary of the potential impacts of the alternatives evaluated in this chapter are presented below.

4.1.1 Alternative 1 – No-Action Alternative

The No-Action Alternative is synonymous with no Federal Action. This alternative is analyzed as the future without-project conditions for comparison with the action alternatives. The No Action Alternative would result in continued flooding problems in the areas around Waiakea and Palai Streams.

4.1.2 Alternative 2 – Recommended Plan

The Recommended Plan includes the Kupulau Ditch Detention and the Hilo Municipal Golf Course Detention.

4.2 Water Resources

Water resources include both surface water and groundwater resources, associated water quality, and floodplains. Surface water includes all lakes, ponds, rivers, streams, impoundments, wetlands and estuaries within the watershed. Subsurface water, commonly referred to as ground water, is typically found in certain areas known as aquifers. Aquifers are areas with high porosity rock where water can be stored within pore spaces. Water quality describes the chemical and physical composition of water affected by natural conditions and human activities.

Hydrology and Hydraulics

As described in Appendix B2, Waiakea and Palai Streams are two of five streams that form the larger Wailoa River system (Figure 4-1). Waiakea and Palai Streams drain into Waiakea Pond, which is contiguous with Hilo Bay and the Pacific Ocean (USDA, 2009).

At the upstream end of the study area, Waiakea Stream contains a poorly defined channel. When the stream overflows, floodwaters travel east to enter Kupulau Ditch. Waiakea Stream above Kupulau Ditch is characterized by poorly-defined channels. The channel bed is composed of basalt rock and the overbanks are highly vegetated. It has a nominal slope of 0.01479 ft/ft (1.48%). The high velocities dislodge rock and vegetation and transport them downstream. It has a channel capacity of less than 1,020 cfs, which is comparable to a 50% AEP storm event. The channel bed is a mix of earth and volcanic rock. Excess water leaves the Waiakea Stream by overtopping the right bank at the 50% AEP event and flows overland eastward toward Kupulau Ditch.

Between Kupulau Ditch and the Kupulau Rd Bridge, Waiakea Stream has a nominal slope of 0.02249 ft/ft (2.25%). It has an average channel capacity of about 1,630 cfs, which is comparable to a 20% AEP storm event. Flows greater than the 20% AEP event flood the right and left overbanks, but due to the surrounding topography this flow ultimately makes its way downstream to the bridge.

Kupulau Ditch was built in 1971 to divert water from the Palai basin into Waiakea Stream in order to reduce flood problems. The ditch is about 3,500 ft long, has an average depth of 7 ft, and a bed slope of 0.006 ft/ft made up of lava rock. Kupulau Ditch receives the overflow from Waiakea Stream and quickly reaches its capacity. The ditch begins to spill over its right (east) bank. The overflow begins to flood the New Hope Church, which is located adjacent to the ditch, and then crosses Kupulau Road, and flows overland in an eastward direction, flooding residential structures along HaiHai Street, and Ainalako Road.

Floodwater from the overtopping of Kupulau Ditch flows into the Hai Hai reach, adding to flooding there, and then enters Palai Stream at the Hilo Municipal Golf Course before continuing down-stream to the developed industrial, commercial and residential areas within Hilo. The channel capacity of Palai Stream is about 1,000 cfs, equivalent to a 20% Annual Exceedance Probability (AEP) flood, from the Hilo Municipal Golf Course downstream to Kawaihine Street, with a bed slope of 0.026 ft/ft. At Kawaihine Street, the channel slope flattens out to about 0.006 ft/ft, but the channel capacity reduces to about 800 cfs, which is equivalent to about a 50% AEP flood. Downstream of Kawaihine Street, Palai Stream floodwaters are conveyed mainly by overland flow. Stream channels are poorly defined with low-lying areas serving as pockets of storage areas.



Figure 4-1. Flood Prone Areas in Waiakea and Palai Streams

Waters of the U.S.

The Clean Water Act (CWA)(33 U.S.C §§1251 *et seq.*) establishes the basic structure for regulating discharges of pollutants into the waters of the United States and regulating quality standards for surface waters. For the purposes of CWA regulatory jurisdiction, the term, “Waters of the U.S.” is defined at 33 CFR 328.3(a). Waters of the U.S. include all tributaries to those waters currently or previously used or susceptible for interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide. Three main waterways occur within the project areas, the Waiakea Stream, Kupulau Ditch and Palai Stream. Both Waiakea and Palai streams feature intermittent flow while the Kupulau Ditch conveys ephemeral flow.

The Waiakea Stream is a tributary to a navigable water, conveying continuous surface connectivity to Hilo Bay and as such, is a water of the U.S. subject to regulatory jurisdiction under the CWA. The Waiakea Stream flows intermittently in the project area and perennially downstream prior to its confluence with a navigable water.

The Kupulau Ditch was artificially-constructed in uplands to convey stormwater flows to the downstream Waiakea Stream, flowing only in response to precipitation events. The Kupulau Ditch conveys ephemeral flow downstream to the Waiakea Stream and features a trapezoidal channel constructed of earthen bed and banks. Under the Navigable Waters Protection Rule, the Kupulau Ditch is not a water of the U.S. e.g. “non-jurisdictional”.

The Palai Stream bifurcates the Hilo Municipal Golf Course. The Palai Stream channel and banks are defined within the project areas. However, based on a site visit attended by USFWS in February 2019, the Corps confirmed that flow within the Palai Stream, downstream of the Golf Course at the intersection of Mamalahoa Highway and Puainako Street, eventually vanishes into swales and storm water conduits. The tributary lacks continuous surface connectivity to a navigable water and according to the Navigable Waters Protection Rule, is not a water of the U.S. e.g. “non-jurisdictional”.

The U.S. Fish and Wildlife Service (USFWS) (2019) has mapped wetlands within the study area as part of the National Wetlands Inventory (NWI). Within the Waiakea-Palai watershed, the NWI identifies five freshwater ponds (three PUBHh, one PUBH, and one PUBHx); however, these ponds are 1,600 to 5,700 feet from the floodplains of the streams. The first letter of the NWI designation refers to the Palustrine hydrology of the wetland. The rest of the designation refers to an unconsolidated bottom (UB), permanently flooded (H), diked or impounded (h), or excavated (x). The NWI characterizes Waiakea Pond as an Estuary (E1UBL). For estuarine systems, the first letter of the wetland designation refers subtidal estuarine (E1) hydrology of the wetland. Waiakea pond has an unconsolidated bottom (UB) and is subtidal (L). According to the NWI, no riverine or palustrine wetlands occur along the streams.

Groundwater

The study area is underlain with the Hilo and Keaau Aquifer System Area (ASYA) of the Northeast Mauna Loa Aquifer Sector Area. Water in the study area aquifer occurs as a lens of basal water floating on saline groundwater (Takasaki, 1993). The aquifer is unconfined and occurs in basalt originating from flank lava flows. The aquifer is designated as a drinking water source, is irreplaceable, and is highly vulnerable to contamination (Mink and Lau, 1990). Wells in the study area indicate that the depth to groundwater is

estimated to be greater than 100 feet. The sustainable yield of the Hilo ASYA is 347 million gallons per day (mgd) and the Keaau ASYA provides a yield of 393 mgd. The combined ASYAs provide the highest yield of all the sector areas on the island. The watersheds associated with Mauna Loa slope contributes 50 to 100 inches per year of groundwater recharge. The aquifer provides water resources for municipal, agricultural, and industrial uses in the Hilo area.

Water Quality

Surface water quality in the study area is influenced by agricultural practices as well as residential, commercial, and industrial development. Palai Stream and Four Mile Creek are not include the 2018 Section 303(d) list of impaired waters (HSDOH, 2018). Therefore, the water quality of these two streams has not been assessed. Waiakea Stream (Water Body ID 8-2-61) has been classified as an impaired waterbody due to elevated Total Nitrogen (TN), nitrite (NO₂) and nitrate (NO₃), and total phosphorous (TP). The Hawaii State Department of Health categorizes the priority for establishing Total Maximum Daily Loads (TMDLs) for streams as high, medium, or low. Waiakea Stream has been assigned as a medium TMDL priority category.

The specific water quality impairments of Waiakea Stream are typical of streams that bisect agricultural areas as TN, nitrate, nitrite, and TP are common constituents of fertilizers used in cultivation. The agricultural areas within the study area are located in the upstream portions of the watershed; therefore, these pollutants are carried downstream into the urban areas and ultimately into Hilo Bay.

4.2.1 Alternative 1 – No-Action Alternative/Future Without-Project Conditions

Hydrology and Hydraulics

Under the No Action Alternative, the Waiakea Stream is susceptible to flooding at a 50% AEP event and the Palai Stream is susceptible to flooding at a 20% AEP event, resulting in continued flood risk to the affected Hilo community in the future without-project condition.

Waters of the U.S.

Under the No Action Alternative, the Waiakea Stream would remain a water of the U.S. The Corps is not aware of any local government effort to define surface connectivity from Palai Stream into a navigable water such as Hilo Bay; the Corps anticipates the Palai Stream will continue to lack surface connectivity to a navigable water and will continue to not meet the definition of a water of the U.S. The Corps expects that the Kupulau Ditch will continue to flow only in response to precipitation events and remain excluded from the definition of waters of the U.S.

Wetlands

No wetlands associated with Waiakea Stream or Palai were identified; therefore, the future without-project condition for wetlands within the study area would not differ from the existing conditions.

Groundwater

The freshwater aquifers within the study area would be infiltrated by saline groundwater as regional sea level change increases in the future without-project condition. The infiltration would result in a shallower freshwater lens in which to draw irrigation and drinking water. Deeper wells may no longer be viable as the saline ground water rises.

Water Quality

Water quality changes under the future without-project are difficult to predict. The Hawaii State Department of Health has not established TMDLs for the Waiakea Stream; however, the agency is required to set the limits according to the Clean Water Act (CWA). The establishment of the TMDLs is the first step in addressing the water quality of the streams. The water quality impairments associated with Waiakea Stream are the result of agricultural practices within the watershed. As the urbanization of the watershed extends into neighboring agricultural lands converting the land to residential and other urban land uses, the contribution of the criteria pollutants identified for the stream should decrease. However, an increase in the application of lawn and garden fertilizers and an increase in runoff from residential areas could result in a conversion of non-point sources resulting in no change, or possibly a decrease, in water quality. If the City of Hilo initiates best management practices to address the future TMDLs, the water quality of Waiakea Stream could improve under the future without-project conditions.

4.2.2 Alternative 2 – Recommended Plan

Hydrology and Hydraulics

The detention areas associated with the Golf Course and Kupulau Ditch features would capture floodwaters from higher intensity flood events and mediate the flows of the water downstream. The impact of these alternatives would result in the extension of time when the intermittent streams are inundated as waters are released over a longer period of time from the detention basins.

For both of these features included in the Recommended Plan, intermittent stream flow could be slightly altered if natural flow is interrupted during construction activities. However, construction activities would be planned to maintain a natural stream channel during the construction period.

With the Kupulau Ditch feature in place, stormwater flows from the Kupulau Ditch would be captured by the floodwalls and levees and temporarily detained in the resulting detention basin. The detention basin would mediate stormwater flows into Waiakea Stream, reducing flooding elevations downstream. The detention of the stormwaters would result in prolonged flows into Waiakea Creek as the basin drains after the rain event. However, the temporal increase of released flows would not be considered a significant impact on the stream resources.

The design features would only address stormwater flows. Consistent with USFWS recommendation, the recommended plan would have no impact on normal surface flows of any water of the U.S.

Waters of the United States

The Recommended Plan would not alter the circumstances under which the Waiakea Stream, Palai Stream or Kupulau Ditch do or do not meet the definition of waters of the U.S. under the Clean Water Act. No Clean Water Act Section 404 discharges of dredged or fill material into Waiakea Stream are proposed, however, during the design phase when construction means and methods are further detailed, any Section 404 discharge into the Waiakea Stream will be addressed accordingly and compliance with all applicable sections of the Clean Water Act will be pursued.

Wetlands

There are no wetlands in the project areas for the final array of alternative; therefore, no impacts to wetland resources would occur from the implementation of the project.

Groundwater

Because the estimated depth to groundwater is greater than 100 feet below the surface and the shallow depth of grading required to construct the alternatives, groundwater is not anticipated to be encountered. Under the future with-project conditions for the final array of alternatives, there would be no anticipated impacts to groundwater.

Water Quality

Construction activities associated with each of the action alternatives could temporarily affect water quality due to grading, excavation and stormwater runoff. Best Management Practices (BMPs) employed during construction (e.g., sediment erosion control barriers such as silt fencing, tarping/covering exposed and stockpiled soils, surface revegetation, etc.) would minimize/eliminate storm water flow from the proposed construction site and any associated degradation of water quality for proximal surface waters. The Corps lacks sufficient information during the feasibility phase of the project to determine if temporary ancillary construction activities such as staging and access would result in the discharge of dredged or fill material into any water of the U.S., as regulated under the CWA. If, during the design phase of the study the Corps determines the Recommended plan would result in a regulated discharge, then the Corps will ensure compliance with all applicable sections of the CWA.

4.3 Biological Resources

Biological communities include plants, animals and the habitats in which they occur. They are important because they influence ecosystem functions and values, have intrinsic value, contribute to the human environment, and are the subject of a variety of statutory and regulatory requirements.

The study area is located in the Lowland Wet ecological system of the Tropical Moist Forest ecoregion. The Lowland Wet ecological system consists of natural communities below 3,000 feet in elevation and receiving greater than 75 inches of annual precipitation. Vegetative communities associated with this system include wet grasslands, shrublands, and forests. Biodiversity in the Lowland Wet system is high and supports specialized plants and animals.

Three separate biological surveys were conducted to assess the existing conditions within the project area, as well as the projected impacts on biological resources from the Recommended Plan (USACE, 2005; USACE, 2010a; and USACE, 2010b). The results of these surveys, and information from additional research were used to characterize and assess the biological resources within the project area.

Vegetation

The vegetative community within the study area has been altered as native habitats have been converted to agriculture and urbanization has introduced ornamental plant species. In addition, non-native invasive species have become established within the study area. These species include strawberry guava, gunpowder, African tulip, common guava, albizia, melochia, and kukui. Native vegetation extends upslope of the study area and is dominated by 'ōhi'a trees and dense patches of 'uluhe. A full list of plant species observed in the study area is described in USACE (2005, 2010a, 2010b).

In consultation with USFWS and by letter dated June 8, 2018, USFWS recommended the Corps implement the following conservation measure based on the project's location on Hawaii Island, in order to avoid and minimize adverse impacts to the native ohia trees (*Metrosideros polymorpha*). While the tree is not

a federally protected species, USFWS has expressed concerns regarding increasing the spread of the newly identified disease, Rapid Ohia Death, caused by a vascular wilt fungus (*Ceratocystis fimbriata*). Per recommendation from USFWS, the Corps has agreed to implement the following avoidance and minimization measures:

- A survey of the proposed project site will be conducted within two weeks prior to any tree cutting to determine if there are any infected ohia trees. If infected ohia are suspected at the site, the following agencies will be contacted for further guidance:
 - USFWS – Jodi Charrier, 808-342-6607 or Jodi_charrier@fws.gov
 - Dr. J.B. Friday, University of Hawaii Cooperative Extension Service, 808-969-8254 or jbfriday@hawaii.edu
 - Dr. Flint Hughes, USDA Forest Service, 808-854-2617 or fhughes@fs.fed.us
 - Dr. Lisa Keith, USDA Agriculture Research Service, 808-959-4357 or Lisa.Keith@ars.usda.gov
- Both prior to cutting ohia and after the project is complete:
 - Tools used for cutting infected ohia trees will be cleaned with a 70 percent rubbing alcohol solution. A freshly prepared 10 percent solution of chlorine bleach and water can be used as long as tools are oiled afterwards, as chlorine bleach will corrode metal tools. Chainsaw blades will be brushed clean, sprayed with cleaning solution, and run briefly to lubricate the chain.
 - Vehicles used off-road in infected forest areas will be thoroughly cleaned. The tires and undercarriage of the vehicle will be cleaned with detergent if they have travelled from an area with ROD or travelled off-road.
 - Shoes and clothing used in infected forests will also be cleaned. Shoes will be decontaminated by dipping the soles in 10 percent bleach or 70 percent rubbing alcohol to kill the ROD Fungus. Other gear can be sprayed with the same cleaning solutions. Clothing can be washed in hot water and detergent.
- Wood of affected ohia trees will not be transported to other areas of Hawaii Island or interisland. All cut wood will be left on-site to avoid spreading the disease. The pathogen may remain viable for over a year in dead wood. Additionally, per the State Department of Agriculture interisland movement, except by permit, of all ohia plant or plant parts is prohibited.

Aquatic Resources

Swordtails and marine toad tadpoles are abundant throughout the study area. Dragonfly and damselfly naiads and crayfish are also common. Guppies are occasionally encountered schooling with swordtails. The full list of observed aquatic fauna species within the study area is included in the reports that document the biological surveys conducted for the study (USACE, 2005; USACE, 2010a; and USACE, 2010b).

Terrestrial Resources

Avian species identified within the project area were dominated by non-native species. The only native species identified was the Pacific-golden Plover. Similarly, no native mammals were identified within the

study area; non-native species included the Indian mongoose, dogs, and pigs. A full list of terrestrial wildlife species observed in the study area is described in USACE (2005, 2010a, 2010b).

Threatened and Endangered Species

The USFWS provided the Corps a species list on July 16, 2008 identifying the following three endangered species that may occur within the project vicinity: the endangered Hawaiian hoary bat (*Lasiurus cinereus semotus*), Hawaiian coot (*Fulica americana alai*) and Hawaiian hawk (*Buteo solitarius*). No critical habitat for these, or any other endangered species, are located within the ESA action area e.g. project areas. Additionally, the project area consists of intermittent bedrock streams that do not support any permanent aquatic biota e.g. Hawaiian coot, and trees that lack the height and breadth adequate to support the Hawaiian hawk. As recommended by the USFWS, the Corps evaluated the potential impacts to these species and determined the proposed action may affect, but is not likely to adversely affect the above listed species. This determination was based on the following: lack of suitable habitat to support the Hawaiian coot or Hawaiian hawk, no threatened or endangered species were observed during field investigations, within the survey area, e.g. project areas (USACE 2005, 2010a, 2010b), and the Corps would implement the USFWS conservation measures recommended in the July 16, 2008 letter intended to avoid and/or minimize adverse impacts to the above listed species. The Corps initiated informal consultation with USFWS by letter dated November 1, 2016 and a follow-up phone call on May 23, 2018 seeking concurrence on the Corps' determination. The USFWS issued its concurrence by letter dated June 8, 2018 and concluding the Corps' Section 7 ESA consultation.

Per the completed ESA consultation, the Corps will implement the following USFWS' recommended conservation measures:

- Hawaiian hoary bat. -Do not disturb, remove, or trim woody plants greater than 15 feet tall during the bat birthing and pup rearing season (June 1 through September 15)*.
- Hawaiian coot. Ensure surface water flows into Waiakea Pond are not appreciably reduced as a result of the proposed projects. Ensure any ponded or standing water e.g. stockpile or pit, within ancillary construction staging and stockpiling areas is covered overnight or any break lasting more than 1 hour to eliminate attraction of endangered waterbirds.
- Hawaiian hawk. No clearing of vegetation or construction activities should occur within 1,600 feet of any active hawk nest during the breeding season (March 1 through September 30) until the young have fledged. Regardless of the time of year, trimming or cutting trees containing a hawk nest is prohibited, as nests may be re-used during consecutive breeding seasons.

*Note, this particular conservation measure has been updated from the conservation measure stipulations recommended in consultation with USFWS to be consistent with current guidance provided on the USFWS Pacific Islands Fish and Wildlife Office website as of March 2020.

4.3.1 Alternative 1 – No-Action Alternative/Future Without-Project Conditions

Vegetation

Historically, the streams within the project area were stable enough to maintain the riparian forest cover as a buffer between the creek channel and overbanks of the two cemetery areas. More frequent flood events in recent years have undercut and eroded the streambanks, destabilizing the channel and

jeopardizing the trees that shade and protect the upper slopes of the streambank. Under the No Action Alternative, these destabilizing conditions would continue and eventually lead to loss of the existing mature tree buffer and subsequent degradation of the riparian corridor.

Aquatic Resources, Terrestrial Resources, and Threatened/Endangered Species

Under the future without-project conditions, fish and wildlife resources would remain generally unchanged. As land use changes in the future, it is reasonable to expect that shifts in the distribution of fish and wildlife communities may occur as communities seek habitat which meets their life requisites. However, such range shifts are only feasible with adequate habitat, an ability to disperse and colonize, availability of food resources, and absence of physical barriers which might preclude movement. Displaced species may be subject to increased predation, be susceptible to disease, or be maladapted to their new habitat.

4.3.2 Alternative 2 – Recommended Plan

Vegetation

The flood frequency and detention time is unlikely to impact vegetation at the Kupulau Ditch or Hilo Golf Course. The levees and floodwall at Kupulau Ditch would result in the conversion of approximately six acres of grassland and riparian vegetation into flood risk management features. Although the detention basin would be comprised of another six acres of maintained land associated with the baseball field, the frequency of flooding events and the short length of time the detention basin would be inundated is unlikely to result in adverse impacts to vegetation in the basin. The Hilo Golf Course feature would convert approximately two acres of maintained golf course vegetation to flood risk management features. Approximately seven acres of the golf course would be temporarily inundated in the resulting detention basin. Similar to the Kupulau Ditch feature, the flood frequency and detention time is unlikely to adversely impact vegetation on the golf course.

During construction, all vegetation disturbance conservation measures will be implemented, including construction windows during life cycle seasons of endangered species and minimizing risk of spread of ROD. Additionally, the Corps will ensure appropriate vegetation of all areas impacted during construction to the pre-construction condition, where possible, as a means of sediment-erosion control. In areas where vegetation type is converted within the flood risk management features, the Corps will grass these areas. To ensure the future structural integrity of these features, restoration to the pre-construction condition is not proposed; these areas will be properly grassed.

Aquatic Resources

The footprint of the Recommended Plan occurs within the intermittent portions of the Waiakea and Palai Streams. The flood risk management features included in the Recommended Plan would be designed to manage the higher flows associated with storm events, but also be designed to maintain lower flows associated with more frequent rainfall events. The levees and detention basins would not result in creating barriers for aquatic organisms immigrating/emigrating from downstream habitats to the upstream habitats. Minor short term adverse impacts to aquatic organisms may result during construction as significant rain events may displace soil from the construction site and increase turbidity in the streams.

However, best management practices such as silt fence and temporary vegetation would minimize the water quality impacts to the aquatic biota. The effect of the flood risk management features on aquatic resources may be of minor benefit to aquatic resources as the extended flows associated with the detention basins would prolong the time the streams flow allowing additional time for species to migrate to and from the higher reaches of the streams. The Recommended Plan will have no effect on normal surface flows of waters of the U.S., accordingly long-term adverse impacts to aquatic resources are not expected.

Terrestrial Resources

Implementation of the Recommended Plan would have temporary, localized adverse impacts during construction, with some loss of less mobile species within the footprint of the levees. Mobile resident wildlife species would be temporarily displaced into adjacent habitats until construction activities were completed, with a minor loss of habitat associated with the approximately ten acres associated with the levee footprints. The maintained nature of these habitats associated with the levee footprints (baseball field, golf course, and maintained pasture) are not considered high quality habitats; therefore, there would be no substantial adverse impacts to terrestrial species resulting from the implementation of any of the alternatives.

Threatened and Endangered Species

As described above, a letter from USFWS dated 16 July 2008 identified three species that may occur in the project area: the Hawaiian hoary bat, Hawaiian Hawk, and the Hawaiian Coot. No critical habitat for these, or any other endangered species, are located within the project areas. The USFWS also indicated the project area is absent of suitable habitat for both the Hawaiian coot and Hawaiian hawk.

There is a chance that Hawaiian hoary bats could utilize native and non-native woody plant species in the study area for nesting habitat and the Hawaiian hawks for intermittent resting during flight. However, most woody vegetation is located on the fringes of the project areas and would not be permanently impacted by the construction of the levees and floodwalls. The removal of woody vegetation would be limited to the extent practicable and in accordance with the conservation measures recommended by USFWS, above, to minimize impacts to endangered species and their preferred habitat. Should the construction contractor determine clearing of woody vegetation must occur during the pup-rearing season for Hawaiian hoary bats or nesting season for Hawaiian hawks, then the trees in the project area would be surveyed, in coordination with USFWS, to determine the presence of Hawaiian hoary bats, Hawaiian hawks, or their nests. If bats, hawks or their nests are observed, regardless of the season, construction activities would cease until the USFWS has been consulted and tree trimming/removal is approved.

The Corps evaluated the potential impacts to these species and determined the Recommended Plan may affect, but is not likely to adversely affect the Hawaiian hoary bat and Hawaiian hawk. The Corps concluded this effect determination based on the following: neither the bat nor the hawk, were observed during field investigations, the site lacks suitable habitat to support the coot and the hawk, and as an integral component of the proposed action, the Corps will ensure implementation of the recommended USFWS conservation measures identified above, to avoid and/or minimize adverse impacts to the above listed species.

The Hawaiian Coot utilizes the wetland habitats surrounding Waiakea Pond in Hilo, located approximately 2.5 miles downstream of the project area. Although the streams terminate into Waiakea Pond, the mediated flows would not substantially affect the wetland habitats of the pond. The design of the Recommended Plan is consistent with conservation measures recommended by the USFWS to minimize adverse impacts to the endangered Hawaiian Coot. The implementation of the Recommended Plan would allow base stream flows to continue downstream and would lessen the impacts of high velocity floodwaters entering the pond.

Although the project areas are void of permanent aquatic habitat necessary for Hawaiian Coot, due to their known proximal occurrence, the Corps will implement conservation measures to avoid and/or minimize adverse impacts to the Hawaiian Coot. Because the Hawaiian Coot has the potential to occur within the project area, the Corps has determined the Recommended plan may affect, but is not likely to adversely affect the endangered Hawaiian Coot. As an integral component of the proposed action, the Corps will ensure implementation, of the USFWS' recommended conservation measures.

4.4 Cultural Resources

Listed Historic Properties

A total of 331 properties and historic districts are listed on the National Register of Historic Places (NRHP) for the State of Hawaii; of these, 73 are located on Hawaii Island. The listed historic property closest to the study area is the Waiakea Mission Station – Hilo Station (NPS, 2014). The Waiakea Mission Station – Hilo Station is located on Haili Street, approximately 4.8 miles from the study area.

The Hawaii Register of Historic Places formally recognizes historic properties in the categories of district, site, structure, building, and object for their architectural, archaeological, cultural, or engineering significance. There are no Hawaii Register of Historic Places-listed historic properties within the vicinity of study area (SHPD, 2014). The historic property closest to the study area is the S. Hata Building, approximately 5.0 miles from the study area.

Archaeology

Several archaeological surveys have been conducted as part of various development projects in the vicinity of the study area. These were reviewed to evaluate the potential for archaeological resources within the study area. Following this, a comprehensive archaeological inventory survey was completed for the entire project area (Reeve and Cleghorn, 2019). This work produced no evidence of archaeological or historic resources and confirmed the highly disturbed and modified nature of the landscape.

The majority of the study area has been developed with residential and community land uses (e.g., parks, community centers, churches) and a few small-scale commercial uses. Due to the land use history of intensive commercial agriculture and residential development, extant archaeological or cultural features are most likely to be associated with former sugarcane cultivation or other Historic Period activities in the area. Any pre-contact resources would likely have been destroyed by the agricultural operations or during subsequent suburban development of the area. (Escott, 2004; Geometrician Associates, 2006; Pacific Legacy, 2005).

The Hawaii State Historic Preservation Division, the Office of Hawaiian Affairs, and the Hawaiian Civic Club of Hilo were consulted on the findings of the Archaeological Survey and the potential for unknown historic and cultural resources in the project area (See Section 6.5). This produced no further evidence of historic or cultural resources.

Traditional or Cultural Practices

Hawaii Revised Statutes Section 7-1 has codified some recognized traditional and cultural practices. These traditional and cultural practices include the right to gather firewood, house-timber, *aho* cord, thatch, or *ki* leaf, for private use. Other traditional or cultural practices not specifically enumerated in the Constitution of the State of Hawaii or its statutes have also been recognized. These practices may include the stewardship and healing/restoration of lands established by actual practice.

A Cultural Impact Study (CIS) was conducted for the study area in 2005. The CIS concluded that, based on the results and findings from interviews and archival research, there are no known culturally significant traditional properties or resources in the study area; and the study area does not appear to support any traditional cultural practices.

4.4.1 Alternative 1 – No-Action Alternative/Future Without-Project Conditions

The study area would remain unchanged from current conditions and there would be no impacts to any potential archaeological, historic, or cultural resources in the study area.

4.4.2 Alternative 2 – Recommended Plan

There are no known historic properties or cultural resources in the study area. In addition, the area does not support any traditional cultural practices. Therefore, the Recommended Plan would not impact these resource types.

4.5 Socioeconomics

Hilo is a Census-Designated Plan in the State of Hawaii with a population of about 43,000 based on 2010 U.S. Census data. Hilo functions as the industrial, commercial, distribution, and population core of the island. The median household annual income for the County of Hawaii in 2012 was \$52,098. This is 22.8% lower than the mean household income for the State of Hawaii, at \$67,492 (U.S. Census Bureau, 2014). The County of Hawaii's racial distribution is such that individuals with one race are 34.2% White, 0.8% Black or African American, 0.6% American Indian and Alaska Native, 22.5% Asian, 12.5% Native Hawaiian and other Pacific Islander, and 29.7% of some other race. Persons of two or more races made up 29.6% of the census tract population (U.S. Census Bureau, 2014).

The County of Hawaii experienced a population increase of 30.6 percent over the 2000-2014 timeframe, the largest of any of the Hawaiian Islands. Population growth has been steady within the study area, but not as extraordinary as for the County. Within the County of Hawaii, the South Hilo District, which includes this study area, population increased 7.5 percent between 2000 and 2013.

4.5.1 Alternative 1 – No-Action Alternative/Future Without-Project Conditions

Under the future without-project condition, there would be no changes to the health risks for children or changes in the minority/low income populations.

4.5.2 Alternative 2 – Recommended Plan

Based on the U.S. Census data and field observations, the implementation of the Recommended Plan would not have a disproportionate adverse impact on specific racial, ethnic, or socioeconomic group living in the vicinity of the project area and would not adversely impact environmental justice populations.

Children would be expected to concentrate at the New Hope Church and the adjacent baseball field in the vicinity of the Kupulau Ditch feature footprint. Measures would be incorporated to ensure the safety of children in the project area such as exclusion fencing, signage, and securing construction equipment. With these mitigative measures in place, the alternative would not have substantial adverse impacts on the local population of children.

The Hilo Golf Course feature would be implemented within an access controlled facility. In addition, children on the golf course would need to be accompanied by an adult; therefore, there would be no adverse impacts to children as it relates to EO 13045 as long as the mitigative measures identified above are implemented.

4.6 Hazardous, Toxic, and Radioactive Waste

To complete the Phase I HTRW survey, the Corps reviewed existing environmental documentation and environmental regulatory databases. The Corps contacted the Hawaii State Departments of Health (DOH), Land and Natural Resource, and Office of Environmental Quality Control, and the Hawaii County Planning Department to obtain information about property history, environmental conditions, and any HTRW incidents, violations, or permit actions which may have occurred within the areas encompassing the final array of alternatives. Federal, state, and local agency environmental records and regulatory databases were searched to determine the existence of any license or permit actions, violations, enforcements, and/or litigation against property owners, and to obtain general information about potential past incidents of HTRW releases. Results of the database searches include:

- No U.S. Environmental Protection Agency (EPA) National Priority List (NPL) or Superfund sites are within a one mile radius of the project alternative areas
- No Comprehensive Environmental Response, Compensation, and Liability Information System site is located within a 0.5-mile radius of the project alternative areas
- No Resource Conservation and Recovery Information System treatment, storage, or disposal facility is located within a 0.5-mile radius from the project alternative areas
- No Resource Conservation and Recovery Act (RCRA) Corrective Action Reports were identified within a one mile radius of the project alternative areas
- No RCRA generators are located within the project alternative areas or adjacent properties
- No underground storage tanks are located within a 0.25-mile radius of the project alternative areas
- One leaking underground storage tank was located within a one mile radius of the project alternative areas
- No active landfills are located within a 0.5-mile radius of the project alternative areas
- No spills or incidents connected with the properties of the project alternative areas are entered in the Emergency Response Notification System database.

The records search of the DOH Solid and Hazardous Waste Branch, Underground Storage Tank Section was conducted for information on the leaking underground storage tanks within, and in the vicinity of the project alternative areas. As stated in the synopsis above, the database revealed one underground storage tank (Kawailani Laundromat, 511 West Kawailani Street) with a confirmed release of diesel fuel on 13 November 1997. The release was less than 25 gallons and resulted in appropriate remedial action including removal of the underground storage tank. This site is located approximately one mile northwest of the project alternative areas.

A visual survey was conducted for areas included in the final array of alternatives on 12 January 2005 to look for evidence of potential HTRW or impacts therefrom. Follow-up HTRW surveys were performed on 5 February and 7 May 2019. Project alternative sites were reconnoitered for evidence of possible HTRW contamination including partially buried containers, discolored soil, seeping liquids, film or sheen on water surfaces, abnormal or dead vegetation or animals, malodors, dead-end pipes, anomalous grading, fills, depressions, or other evidence of possible environmental contamination. Based on the visual survey of the area, no apparent signs of HTRW contamination exists within the proposed alternative project areas.

4.6.1 Alternative 1 – No-Action Alternative/Future Without-Project Conditions

As described above, the study area has been essentially built out and no new HTRW sources are expected to be introduced into the area. As such, there are no expected changes to HTRW sites in the future without-project condition.

4.6.2 Alternative 2 – Recommended Plan

In the short-term, the Recommended Plan may generate solid waste from the clearing of vegetation and unused construction materials in the proposed project area. During construction of the Recommended Plan, the contractor would be responsible for such solid waste disposal. In the long-term, the Recommended Plan would require infrequent solid waste disposal of cleared debris, in accordance with applicable regulations. Overall, implementation of the Recommended Plan is expected to have a less than significant impact on solid waste generation in the affected environment for the foreseeable future.

During construction of the Recommended Plan, there may be the potential of petroleum and petroleum-related products spillage associated with construction vehicles and equipment. To minimize this hazard, all applicable County of Hawaii Spill and Prevention Control BMPs would be implemented to ensure that accidental releases are minimized and contained. For example, vehicles and equipment would be regularly inspected for leaks and performance and maintained accordingly to prevent spills from occurring. Any potentially hazardous materials required for the project or any resultant hazardous waste will be managed and disposed of in compliance with all applicable state and federal regulations, including RCRA. In the long term, the potential for petroleum spillage exists from maintenance vehicles. Again, all applicable County of Hawaii Spill and Prevention Control BMPs would be implemented. Implementation of the Recommended Plan is expected to have less than significant solid waste generation in the affected environment for the foreseeable future.

4.7 Air Quality

The U.S. Environmental Protection Agency (EPA) has the primary responsibility for regulating air quality nationwide. The Clean Air Act (42 U.S.C. 7401 *et seq.*), as amended, requires the EPA to set National

Ambient Air Quality Standards (NAAQS) for wide-spread pollutants from numerous and diverse sources considered harmful to public health and the environment.

EPA has set NAAQS for six principal pollutants, which are called “criteria” pollutants. These criteria pollutants include carbon monoxide (CO), nitrogen dioxide (NO₂), ozone (O₃), particulate matter less than 10 microns (PM₁₀), particulate matter less than 2.5 microns (PM_{2.5}), sulfur dioxide (SO₂), and lead (Pb). If the concentration of one or more criteria pollutants in a geographic area is found to exceed the regulated “threshold” level, the area may be classified as a non-attainment area. Areas with concentrations of criteria pollutants that are below the levels established by the NAAQS are considered in attainment.

There are no non-attainment areas within the State of Hawaii (EPA, 2019).

4.7.1 Alternative 1 – No-Action Alternative/Future Without-Project Conditions

No impacts to air quality and no violations of existing air quality standards would be anticipated to occur if the proposed project is not implemented.

4.7.2 Alternative 2 – Recommended Plan

Ground disturbance could generate fugitive dust (e.g., PM) and use of construction equipment and personal vehicles to access the project area could lead to temporary increases in vehicular airborne pollutant concentrations. These impacts would be temporary, and applicable best management practices, including silt fence and watering stockpiled soil, would be implemented. To reduce vehicle and equipment emissions, idling of vehicles and equipment would be minimized to the extent practicable and equipment would be maintained.

The Council on Environmental Quality requires a quantitative assessment of Greenhouse Gas (GHG) emissions for activities that result in more than 25,000 tons of CO₂-equivalent per year. The Recommended Plan would contribute less than 25,000 tons of CO₂ into the atmosphere. With the possible exception of maintenance vehicles, each of the features included in the Recommended Plan is passive, with no further contribution of GHG.

5 Recommended Plan

This chapter discusses the details of the Recommended Plan, which include material quantities and classifications, requirements for operations, maintenance, repair, rehabilitation, and replacement (OMRR&R), cost and benefits, and risk and uncertainty.

5.1 Description of the Recommended Plan

The Recommended Plan includes the Kupulau Ditch Detention and Hilo Municipal Golf Course Detention (Figure 5-1). The following sections provide more information about each of the features included in the Recommended Plan.

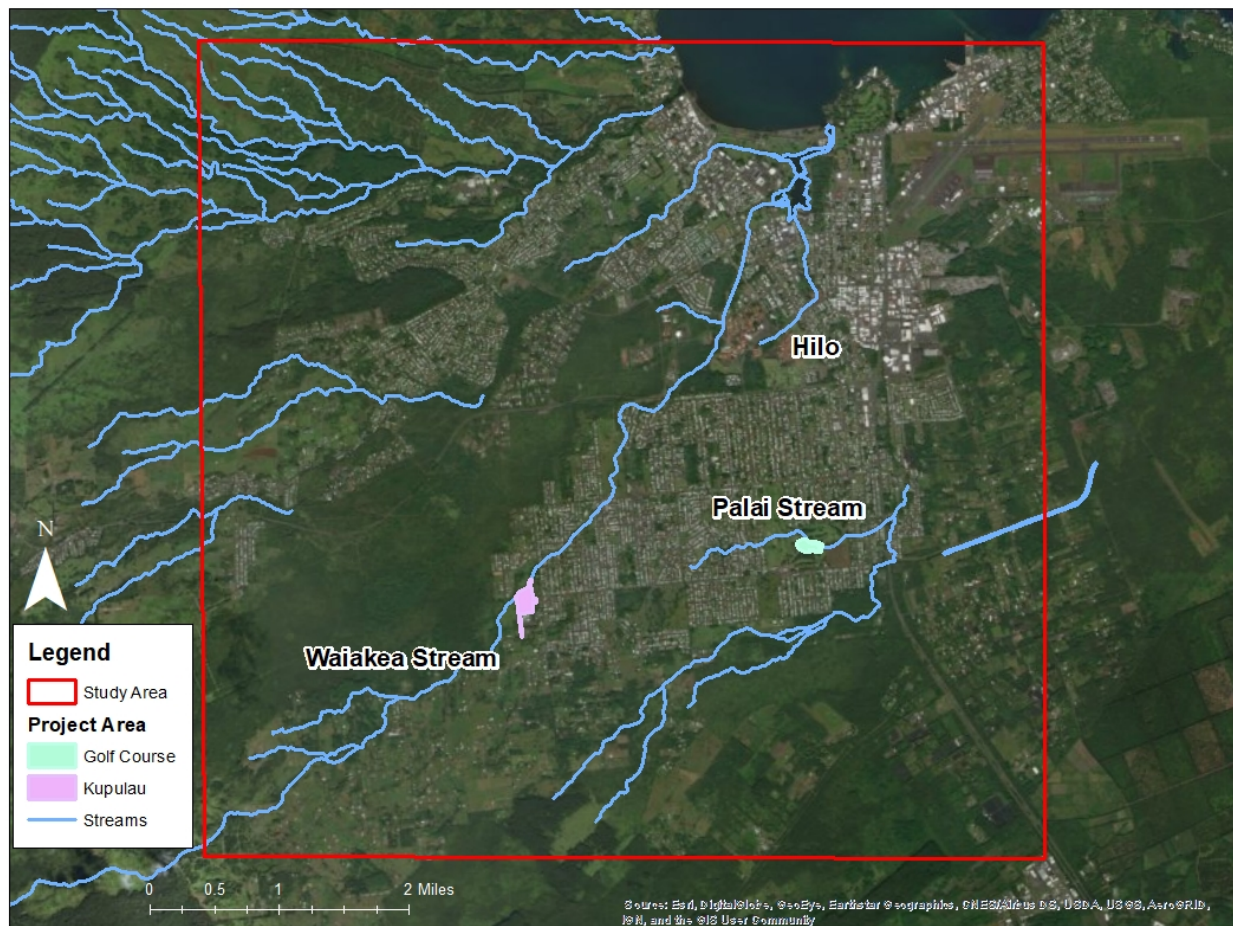


Figure 5-1. Recommended Plan

5.1.1 Kupulau Ditch Detention

The Kupulau Ditch Detention (Figure 5-2) includes construction of a detention basin on property located to the north of the New Hope Church and adjacent to the right bank of Kupulau Ditch (located east of the confluence of Kupulau Ditch and Waiakea Stream). Impounding of the runoff would be accomplished by constructing a series of three levees and one floodwall to enclose the landscape by utilizing the natural topography of the area. The detention basin would reduce peak flows along Waiakea Stream downstream of Kupulau Road, resulting in a reduction of flood damages in the Waiakea Stream damage reach by 42%.

The total project first cost for Kupulau Ditch is \$7.8 million with expected annual costs of \$446,000 and expected annual benefits of \$1.9 million. As described in Section 5.3.2, real estate requirements for this feature include flowage easements (perpetual and occasional), channel improvement easements, flood protection levee easements, road easements, and temporary work area easements on both public and private lands. Ten parcels (one public parcel and nine private parcels) are affected for the Kupulau Ditch feature. Finally, please refer to section 5.4 for a discussion of residual risk associated with this feature.



Figure 5-2. Kupulau Ditch Detention

5.1.2 Hilo Municipal Golf Course Detention

The embankment constructed to create the detention pond would have a maximum height of approximately 22 feet from the channel bottom (Figure 5-3). An in-channel barrier with an uncontrolled outlet consisting of three (3) four-foot diameter aluminized steel pipes would be constructed. The barrier has a total length of about 823 feet. Side embankments located on the north and south sides of Palai

Stream prevent flow from escaping the stream. The in-channel portion of the structure has a height of about 10 feet. The north embankment has an average height of about 2.4 feet, while the south embankment has an average height of about 2.1 feet. Grouted riprap on both the upstream and downstream face of the in-channel embankment is required to protect it from erosion. Analysis of this structure has a storage volume of about 7 acre-ft. at the 1% AEP event and about 12 acre-ft. at the 0.2% AEP event.

The total project first cost for the Hilo Golf Course Detention is \$3.4 million with expected annual costs of \$203,000 and expected annual benefits of \$286,000. As described in Section 5.3.2, real estate requirements for this feature include flowage easements (perpetual and occasional), channel improvement easements, flood protection levee easements, road easements, and temporary work area easements on both public and private lands. Four parcels (all public ownership) are affected for the Hilo Golf Course feature. Finally, please refer to section 5.4 for a discussion of residual risk associated with this feature.

It should be noted that a new residential development is being constructed near the southeast corner of the Hilo Golf Course. While the development is outside of the proposed footprint of the detention basin feature, the height and alignment of the detention basin may require refinement to ensure the Recommended Plan will not negatively impact the housing development. The Corps will continue to coordinate with the County of Hawaii to assess permitting requirements for floodplain developments and may refine the design of the Hilo Golf Course detention basin during the Design and Implementation phase of the project. Potential design refinements are expected to be minimal and would not significantly impact costs, benefits, or overall justification of the Recommended Plan.



Figure 5-3. Hilo Municipal Golf Course Detention

5.2 Cost Estimate and Economic Summary

The total project first cost (Constant Dollar Cost at FY2020 price levels) of the Recommended Plan is \$10,768,000. The fully funded total project cost (Constant Dollar Cost) for the Recommended Plan is \$11,501,000, including escalation to the midpoint of construction. In accordance with the cost share provisions of Section 104 of the Water Resources Development Act (WRDA) of 1986, as amended (33 U.S.C. 2213), the Federal share (65%) of the project first cost is estimated to be \$6,390,150 and the non-Federal share (35%) is estimated to be \$4,377,850 which includes \$937,000 in lands, easements, rights-of-way, relocations, and disposal (LERRD). Table 5-3, Table 5-2, and Table 5-3 provides the cost breakdown for total project first cost, equivalent annual benefits and costs, and cost-share information. Detailed information on Project costs can be found in Appendix E.

Table 5-1. Total Project First Cost Summary

| Construction Item Cost | Project First Cost (FY20 Price Level) |
|--------------------------------------|--|
| Construction | 6,781 |
| LERRDs | 937 |
| Preconstruction Engineering & Design | 2,068 |
| Construction Management | 982 |
| Total First Cost (\$1000s) | 10,768 |

Table 5-2. Equivalent Annual Benefits and Costs**(October 2020 Price Level; 50-year Period of analysis, 2.75% Discount Rate)**

| Investment Costs | |
|---|-----------------|
| Total Project Construction Costs | \$10,816 |
| Interest During Construction | \$355 |
| Total Investment Cost (\$1000s) | \$11,171 |
| Average Annual Costs | |
| Interest and Amortization of Initial Investment | \$424 |
| OMRR&R | \$225 |
| Total Average Annual Costs (\$1000s) | \$649 |
| Average Annual Benefits | |
| Average Annual Benefits | \$2,239 |
| Net Annual Benefits | \$1,591 |
| Benefit-Cost Ratio | 3.5 |

Table 5-3. Estimated Project First Cost and Cost-Share

| Item | Project First Cost (FY20 Price Level) | Federal Cost | Non-Federal Cost |
|--|---|-----------------|---------------------|
| Construction | 6,781 | 4,408 | 2,373 |
| LERRDs (non-cash contribution) | 937 | 0 | 937 |
| Preconstruction Engineering and Design | 2,068 | 1,344 | 724 |
| Construction Management | 982 | 638 | 344 |
| Total (\$1000s) | 10,768 | 6,390 | 4,378 |

5.3 Plan Implementation

The following sections outline the requirements for implementation of the recommended plan.

5.3.1 Non-Federal Sponsor

The County of Hawaii is supportive of the recommended plan. Non-Federal cost requirements are described in section 5.2. Self-certification of financial capability documentation will be included in subsequent agreements between the County and Corps.

5.3.2 Real Estate Requirements

Requirements for LERRDs include flowage easements (perpetual and occasional), channel improvement easements, flood protection levee easements, road easements, and temporary work area easements on both public and private lands. Ten parcels are affected for the Kupulau Ditch feature and four parcels are affected for the Hilo Golf Course Detention. Additional details of the real estate requirements for this project are presented in Appendix D.

5.3.3 Operations, Maintenance, Repair, Rehabilitation and Replacement Requirements

Operations, Maintenance, Repair, Rehabilitation, and Replacement (OMRR&R) requirements include standard activities for detention and diversion structures as well as levees and floodwalls. Maintenance would include yearly inspections of the levees and floodwalls at Kupulau Ditch, cutting or clearing of vegetation within the cleared zone at both sites, clearing of accumulated debris at both sites following flood events or annually (whichever is greater), and possibly minor grouted riprap replacement at the Hilo Golf Course Detention and after large events. The estimated annual O&M costs for the Project would be approximately \$225,000, which is approximately 1/50 of the initial construction and construction management cost. OMRR&R is a non-Federal sponsor responsibility and final O&M requirements will be confirmed during the detailed design phase.

5.4 Residual Risk

Residual risk is the risk remaining after implementation of a plan; that is, it is the difference in damages between the with- and without-project conditions. Depending on the current conditions and the changes created by the alternative plan, inundation at a reach usually starts to occur at different AEPs. These changes in AEPs are correlated to structure and content dollar damages. In the case of the Waiakea-Palai project, the residual risk is computed as the remaining dollar damages to commercial, public, and residential structures and contents after implementing the Recommended Plan. According to Table 5-4, there are residual expected annual damages of approximately \$2.5 million following the implementation of the Recommended Plan. The largest portion of these residual damages come from Palai Stream, but Waiakea Stream has significant residual damage as well since the Kupulau Ditch improvement is the only one of the Recommended Plan measures that reduces the risk of flooding to properties along Waiakea. Table 5-4 also shows that after incorporating the Recommended Plan, there will be approximately 53% of existing condition damages that remain as residual damages. Further information on residual risk is available in the Economics Appendix.

Finally, the Recommended Plan reduces without-project damages (no Federal project) by approximately 47 percent. Table 5-5 shows that there is a greater than 75 percent chance that expected annual benefits for the combination plan will exceed \$1.4 million. Compared with the current expected annual cost estimate of \$649,000 for the Recommended Plan, this means there is a greater than 75 percent change that the benefit to cost ratio for the Recommended Plan exceeds 2.0.

Table 5-4. Residual Damages (\$1000s)**(FY2020 Price Level; FY2020 Federal Discount Rate 2.75%)**

| Project Alternatives | Existing Condition Damages | Damage Reduced | | Residual Damages |
|----------------------|----------------------------|----------------------------------|-------------------------------------|------------------|
| | | Ainalako Diversion - 1% ACE Plan | Golf Course Detention - 1% ACE Plan | |
| 4 Mile Creek | 91 | - | - | 91 |
| Ainola | 173 | 111 | - | 62 |
| Debris | 25 | - | - | 25 |
| HaiHai | 128 | 71 | - | 57 |
| Kupulau | 816 | 816 | - | - |
| Palai | 2,785 | 709 | 286 | 1,790 |
| Puhau | 5 | 5 | - | - |
| Waiakea | 715 | 240 | - | 475 |
| Total | 4,739 | 1,953 | 286 | 2,500 |

Table 5-5. EAD Probability Distribution (\$1000s)**(FY2020 Price Level; FY2020 Federal Discount Rate 2.75%)**

| Project Alternatives | Expected Annual Benefits | Probability Damage Reduced Exceeds Indicated Values | | |
|-------------------------------------|--------------------------|---|-------|-------|
| | | 75% | 50% | 25% |
| Kupulau Ditch | \$1,953 | 1,236 | 1,917 | 2,699 |
| Golf Course Detention | \$286 | 173 | 269 | 405 |
| Combination Plan (Recommended Plan) | \$2,239 | 1,409 | 2,186 | 3,104 |

6 Compliance with Environmental Statutes*

This chapter provides documentation of how the Recommended Plan complies with all applicable Federal environmental laws, statutes, and executive orders (EOs). Appendix C includes a full discussion of environmental compliance activities, including relevant correspondence and supporting documentation.

6.1 Endangered Species Act of 1973

The District has determined that the Recommended Plan may affect, but is not likely to adversely affect the Hawaiian bat, Hawaiian hawk, and Hawaiian coot and the study area is absent of designated critical habitat. The Corps will implement the conservation measures recommend by the USFWS in Section 4.3 to avoid and/or minimize adverse impact to the above listed species. By letter dated June 8, 2018, the USFWS concurred with the Corps' effect determination, thereby concluding informal consultation pursuant to Section 7 of the ESA.

6.2 Clean Water Act of 1972

The Palai Stream that bifurcates the Hilo Municipal Golf Course within the project area does not provide continuous surface flow to a navigable water. It is not a tributary to a navigable water and therefore does not meet the definition of a water of the U.S. Accordingly, the Palai Stream is not subject to regulation under the Clean Water Act (CWA).

The Waiakea Stream is a tributary to a navigable water that conveys continuous surface flow to Hilo Bay, a navigable water. It is a water of the U.S. subject to regulation under the CWA.

The Kupulau Ditch was artificially-constructed in uplands to convey stormwater flows to the downstream Waiakea Stream, flowing only in response to precipitation events,. The Kupulau Ditch conveys ephemeral flow downstream to the Waiakea Stream and features a trapezoidal channel constructed of earthen bed and banks. Under the Navigable Waters Protection Rule, the Kupulau Ditch is not a water of the U.S. e.g. "non-jurisdictional".

The feasibility level of design neither requires construction activities nor proposes discharges of dredged or fill material into the Waiakea Stream channel. Accordingly, the proposed action would not result in the loss of waters of the U.S. and does not warrant preparation of a proposal for compensatory mitigation at this time. If, during the design phase of the study the Corps determines the Recommended plan would result in a 404 discharge, then the Corps will ensure compliance with all applicable sections of the CWA e.g. 404, 401, etc. Additionally, if during the design phase, the Corps determines the construction activity will trigger the need to obtain a Section 402 National Pollutant Discharge Elimination System permit from the State of Hawaii, then the Corps will ensure one is obtained.

The Corps met with the State of Hawaii Department of Health Clean Water Branch (CWB) on November 23, 2020 to discuss the project details and to propose a process by which the Corps would comply with Section 401 of the CWA. The Corps, in coordination with CWB, determined that the level of detail available at the feasibility level of the study is insufficient to successfully apply for and obtain a Section 401 Water Quality Certification. Accordingly, the Corps proposed to CWB to apply for the Section 401 WQC during the design phase, and prior to construction, when adequate information regarding the design and any discharges are adequately defined in order to apply for and obtain a Section 401WQC. By letter dated December 14, 2020 the CWB confirmed the Corps' coordination of this approach, preliminarily

determined there is no issue with the Corps furthering the design of the alternatives, and concurred with the Corps' plan to apply for and obtain a Section 401 WQC during the design phase and prior to construction.

6.3 Clean Air Act of 1972

Federal agencies are required by this Act to review all air emissions resulting from federally funded projects or permits to insure conformity with the State Implementation Plans in non-attainment areas. The Hilo/Waiakea-Palai Stream area is currently in attainment for all air emissions; therefore, the proposed project would be in compliance with the Clean Air Act.

6.4 Coastal Zone Management Act

Section 307(c) of the Coastal Zone Management Act (CZMA) requires federal agency activities and development projects affecting any coastal use or resource to be undertaken in a manner consistent to the maximum extent practicable with the state's CZM program. Such federal actions are reviewed by the State Office of Planning to ensure the proposed action is consistent with state enforceable policies and objectives.

The Corps has developed the Recommended Plan to be compatible and consistent with the policies and objectives of the state's CZM program and will not adversely impact coastal recreation opportunities, impede economic uses, increase coastal hazards, or conflict with development within the coastal zone. The Corps requested and received conditional concurrence from the State CZM Office by letter dated September 14, 2020. The Corps will implement all conditions of the CZM concurrence letter to ensure the project, when implemented, is compatible and consistent with the State CZM policies and objectives.

6.5 National Historic Preservation Act of 1966

Federal agencies are required under Section 106 of the National Historic Preservation Act (NHPA) of 1966, as amended, to "take into account the effects of their undertakings on historic properties" and consider alternatives "to avoid, minimize, or mitigate the undertaking's adverse effects on historic properties" [(36 CFR 800.1(a-c)]. This is to be completed in consultation with the State Historic Preservation Officer (SHPO) and other appropriate consulting parties (e.g., Native Hawaiian Organizations). Additionally, at the State level, Hawaii Revised Statutes (HRS) Chapter 6E requires consultation on effects to historic properties under a very similar process. Federal-level Section 106 and State-level 6E consultations were conducted concomitantly.

In accordance with Section 106 of the NHPA and HRS Chapter 6E, USACE consulted with the Hawaii State Historic Preservation Division, the State of Hawaii's Office of Hawaiian Affairs, and the Hawaiian Civic Club of Hilo regarding the presence of historic and cultural properties in the project area, and the potential for adverse impacts due to the preferred alternative (Appendix C). No response was received within the statutory time limit from any of the consulting parties. The consultation was thus completed with a standing determination of "no effect" to historic properties. Archaeological Inventory Survey conducted in support of the consultation produced no evidence of historic properties eligible for listing on the National Register of Historic Places or historic properties considered "significant" under Hawaii Administrative Rules (HAR) §13-275-6. Copies of all correspondence documenting the Section 106 consultation, as well as supporting technical investigations, are included in Appendix C.

6.6 Fish and Wildlife Coordination Act of 1934

The FWCA and its amendments require federal agencies to consult with the USFWS, and give equal consideration to other water resources development programs regarding the fish and wildlife impacts of projects that propose to impound, divert, channel, or otherwise alter a body of water. A final FWCA Planning Aid Report was provided in February 2020, which indicated that the USFWS concurred with the preferred alternative if best management practices are implemented during construction. The Corps accepted all USFWS recommendations in the FWCA Planning Aid Report, will incorporate the USFWS recommended standard best management practices into any construction contract and will coordinate any future modification to the preferred alternative with USFWS.

6.7 Magnuson-Stevens Fishery Conservation and Management Act

Essential Fish Habitat (EFH) is identified and conserved under the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) of 1976, as amended, (16 U.S.C. 1801 *et. seq.*). The study area is absent designated EFH. The Recommended Plan would have no effect on designated EFH located downstream of the study area.

6.8 Farmland Protection Policy Act

The Farmland Protection Policy Act (FPPA) require federal agencies to coordinate with the Natural Resources Conservation Service (NRCS) when a federal action impacts prime farmland soils. The Recommended Plan project area is not located on prime farmland soils; therefore, the FPPA does not apply and coordination with the NRCS is not required.

6.9 Migratory Bird Treaty Act of 1918 and Executive Order 13186 Migratory Bird Habitat Protection

Potential effects to migratory birds were considered during the planning of this project. Because of the generally urbanized nature of landcover and ongoing disturbance from proximity to human activities, there would be little potential for migratory bird take as defined by the Act. The Recommended Plan would not adversely affect migratory birds and is in compliance with the applicable laws and policies.

6.10 Executive Order 12898 Environmental Justice

Compliance with EO 12898, Environmental Justice, requires consideration of social equity issues, particularly any disproportionate impacts to minority or low income groups. Environmental justice impacts have been considered during the planning of this project and no minority or low-income populations would be disproportionately affected by the Recommended Plan. Even though minorities account for a large portion of the local population and the low-income population is above the national averages, construction of the proposed alternatives would not have a disproportionately high or adverse effect on these populations.

6.11 Executive Order 11988 Floodplain Management

Executive Order 11988 requires Federal agencies to recognize the significant values of floodplains and to consider the public benefits that would be realized from restoring and preserving floodplains. It is the general policy of the Corps to formulate projects that, to the extent possible, avoid or minimize adverse impacts associated with use of the base floodplain and avoid inducing development in the base floodplain

unless there is no practicable alternative that meets the project purpose. Per the procedures outlined in ER 1165-2-26 (Implementation of Executive Order 11988 on Flood Plain Management), the Corps has analyzed the potential effects of the Recommended Plan on the overall floodplain management of the study area.

Implementation of the Recommended Plan would avoid, to the extent possible, long- and short-term adverse impacts associated with the occupancy and modification of the base floodplain. The Recommended Plan also avoids direct and indirect support of development or growth (construction of structures and/or facilities, habitable or otherwise) in the base floodplain. Therefore, the Project would be in full compliance.

7 Public Involvement, Review, and Consultation

Public involvement activities and agency coordination are summarized in this chapter.

7.1 Public Involvement Process

Corps Planning Policy and NEPA emphasize public involvement in government actions affecting the environment by requiring that the benefits and risks associated with the Recommended Plan be assessed and publicly disclosed. Throughout the planning process, the District has been coordinating with other Federal, state, and regional agencies, and Native Hawaiian Organizations.

There were three large audience engagements and several smaller engagements with various stakeholders. The first meeting was April 30, 2019 with homeowners, and property owners in the project area; the second meeting was a public meeting on May 21, 2019, after which a copy of the draft report was left in the Public Library. The draft Feasibility Report and Environmental Assessment was released for a 30-day public review and comment period between June 23, 2019 and July 23, 2019. A total of 12 comment submittals were received on the Draft FR/EA via email submittals, handwritten comments, and letters. The team conducted a final public meeting on September 12, 2019 after the public and Agency review and the final plan was complete; without Ainalako Diversion included. All comments and responses are presented in Appendix F.

7.2 Agencies and Persons Consulted*

The Corps consulted the following list of agencies, tribes, and individuals during the plan formulation and environmental compliance of this feasibility study and preparation of the Integrated FR/EA.

- Hawaii Department of Health Clean Water Branch
- State of Hawaii Office of Planning
- Hawaii Division of Aquatic Resources
- Hawaii Division of Forestry and Wildlife
- Hawaii State Historic Preservation Office
- Hawaiian Civic Club of Hilo
- National Marine Fisheries Service
- Office of Hawaiian Affairs
- U.S. Fish and Wildlife Service

7.3 Public and Agency Review of Final Recommended Plan

The final recommended plan removed Ainalako Diversion from the project due to changes in conditions, including, anticipated impacts to costs, real estate, environment, as well as increased risk to a new subdivision constructed adjacent to Four Mile Creek. The impacts of removing Ainalako Diversion from the project were determined less than the impacts of leaving Ainalako Diversion in the recommended plan. The team notified Agencies, and the public prior to the completion of coordination requirements so all recommendations and coordination are based on a final plan without Ainalako Diversion.

8 Recommendations

I have considered all significant aspects of this project, including environmental, social and economic effects; and engineering feasibility. I recommend that the Recommended Plan for flood risk management for the Waiakea-Palai project area as generally described in this report be authorized for implementation as a Federal project, with such modifications thereof as in the discretion of the Commander, USACE may be advisable. The estimated first cost of the recommended plan is \$10,768,000. Operations, maintenance, repair, rehabilitation, and replacement (OMRR&R) expenses are estimated to be approximately \$215,000 per year at this time. The Federal portion of the estimated first cost is \$6,390,150. The non-Federal sponsors' portion of the required 35 percent cost share of total project first costs is \$4,377,850. The non-Federal partner shall, prior to implementation, agree to perform the following items of local cooperation:

a. Provide the non-federal share of total project costs, including a minimum of 35 percent but not to exceed 50 percent of total costs of the NED Plan, as further specified below:

1. Provide 35 percent of design costs in accordance with the terms of a design agreement entered into prior to commencement of design work for the project;

2. Provide, during construction, a contribution of funds equal to 5 percent of total costs of the NED Plan;

3. Provide all lands, easements, and rights-of-way, including those required for relocations, the borrowing of material, and the disposal of dredged or excavated material; perform or ensure the performance of all relocations; and construct all improvements required on lands, easements, and rights-of-way to enable the disposal of dredged or excavated material all as determined by the government to be required or to be necessary for the construction, operation, and maintenance of the project;

4. Provide, during construction, any additional funds necessary to make its total contribution equal to at least 35 percent of total costs of the NED Plan;

b. Shall not use funds from other federal programs, including any non-federal contribution required as a matching share therefore, to meet any of the non-federal obligations for the project, unless the Federal agency providing the funds verifies in writing that such funds are authorized to be used to carry out the project;

c. Not less than once each year, inform affected interests of the extent of protection afforded by the flood risk management features;

d. Agree to participate in and comply with applicable federal flood plain management and flood insurance programs;

e. Comply with Section 402 of WRDA 1986, as amended (33 U.S.C. 701b-12), which requires a non-federal interest to prepare a flood plain management plan within one year after the date of signing

a project partnership agreement, and to implement such plan not later than one year after completion of construction of the project;

f. Publicize flood plain information in the area concerned and provide this information to zoning and other regulatory agencies for their use in adopting regulations, or taking other actions, to prevent unwise future development and to ensure compatibility with protection levels provided by the flood risk management features;

g. Prevent obstructions or encroachments on the project (including prescribing and enforcing regulations to prevent such obstructions or encroachments) such as any new developments on project lands, easements, and rights-of-way or the addition of facilities which might reduce the level of flood risk management the project affords, hinder operation and maintenance of the project, or interfere with the project's proper function;

h. Comply with all applicable provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, Public Law 91-646, as amended (42 U.S.C. 4601-4655), and the Uniform Regulations contained in 49 CFR Part 24, in acquiring lands, easements, and rights-of-way required for construction, operation, and maintenance of the project, including those necessary for relocations, the borrowing of materials, or the disposal of dredged or excavated material; and inform all affected persons of applicable benefits, policies, and procedures in connection with said Act;

i. For so long as the project remains authorized, OMRR&R of the project, or functional portions of the project, including any mitigation features, at no cost to the federal government, in a manner compatible with the project's authorized purposes and in accordance with applicable federal and state laws and regulations and any specific directions prescribed by the federal government;

j. Give the federal government a right to enter, at reasonable times and in a reasonable manner, upon property that the non-federal sponsor owns or controls for access to the project for the purpose of completing, inspecting, operating, maintaining, repairing, rehabilitating, or replacing the project;

k. Hold and save the United States free from all damages arising from the construction, OMRR&R of the project and any betterments, except for damages due to the fault or negligence of the United States or its contractors;

l. Keep and maintain books, records, documents, or other evidence pertaining to costs and expenses incurred pursuant to the project, for a minimum of 3 years after completion of the accounting for which such books, records, documents, or other evidence are required, to the extent and in such detail as will properly reflect total project costs, and in accordance with the standards for financial management systems set forth in the Uniform Administrative Requirements for Grants and Cooperative Agreements to State and Local Governments at 32 Code of Federal Regulations (CFR) Section 33.20;

m. Comply with all applicable federal and state laws and regulations, including, but not limited to Section 601 of the Civil Rights Act of 1964, Public Law 88-352 (42 U.S.C. 2000d) and Department of Defense Directive 5500.11 issued pursuant thereto; Army Regulation 600-7, entitled "Nondiscrimination on the Basis of Handicap in Programs and Activities Assisted or Conducted by the Department of the Army"; and all applicable federal labor standards requirements including, but not limited to, 40 U.S.C. 3141-3148 and 40 U.S.C. 3701-3708 (revising, codifying and enacting without substantial change the provisions of the Davis-Bacon Act (formerly 40 U.S.C. 276a et seq.), the Contract Work Hours and Safety Standards Act (formerly 40 U.S.C. 327 et seq.), and the Copeland Anti-Kickback Act (formerly 40 U.S.C. 276c et seq.);

n. Perform, or ensure performance of, any investigations for hazardous substances that are determined necessary to identify the existence and extent of any hazardous substances regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Public Law 96-510, as amended (42 U.S.C. 9601-9675), that may exist in, on, or under lands, easements, or rights-of-way that the federal government determines to be required for construction, operation, and maintenance of the project. However, for lands that the federal government determines to be subject to the navigation servitude, only the federal government shall perform such investigations unless the federal government provides the non-federal sponsor with prior specific written direction, in which case the non-federal sponsor shall perform such investigations in accordance with such written direction;

o. Assume, as between the federal government and the non-federal sponsor, complete financial responsibility for all necessary cleanup and response costs of any hazardous substances regulated under CERCLA that are located in, on, or under lands, easements, or rights-of-way that the federal government determines to be required for construction, operation, and maintenance of the project;

p. Agree, as between the federal government and the non-federal sponsor, that the non-federal sponsor shall be considered the operator of the project for the purpose of CERCLA liability, and to the maximum extent practicable, OMRR&R of the project in a manner that will not cause liability to arise under CERCLA; and

q. Comply with Section 221 of Public Law 91-611, Flood Control Act of 1970, as amended (42 U.S.C. 1962d-5b), and Section 103G) of the WRDA 1986, Public Law 99-662, as amended (33 U.S.C. 2213G), which provides that the Secretary of the Army shall not commence the construction of any water resources project or separable element thereof, until each non-federal interest has entered into a written agreement to furnish its required cooperation for the project or separable element.

The recommendations contained herein reflect the information available at this time and current departmental policies governing the formulation of individual projects. They do not reflect program and budgeting priorities inherent in the formulation of the national civil works construction program or the perspective of higher levels within the executive branch.

A handwritten signature in black ink, appearing to read 'E. Marshall', with a stylized, cursive script.

ERIC MARSHALL

Lieutenant Colonel, Corps of Engineers
District Commander

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FINDING OF NO SIGNIFICANT IMPACT

WAIAKEA-PALAI STREAMS HILO, ISLAND OF HAWAII, HAWAII

The U.S. Army Corps of Engineers, Honolulu District (Corps) has conducted an environmental analysis in accordance with the National Environmental Policy Act of 1969, as amended. The final Integrated Feasibility Report and Environmental Assessment (IFR/EA) dated 17 June 2021, for the Waiakea-Palai Streams addresses Flood Risk Management opportunities and feasibility in Hilo, Island of Hawaii, Hawaii.

The Final IFR/EA, incorporated herein by reference, evaluated various alternatives that would reduce flood risk in the study area. The recommended plan includes:

- The construction of a detention basin on property located to the north of the New Hope Church and adjacent to the right bank of Kupulau Ditch (located east of the confluence of Kupulau Ditch and Waiakea Stream);
- The construction of a series of three levees and one floodwall to enclose the Kupulau Ditch detention basin;
- The construction of a detention basin at the Hilo Municipal Golf Course with a maximum height of 22 feet from the channel bottom;
- and construction of a ten foot tall in-channel barrier with an uncontrolled outlet consisting of three four foot diameter aluminized steel pipes on the north (average height of 2.4 feet) and south (average height of 2.1 feet) sides of the Palai Stream at the Hilo Municipal Golf Course detention basin;

In addition to a “no action” plan, four alternatives were evaluated. The alternatives included the detention basin at the Kupulau Ditch, the detention basin the Hilo Municipal Golf Course, the diversion channel at Palai Stream and Four Mile Creek, and the combination of all three features.

For all alternatives, the potential effects were evaluated, as appropriate. A summary assessment of the potential effects of the recommended plan are listed in Table 1:

Table 1: Summary of Potential Effects of the Recommended Plan

| | Insignificant effects | Insignificant effects as a result of mitigation* | Resource unaffected by action |
|--|-------------------------------------|--|-------------------------------------|
| Aesthetics | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Air quality | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Aquatic resources/wetlands | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| Invasive species | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Fish and wildlife habitat | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Threatened/Endangered species/critical habitat | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| Historic properties | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| Other cultural resources | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| Floodplains | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Hazardous, toxic & radioactive waste | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| Hydrology | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Land use | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Navigation | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| Noise levels | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Public infrastructure | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| Socio-economics | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| Environmental justice | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| Soils | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| Tribal trust resources | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| Water quality | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| Climate change | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |

All practicable and appropriate means to avoid or minimize adverse environmental effects were analyzed and incorporated into the recommended plan. Best management practices (BMPs) as detailed in the IFR/EA will be implemented, if appropriate, to minimize impacts. BMP's would include, but not be limited to, the installation of silt fence to minimize erosion and sedimentation and minimizing areas of disturbance to the extent practicable.

No compensatory mitigation is required as part of the recommended plan.

Public review of the draft IFR/EA and FONSI was completed on 3 July 2019. All comments submitted during the public review period were responded to in the Final IFR/EA and FONSI.

Pursuant to Section 7 of the Endangered Species Act of 1973, as amended, the U.S. Army Corps of Engineers determined that the recommended plan may affect, but is not likely to adversely effect federally listed species and that the action area is absent of designated critical habitat.

Pursuant to Section 106 of the National Historic Preservation Act of 1966, as amended, the U.S. Army Corps of Engineers determined that the recommended plan has no effect on historic properties.

Pursuant to the Clean Water Act of 1972, as amended, the U.S. Army Corps of Engineers determined the recommended plan will not result in the discharge of dredged or fill material into waters of the United States. Any regulated discharges proposed in the pre-construction engineering and design phase necessary to achieve the recommended plan will comply with the CWA.

CLEAN WATER ACT SECTION 401 COMPLIANCE:

401 WQC TO BE OBTAINED IN THE DESIGN PHASE:

A water quality certification pursuant to section 401 of the Clean Water Act will be obtained from the Hawaii Department of Health, Clean Water Branch (CWB) prior to construction, if applicable. The Corps determined, in coordination with the CWB, that there is not sufficient information available during the current feasibility phase of the project to meet the minimum requirements to complete the application for a water quality certification (WQC). By letter dated December 14, 2020, the CWB confirmed the Corps' coordination of the study with the CWB, preliminarily determined it has no issue with the Corps furthering design and confirmed the Corps' plan to apply for and obtain a water quality certification during the pre-construction engineering and design phase. All conditions of the water quality certification will be implemented during construction to minimize adverse impacts to water quality.

COASTAL ZONE MANAGEMENT ACT

CZMA CONSISTENCY CONDITIONAL CONCURRENCE OBTAINED:

A determination of consistency with the Hawaii Coastal Zone Management program pursuant to the Coastal Zone Management Act of 1972 was obtained from the Hawaii Coastal Zone Management Office by letter dated September 14, 2020, including conditions necessary to be implemented in the design phase to ensure consistency. The Corps has developed the Recommended Plan to be compatible and consistent with the policies and objectives of the State's CZM program. All conditions of the consistency determination shall be implemented as stated in the State's conditional concurrence in order to minimize adverse impacts to the coastal zone.

All applicable environmental laws have been considered and coordination with appropriate agencies and officials has been completed.

Technical, environmental, economic, and cost effectiveness criteria used in the formulation of alternative plans were those specified in the Water Resources Council's 1983 Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies. All applicable laws, executive orders, regulations, and local government plans were considered in evaluation of alternatives. Based on this report, the reviews by other Federal, State and local agencies, input of the public, and the review by my staff, it is my determination that the recommended plan would not cause significant adverse effects on the quality of the human environment; therefore, preparation of an Environmental Impact Statement is not required.

17 JUN 21

Date



ERIC MARSHALL

Lieutenant Colonel, Corps of Engineers
District Commander