DEPARTMENT OF THE ARMY
PACIFIC OCEAN DIVISION, U.S. ARMY CORPS OF ENGINEERS
FORT SHAFTER, HAWAII 96858-5440

REPLY TO
ATTENTION OF

CEPOD-PDC

14 MAY 2013

MEMORANDUM FOR COMMANDER HONOLULU ENGINEER DISTRICT (CEPOH-PP-C/ATHLINE CLARK), BUILDING 230, FORT SHAFTER, HI 96858-5440

SUBJECT: Review Plan Approval for the Ala Wai Canal (a.k.a Ala Wai Watershed) Project, Island of Oahu, Hawaii, Feasibility Report

1. References:

a. Engineering Circular 1165-2-214, Civil Works Review, 15 December 2012.

b. Review Plan for the Ala Wai Canal (a.k.a. Ala Wai Watershed) Project, Island of Oahu, Hawaii, Feasibility Report, Honolulu District, U.S. Army Corps of Engineers.

2. IAW reference 1.a., the Review Plan (reference 1.b.) was coordinated with the Flood Risk Management Planning Center of Expertise (FRM-PCX) in the South Pacific Division, which is the lead office to execute this Review Plan. For further information, contact the FRM-PCX at 415-503-6852. This Review Plan includes Type I Independent External Peer Review.

3. I approve this Review Plan. It is subject to change as circumstances require, consistent with project development under the Project Management Business Process. Subsequent significant revisions to this Review Plan or its execution will require new written approval from this office.

4. POC for this memorandum is Mr. Russell Iwamura, Senior Economist, Civil Works Integration Division, 808-835-4625, or email, Russell.K.Iwamura@usace.army.mil.

Encl

GREGORY J. GUNTER
Colonel, EN
Acting Commander

REVIEW PLAN

ALA WAI CANAL (A.K.A. ALA WAI WATERSHED) PROJECT
ISLAND OF OAHU, HAWAII
FEASIBILITY REPORT

U.S. Army Corps of Engineers, Honolulu District

MSC Approval Date: 14 May 2013
Last Revision Date: 3 March 2013

US Army Corps of Engineers ®

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REVIEW PLAN

ALA WAI WATERSHED PROJECT
ISLAND OF OAHU, HAWAII
FEASIBILITY REPORT

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1. PURPOSE AND REQUIREMENTS

a. Purpose. This Review Plan defines the scope and level of peer review for the feasilbity report and Environmental Impact Statement (EIS) for the Ala Wai Watershed Project, Island of Oahu, Hawaii.

This Review Plan was developed using the National Planning Center of Expertise (PCX) Review Plan template dated 15 June 2011. The Review Plan was originally approved by Pacific Ocean Division (POD), U.S. Army Corps of Engineers (USACE), on 22 March 2010. The Review Plan is being updated to reflect changes in scope and schedule as a result of the Civil Works re-scoping charette held on 16-19 October 2012 and consistency with the USACE SMART[1] Planning Guidance.

b. References.

(1) Engineer Circular (EC) 1165-2-214, Civil Works Review, 15 December 2012.

(2) EC 1105-2-412, Assuring Quality of Planning Models, 31 March 2011.

(3) Engineer Regulation (ER) 1110-1-12, Quality Management, 30 September 2006.

(4) ER 1105-2-100, Planning Guidance Notebook, Appendix H, Policy Compliance Review and Approval of Decision Documents, Amendment #1, 20 November 2007.

(5) Ala Wai Watershed Project Management Plan (PMP), 2 November 2012.

(6) USACE POD Quality Management Plan, December 2010.

(7) USACE Honolulu District (POH) Civil Works Review Policy (ISO CEPOH-C_12203), 1 November 2010.

c. Requirements. This Review Plan was developed in accordance with EC 1165-2-214, which establishes an accountable, comprehensive, life-cycle review strategy for Civil Works products by providing a seamless process for review of all Civil Works projects from initial planning through design, construction, and Operation, Maintenance, Repair, Replacement, and Rehabilitation (OMRR&R). The EC outlines four general levels of review: District Quality Control/Quality Assurance (DQC), Agency Technical Review (ATR), Independent External Peer Review (IEPR), and Policy and Legal Compliance Review. In addition to these levels of review, decision documents are subject to cost engineering review and certification (per EC 1165-2-214), and planning model certification/approval (per EC 1105-2-412) and the Value Management Plan requirements in the Project Management Business Process Reference 8023G and ER 11-1-321, Change 1.

[1] Specific, Measurable, Attainable, Risk-Informed, and Timely

2. REVIEW MANAGEMENT ORGANIZATION (RMO) COORDINATION

The RMO is responsible for managing the overall peer review effort described in this Review Plan. The RMO for decision documents is typically either a Planning Center of Expertise (PCX) or the Risk Management Center (RMC), depending on the primary purpose of the decision document. The RMO for the peer review effort described in this Review Plan is the Flood Risk Management (FRM) PCX.

The FRM-PCX will coordinate with the Cost Engineering Mandatory Center of Expertise (MCX) to ensure the appropriate expertise is included on the review teams to assess the adequacy of cost estimates, construction schedules and contingencies. The FRM-PCX will coordinate with the Ecosystem Restoration (ECO) PCX as appropriate to ensure compliance with mitigation, if needed, as well as National Environmental Policy Act (NEPA) compliance. The FRM-PCX will also coordinate with the RMC as appropriate to review potential life safety issues associated with the plan formulation.

3. STUDY INFORMATION

a. Authority. The Ala Wai Watershed Project is a specifically authorized multiple purpose project being investigated under Section 209 of the Rivers and Harbors Act of 1962 (Public Law 87-874). Section 209 is a general authority that authorizes surveys in harbors and rivers in Hawaii "with a view to determining the advisability of improvements in the interest of navigation, flood control, hydroelectric power development, water supply, and other beneficial water uses, and related land resources."

b. Decision Document. The project is currently in the feasibility phase, resulting in a feasibility report and EIS that will be the basis for a Chief of Engineers Report. If the feasibility report results in a positive determination recommending implementation of a preferred alternative, Congressional authorization will be needed before the project may proceed to construction.

c. Project Sponsor. The non-federal sponsor for this project is the State of Hawaii, as represented by the Department of Land and Natural Resources (DLNR). Through a separate Memorandum of Agreement with DLNR, the City and County of Honolulu (C&C) is also providing cash and work-in-kind support to this project. The C&C is represented by the Department of Environmental Services (ENV) and Department of Design and Construction (DDC).

d. Study Location. The Ala Wai watershed is located on the southeastern side of the island of Oahu, Hawaii. The watershed is 19 square miles and encompasses three sub-watersheds of Maikiki, Manoa, and Palolo. There are three perennial streams and two canals in the watershed (See Figure 1).

e. Study Background. The study area is the most densely populated watershed in Hawaii with 160,000 residents. Within the urban footprint, the population density is one of the highest

in the nation with 12.36 persons per urbanized acre. Waikiki District, within the watershed, is the primary economic engine for the State providing 8% of the Gross State Product, 11% of the civilian jobs in the State, and 12% of the State and county tax revenue. Waikiki has over 72,000 visitors a day.

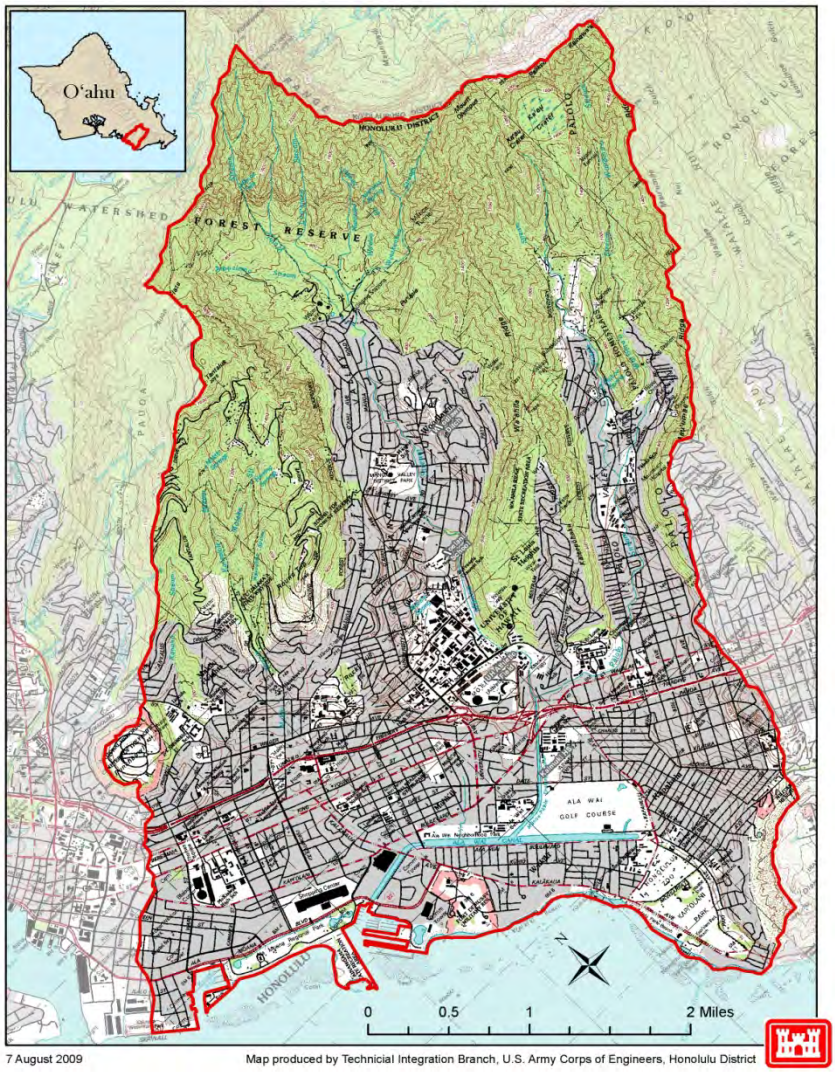

Figure 1: Ala Wai Watershed Study Area

The watershed includes three sub-watersheds. The upper watershed (7.5 square miles or 40% of the watershed) is zoned as Conservation District to protect the island's aquifer. Approximately 11 square miles of the middle and lower watershed is urbanized, supporting 1,600 businesses, 21 public schools, 17 private schools and two universities, including University of Hawaii at Manoa, the largest university in the State. Approximately 53 parks of varying sizes occur throughout the urbanized watershed. The parks provide for water-based activities, nature-based activities, sports activities, and interpretive activities. Off shore of Waikiki are two State designated Fisheries Management Areas (FMAs), a Marine Life Conservation District (MLCD)

and the Hawaiian Humpback Whale National Marine Sanctuary. The reconnaissance report for the Ala Wai Canal study was completed in August 1999 and approved by HQUSACE in September 1999. The Feasibility Study Cost Sharing Agreement was executed in April 2001, amended in December 2006 to expand the scope of the studies as a result of the October 2004 floods, and amended again in November 2012 based on re-scoping efforts associated with the Corps of Engineer's Planning Modernization Initiative. A final array of alternatives was approved by the Vertical Team on 6 February 2013.

f. Problems and Opportunities. Following are the problems identified for the project, which were agreed to by the USACE Vertical Team (POH, POD, FRM-PCX, ECO-PCX, and HQUSACE) at the October 2012 SMART Planning Charette.

(1) Flood Risk Problems.

- Hawaii streams are prone to flash floods with high velocity flows. Within the study area, rain often starts in the mountainous areas of the upper watershed with little precipitation in the lower elevations. The peak flow rate from mountains to sea is approximately 30 minutes. Storms typically last for 24 hours or less. With the sudden nature of the flood events and the associated high velocities, floods within the watershed threaten life safety and may result in significant damages. Rarely does the watershed experience long periods of standing water from a flood event. When heavy rains do occur over multiple days, standing flood waters do become a problem. Based on the USACE hydrology and hydraulic modeling, the majority of the peak flow is from the Manoa Stream, with Palolo Stream being the second highest contributor and Makiki Stream the third.

- In October 2004, a flash flood event occurred in the Manoa Stream that was estimated at a 4-5% annual chance of flood. The energy of the flood dislodged trees in the upper watershed and along stream banks that blocked bridges and transported cars from one stream bank to the other (See Figure 2). Approximately $80 million in damages was caused by this event.

Figure 2: October 2004 Flood, Debris Blockage and Car Damage at Woodlawn Bridge, Manoa Stream

- In March 2006, the Island of Oahu experienced 40 days of constant rainfall. None of the storm events were very large (typically a 10% annual chance of flood or less). However the constant rain resulted in standing water in the lower portion of the watershed in the Makiki and Moilili Neighborhoods (See Figure 3).

- Urbanization of the watershed has placed more people and properties at risk of flooding.

- Over 3,000 properties occur in the USACE modeled floodplain for 1% annual chance of flood, with estimated damages at $311 million. The USACE modeled floodplain shows a significantly larger area of flooding than the National Flood Insurance Program (NFIP) maps approved by the Federal Emergency Management Agency (FEMA). The NFIP maps were developed in the 1970s. The USACE model incorporates a larger area into the analysis and it is more accurate than the models used for the NFIP map, and incorporates impacts of increased urbanization since the 1970s.

Figure 3: Standing Water in the Maikiki Neighborhood as a result of March 2006 consistent rainfall

- Existing potential flooding creates a life safety risk for people in or passing through the watershed. As mentioned above, approximately 160,000 people live in the watershed and Waikiki supports approximately 72,000 visitors on a daily basis. The main highway, H1, is the primary corridor connecting eastern Oahu with the downtown Honolulu and Pearl Harbor areas, two of the primary employment locations. Because of measures the State of Hawaii, Department of Transportation has put in place for the highway management, the USACE models do not show flooding of the highway. However, the surface streets and alternative routes are likely to flood in large events.

- Increased impervious surface in the urbanized watershed and invasive species dominated forests in the conservation area have resulted in decreased infiltration and increasing peak flows downstream.

- The anticipated majority of the economic damages are in the Diamondhead (eastern) end of Waikiki.

- Historic alterations to the stream channels do not adequately manage flood risk.

- Since the early 1900s, varying alterations of the stream channels and drainages have occurred with inconsistent project designs. Some bridges are designed for the 5% annual chance of flood, while other bridges or channels are designed for the 10% annual chance of flood. These alterations have resulted in non-systematic or inadequate stream channels to hold flood waters and in some cases, created blockages or constraints that have exacerbated flooding in other areas.

- Many of the alterations are at the end of the design life. This aging FRM infrastructure may not be functional in 2070 (the design life for the Ala Wai Watershed project).

- Similarly the storm drainage system managed by the C&C is also aging and in many cases inadequately sized for the present day development and runoff. The storm drainage system does not adequately convey the water off the landscape and through the stream channels, increasing sheet flow flooding within the watershed. Based on the identification of this problem within the study, the C&C is developing plans and projects to address the storm drainage issue.

- Stream channel capacities are decreased due to debris and sediment.

- Historically the upper watershed was dominated by a native forest that was well adapted to the tropical flash flood systems in the watershed. The trees had strong, stable roots to withstand high water and wind velocities and secure sediment. The understory was thick, helping to stabilize soil. The canopy structure was complex to capture rainfall, absorbing and slowing the energy before it hit the surface. Today the upper watershed is dominated by invasive tree species with shallow root systems, limited understory cover, and simple canopy that does not slow the rainfall. The results is during large storm events, the upper watershed contributes a high amount of large woody debris and sediment above natural background levels that decrease channel capacities, block bridges and exacerbate flooding.

- In addition to the debris on the upper watershed, debris from adjacent stream properties also contributes to the project. On the island of Oahu, adjacent land owners own property to the center line of the stream and are responsible for maintaining the stream. There are over 1,000 property owners of the stream channels in the study area. The C&C has easements to maintain the stream when there is an imminent threat of flood, or as clean up response to a flood event. Regular maintenance is limited to the properties and bridges owned by the C&C. There is no regular comprehensive maintenance program for the entire stream system within the watershed. As shown in Figure 2, the debris in the October 2004 event included large woody debris and urban debris.

- Flooding may be exacerbated by climate change and associated projected increases in sea level rise.

- In the last 30 years, Hawaii has seen 1% daily rainfall events increase by 12%. Global Climate Change models project that this trend will continue or increase further.

- The island of Oahu is already experiencing impacts for the increased sea level rise. The Waikiki area has experienced an increase in flooding and inundation of underground parking areas and outfalls associated with high tide events. Downscaled Global Climate Change models for the area from Diamondhead to Pearl Harbor, including Waikiki, anticipate a 1-meter increase in sea level rise by 2100.

- Hurricanes and tsunamis cause flood damage in the lower areas.

- Hurricane Iwa in 1982 and Hurricane Iniki in 1992 resulted in road closures, flooding of belowground garages and the first level of Waikiki hotels.

- Specific coastal storm protection is not addressed in scope of study but is being addressed through other Federal, State, and C&C programs and projects. This information is being incorporated by reference into the study.

(2) Ecosystem Restoration Problems. As a result of the Ala Wai Watershed Project Re-scoping charette, the PDT and non-Federal Sponsors revisited the ecosystem restoration objective to determine whether there was a viable National Ecosystem Restoration (NER) Plan for this study. Based on the recommendations from POH, the Vertical Team concurred with the removal of ecosystem restoration as a study objective at the Alternatives Milestone in February 2013. To address Sponsor and public concerns to ensure that impacts to stream habitat are avoided and minimized to the full extent practicable, all flood risk management measures will be designed as innovative, environmentally sound solutions to meet existing laws, USACE regulations and policies such as the Environmental Operating Principles (EOP). Therefore the following problems will still be considered.

- Endemic goby fish (oopu), shrimp (opae) and mollusk species (hapawai and hihiwai) are identified as a species of greatest conservation needed by the State of Hawaii. These endemic aquatic species are significantly impaired, due to impaired physical, biological and chemical functions of stream habitat.

- Oopu and opae have been documented in limited numbers throughout the Manoa stream. Hapawai and hihiwai have been found in the Manoa-Palolo canal.

- Approximately ¼ mile of Makiki Stream is underground. The oopu have difficulty passing through this reach. Oopu and opae have been found below the reach. A single oopu was collected above this reach in 2006.

- Palolo Stream is fully lined throughout the urbanized footprint. The oopu can only access the upper watershed during high flow conditions. Habitat for the opae is now restricted to the upper watershed. Invasive grass shrimp have displaced much of the opae population.

- There are no federally listed species under the Endangered Species Act (ESA) in the study area streams. However, there are a total of nine federally listed species in the upper watershed – including seven plant species and designated critical habitat, one forest bird, and a forest snail. There are four federally listed marine species in the study area with the green sea turtle most commonly observed in Waikiki. Some federally listed waterfowl may be seen in the study area during the wet season, but do not regularly nest in the area.

- Urbanization of the watershed has resulted in the loss of approximately 2,000 acres of wetlands in the lower watershed, resulting in a loss of floodplain water storage and habitat for federally listed waterfowl.

- Historically Waikiki, the lower watershed and most of Manoa valley was dominated by wetlands and taro beds. The Ala Wai Canal was built in the 1920s to drain the wetlands and create buildable land. By the 1950s, almost all of the wetlands in the watershed had been filled or drained. A couple of small pockets of wetlands less than 1 acre in size occur in the Manoa and Palolo valleys. These areas are currently used for demonstration taro beds by the University of Hawaii and Native Hawaiian organizations. A large bog wetland occurs at the headwaters of Paolo Stream, high in the Koolau Mountains.

- All canals and streams are listed as impaired under Clean Water Act (CWA) 303(d) for trash, pesticides and nutrients negatively impacting endemic aquatic species habitat.

- Urbanization has resulted in modified hydrology (decreased low and base flow conditions and increased quantity during high flows), loss of riparian habitat, and loss of adjacent floodplain.

- Little to no riparian area of adjacent floodplain occurs in the study area.

- Alterations to stream channels have resulted in degraded migratory pathways (no low flow channels), unnaturally high water conditions (concrete channels with no riparian habitat), and degraded channel form.

- Lack of infrastructure maintenance or poor management of adjacent land has resulted in channel bank instability, erosion and accumulation of trash, ultimately reducing water quality functions for native species and habitats.

- Increased prevalence of invasive terrestrial species, such as feral pigs, has significantly modified the terrestrial and riparian habitat and subsequently the stream habitat.

- The feral pigs uproot and remove native plant species, allowing for invasive plant species to populate. The invasive plant species, such as strawberry guava and acacia trees, alter the riparian habitat and food web, critical to endemic aquatic species. The pigs' rooting and burrowing activities increase sediment and erosion, impairing the water quality of the stream for endemic aquatic species.

- Little to no native forest occurs in the upper watershed, including the riparian areas.

- Land based pollution throughout the watershed and overuse of nearshore habitat has resulted in degradation of coral reef habitat.

- The study does not have a priority focus on improving coral reefs, but intends that by improving stream habitat, there would be an indirect minimization of impacts to coral reefs.

g. Study Goal and Objectives. The following are the study goals and objectives that were agreed to by the USACE Vertical Team at the October 2012 re-scoping charette and modified based on additional input received from the USACE Vertical Team at the 6 February 2013 In-Progress Review (IPR).

Study Goal**.** The goal of the Ala Wai Watershed Project is to improve the overall quality of the Ala Wai watershed, from the crest of the Koolau Mountains to the nearshore waters, with a focus on reducing flood hazards and restoring aquatic ecosystem function.

Study Objectives**.** This is a single purpose FRM project. Incremental opportunities for ecosystem restoration will be considered in reaches throughout the watershed to improve the overall stream function, as appropriate. As mentioned above, as a result of the Ala Wai Watershed Project Re-scoping charette, the PDT and non-Federal Sponsors revisited the ecosystem restoration objective and confirmed there is a NOT viable NER Plan for this study. This decision was confirmed at the Alternatives Milestone IPR.

*FRM Objective***:** Reduce riverine flood hazards to property and life safety in the Ala Wai watershed, including:

- Improving water conveyance;

- Using environmentally sustainable designs for FRM features, where practicable; and,

- Integrating non-structural approaches, where practicable**.**

h. Alternatives: The following are the final array of alternatives for this project. All alternatives include modifying the existing flood warning system to be more specific to the Ala Wai watershed.

- Alternative 1 – Manoa Flood Storage Reservoir: It includes a wet/dry reservoir at the upper watershed of Manoa; debris catchment in upper Palolo watershed; floodwalls at the Palolo stream levees near Palolo School; floodwalls on Makiki Stream near Jack-in-the-Box; raising of McCully Bridge and improvements at the opening of Ala Wai Canal.

- Alternative 2 – Detention Basins. This includes debris catchment in the upper watershed of Manoa, multi-purpose detention basins at Manoa District Park, Kanewai Field, and

University of Hawaii Athletic Field; detention basin below Woodlawn Cemetery and instream debris catchment throughout Manoa Stream. There would be floodproofing of homes above Manoa District Park. Detention basins would be installed in the upper watershed of Palolo. The existing Board of Water Supply detention basin in Makiki would be cleaned out, and an additional basin added at Roosevelt High School. The Ala Wai Golf Course would be modified into a multipurpose detention basin. Some low levees/berms would be placed along the Ala Wai Canal.

- Alternative 3 – Small Dry Reservoirs/Detention Basins. This alternative focuses on minimizing measures that are not well accepted by the residents of Ala Wai. This would include two small dry reservoirs in the upper Manoa watershed, in-stream debris catchment throughout the Manoa Stream, and a detention basin below Woodlawn Cemetery. Two detention basins would be installed in the upper Palolo watershed. The existing Board of Water Supply detention basin in Makiki would be cleaned out and an additional basin added at Roosevelt High School. The Ala Wai Golf Course would be modified into a multipurpose detention basin. Some low levees/berms would be placed along the Ala Wai Canal.

- Alternative 4 – Lower Makiki/Ala Wai Focus. This alterantive focuses on maximizing measures in the area that experiences the greatest amount of flood damage – lower Maikiki and Ala Wai/Waikiki neighborhoods. This includes two small dry reservoirs in the upper Manoa watershed, two debris catchments in the upper Palolo watershed, raising the levees at the Palolo School, placing floodwalls along Makiki Stream from Jack-in-the-Box, down to the Ala Wai Canal, constructing low levees/floodwalls around the Ala Wai Neighborhood Park and Ala Wai Golf Course on the mountain side of the canal and low levees/floodwalls along the ocean side of the canal. The McCully Bridge would be modified for increased capacity, along with the opening of the Ala Wai Canal. Flood proofing would occur for residents near Hausten ditch and directly adjacent to the ocean side of the Ala Wai Canal.

- Alternative 5 – Non-structural. A non-structural alternative was developed to address non-structural measures by depth and within each sub-watershed, based on the primary structures impacted.

i. Estimated Construction Cost: Estimated construction cost for this project is between $60-$100 million. Construction will likely be phased, based on available federal and non-federal funds.

j. Factors Affecting the Scope and Level of Review. The following is an assessment of the factors affecting the scope and level of review as outlined in EC 1165-2-214.

- The estimated cost of construction is over $45 million.

- An EIS is necessary to comply with the NEPA.

- Some of the measures being proposed are likely to be challenging because measures such as multi-purpose detention basins, have not been implemented in Hawaii. Adjusting these

measures to the constrained space and flashy conditions of the watershed will be technically challenging. The community and sponsors will have institutional and social challenges with the multipurpose aspect of these measures, balancing recreational services with public safety.

- Because the watershed is heavily urbanized, there are likely to be project risks associated with the proximity of residents and businesses to the FRM measures.

- The project likely involves significant threat to human life/safety assurance because of the proximity of people to the FRM measures with the heavily urbanized setting. Mr. Todd Barnes, POH Chief of Engineering and Construction Division concurs with the current assessment of potential life safety issues. During plan formulation, the Project Delivery Team (PDT) will work to minimize safety issues to the full extent practicable.

- In general, the public has been supportive of the project to date. However, there is a potential for significant public dispute if large wet/dry reservoirs are proposed as part of the Tentatively Selected Plan (TSP). There may also be public dispute over the multi-purpose detention basins depending on the impacts to recreational services.

- The methods under consideration have been used frequently in the continental U.S., however, these methods are novel and innovative to Hawaii and will need to be adjusted to meet the physical constraints within the watershed and the extremely flashy nature of tropical island systems.

- The project design may require redundancy, resiliency, and/or robustness, unique construction sequencing, or a reduced or overlapping design construction schedule based on the potential life safety issues within the watershed.

- The Federal action may be justified by life safety issues and will require a Safety Assurance Review (SAR).

- The project may involve the use of innovative materials or techniques where engineering is based on novel methods, present complex challenges for interpretations, contain precedent-setting methods or models, or present conclusions that are likely to change prevailing practices. Some of the measures may be novel to Hawaii, however, may be ruled out before the selection of the final plan.

- There has been no request nor is there expected to be a request by the Governor of the State of Hawaii for peer review by independent experts.

- The study is not likely to involve significant public dispute as to the economic or environmental cost or benefit of the project. The area has experienced significant damages from flooding in the recent past.

- The study is not likely to contain influential scientific information or be highly influential in its scientific assessment.

- There has been no request, nor expected to have a request for IEPR by a head of a Federal or state agency.

k. In-Kind Contributions. Products and analyses provided by non-Federal sponsors as work-in-kind services are subject to DQC, ATR, and IEPR. The in-kind products and analyses to be provided by the non-Federal sponsor are detailed in the Project Management Plan for the study. All these products will be subject to DQC, ATR, and IEPR as part of the feasibility study and EIS.

4. DISTRICT QUALITY CONTROL (DQC)

All decision documents (including supporting data, analyses, environmental compliance documents, etc.) shall undergo DQC. DQC is an internal review process of basic science and engineering work products focused on fulfilling the project quality requirements defined in the PMP. POH shall manage the DQC process. Documentation of DQC activities is required and should be in accordance with POH and POD Quality Manuals.

a. Documentation of DQC. Consistent with the POH Quality Manual, DQC will be documented using the POH DQC review table. When all comments have been addressed and back checked, the DQC lead will sign a DQC certification in compliance with the POH Quality Manual. The DQC comments and responses will be provided for the ATR team at each review.

b. Products to Undergo DQC. The following products will be subject to DQC:

- The Draft Feasiblity Report/EIS;
- The Final Feasiblity Report/EIS;
- The Draft and Final Record of Decision; and,
- All supporting technical reports.

c. Required DQC Expertise. The following expertis is needed for DQC.

Table 1: DQC Required Expertise

DQC Team Members/Disciplines	Expertise Required
DQC Lead	The DQC lead should be a senior professional with experience in preparing Civil Works decision documents and conducting DQC. The lead should also have the necessary skills and experience to lead a team through the DQC process. The DQC lead may also serve as a reviewer for a specific discipline (such as planning, economics, environmental resources, etc).

DQC Team Members/Disciplines	Expertise Required
Planning	The Planning reviewer should be a senior water resources planner with experience in FRM projects in urban settings. The planning reviewer should have experience with FRM planning and decision analysis methodologies and processes.
Economics	The Economics reviewer should be a senior economist with experience in FRM project, development of the National Economic Development (NED) plan, and trade-off analysis.
Environmental Resources	The Environmental Resources reviewer should be a senior environmental specialist with experience in complex FRM projects in urban settings. The reviewer should have experience with the following regulatory authorities: NEPA – specifically EIS compliance, CWA Section 404(b)(1) analysis, Fish and Wildlife Coordination Act (FWCA), and compliance with Executive Order (EO) 11988 for flood plain management. There are no species listed under the Endangered Species Act (ESA) in the footprint of the alternatives. However there may be indirect impacts to listed species downstream of the study area. It is expected that the alternatives are not likely to adversely affect any federally listed species. Familiarity with tropical systems is also required. The environmental reviewer should also be familiar with State of Hawaii environmental compliance requirements.
Ecosystem Restoration Output Models	Reviewer must have experience in Habitat Equivalency Protocol (HEP) or requirements (if any) for compensatory mitigation.
Cultural Resources	The Cultural Resources reviewer should be experienced with National Historic Preservation Act (NHPA) consultation especially for historic structures. The cultural resources reviewer should be familiar with the archaeology and history of Hawaii and State of Hawaii cultural resource requirements.
Hydrology and Hydraulic Engineer	The Hydrology and Hydraulics Engineering reviewer will be an expert in the field of hydraulics and have experience with flash-flood systems in urbanized watersheds. The reviewer should be familiar with application of detention/retention basins, application of flood walls, non-structural solutions involving flood warning systems and flood proofing, etc and/or computer modeling techniques that will be used such as HEC-RAS, or Hydraulics and HEC-HMS. The reviewer should be familiar with EO 11988 Floodplain Management.
Geotechnical Engineering	The Geotechnical Engineering reviewer should have an extensive experience in geotechnical evaluation of FRM

DQC Team Members/Disciplines	Expertise Required
	structures such as static and dynamic slope stability evaluation, evaluation of the seepage through the foundation of the FRM structures, including detention basins, reservoirs, debris basins, floodwalls, in settlement evaluation of the structures, and design and analysis of shallow and deep foundations of structures, including major highway bridges.
Civil/Structural Engineering	The Civil/Structural Engineering reviewer should have an extensive experience in FRM structures, including debris basins, floodwalls, in settlement evaluation of the structures, and design and analysis of structures, including major highway bridges.
Cost Engineering	The Cost Engineering reviewer must be experienced in design requirements for standard FRM measures.
Real Estate	Reviewer must be experienced in civil works real estate laws, policies and guidance and experience working with sponsor real estate issues.

5. AGENCY TECHNICAL REVIEW (ATR)

ATR is mandatory for all decision documents (including supporting data, analyses, environmental compliance documents, etc.). The objective of ATR is to ensure consistency with established criteria, guidance, procedures, and policy. The ATR will assess whether the analyses presented are technically correct and comply with published USACE guidance, and that the document explains the analyses and results in a reasonably clear manner for the public and decision makers. ATR is managed within USACE by the FRM-PCX and is conducted by a qualified team from outside POH that is not involved in the day-to-day production of the project/product. ATR teams will be comprised of senior USACE personnel and may be supplemented by outside experts as appropriate. The ATR team lead will be from outside POD.

a. Products to Undergo ATR. An ATR was already completed for the Feasibility Scoping Meeting (FSM) report. In accordance with USACE SMART planning guidelines, ATR will be required on the draft reports. Unless significant comments are raised by the USACE Vertical Team during plan formulation, it is anticipated that ATR will not be needed on the final reports. The following additional products will be subject to ATR:

- Draft Feasiblity Report/EIS; and,
- All supporting technical information and analyses.

b. Required ATR Team Expertise. The following ATR expertise is required for this project. Because the project is small, where possible, ATR team members will address multiple disciplines and emphasis. The FRM-PCX, as the RMO, will identify the final make-up of the ATR team and identify the ATR team lead in coordination with the Project Manager (PM),

vertical team, and other appropriate centers of expertise. Once identified, the ATR team members for this study and a brief description of their credentials will be added in Attachment 1.

Table 2: ATR Required Expertise

ATR Team Members/Disciplines	Expertise Required
ATR Lead	The ATR lead should be a senior professional with extensive experience in preparing Civil Works decision documents and conducting an ATR. The lead should also have the necessary skills and experience to lead a virtual team through the ATR process. The ATR lead may also serve as a reviewer for a specific discipline (such as planning, economics, environmental resources, etc). The ATR lead must be outside of POD.
Planning	The Planning reviewer should be a senior water resources planner with experience in FRM and ecosystem restoration projects in urban settings. The planning reviewer should have experience with FRM planning decision analysis methodologies and processes.
Economics	The Economics reviewer should be a senior economist with experience in FRM projects, and trade-off analysis.
Environmental Resources	The Environmental Resources reviewer should be a senior environmental specialist with experience in complex FRM projects in urban settings. The reviewer should have experience with the following regulatory authorities: NEPA – specifically EIS compliance, CWA Section 404(b)(1) analysis, FWCA, and compliance with EO 11988 for flood plain management. Familiarity with tropical systems is also required.
Ecosystem Restoration Output Models	Reviewer must have experience in HEP site specific ecosystem restoration model to be used to determine requirements (if any) for compensatory mitigation.
Cultural Resources	The Cultural Resources reviewer should be experienced with NHPA consultation especially for historic structures. The cultural resources reviewer should be familiar with the archaeology and history of the Pacific Islands.
Hydrology and Hydraulic Engineer	The Hydrology and Hydraulics Engineering reviewer will be an expert in the field of hydraulics and have experience with flash-flood systems in urbanized watersheds. The reviewer should be familiar with application of detention/retention basins, application of flood walls, non-structural solutions involving flood warning systems and flood proofing, etc and/or computer modeling techniques that will be used such as HEC-RAS, or Hydraulics and HEC-HMS. The reviewer

ATR Team Members/Disciplines	Expertise Required
	should be familiar with EO 11988 Floodplain Management.
Flood Risk Analysis Expert	The flood risk analysis review should have extensive experience with multi-discipline flood risk analysis to ensure consistent and appropriate identification, analysis and written communication of risk and uncertainty. The flood risk analysis review may also serve as a reviewer for a specific discipline (for example, hydraulics or economics).
Geotechnical Engineering	The Geotechnical Engineering reviewer should have an extensive experience in geotechnical evaluation of FRM structures such as static and dynamic slope stability evaluation, evaluation of the seepage through the foundation of the FRM structures, including detention basins, reservoirs, debris basins, floodwalls, in settlement evaluation of the structures, and design and analysis of shallow and deep foundations of structures, including major highway bridges.
Civil/Structural Engineering	The Civil/Structural Engineering reviewer should have an extensive experience in FRM structures, including debris basins, floodwalls, in settlement evaluation of the structures, and design and analysis of structures, including major highway bridges.
Cost Engineering	The Cost Enginering reviewer must be experienced in design requirements for standard flood risk management measures.
Real Estate	Reviewer must be experienced in civil works real estate laws, policies and guidance and experience working with sponsor real estate issues.

c. Documentation of ATR. DrChecks[sm] review software will be used to document all ATR comments, responses and associated resolutions accomplished throughout the review process. Comments should be limited to those that are required to ensure adequacy of the product. The four key parts of a quality review comment will normally include:

- The review concern – identify the product's information deficiency or incorrect application of policy, guidance, or procedures;

- The basis for the concern – cite the appropriate law, policy, guidance, or procedure that has not been properly followed;

- The significance of the concern – indicate the importance of the concern with regard to its potential impact on the plan selection, recommended plan components, efficiency (cost), effectiveness (function/outputs), implementation responsibilities, safety, Federal interest, or public acceptability; and

- The probable specific action needed to resolve the concern – identify the action(s) that the reporting officers must take to resolve the concern.

In some situations where information is incomplete or unclear, comments may seek clarification in order to then assess whether further specific concerns may exist.

The ATR documentation in DrChecks[sm] will include the text of each ATR concern, the PDT response, a brief summary of the pertinent points in any discussion, including any vertical team coordination (the vertical team includes POH, FRM-PCX, ECO-PCX, POD, and HQUSACE), and the agreed upon resolution. If an ATR concern cannot be satisfactorily resolved between the ATR team and the PDT, it will be elevated to the vertical team for further resolution in accordance with the policy issue resolution process described in either ER 1110-1-12 or ER 1105-2-100, Appendix H, as appropriate. Unresolved concerns can be closed in DrChecks[sm] with a notation that the concern has been elevated to the vertical team for resolution.

At the conclusion of each ATR effort, the ATR team will prepare a Review Report summarizing the review. Review Reports will be considered an integral part of the ATR documentation and shall:

- Identify the document(s) reviewed and the purpose of the review;

- Disclose the names of the reviewers, their organizational affiliations, and include a short paragraph on both the credentials and relevant experiences of each reviewer;

- Include the charge to the reviewers;

- Describe the nature of their review and their findings and conclusions;

- Identify and summarize each unresolved issue (if any); and

- Include a verbatim copy of each reviewer's comments (either with or without specific attributions), or represent the views of the group as a whole, including any disparate and dissenting views.

ATR may be certified when all ATR concerns are either resolved or referred to the vertical team for resolution and the ATR documentation is complete. The ATR Lead will prepare a Statement of Technical Review, certifying that the issues raised by the ATR team have been resolved (or elevated to the vertical team). A Statement of Technical Review should be completed, based on work reviewed to date, for the draft report, and final report. A sample Statement of Technical Review is included in Attachment 2.

6. INDEPENDENT EXTERNAL PEER REVIEW (IEPR)

IEPR may be required for decision documents under certain circumstances. IEPR is the most independent level of review and is applied where the risk and magnitude of the proposed project

are such that a critical examination by a qualified team outside of USACE is warranted. A risk-informed decision, as described in EC 1165-2-214, is made to assess whether an IEPR is appropriate. IEPR panels will consist of independent, recognized experts from outside of the USACE in the appropriate disciplines. The IEPR panel will represent a balance of areas of expertise suitable for the review being conducted. There are two types of IEPR:

- Type I IEPR. Type I IEPR reviews are managed by an Outside Eligible Organization (OEO) external to USACE and are conducted on project studies. Type I IEPR panels assess the adequacy and acceptability of the economic and environmental assumptions and projections, project evaluation data, economic analysis, environmental analyses, engineering analyses, formulation of alternative plans, methods for integrating risk and uncertainty, models used in the evaluation of environmental impacts of proposed projects, and biological opinions of the project study. Type I IEPR will cover the entire decision document or action and will address all underlying engineering, economics, and environmental work, not just one aspect of the study. For decision documents where a Type II IEPR (Safety Assurance Review (SAR)) is anticipated during project implementation, safety assurance shall also be addressed during the Type I IEPR per EC 1165-2-214.

- Type II IEPR. Type II IEPR, or SAR, is managed by the RMC and is conducted on design and construction activities for hurricane, storm, and FRM projects or other projects where existing and potential hazards pose a significant threat to human life. Type II IEPR panels will conduct reviews of the design and construction activities prior to initiation of physical construction and, until construction activities are completed, periodically thereafter on a regular schedule. The reviews shall consider the adequacy, appropriateness, and acceptability of the design and construction activities in assuring public health safety and welfare.

a. Decision on IEPR. A Type I IEPR will be conducted for this study and will incorporate safety assurance for the review. Type II IEPR applies to design and construction only. As a feasibility study, Type II IEPR is not required at this phase. If the project is approved and is authorized for construction, Type II IEPR will be conducted as appropriate.

b. Products to Undergo Type I IEPR. The Draft Feasiblity Report/EIS.

c. Required Type I IEPR Panel Expertise. The following IEPR expertise is required for this project. Where possible, IEPR panel members will address multiple disciplines and emphasis. The FRM-PCX, as the RMO, will identify the final make-up of the IEPR team in coordination with the PM, vertical team, and other appropriate centers of expertise. The panel will include the necessary expertise to assess the engineering, environmental, and economic adequacy of the decision document as required by EC 1165-2-214, Appendix D. The IEPR panel members for this study and a brief description of their credentials will be included in Attachment 1, once they are identified.

Table 3: IEPR Required Expertise

IEPR Panel Members/Disciplines	Expertise Required
Economics	The Economics review should be produced by a senior economist with experience in FRM projects, NED analysis, and trade-off analysis.
Environmental - NEPA Compliance Expert and Tropical Stream Ecology	The Environmental panel member should have environmental regulatory expertise in NEPA, CWA, and FWCA. In addition, the environmental expert should be familiar with tropical stream ecology and changes in stream function and processes, due to implementation of FRM structures.
Engineering - Hydraulic Engineer AND Geotechnical/Structural/Civil Engineer	The Hydraulic Engineering reviewer should have expertise in FRM in flash-flood urbanized systems (preferably tropical systems). The Geotechnical engineering reviewer should have an extensive experience in geotechnical evaluation of FRM structures such as static and dynamic slope stability evaluation, evaluation of the seepage through the foundation of the FRM structures, including debris basins, floodwalls, and in settlement evaluation of the structures. The Civil/Structural reviewer should have extensive experience in reinforced concrete design /construction/evaluation of FRM structures (i.e., Concrete channels, floodwalls, levee embankments, etc.) and major highway bridges The Engineering reviewer will also address Type II IEPR/SAR related charge questions during the Type I IEPR review.

d. Documentation of Type I IEPR. The IEPR panel will be selected and managed by an OEO per EC 1165-2-214, Appendix D. Panel comments will be compiled by the OEO and should address the adequacy and acceptability of the economic, engineering and environmental methods, models, and analyses used. IEPR comments should generally include the same four key parts as described for ATR comments in Section 5.c. above. The OEO will prepare a final Review Report that will accompany the publication of the final decision document and shall:

- Disclose the names of the reviewers, their organizational affiliations, and include a short paragraph on their credentials and relevant experiences of each reviewer;

- Include the charge to the reviewers;

- Describe the nature of their review and their findings and conclusions; and

- Include a verbatim copy of each reviewer's comments (either with or without specific attributions), or represent the views of the group as a whole, including any disparate and dissenting views.

The final Review Report will be submitted by the OEO no later than 60 days following the close of the public comment period for the draft decision document. USACE shall consider all recommendations contained in the Review Report and prepare a written response for all recommendations adopted or not adopted. The final decision document will summarize the Review Report and USACE response. The Review Report and USACE response will be made available to the public, including through electronic means on the internet.

7. POLICY AND LEGAL COMPLIANCE REVIEW

All decision documents will be reviewed throughout the study process for their compliance with law and policy. Guidance for policy and legal compliance reviews are addressed in Appendix H, ER 1105-2-100. These reviews culminate in determinations that the recommendations in the reports and the supporting analyses and coordination comply with law and policy, and warrant approval or further recommendation to higher authority by the POD Commander. DQC and ATR augment and complement the policy review processes by addressing compliance with pertinent published Army policies, particularly policies on analytical methods and the presentation of findings in decision documents.

8. COST ENGINEERING MANDATORY CENTER OF EXPERTISE (MCX) REVIEW AND CERTIFICATION

All decision documents shall be coordinated with the Cost Engineering MCX, located in the Walla Walla District. The MCX will assist in determining the expertise needed on the ATR team and Type I IEPR team (if required) and in the development of the review charge(s). The MCX will also provide the Cost Engineering MCX certification. The FRM-PCX is responsible for coordination with the Cost Engineering MCX.

9. MODEL CERTIFICATION AND APPROVAL

a. Planning Models. EC 1105-2-412 mandates the use of certified or approved models for all planning activities to ensure the models are technically and theoretically sound, compliant with USACE policy, computationally accurate, and based on reasonable assumptions. Planning models, for the purposes of the EC, are defined as any models and analytical tools that planners use to define water resource management problems and opportunities to formulate potential alternatives to address the problems and take advantage of the opportunities, to evaluate potential effects of alternatives and to support decision making. The use of a certified/approved planning model does not constitute technical review of the planning product. The selection and

application of the model and the input and output data is still the responsibility of the users and is subject to DQC, ATR, and IEPR (if required).

In accordance with EC 1105-2-412 Paragraph 5.c., models that are single-use or study-specific require approval that the model is a technically and theoretically sound and functional tool that can be applied during the planning process by knowledgeable and trained staff for purposes consistent with the model's purpose and limitations. For this project, the PM will coordinate with the FRM-PCX and ECO-PCX in determining the appropriate level of review for model approval. At this time, an additional ATR reviewer has been added to specifically approve models for site specific use.

The following planning models are anticipated to be used in the development of the decision document:

Table 4: Planning Models

Model Name and Version	Brief Description of the Model and How It Will Be Applied in the Study	Certification /Approval Status
HEC-FDA 1.2.5 (Flood Damage Analysis)	The Hydrologic Engineering Center's Flood Damage Analysis (HEC-FDA) program provides the capability for integrated hydrologic engineering and economic analysis for formulating and evaluating FRM plans using risk-based analysis methods. The program will be used to evaluate and compare the future without- and with-project plans within the Ala Wai watershed to aid in the selection of a recommended plan to manage flood risk.	Certified
Institute of Water Resources (IWR) Planning Suite	This model assists with formulating plans, Cost-Effectiveness, and Incremental Cost Analysis (CE/ICA), which are required for ecosystem restoration projects. An "annualizer" module has been included to allow for easy calculations of equivalent annual average values, total net values, and annualizing non-monetary benefits and calculating costs.	Certified
Ala Wai Watershed Site Specific Mitigation Model	A site specific model will be developed for this project. In the absence of any regionalized ecosystem output model that quantifies habitat benefits for stream habitats in Hawaii, a customized spreadsheet model will be developed specifically for use on the Ala Wai Watershed Project. This is considered an appropriate approach. A spreadsheet model can be tailored to focus on metrics that are directly applicable to any mitigation objectives (as needed). In particular, habitat quality parameters contained within the model can serve as a key dataset for quantification of habitat impacts and benefits in the	Approval review to be coordinated with ECO-PCX.

Model Name and Version	Brief Description of the Model and How It Will Be Applied in the Study	Certification /Approval Status
	spreadsheet model. In addition, elements of the HEP approach will be used, as the State of Hawaii Division of Aquatic Resources has conducted a state wide stream and watershed assessment using this approach, providing focused baseline information on stream functions throughout the State, including the streams within the Ala Wai watershed.	

b. Engineering Models. EC 1105-2-412 does not cover engineering models used in planning. The responsible use of well-known and proven USACE developed and commercial engineering software will continue and the professional practice of documenting the application of the software and modeling results will be followed. As part of the USACE Scientific and Engineering Technology initiative, many engineering models have been identified as preferred or acceptable for use on USACE studies and these models should be used whenever appropriate. The selection and application of the model and the input and output data is still the responsibility of the users and is subject to DQC, ATR, and IEPR (if required).

The following engineering models are anticipated to be used in the development of the decision document:

Table 5: Engineering Models

Model Name and Version	Brief Description of the Model and How It Will Be Applied in the Study	Approval Status
HEC-RAS 4.0 (River Analysis System)	The Hydrologic Engineering Center's River Analysis System (HEC-RAS) program provides the capability to perform one-dimensional steady and unsteady flow river hydraulics calculations. The program will be used for steady flow analysis to evaluate the future without- and with-project conditions along the streams and tributaries in the Ala Wai watershed.	HH&C CoP Preferred Model
HEC-HMS 3.5 (Hydrologic Modeling System)	The HEC Hydrologic Modeling System (HMS) program provides the capability to simulate the precipitation-runoff processes of dendritic watershed systems. It is designed to be applicable in a wide range of geographic areas for solving the widest possible range of problems. This includes large river basin water supply and flood hydrology, and small urban or natural watershed runoff. The program will be used to evaluate different storms in the Ala Wai watershed to produce hydrographs which will then be used in the HEC-RAS models.	Approved
HEC-SSP 2.0	The HEC Statistical Software Package (SSP) program	Approved

Model Name and Version	Brief Description of the Model and How It Will Be Applied in the Study	Approval Status
(Statistical Software Package)	allows you to perform statistical analyses of hydrologic data. The program will be used to perform flood flow frequency analysis based on Bulletin 17B, "Guidelines for Determining Flood Flow Frequency" (1982) for the Ala Wai watershed.	
Microcomputer Aided Cost Engineering System (MCACES) 2nd Generation (MII)	The MCACES MII construction cost estimating software is a tool used by cost engineers to develop and prepare all USACE Civil Works cost estimates. Using the features in this system, cost estimates are prepared uniformly, allowing cost engineering throughout USACE to function as one virtual cost engineering team.	Cost Engineering MCX Required Model

10. REVIEW SCHEDULES AND COSTS

a. ATR Schedule and Cost. The ATRs for this study will be accomplished in accordance with the cost and schedule in the PMP. Consistent with the USACE SMART planning guidance, the ATRs will be scheduled concurrent with the IEPR, policy and public reviews. However, the ATR lead will be engaged throughout the planning process with the USACE vertical team. As of the approval date of this Review Plan, the ATRs of the various documents are scheduled as follows:

- Feasibility Scoping Meeting Package: March 2011.
  Cost: $32,000.

- Draft Integrated Feasibility Report/EIS: March 2014.
  Estimated Cost: $60,000.

b. Type I IEPR Schedule and Cost. The IEPR for this study will be accomplished in accordance with the cost and schedule in the PMP. As of the approval date of this Review Plan, the IEPR is scheduled as follows:

- Draft Integrated Feasibility Report/EIS: March 2014.

- Estimated Contract Cost: $153,000.

Pursuant to Section 2034 of the Water Resource Development Act of 2007, this amount is 100% federally funded.

- Estimated cost for POH and FRM-PCX Coordination of the IEPR: $70,000.

This estimate was developed using the Type I IEPR Standard Operating Procedure table provided by the PCXs. This amount is cost-shared between USACE and the non-Federal Sponsor.

c. Model Certification/Approval Schedule and Cost. The Ala Wai watershed site specific ecosystem output model will be used on a one-time basis. Consistent with EC 1105-2-412, the model will require approval for use. The approval review of the single use site specific model will be coordinated with the ECO-PCX to determine if approval during ATR is acceptable. In the event that the ECO-PCX requires a separate or regional approval, schedule and costs will be adjusted accordingly.

11. PUBLIC PARTICIPATION

A Public Involvement Plan (PIP) was developed in 2009. The PIP outlines public and stakeholder involvement throughout the plan formulation, including regular stakeholder meetings, a project website, participation at public events and community meetings, small group meetings, public scoping meetings, public information meetings and a public hearing on the draft document. The PIP also outlines engagement with Federal and State agencies, the non-Federal sponsors, media and legislative inquiries. The PIP will continue to be implemented throughout the study process. The public involvement and comments will be summarized in the Draft and the Final Feasiblity Report/EIS and shared with the DQC and ATR team.

12. REVIEW PLAN APPROVAL AND UPDATES

The POD Commander is responsible for approving this Review Plan. The POD Commander's approval reflects vertical team input (involving POH, POD, FRM-PCX, ECO-PCX, and HQUSACE members) as to the appropriate scope and level of review for the decision document. Like the PMP, the Review Plan is a living document and may change as the study progresses. POH is responsible for keeping the Review Plan up to date. Minor changes to the Review Plan since the last POD Commander approval are documented in Attachment 3. Significant changes to the Review Plan (such as changes to the scope and/or level of review) will be re-approved by the POD Commander, following the process used for initially approving the plan. The latest version of the Review Plan, along with the POD Commander's approval memorandum, will be posted on the POH webpage. The latest Review Plan will also be provided to POD and the FRM-PCX.

13. REVIEW PLAN POINTS OF CONTACT

Public questions and/or comments on this Review Plan can be directed to the following points of contact:

Honolulu District
Ms. Athline Clark, Project Manager
Civil and Public Works Branch, Programs and Project Management Division
U.S. Army Corps of Engineers, Honolulu District
Bldg 230, Room 307
Fort Shafter, Hawaii 96858-5440
Telephone: (808) 835-4032

Pacific Ocean Division
Mr. Russell Iwamura
U.S. Army Corps of Engineers, Pacific Ocean Division
Building 525
Fort Shafter, Hawaii 96858-5440
Telephone: (808) 835-4625

Review Management Organization
Mr. Eric Thaut, Flood Risk Management Planning Center of Expertise
U.S. Army Corps of Engineers, South Pacific Division
1455 Market Street, Room 2048B
San Francisco, CA 94103-1398
Telephone: (415) 503-6852

ATTACHMENT 1: TEAM ROSTERS

Table 6: Project Delivery Team

DISCIPLINE	NAME	OFFICE
Project Manager	Ms. Athline Clark	PP-C
Technical Lead/Hydraulic Engineer	Mr. Jarrett Hara	EC-T
Program Analyst	Mr. Geoffrey Lee	PP-PC
P2 Scheduler	Ms. Laureen Vizcarra	PP-P
Archaeologist	Mr. Kanalei Shun	PP-E
Cost Engineer	Ms. Tracy Kazunaga	EC-S
Economist	Mr. Bob Finch/Mr. Lance Shiroma	EC-T
Geographer/GIS Specialist	Ms. Sarah Falzarano	EC-G
Geotechnical Engineer	Mr. Russell Leong	EC-Q
Real Estate Specialist	Mr. Michael Sakai	PP-R
Value Engineer Officer	Mr. Elton Choy	EC-S
Engineering Services Branch	Mr. Glenn Oshiro	EC-M
Contracting Branch	Mr. Roger David Williams	CT
Small Business	Ms. Cathy Yoza	DB
Public Affairs Office	Mr. Joe Bonfiglio	PA
Office of Counsel	Ms. Lindsey Kasperowicz	OC
Plan Formulation/Environmental Specialist	Ms. Lisa Kettley and CH2M Hill Team	Consultant

Table 7: DQC Review Team

DISCIPLINE	ORGANIZATION CODE	DESCRIPTION OF CREDENTIALS
Team Lead/Planning	CEPOH-PP-C	The DQC lead is a senior professional with experience in preparing Civil Works decision documents and conducting DQC. The team lead has the necessary skills and experience to lead a team through the DQC process. The Planning reviewer is also a senior engineer/planner/project manager with experience in FRM projects in urban settings. The planning reviewer has experience FRM plan formulation analysis methodologies and processes.

DISCIPLINE	ORGANIZATION CODE	DESCRIPTION OF CREDENTIALS
Hydrology & Hydraulic Engineering	CEPOH-EC	The Hydrology and Hydraulics Engineering reviewer is an expert in the field of hydraulics and has experience with flash-flood systems in urbanized watersheds. The reviewer is familiar with application of detention/retention basins, application of flood walls, non-structural solutions involving flood warning systems and flood proofing, etc and/or computer modeling techniques that will be used such as HEC-RAS, or Hydraulics and HEC-HMS. The reviewer is also familiar with EO 11988 Floodplain Management. The flood risk analysis review also has extensive experience with multi-discipline flood risk analysis to ensure consistent and appropriate identification, analysis and written communication of risk and uncertainty.
Economics	SPN	The Economics reviewer is a senior economist with experience in FRM project, development of the National Economic Development (NED) plan, and trade-off analysis.
Environmental Resources	To Be Determined (TBD)	TBD
Ecosystem Restoration Output Models	TBD	TBD
Cultural Resources	TBD	TBD
Geotechnical Engineering	TBD	TBD
Civil/Structural Engineering	TBD	TBD
Cost Engineering	TBD	TBD
Real Estate	TBD	TBD

Table 8: ATR Review Team

TASK	ORGANIZATION	DESCRIPTION OF CREDENTIALS
SMART Planning Team Lead	FRM-PCX	The SMART planning team lead is also a flood risk analysis reviewer who has extensive experience with multi-discipline flood risk analysis to ensure consistent and appropriate identification, analysis and written communication of risk and uncertainty.
ATR Team Lead/Planning	SPK	The ATR lead is a senior professional with experience in preparing Civil Works decision documents and conducting ATR. The team lead has the necessary skills and experience to lead a team through the ATR process. The Planning reviewer is also a senior engineer/planner/project manager with experience in FRM projects in urban settings. The planning reviewer has experience FRM plan formulation analysis methodologies and processes.
Economics	SPL	The Economics review is a senior economist with experience in FRM project, development of the National Economic Development (NED) plan, and trade-off analysis.
Environmental Resources	SPK	The Environmental Resources reviewer is a senior environmental specialist with experience in complex FRM projects in urban settings. The reviewer has experience with the following regulatory authorities: NEPA – specifically EIS compliance, CWA Section 404(b)(1) analysis, FWCA, and compliance with EO 11988 for flood plain management. Familiarity with tropical systems is also required.
Ecosystem Restoration Output Model	TBD	TBD

Cultural Resources	SPK	The Cultural Resources reviewer is experienced with National Historic Preservation Act (NHPA) consultation especially for historic structures. The cultural resources reviewer is also somewhat familiar with the archaeology and history of Hawaii and State of Hawaii cultural resource requirements.
Hydrology & Hydraulic Engineering	SPK & SAJ	The Hydrology and Hydraulics Engineering reviewers are experts in the field of hydraulics and have experience with flash-flood systems in urbanized watersheds. The reviewers are familiar with application of detention/retention basins, application of flood walls, non-structural solutions involving flood warning systems and flood proofing, etc and/or computer modeling techniques that will be used such as HEC-RAS, or Hydraulics and HEC-HMS. The reviewers are also familiar with EO 11988 Floodplain Management.
Flood Risk Analysis Expert	TBD	An additional flood risk analysis will be determined if others on the team do not already have this expertise.
Geotechnical Engineering	TBD	TBD
Civil/Structural Engineering	TBD	TBD
Cost Engineering	NWW	The Cost Engineering reviewer is experienced in design requirements for standard flood risk management measures and cost risk assessments for projects valued at over $40 million.
Real Estate	TBD	TBD

Table 9: IEPR Team

DISCIPLINE	NAME	DESCRIPTION OF CREDENTIALS
Economics	TBD	TBD
Environmental Resources	TBD	TBD
Engineering	TBD	TBD

ATTACHMENT 2: SAMPLE STATEMENT OF TECHNICAL REVIEW FOR DECISION DOCUMENTS

COMPLETION OF AGENCY TECHNICAL REVIEW

The ATR has been completed for the *<type of product>* for *Ala Wai Watershed Project, Island of Oahu, Hawaii*. The ATR was conducted as defined in the project's Review Plan to comply with the requirements of EC 1165-2-214. During the ATR, compliance with established policy principles and procedures, utilizing justified and valid assumptions, was verified. This included review of: assumptions, methods, procedures, and material used in analyses, alternatives evaluated, the appropriateness of data used and level obtained, and reasonableness of the results, including whether the product meets the customer's needs consistent with law and existing USACE policy. The ATR also assessed the DQC documentation and made the determination that the DQC activities employed appear to be appropriate and effective. All comments resulting from the ATR have been resolved and the comments have been closed in DrChecks[sm].

SIGNATURE _____ _____

Name Date
ATR Team Leader
Office Symbol/Company

SIGNATURE _____ _____

Name Date
Project Manager
Office Symbol

SIGNATURE _____ _____

Name Date
Architect Engineer Project Manager[1]
Company, location

SIGNATURE _____ _____

Name Date
Review Management Office Representative
Office Symbol

CERTIFICATION OF AGENCY TECHNICAL REVIEW

Significant concerns and the explanation of the resolution are as follows: *Describe the major technical concerns and their resolution.*

As noted above, all concerns resulting from the ATR of the project have been fully resolved.

SIGNATURE _____ _____

Name Date
Chief, Engineering Division
Office Symbol

SIGNATURE _____ _____

Name Date
Chief, Planning Division
Office Symbol

[1] Only needed if some portion of the ATR was contracted

ATTACHMENT 3: REVIEW PLAN REVISIONS

Table 10: Review Plan Revisions

Revision Date	Description of Change	Page / Paragraph Number
26 July 2011	Update schedule. Update Scope based on Feasibility Scoping Meeting. Update DQC and ATR Team members	Section 3, Section 5, Attachment 1
8 April 2012	Update schedule.	Section 5
7 December 2012	Update schedule, Update scope based on rescoping charette, Update DQC and ATR disciplines. Update document to be consistent with recent modifications to Review Plan Template	All Sections

ATTACHMENT 4: ACRONYMS AND ABBREVIATIONS

Table 11: Standard Acronyms and Abbreviations

Term	Definition	Term	Definition
ATR	Agency Technical Review	NEPA	National Environmental Policy Act
CWA	Clean Water Act	OMRR&R	Operation, Maintenance, Repair, Replacement, and Rehabilitation
DQC	District Quality Control/Quality Assurance	OEO	Outside Eligible Organization
DX	Directory of Expertise	PCX	Planning Center of Expertise
EC	Engineer Circular	PDT	Project Delivery Team
EIS	Environmental Impact Statement	PMP	Project Management Plan
EO	Executive Order	POD	U.S. Army Corps of Engineers, Pacific Ocean Division
ER	Engineer Regulation	POH	U.S. Army Corps of Engineers, Honolulu District
FEMA	Federal Emergency Management Agency	QMP	Quality Management Plan
FRM	Flood Risk Management	QA	Quality Assurance
FSM	Feasibility Scoping Meeting	QC	Quality Control
HQUSACE	Headquarters, U.S. Army Corps of Engineers	RMC	Risk Management Center
IEPR	Independent External Peer Review	RMO	Review Management Organization
NED	National Economic Development	SAR	Safety Assurance Review
NER	National Ecosystem Restoration	USACE	U.S. Army Corps of Engineers