

# Mākaha Valley Flood Study

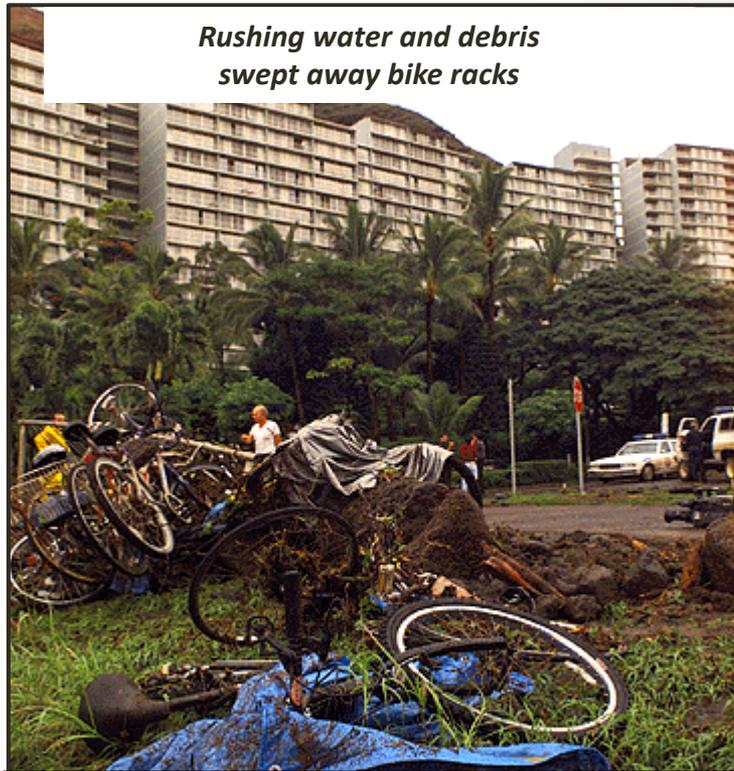
Community Meeting No. 1

March 25, 2014

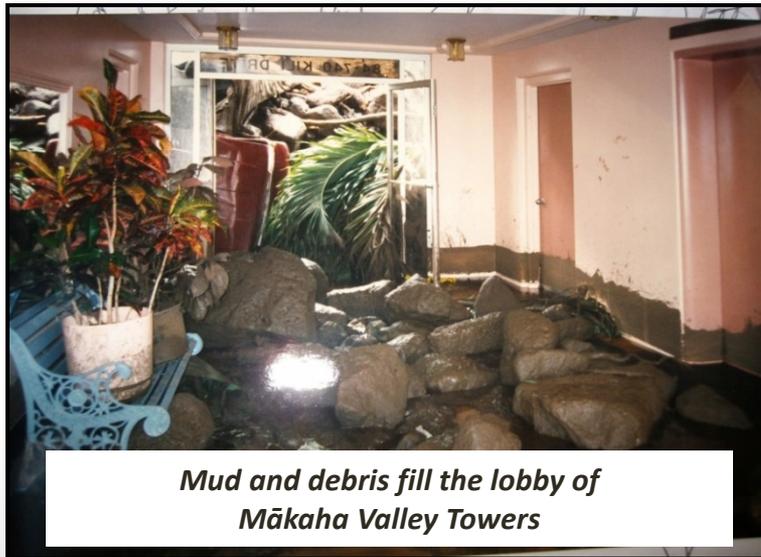
# 1996 storm



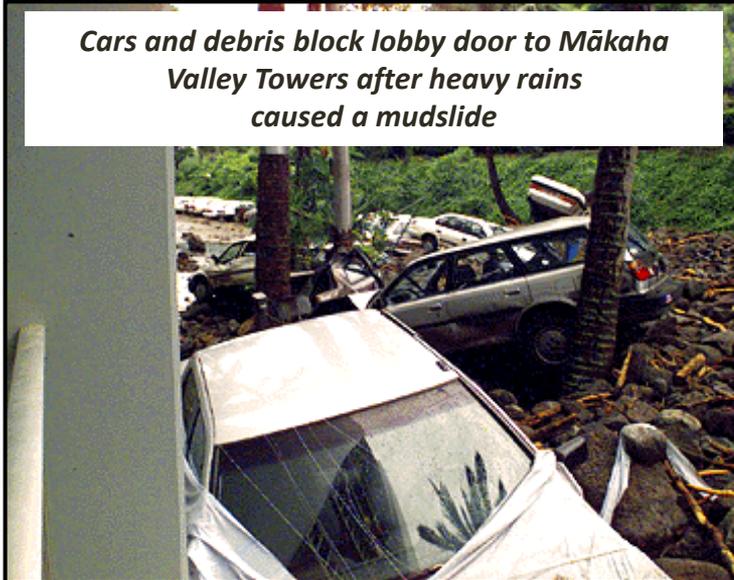
*Car overturned in upper parking lot of Mākaha Valley Towers*



*Rushing water and debris swept away bike racks*



*Mud and debris fill the lobby of Mākaha Valley Towers*



*Cars and debris block lobby door to Mākaha Valley Towers after heavy rains caused a mudslide*

# 2008 storm

*Kili Drive mauka of Mākaha Valley Towers*



Photo Credit: Hawaii State Civil Defense

3 of 69

*Backyard of resident on Manuku Street turns into a river*



Photo Credit: KHNL

*Broken berm below Mākaha West Golf Course*



Photo Credit: Hawaii State Civil Defense

*Flooding near Farrington Highway*



Photo Credit: Hawaii State Civil Defense

# Agenda

- Project Background
- Existing conditions in Mākaha
- Flood map & drainage issues
- Preliminary Flood Mitigation Measures
- Next steps

# Project Background

- Funded by House Bill No. 2883 in 2012
- Appropriated \$500,000 for flood study

*“The purpose of this Act is to require the department of land and natural resources to conduct a flood study for Mākaha Valley and investigate all potential funding sources to finance the flood study and any improvements or repairs as recommended by the flood study.”*

- Contracted Townscape, Inc. to conduct flood study
  - Subconsultants: Okahara and Associates

# Our commitment to the Mākaha community:

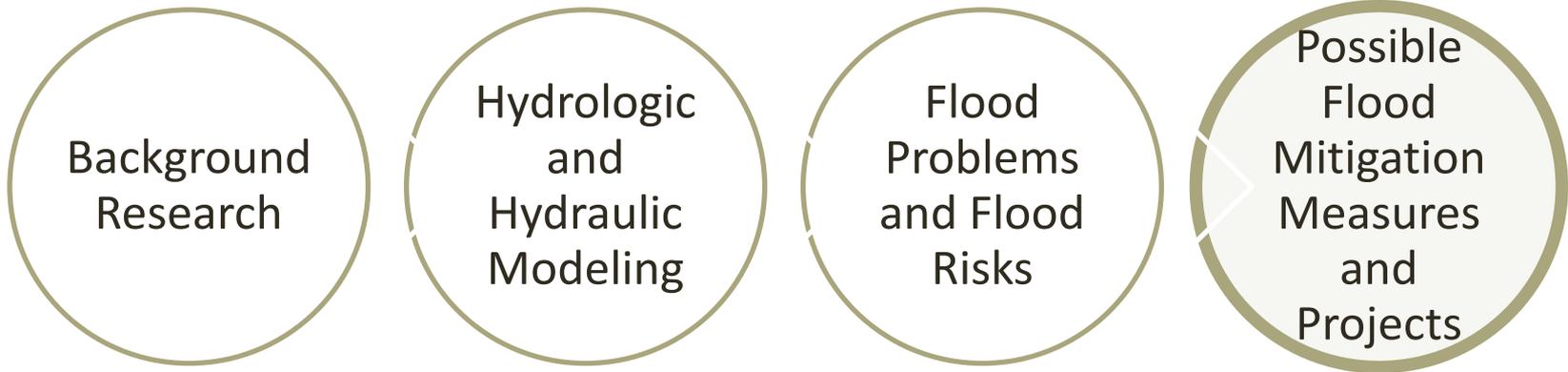
- We will present FLOOD FACTS based on objective analysis.
- We will work with the Mākaha community, your elected officials and the DLNR to implement FLOOD MITIGATION PROJECTS for Mākaha Valley.

# Townscape projects in Wai‘anae

- **Mākaha Flood Study**- Dept. of Land & Natural Resources
- **Ma‘ili‘ili Watershed Plan**- Dept. of Health
- **Ka‘ala Cultural Learning Center Plan**- Ka‘ala Farm, Inc.
- **Wai‘anae Sustainable Communities Plan Update**- Dept. of Planning & Permitting
- **Update of the Nānākuli and Wai‘anae/Lualualei Regional Plan**- Dept. of Hawaiian Homelands
- **Wai‘anae Watershed Management Plan**- Honolulu Board of Water Supply
- **Mākaha Special Area Plan**- Dept. of Planning & Permitting
- **Nānākuli Valley Cultural Landscape Plan**- Mālama Nānākuli Ahupua‘a

# Project Scope and Schedule

JUNE 2013 *20 months* JANUARY 2015



# Our Stakeholder Outreach Process

## Community

- Community members
- Land owners
- Businesses

## Public Agencies

- State Department of Transportation
- State Civil Defense
- City DPP Drainage
- Board of Water Supply

## Elected Officials

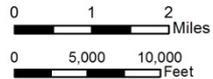
- Representative Jo Jordan
- Senator Maile Shimabukuro

# Wai'anae Moku



Mākaha Valley Flood Study

**WAI'ANAE MOKU**



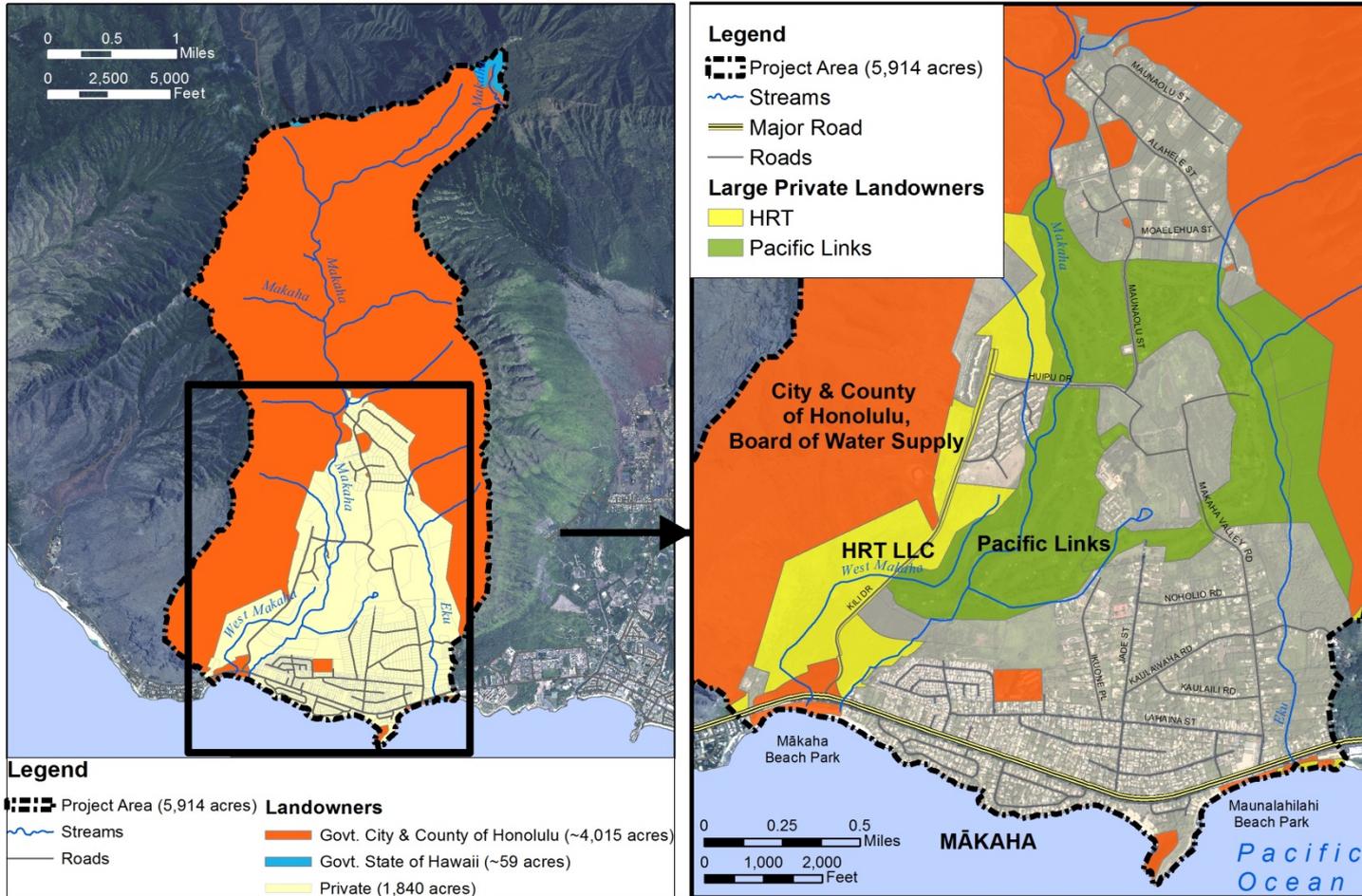
By: Townscape, Inc. For: Hawaii State DLNR Date: January 2014

# Project Area

- Total area: **5,914 acres**
- Streams:
  - Mākaha
  - West Mākaha
  - Eku
- Annual Rainfall: 22 to 76 inches per year
  - 1996- 22" over 5 days
  - 2008- 12" in 1 day

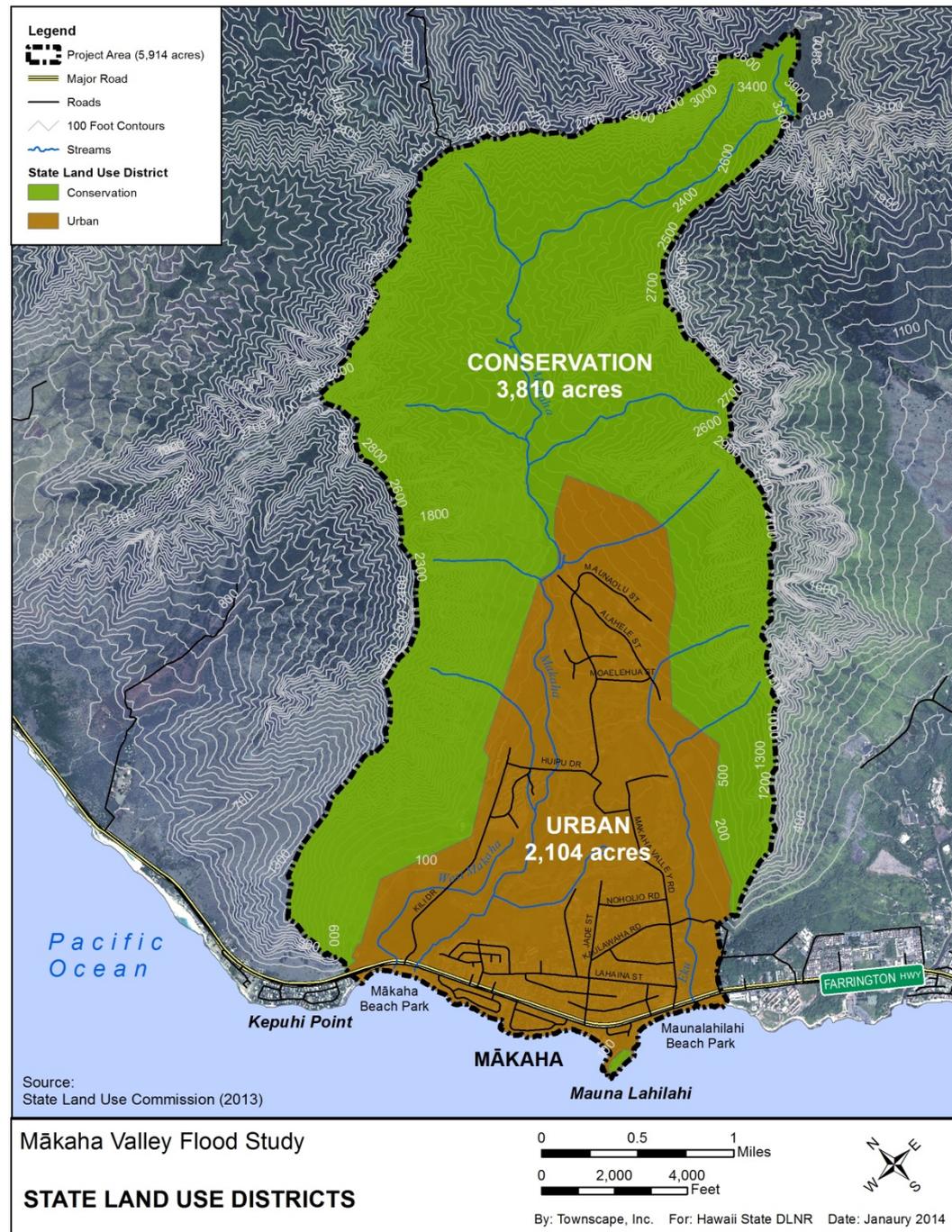


# Landowners



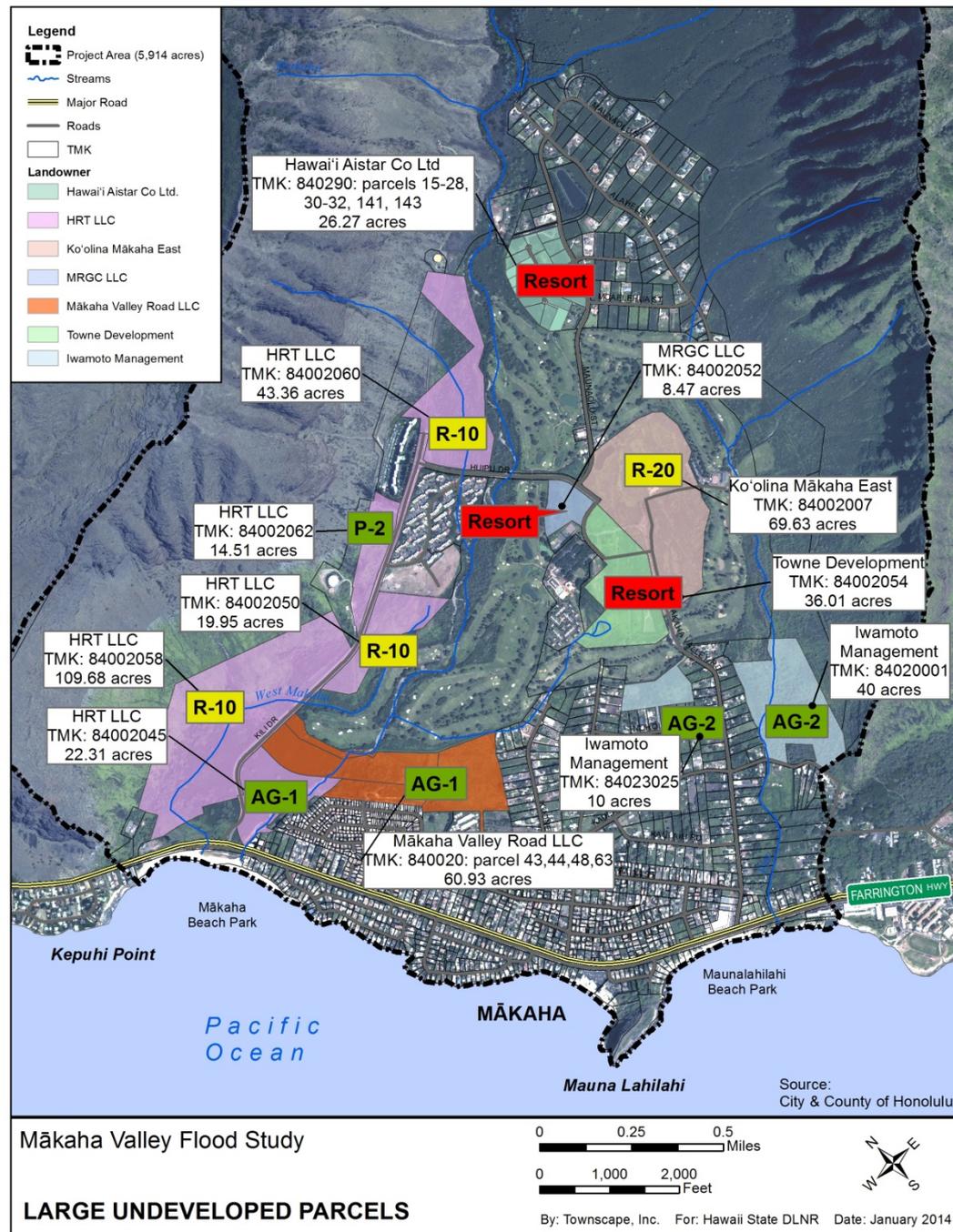
# State Land Use Districts

- 35% of the valley is urban
- Largest urban district in the Wai‘anae Moku



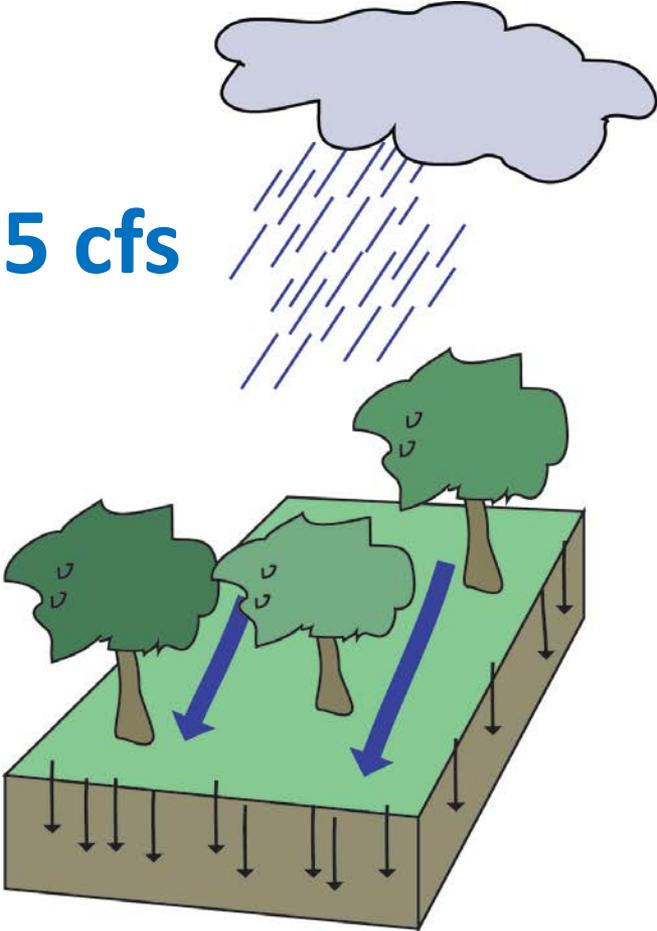
# Large Undeveloped Parcels

- 13+ large undeveloped parcels
- Total 462 acres
- Zoning could allow for single family homes, hotels, duplex units, recreational facilities



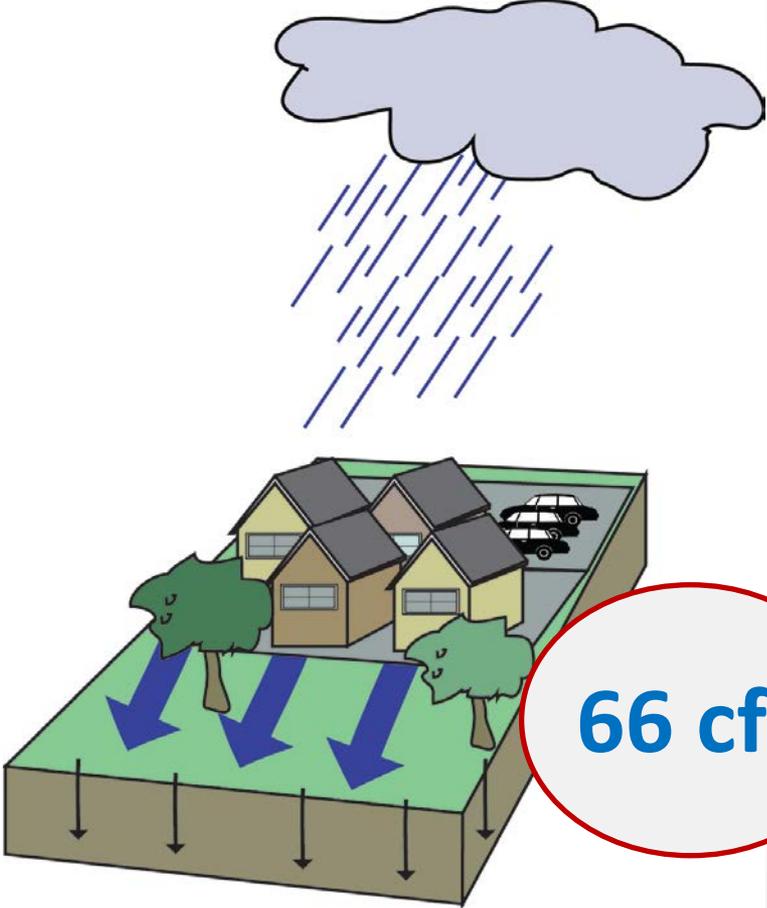
Runoff from a 20-acre parcel in Mākaha that is zoned for residential use for a 10-year flood is approximately :

15 cfs



UNDEVELOPED AREA

66 cfs



DEVELOPED AREA

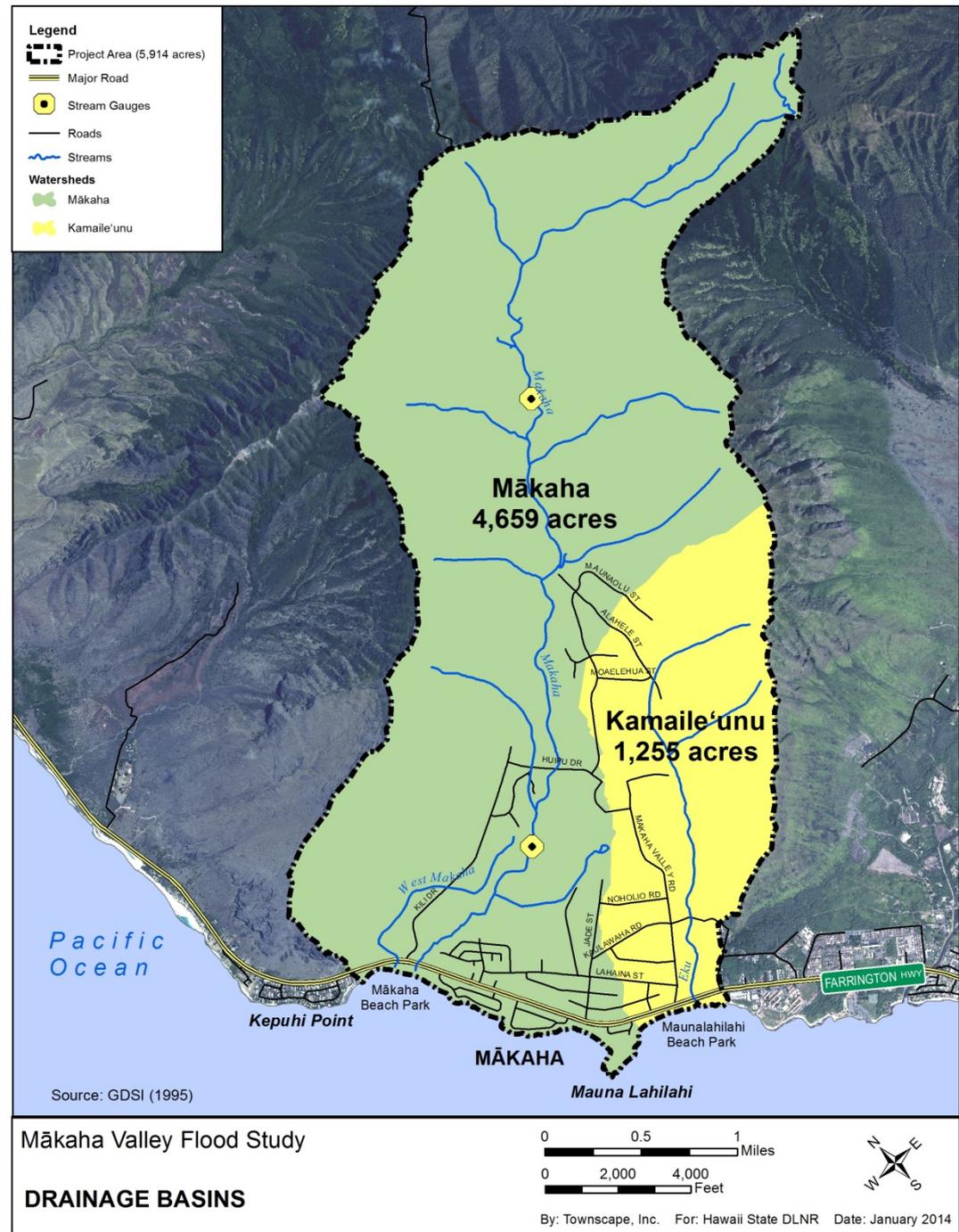
# Impacts of climate change include:

- Increase in air temperature
- Decrease in rainfall
- **Increase in intensity of major storms**
- Increase in sea level and ocean temperatures
- Increase in ocean acidity resulting in coral reef die-off



# Drainage Basins

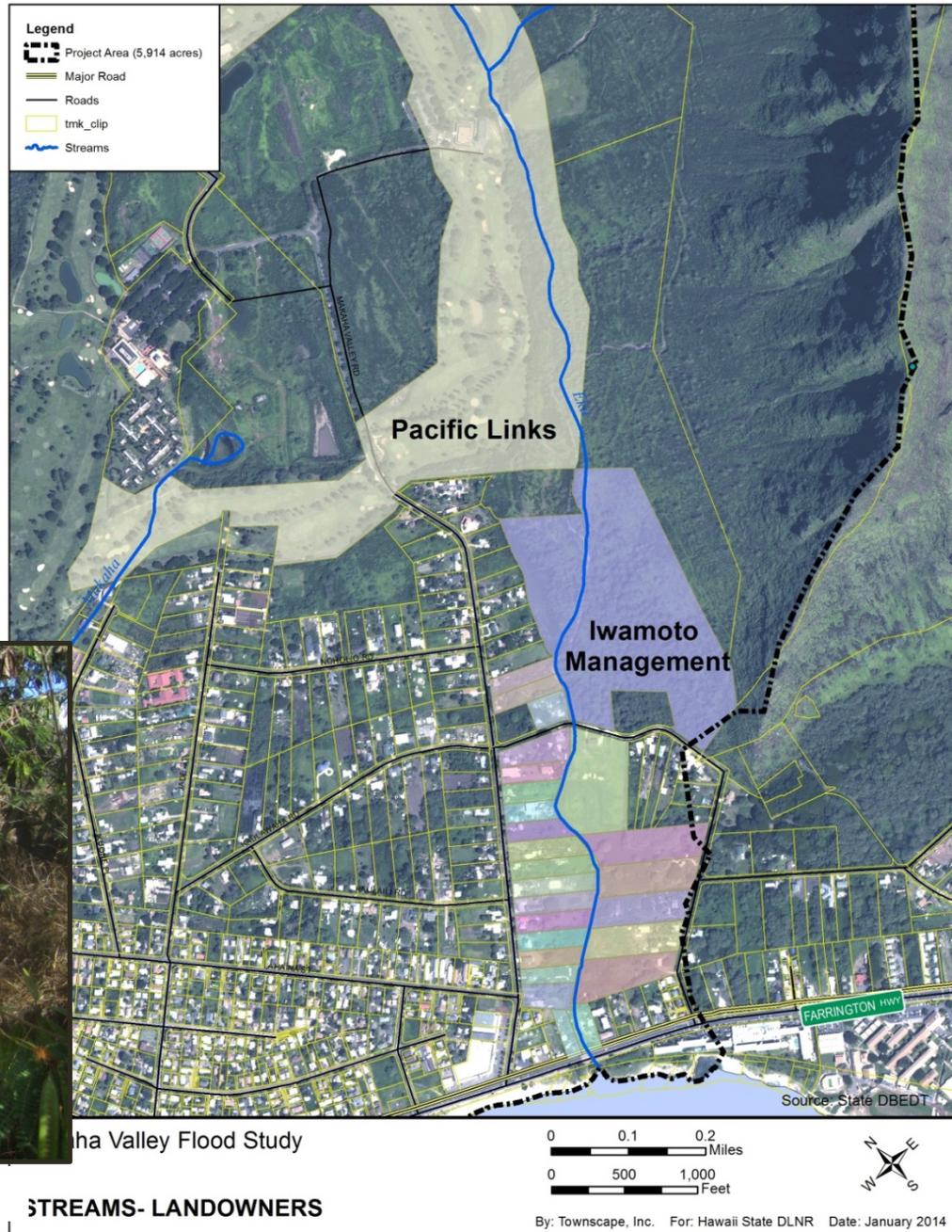
- 75% of the valley drains into Mākaha Stream
- 25% of the valley drains into Eku Stream





# Ekū Stream

- Property lines include up to the **centerline** of stream



*Overgrown vegetation in Eku Stream*

Photo Credit: Hawaii State Civil Defense

STREAMS- LANDOWNERS

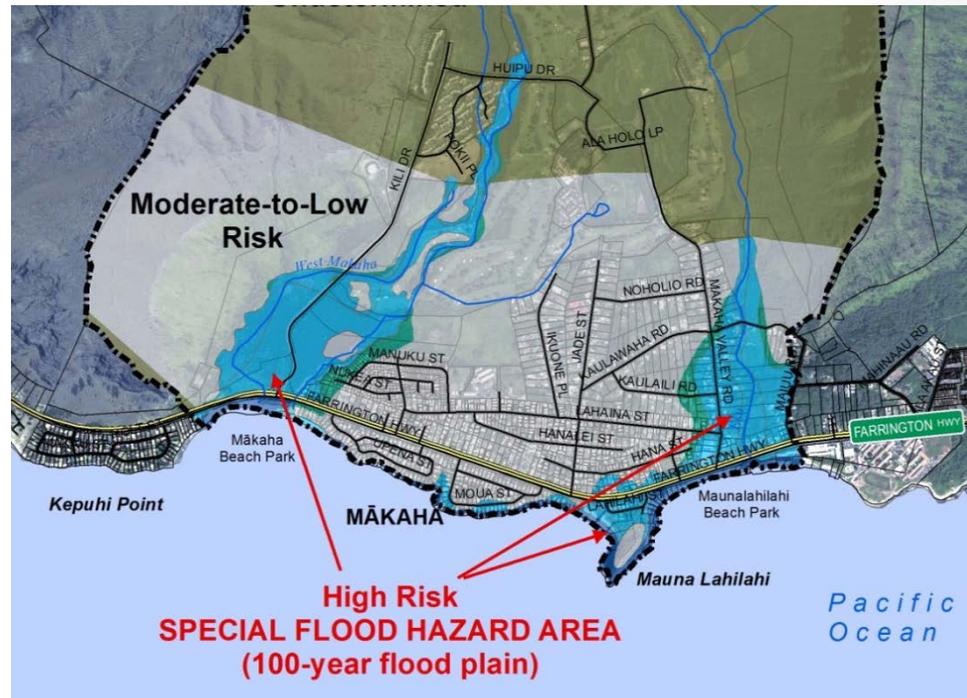


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# What is a High Risk Area?

- **SPECIAL FLOOD HAZARD AREA-** Zones A and Zones V
  - Flood insurance requirement
  - Building standards
- At least 26% chance of flooding during a 30-year mortgage
- **ISSUE-** Houses built before 1980 in high risk areas may not meet FEMA building standards



FEMA

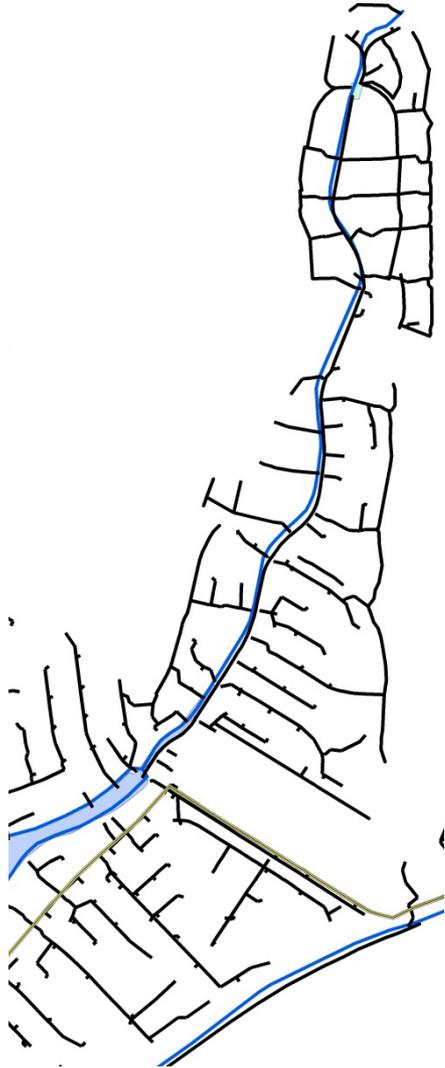


# Drainage Systems

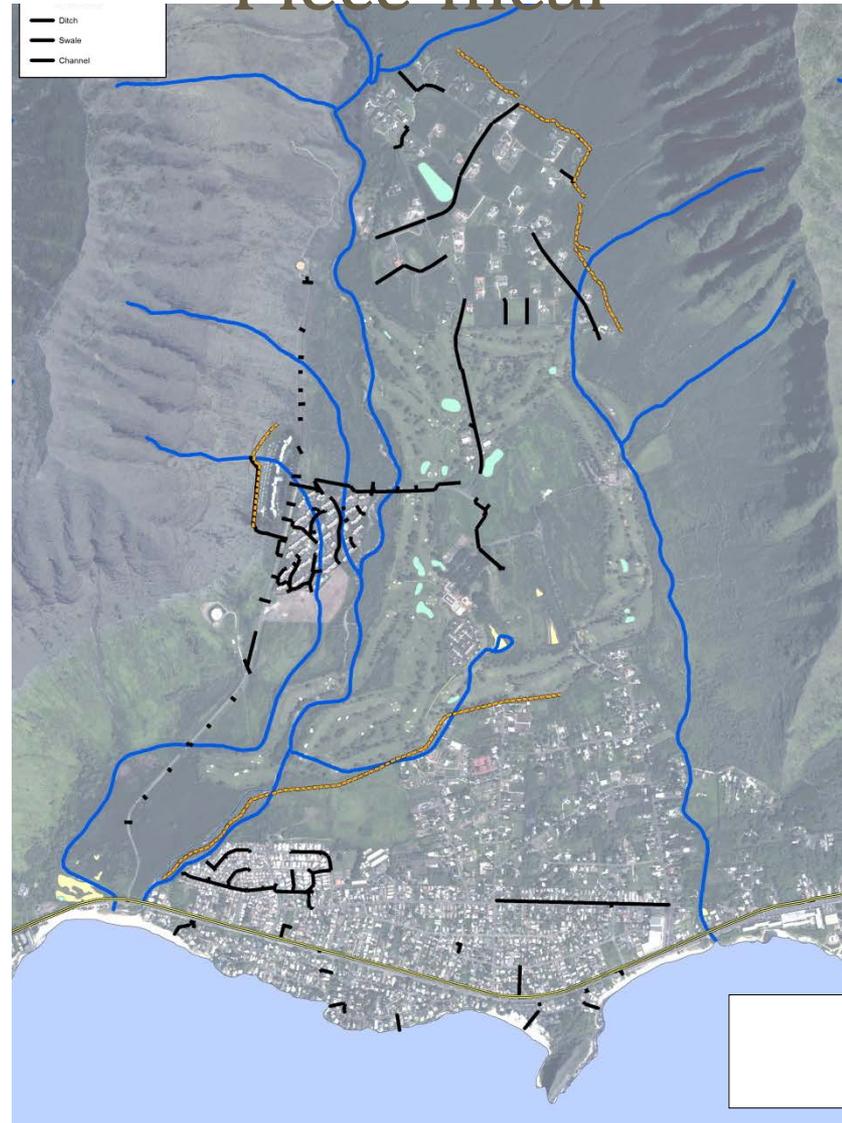
- Includes berms, concrete channel, swales, concrete pipes
- Ditch/berm located:
  - Behind Mākaha Valley Towers
  - Behind Mauna 'Olu Estates
  - Below golf course



# Example of “Well-Planned” Drainage System



# Mākaha Valley Current Drainage System: “Piece-meal”



# Flooding in Mākaha is caused by:

- Damaged drainage systems

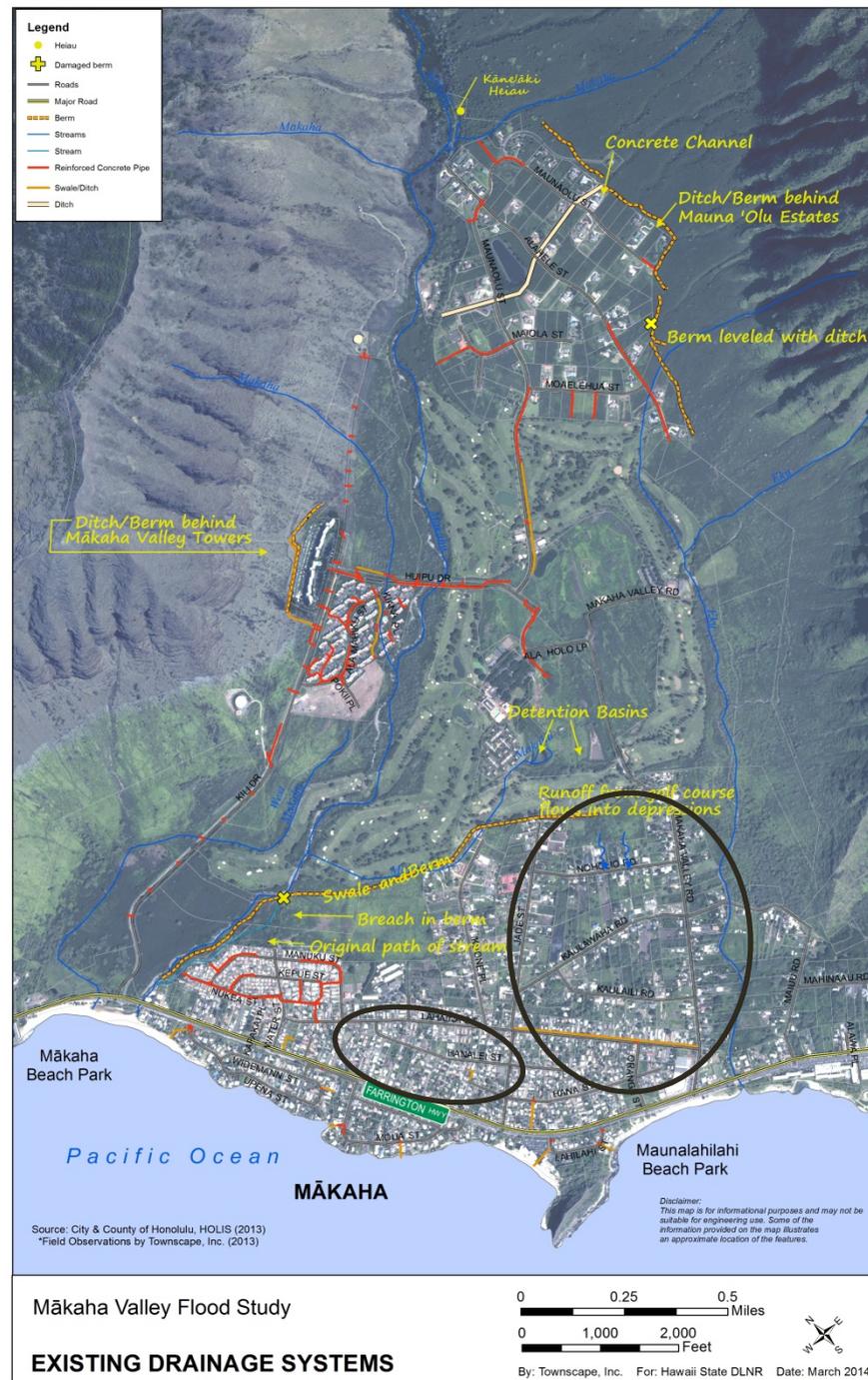


Damaged water berm wall in lower Mākaha



# Flooding in Mākaha is caused by:

- Damaged drainage systems
- Depressions and lack of drainage infrastructure

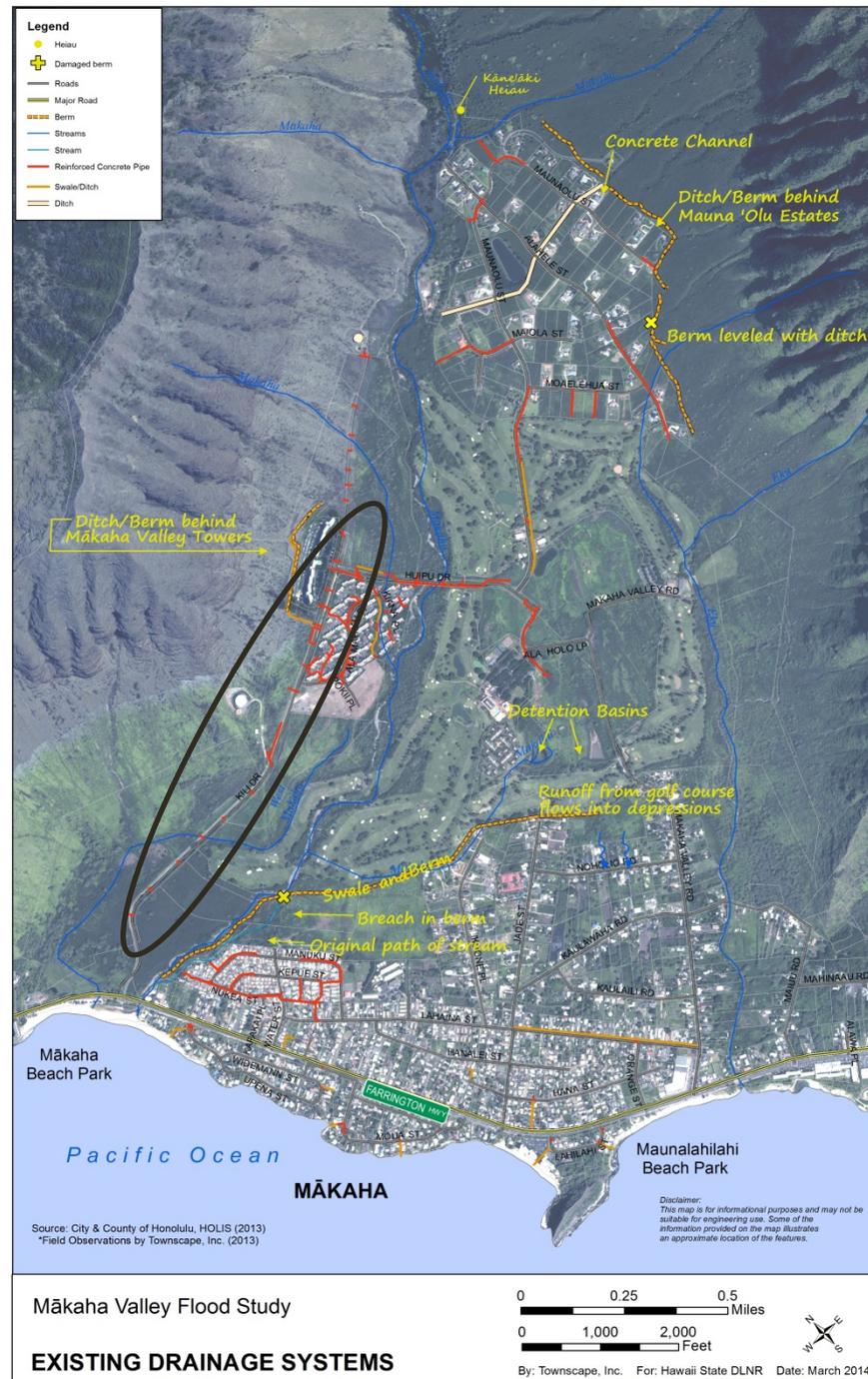


# Flooding in Mākaha is caused by:

- Damaged drainage systems
- Depressions and lack of drainage infrastructure
- **Clogged drainage infrastructure**



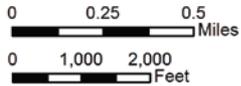
**Rocks and debris clog storm drains along Kili Drive**







**Mākaha Valley Flood Study  
PRELIMINARY IDEAS FOR  
FLOOD MITIGATION PROJECTS**

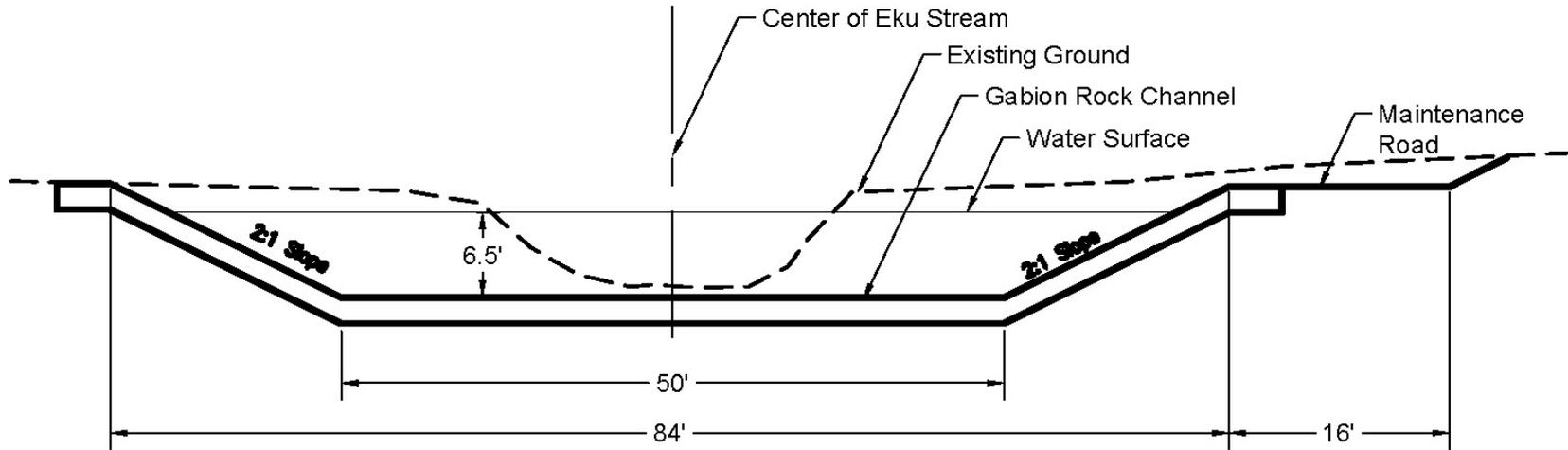
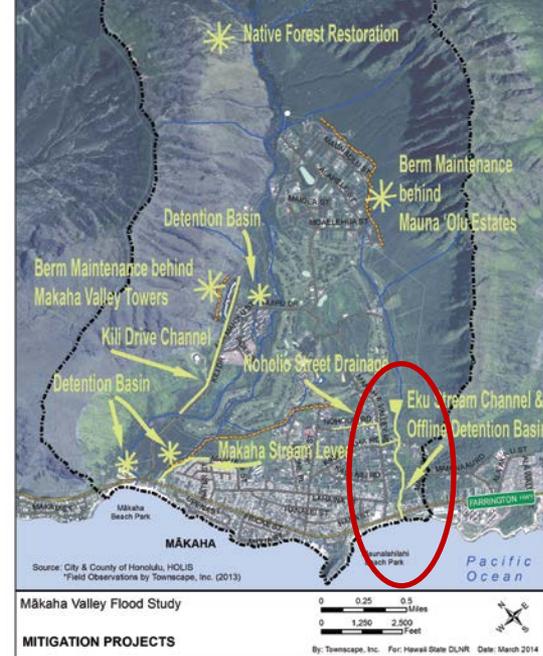


By: Townscape, Inc. For: Hawaii State DLNR Date: March 2014

*\*Projects shown are for illustrative purposes only.*

# Preliminary ideas for flood mitigation measures

## STRUCTURAL

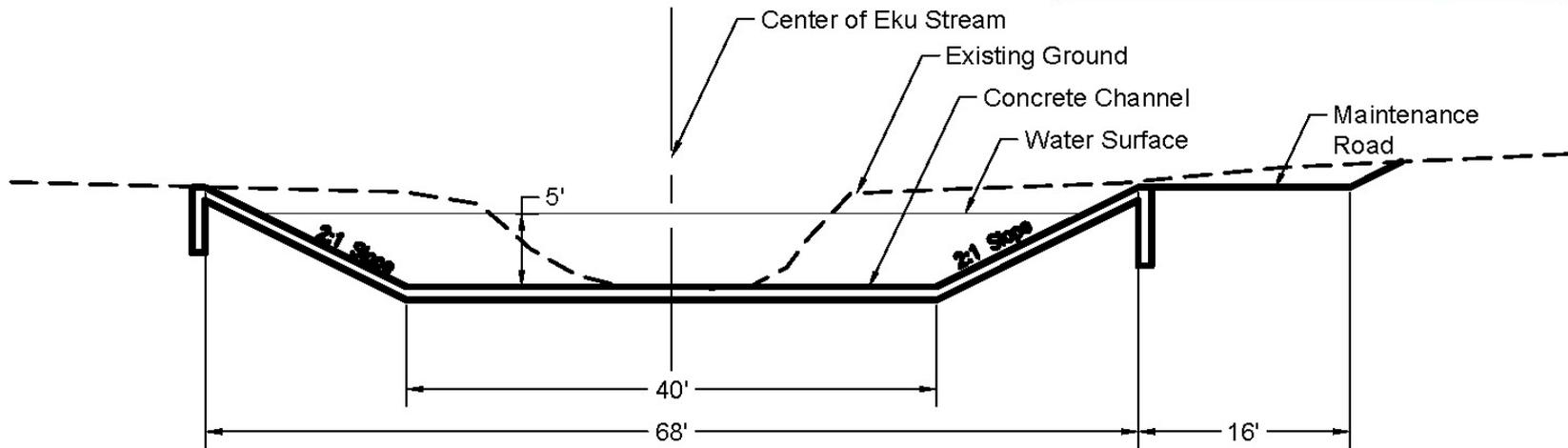
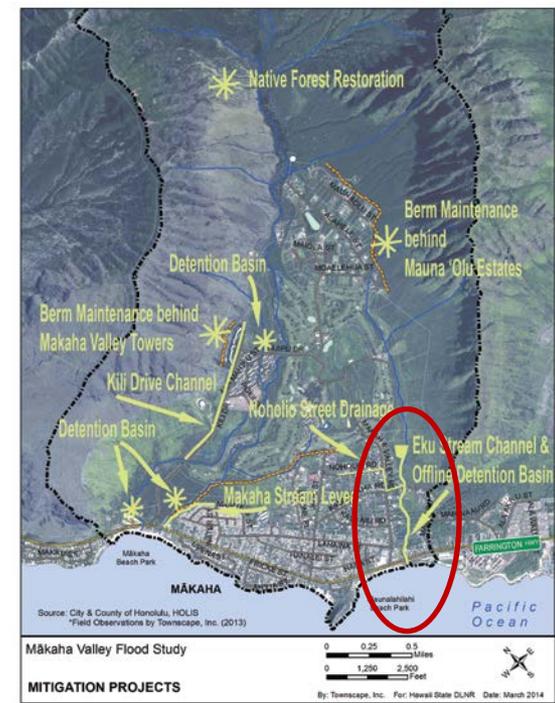


Eku Stream - Gabion Rock Channel

Looking Makai

# Preliminary ideas for flood mitigation measures

## STRUCTURAL

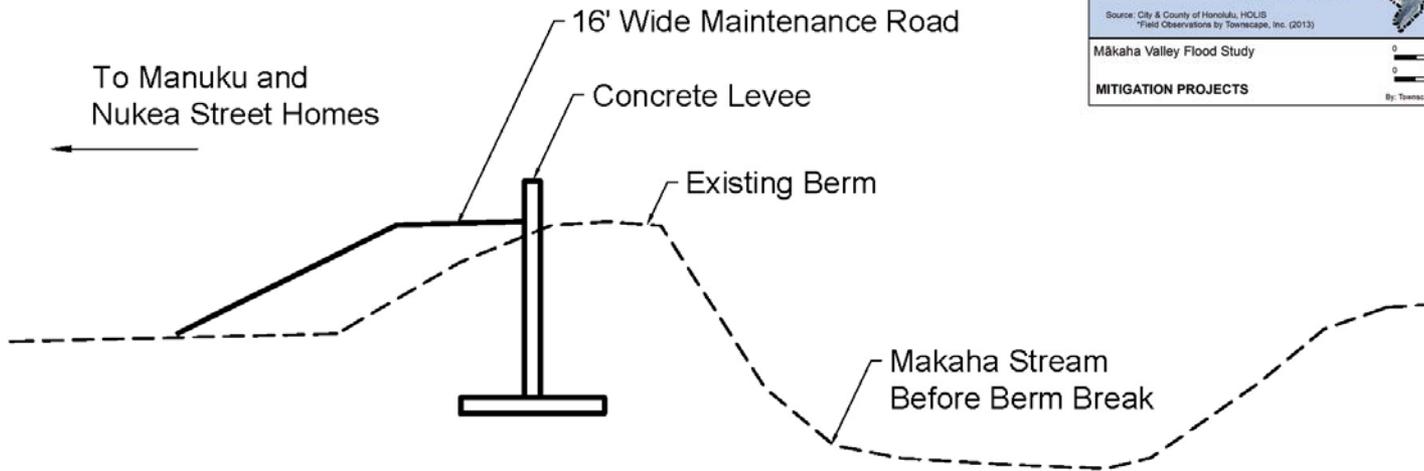


Eku Stream - Concrete Channel

Looking Makai

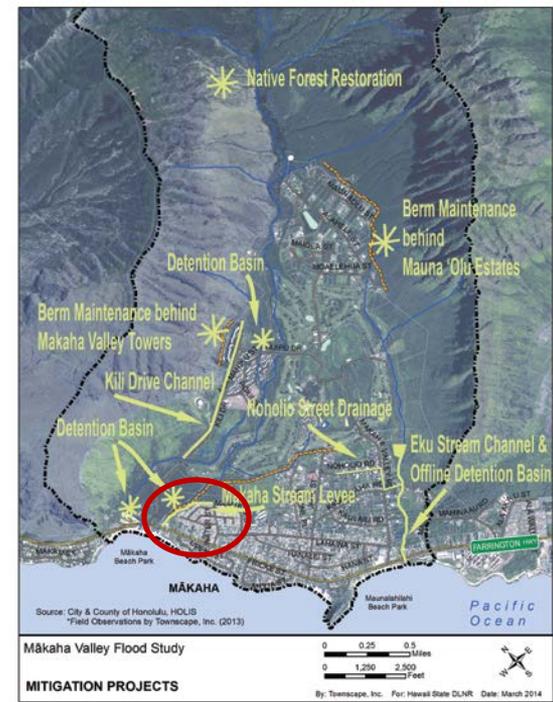
# Preliminary ideas for flood mitigation measures

## STRUCTURAL



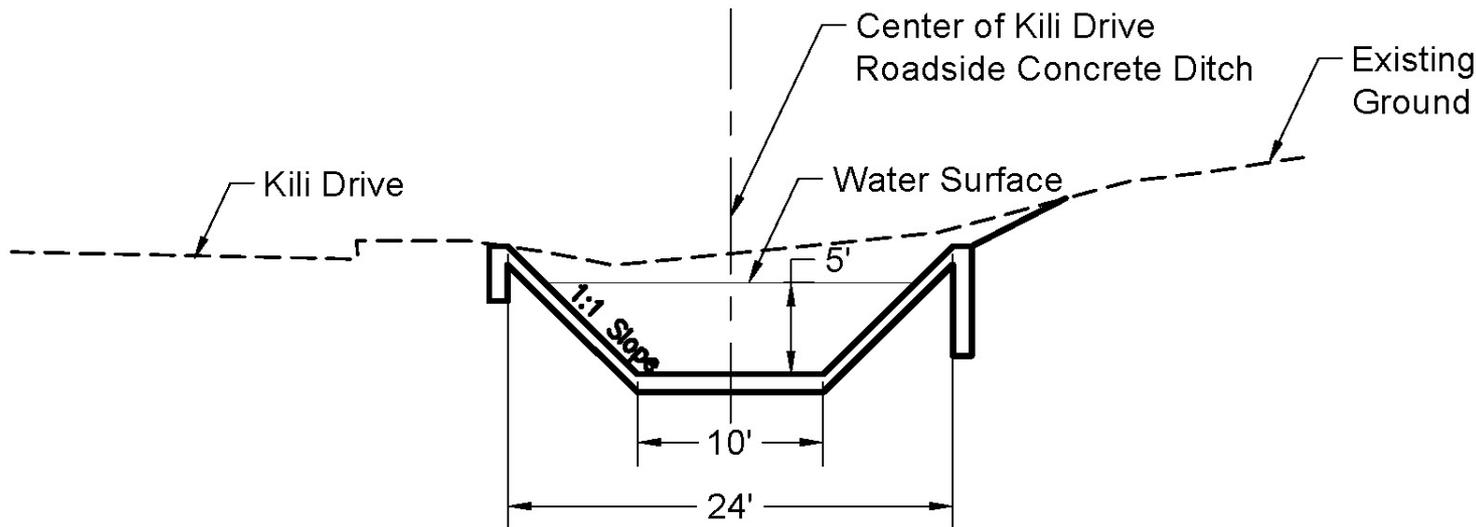
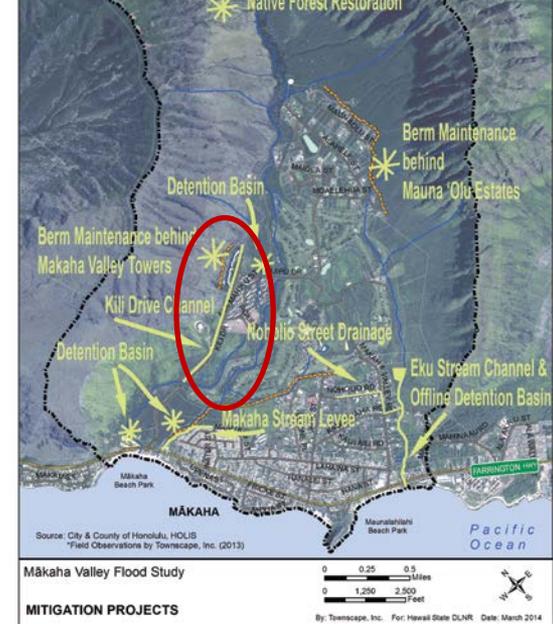
## Makaha Stream Levee

Looking Makai



# Preliminary ideas for flood mitigation measures

## STRUCTURAL



## Kili Drive - Concrete Channel

Looking Makai

# Preliminary ideas for flood mitigation measures

## NON-STRUCTURAL

- Stream Channel Scheduled Maintenance
  - Remove debris in channel
  - Maintain overgrown vegetation



# Preliminary ideas for flood mitigation measures

## NON-STRUCTURAL

- Storm Drainage Infrastructure Maintenance
  - Including berm/ditch behind Mākaha Valley Towers and Mauna 'Olu Estates



*Earth berm eroding beneath gunnite*



*Rocks filled to the top of the debris poles*

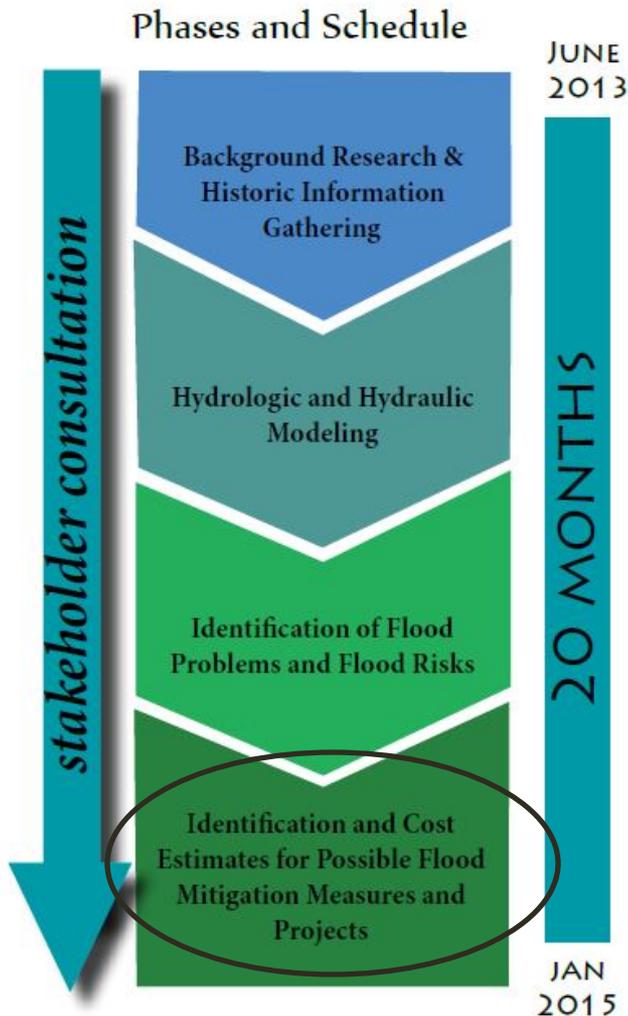
# Preliminary ideas for flood mitigation measures

## NON-STRUCTURAL

- Native Forest Restoration



# Next steps...



- Finalize flood mitigation measures
- Provide cost estimates and “effectiveness analysis”
- Develop priority/phased list for flood control measures
- Identify funding sources for projects

Thank you for your attention.

Questions?

Contact Information:



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