



Flood Study and Mapping Plan

Hanapepe and Waimea Rivers – Kauai County, Hawaii

October 2017

Final



FEMA

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1 Introduction

The purpose of this plan is to document and facilitate communications between stakeholders involved in the flood hazard restudy along the Hanapepe and Waimea Rivers. The updated flood zone information is to help local officials and citizens reduce future flood losses, communicate existing flood risk and revise the Kauai County Flood Insurance Rate Map (FIRM).

This plan was prepared by the Federal Emergency Management Agency (FEMA) in coordination with Kauai County, State Department of Land and Natural Resources, U.S. Army Corps of Engineers and FEMA's contractor, STARR II. The plan was finalized once available data had been provided to FEMA and stakeholders met on July 11, 2017, to discuss FEMA's restudy along the Hanapepe and Waimea Rivers.

1.1 Levee Systems Description

The Hanapepe River levee systems are located on the southwest coast of Kauai. The flood control project was built by the U.S. Army Corps of Engineers (USACE) as authorized by the 1944 Flood Act. The project consists of approximately 2,200 feet of floodwall with an I-wall reach on the left bank and approximately 4,500 feet of earthen levee on the right bank. Improvements were constructed by the USACE in 1959, 1963 and 1966. Approximately 900 homes and commercial buildings are protected by the levee systems. The local sponsor is the County of Kauai, Department of Public Works.

The Waimea River levee system is also located on the southwest coast of Kauai. The flood control project was completed by the USACE in December 1984 and modified an original levee constructed by the County of Kauai. The flood protection system consists of approximately 3,300 feet of floodwall, approximately 1,000 feet of levee, rock protection and floodgates. Approximately 600 homes and commercial buildings are protected by the levee system. The local sponsor is the County of Kauai, Department of Public Works.

1.2 Mapping History

Appendix A depicts the current (effective) flood hazard delineation on FIRM numbers 1500020286F, 0287F, 0288F and 0289F, dated November 26, 2010, in the vicinity of the Hanapepe River. FIRM numbers 15000256F, 0258F and 0259F, dated November 26, 2010, cover the Waimea River. The original FIRM for the County of Kauai is from November 1981.

Kauai County signed a provisional accreditation agreement for the levee systems along the Hanapepe and Waimea Rivers on January 11, 2008. On November 26, 2010, revised FIRM panels for Kauai County became effective reflecting a new coastal, hurricane flood insurance study. The levees along the Waimea and Hanapepe Rivers are currently shown as provisionally accredited on the Kauai County FIRM. However, the provisional accreditation agreement expired on February 1, 2010. FEMA initiated a FIRM revision to show the area landward of the levees as located in the Special Flood Hazard Area (SFHA). The SFHA is the mapped, high-hazard area having special flood, mudflow or flood-related erosion hazards as subject to flooding by the base (1-percent annual chance) flood event.

This initial mapping effort for the Hanapepe and Waimea Rivers was previously put on-hold as FEMA undertook an effort to revisit the approach for analyzing and mapping flood hazards impacted by a levee

system that cannot be shown as providing protection from the base flood event. A summary of FEMA’s current approach for mapping flood hazards around levees is shown on a fact sheet in Appendix B.

FEMA wrote to the County of Kauai on December 27, 2010, June 6, 2011, and December 15, 2016, to provide updated information on the restudy of flood hazards along the Hanapepe and Waimea Rivers. Copies of these letters are in Appendix C. A mapping project planning meeting was also held in Lihue, Hawaii, on August 25, 2010. The Local Levee Partnership Team meeting was held in Lihue, Hawaii, on July 11, 2017. The area behind the levees along the Hanapepe and Waimea Rivers is currently mapped Zone X (shaded) which represents areas of moderate flood hazard. It is anticipated that this FEMA flood study will convert the flood zone for these areas to a SFHA since the levees along the Hanapepe and Waimea Rivers are currently provisionally accredited and not certified in accordance with Title 44, Code of Federal Regulations, Section 65.10.

2 Stakeholder Engagement and Data Collection

2.1 Stakeholder Engagement

A FEMA-led project team engaged Kauai County, which is the levee owner and operator, as well as State and Federal officials during the Stakeholder Coordination and Data Collection process. Contact information for the project team is provided below. The purpose of this engagement was twofold: (1) to discuss the analysis and mapping process and (2) to collect initial community/levee-related data, information, and documentation to help streamline and facilitate future coordination meetings. Table 1 summarizes the stakeholders contacted during this process.

Table 1 – Summary of Initial Stakeholder Contacts

<i>Stakeholder Contacted</i>	<i>Role</i>	<i>Dates Contacted</i>
Bernard Carvalho, Jr.	Mayor, Kauai County	December 27, 2010 June 6, 2011 December 15, 2016 October 3, 2017
Stanford Iwamoto	Kauai County Floodplain Administrator	April 20, 2017 May 23, 2017 June 5, 2017 June 29, 2017 September 19, 2017 October 3, 2017
Jesse Colandrea	Hawaii Department of Land & Natural Resources	May 23, 2017 June 5, 2017 June 29, 2017 October 3, 2017
Carol Tyau-Beam	Hawaii Department of Land & Natural Resources	April 20, 2017 May 23, 2017 June 5, 2017 June 29, 2017 October 3, 2017
Lincoln Gayagas	USACE Honolulu District	April 20, 2017 May 23, 2017 June 5, 2017 June 29, 2017 October 3, 2017

Michael Wong	USACE Honolulu District	April 20, 2017 May 23, 2017 June 5, 2017 June 29, 2017 October 3, 2017
Mazie Hirono / Tulsi Gabbard's Office	US Representative, Hawaii's 2 nd District	December 27, 2010 June 28, 2017 October 3, 2017

The project team initiated a series of emails and telephone calls to get a better understanding of the levee systems and data availability. These resources were used by FEMA to choose a modeling and mapping approach for the levee systems that meets the needs of the community and recognizes the available data, information, and documentation on the levee system.

2.2 Data Collection

Through the Stakeholder Coordination and Data Collection process, FEMA requested all available data, information, and documentation associated with the levee systems.

Table 2 provides a summary of the data, information, and documentation collected during this process. The operation and maintenance plan for the Hanapepe and Waimea River levees is from August 2005. After signing the forms to provisionally accredit the levees along the Hanapepe and Waimea Rivers, the County of Kauai contracted the USACE to assess these levee systems. USACE reports on the evaluation were finalized in March 2010 and contain horizontal alignment data for the levees as well as a summary of the hydraulic analyses along the Hanapepe and Waimea Rivers. The USACE reports describe the HEC-RAS models provided to FEMA that are the basis of updated flood hazard data proposed to be used to revised the Kauai County FIRM.

Table 2 – Data Sources for Flood Hazard Mapping around the Levee Systems

<i>Data Type</i>	<i>Data Description</i>	<i>Source</i>	<i>Date</i>
Digital terrain model / topographic data	LIDAR collected for the Hawaii hurricane study. Vertical datum is Local Mean Sea Level	FEMA	Fall 2006
Operation and Maintenance Plan	Policy and standard operating procedure for the Waimea and Hanapepe Levee Maintenance Program	County of Kauai, Department of Public Works	August 2005
Inspection Reports	Letters & Reports from USACE to Kauai County verifying maintenance deficiency corrections	USACE	Various
Hanapepe and Waimea Levee Studies	Reports on the USACE's hydrologic and hydraulic evaluations documenting levee overtopping by the 1% annual chance flood	USACE	March 2010

Hydraulic Analyses	HEC-RAS one-dimensional, steady state models of existing conditions. The USACE analyses used topographic data from LIDAR data funded by FEMA. These hydraulic models were updated as necessary for this flood insurance study	USACE as updated by FEMA contractor, STARR II	2010
Technical Review of Hydraulic Modeling	Quality review document of hydraulic models developed by USACE for Hanapepe and Waimea Rivers	FEMA Contractor, BakerAECOM, LLC	2011
Hydrologic data	The FEMA restudy is using peak discharges from the effective FIS as they are confirmed as reasonable though newer hydrologic analyses were developed for the USACE studies	FEMA	Various

2.3 Stakeholder Coordination and Data Collection Meeting

FEMA held a mapping coordination meeting on July 11, 2017, at the Kauai County office in Lihue, Hawaii. Notes from this meeting are in Appendix D. The primary objectives of the meeting were to update stakeholders of this project as well as discuss the anticipated schedule and path going forward. Additionally, stakeholders were given an opportunity to discuss flood risk, mitigation, available data and information, and learn about the FEMA process for analyzing and mapping flood hazards landward of non-accredited levee systems.

Based on the discussion during this meeting, several stakeholders were confirmed as members of a Local Levee Partnership Team (LLPT), as shown in Table 3. The primary function of the LLPT is to provide feedback and, if necessary, additional data, information, or documentation.

2.4 Initial Data Analysis

The project team analyzed the collected data, information, and documentation to prepare for the July 11, 2017, meeting. Beforehand, FEMA’s contractor, STARR II, distributed draft flood mapping for the Hanapepe and Waimea Rivers on June 5, 2017. This mapping depicts the draft boundaries of the 1% and 0.2% annual chance floods behind the levees as well as related water-surface elevations.

The currently available and potentially available data were analyzed to determine what reach-specific procedures could potentially be applied to the levee systems within the study areas. Only the natural valley procedure is applicable to the levee systems along the Hanapepe and Waimea Rivers.

3 Local Levee Partnership Team

An LLPT was formed to provide data and input to FEMA, including commenting on the procedures to be used for analyzing and mapping the reaches based on existing levee conditions. The creation of levee reaches is not applicable for neither the Hanapepe nor Waimea River levee systems. Additional information on the LLPT participants and the meeting held with the LLPT members is provided below.

Table 3 – Local Levee Partnership Team Participants

<i>Participant</i>	<i>Contact Information</i>	<i>Meeting Attended</i>
Lyle Tabata	Kauai County Engineer, Acting 4444 Rice Street, Suite 275 Lihue, HI 96766 (808) 241-4896 siwamoto@kauai.gov	July 11, 2017
Stanford Iwamoto	Kauai County Floodplain Administrator 4444 Rice Street, Suite 275 Lihue, HI 96766 (808) 241-4896 siwamoto@kauai.gov	July 11, 2017
Pani Ramalingam (via phone)	STARR II Engineer 1440 Broadway, Suite 725 Oakland, CA 94612 (415) 671-7186 pani.ramalingam@atkinsglobal.com	July 11, 2017
Eric Simmons	FEMA Region IX Engineer 1111 Broadway, Suite 1200 Oakland, CA 94607-4052 (510) 627-7029 eric.simmons@fema.dhs.gov	July 11, 2017
Jesse Colandrea	Hawaii Department of Land & Natural Resources 1151 Punchbowl Street #221 Honolulu, HI 96813 (808) 587-0277 Jesse.k.colandrea@hawaii.gov	July 11, 2017

Major issues discussed during the LLPT meeting included data availability for both rivers, next steps and mapping schedule, identification of the LLPT participants, and the proposed analysis methodology for the flood hazards behind the levees. Meeting notes are included in Appendix D.

4 Expected Additional Data

During the Stakeholder Coordination and Data Collection and LLPT processes, stakeholders did not identify additional data, information, and documentation they expect to collect and submit to FEMA for consideration.

5 Modeling and Mapping Approach

Based on the discussions during the LLPT meeting and FEMA’s review of the data, information, and documentation collected, the approach outlined above in Section 2.4 and Table 4 will be used to model and map the flood hazards landward of the Hanapepe and Waimea levee systems.

Table 4 –Analysis Approaches

<i>Start Station</i>	<i>End Station</i>	<i>Procedure</i>	<i>Comments</i>
Mouth of Hanapepe River at the Pacific Ocean	Approximately 2 miles upstream, which is above both left and right bank levees Note: the left bank levee spans from Kaunualii Highway to approximately 2,200 feet upstream; the right bank levee spans approximately 4,500 feet upstream from the old highway bridge	Natural Valley	The natural valley procedure will be undertaken using the hydraulic model provided by the USACE as a basis for mapping the flood hazard behind both levees along the Hanapepe River. No Zone D is to be mapped using the detailed analyses.
Mouth of Waimea River at the Pacific Ocean	Approximately 2 miles upstream, which is above the upper limit of right bank levee	Natural Valley	The natural valley procedure will be undertaken using the hydraulic model of the Waimea River provided by the USACE. No Zone D is to be mapped using the detailed analyses.

Per Kauai County’s request during the July 11th meeting, the following non-regulatory products based on the natural valley approach are also to be developed in addition to the revised FIRM panels, FIS report and FIRM database:

- **1% and 0.2% Annual Chance Natural Valley Water Surface Elevation:** This can be used by the community as a resource for determining the water surface elevations, especially if another mapping approach is used in the future or Zone D is mapped behind a levee.
- **1% and 0.2% Annual Chance Natural Valley Depth Grids:** This can be used by the community as another resource for determining the depth of flooding associated with a specified recurrence interval.
- **Changes Since Last FIRM:** Changes Since Last FIRM mapping provides a visual representation of the flood zones revised since the previously effective Flood Insurance Rate Map. It is often used to help focus outreach and communicate to the public.

6 Path Forward

FEMA has worked with many counties to manage circumstances around levees that provide less than a moderate level of protection. The topics are complex. Flood insurance, risk, flood operations, levee maintenance, individual preparedness, economic development, building standards, and post-disaster rebuilding decisions are common issues. We continue to look for more tools to reduce future losses and for communities to cope with past development in a floodplain.

The creation and update of a floodplain management plan has helped many counties achieve several noteworthy benefits. A floodplain management plan documents an overall strategy of programs, projects

and measures. These plans typically include actions for reducing flood risk, options for future development, and responsibilities for stakeholders involved in flood risk management. The plan serves as an informational resource. Flood insurance in communities that participate in the Community Rating System (CRS) may be less expensive when an adopted floodplain management plan meets the CRS steps.

Programs administered by FEMA, most notably the National Flood Insurance Program, traditionally offer several options for communities with high flood risk: build new development reasonably safe, help existing owners purchase flood insurance, create and maintain a local mitigation plan, improve the community's CRS rating, support public outreach, and pursue mitigation grants to reduce future losses. These options, however, may not be well received in a community that is having flood insurance required in a newly mapped flood zone behind a levee.

The USACE option of a flood risk management project is attractive if federal funding for a levee project is available, which is unlikely for Hanapepe or Waimea. These existing flood control projects remain active in USACE's Inspection of Completed Works Program (Public Law 84-99). This determination confirms Kauai County's active maintenance efforts. The levee systems along the Hanapepe and Waimea Rivers therefore maintain eligibility for Federal rehabilitation assistance in the event of future damage.

It is worth noting that hazard mapping is the foundation for all flood risk reduction approaches. As part of this study and mapping project, FEMA is open to discussing options that can be enacted locally to reduce risk. The identification of tools and approaches to reduce future flood losses is critical to local resilience and economic strength.

7 Appendix – Associated Files

The following appendices are available digitally and included with this report.

Appendix A – Effective Flood Insurance Rate Map Delineations

Appendix B – Stakeholder Engagement Process

Appendix C – Stakeholder Communications

Appendix D – Local Levee Partnership Team Meeting Notes