

# Ala Wai Watershed Project

## Quarterly Stakeholder Meeting

August 5, 2010

# Agenda

- Overview and meeting purpose (5 min.)
- Status of Ala Wai Watershed Project (5 min.)
  - Draft Feasibility Scoping Meeting Report (Baseline Conditions Report)
- Initial report results (60 min.)
- Break (15 min.)
- Update on associated activities (30 min.)
- Wrap-up (5 min.)

# Draft FSM Report

- Draft completed in July
- Currently in District Quality Review process
- Report contents organized according to USACE planning process
  - Introduction
  - Problems and Opportunities
  - Objectives and Constraints
  - Inventory and Forecast of Watershed Conditions
  - Alternatives Formulation
    - Conceptual Measures
    - Alternatives Development Strategy
- Highlight and discuss outcomes in each section

# Goal and Objectives

- To improve the overall quality of the watershed, from the crest of the Ko'olau Mountains to the nearshore waters, while ~~minimizing risk of~~ maximizing opportunities to reduce flood damages to the public and restore aquatic ecosystems
  - Flood risk management
  - Water quality
  - Stakeholder involvement
  - Recreation
  - Ecosystem restoration
  - Infrastructure maintenance
  - Water supply

# Definitions

## ➤ “Project”

- The set of actions that will be described and analyzed within the Feasibility Study and Environmental Impact Statement (EIS) with the anticipated outcome to be implemented all or in part through USACE programs and funding
  - USACE/DLNR/C&C joint funded actions (within USACE authority)
  - Actions by others – including only those where there is commitment to fund and implement, and those entities provide documentation to insert into Feasibility Study/EIS

# Definitions

## ➤ “Plan”

- An overarching and comprehensive strategy to promote long-term watershed stewardship within the Ala Wai watershed
- Includes the project, as well as other actions that are complementary to the project
- Plan actions should be coordinated by another entity to occur both during and beyond project implementation
  - Examples of plan actions include terrestrial efforts, LID activities in community, education and outreach

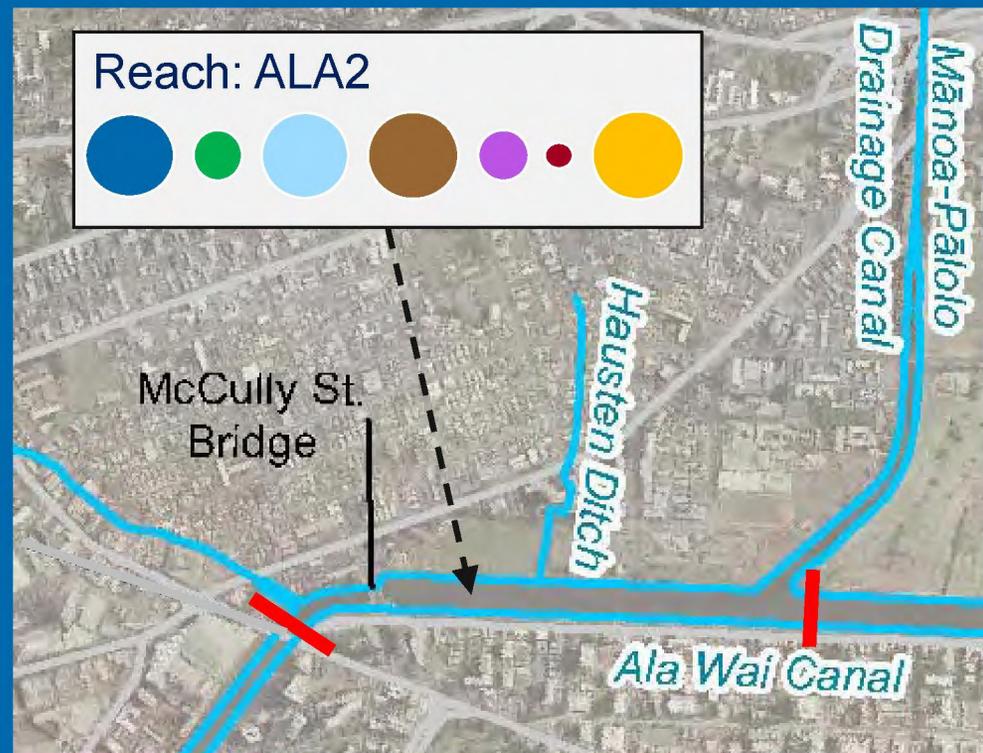
# Definitions

## ➤ “100-year flood”

- A flood with a 1-percent chance (1 in 100) of occurring in any single year
- The term does not mean that this degree of flood occurs every 100 years

# Problems and Opportunities

- Identified specific problems for each of the project objectives
  - Causes, effects/implications, historic/future conditions, references
- Define reaches based on existing conditions
- Developing matrix and map to show degree of problems by stream reach



# Inventory and Forecast

## ➤ Historic Conditions

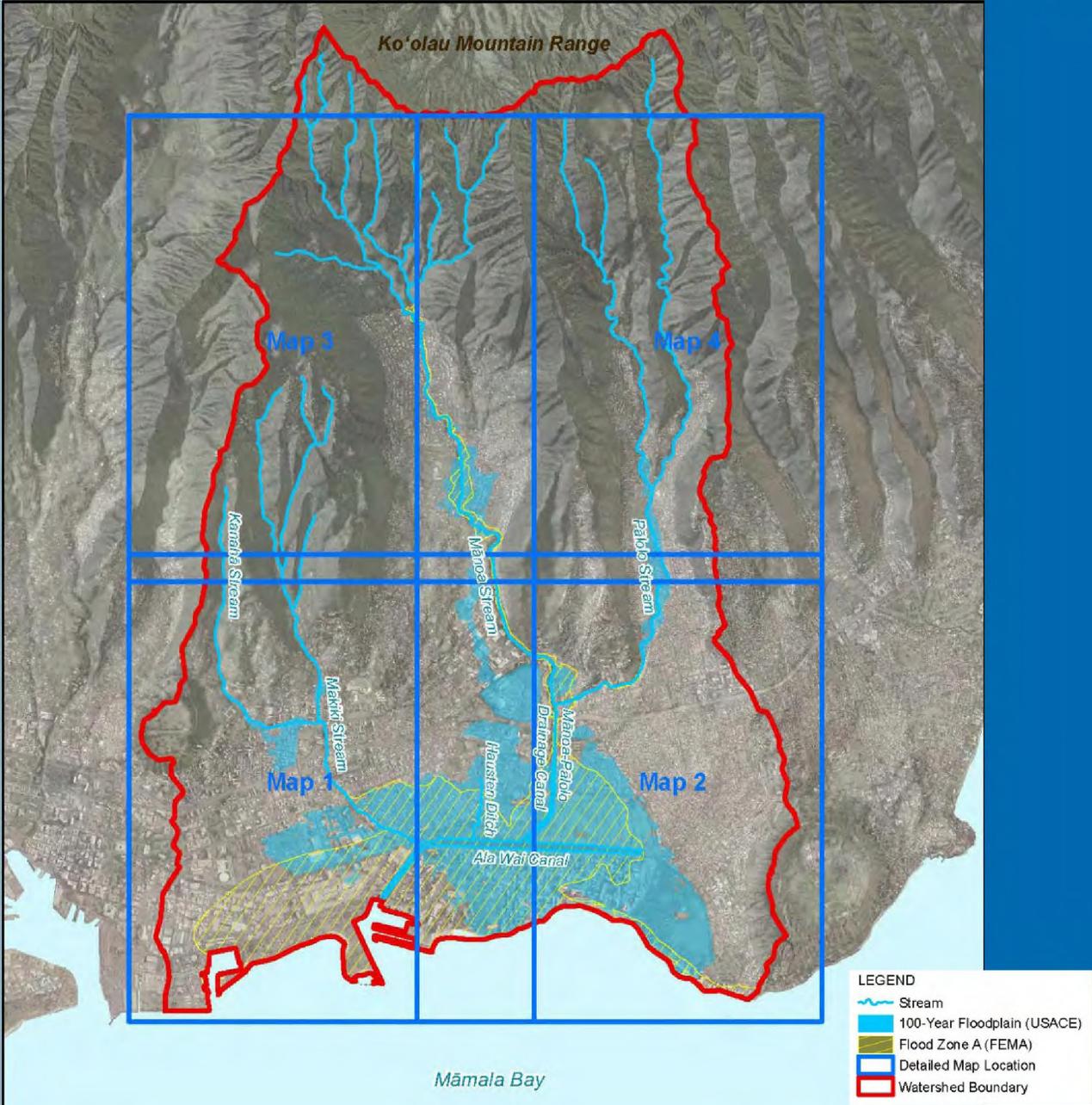
- Channel modifications over time

## ➤ Existing Conditions

- Resource inventories
  - Biological, cultural, geology, hazardous waste, recreation
- Modeling efforts
  - Hydrology and hydraulics
  - Economic damages

## ➤ Future Without-Project Conditions

# 100-Year Floodplain - Existing Conditions



# Economic Modeling

## ➤ Evaluation Concepts

- Without Project Condition: Mostly likely projection of the base year characteristics
- Damage Types: Residential, Commercial, Public, Automobiles
- Monte Carlo Simulation: Taking the known factors and running them through a random simulation
- Expected Annual Damages (EAD): The present worth of damages amortized over 50 years

# Economic Modeling

- Hydrologic Engineering Center – Flood Damage Reduction Analysis (HEC-FDA)
    - Evaluates the w/o project condition
    - Primarily consists of Residential, Commercial, Public, & Auto damages
    - Model uses several functions
      - Discharge-frequency
      - Depth-discharge
      - Depth-damage
- Frequency => Discharge => Depth => Damage  
Frequency-damage + Monte Carlo simulation = EAD

# Economic Modeling Results

## Existing Conditions

- HEC-FDA Results (\$000)
  - Total Structures: 6,468
  - EAD Residential: \$13,472
  - EAD Commercial/Public: \$214,747
  - EAD Automobiles: \$600
  - EAD Total: \$228,819

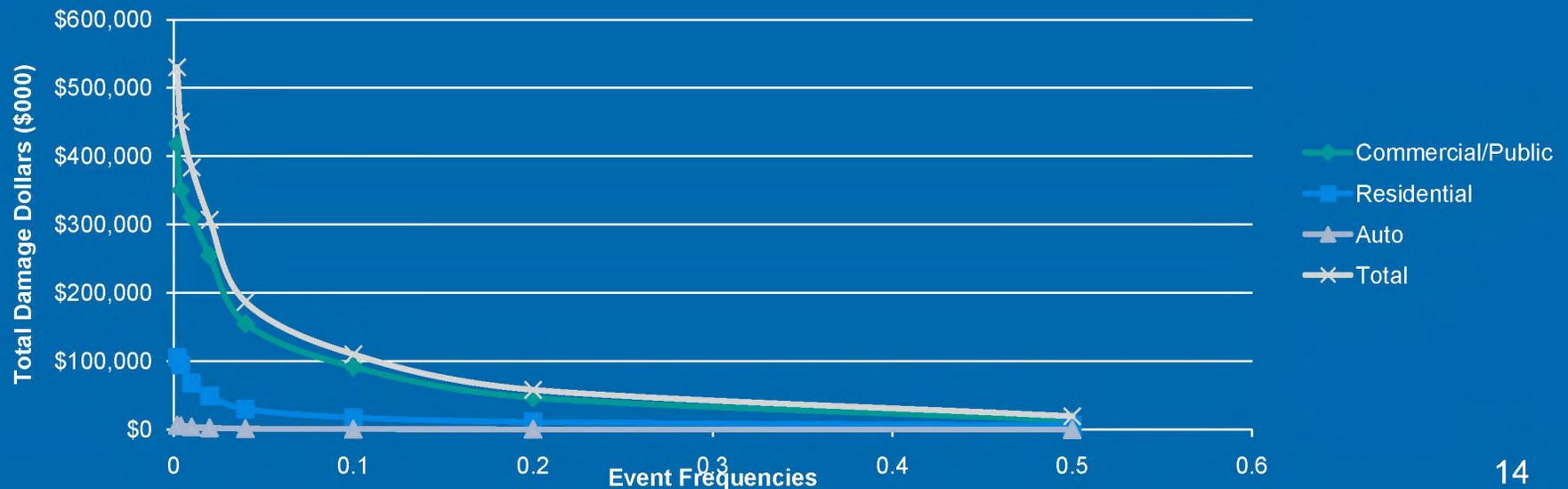
# Economic Modeling Results

## Existing Conditions

Frequency-Total Damage Curves (\$000)

	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	250 Year	500 Year
Categories	0.5	0.2	0.1	0.04	0.02	0.01	0.004	0.002
Commercial/Public	\$13,193	\$46,625	\$91,838	\$155,376	\$255,059	\$312,113	\$350,323	\$418,244
Residential	\$6,020	\$11,104	\$17,503	\$29,906	\$49,436	\$67,648	\$94,957	\$105,520
Auto	\$215	\$390	\$662	\$1,415	\$2,754	\$4,054	\$5,705	\$6,588
Total	\$19,430	\$58,120	\$110,003	\$186,697	\$307,249	\$383,814	\$450,985	\$530,352

Frequency-Total Damage Curves (\$000)

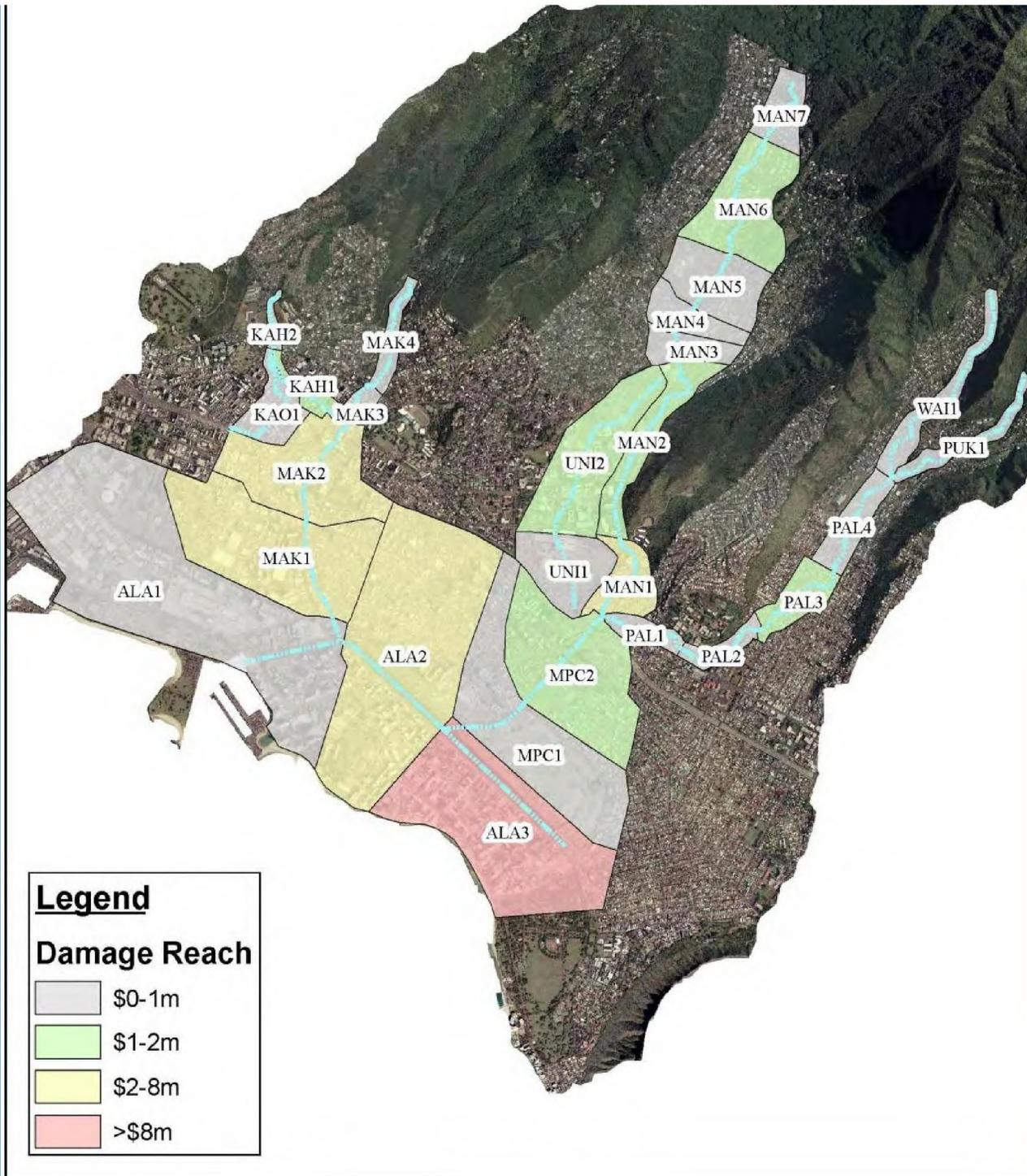


# Economic Modeling Results

## Existing Conditions

### ➤ Interesting Notes

- 27 Reaches
- The most EAD damage: ALA3
- EAD \$2-8 million: ALA2, MAK1, MAK2, & MAN1
- EAD \$1-2 million: KAH1, MAN2, MAN6, MCPC2, PAL3, UNI2



# Conceptual Measures

- Identified approx. 70 conceptual measures
- Organized measures into 19 categories
- Assigning conceptual measure categories by reach

Conceptual Measure Category	Conceptual Measure Name	Structural Measure	Non-structural Measure	"Plan" Action	General Description	Project Objectives							Considerations for Site Selection	Preliminary Screening Considerations				
						Flood Damage Reduction	Ecosystem Restoration	Water Quality	Recreation	Water Supply	Infrastructure Maintenance	Stakeholder Involvement		Maintenance	Construction Cost	Land Acquisition	Public Safety / Liability	Additional Screening Considerations / Comments
Peak Flow Reduction	Detention basins (surface and sub-surface)	X			Create surface and/or subsurface temporary storage facilities to collect flood flows during larger storm events; operate to control storm flow hydrographs	●	●	○		○			Availability of open space for storage; access and easements for maintenance; location in watershed relative to production of peak flows; condition of existing in-stream habitat	X			X	Uncertain who would be responsible for maintenance; multi-use measure could result in temporary loss of open space areas (e.g., parks, golf course); measure could present safety risk for open space users
	Dams / reservoirs	X			Create much larger storage facilities than detention basins; can also create permanent pools for habitat. Potential locations previously identified in upper Manoa and Palolo valleys	●	○	○	○	●			Availability of open space for storage; access and easements for maintenance; location in watershed relative to production of peak flows	X	X	X	X	Maintenance cost could be significant; loss of forest habitat and impacts to recreation (e.g., hiking trails); safety concerns associated with dam
	Diversion structures (surface and sub-surface)	X			Create sub-surface diversions to reduce peak flows upstream of constricted channel areas (Makiki and Manoa Streams); create surface diversions to protect hill slope areas; create sub-surface or surface diversion from Canal to ocean	●							Availability of open space or easements for construction of diversions; access and easements for maintenance; location in watershed relative to input and outflow of peak flows		X			Construction costs could be significant, especially if measure requires drilling underneath homes, relocation of utilities, etc.
	Low Impact Development (LID)		X	X	Various methods of retaining stormwater to allow for natural infiltration and decreased runoff; typically implemented on individual properties (residential or commercial) in many locations throughout watershed	●	○	○		○			Participating developers/landowners throughout watershed; regional application could involve multiple developers/landowners	X				Uncertain who would be responsible for maintenance; effectiveness could be minimal depending on scale of implementation

# Conceptual Measure Categories

## Primary Objectives

### ➤ Flood Damage Reduction

- Peak flow reduction
- Increase channel, storm drain and bridge capacities
- Minimize damages (non-structural)

### ➤ Ecosystem Restoration

- Channel morphology
- Fish passage improvement
- Hydraulic complexity
- Minimum stream flows
- Invasive fish/wildlife control
- Invasive vegetation control
- Vegetation enhancement
- Channel stability
- Sediment/debris management

# Conceptual Measure Categories

## Secondary Objectives

- Water Quality
  - Remove and/or reduce input of pollutants
  - Reduce risk of exposure to pollutants
- Recreation
  - Improve public access
- Water Supply
  - Stormwater reuse
- Infrastructure Maintenance
  - Channel maintenance
- Stakeholder Involvement
  - Stakeholder education

# Alternatives Development

## ➤ Alternative

- Combination of site-specific measures to be implemented throughout watershed

## ➤ Strategy for alternatives development

- Identify types of alternatives
- Group flood damage reduction and ecosystem restoration measure categories
- Expected to yield approx. 8 – 10 types of alternatives

## ➤ Formulation of alternatives

- To be conducted in next phase
- Site measures in specific locations throughout watershed
- For each type of alternative, various combinations of site-specific measures
- Incorporate measures for secondary objectives

# Alternatives Development

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# Alternatives Development

## ➤ Flood Damage Reduction

- Peak flow reduction
- Increase channel, storm drain and bridge capacities
- Minimize damages (non-structural)

### STEP 1: Group measure categories

*Peak flow reduction + fish passage / min. stream flows / sed. management*

## ➤ Ecosystem Restoration

- Channel morphology
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**= Alternative Type 1**

# Alternatives Development

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### STEP 1: Group measure categories

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NEXT PHASE  
-----

### STEP 2: Site primary measures

*Detention basin at Manoa District Park + low-flow channel on Palolo Stream*

## ➤ Ecosystem Restoration

- Channel morphology
- Fish passage improvement
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# Alternatives Development

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### STEP 1: Group measure categories

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NEXT PHASE  
-----

### STEP 2: Site primary measures

*Detention basin at Manoa District Park + low-flow channel on Palolo Stream*

### STEP 3: Add secondary measures

*Add recreational trail + stormwater reuse*

## ➤ Ecosystem Restoration

- Channel morphology
- Fish passage improvement
- Hydraulic complexity
- Minimum stream flows
- Invasive vegetation control
- Invasive fish/wildlife control
- Vegetation enhancement
- Channel stability
- Sediment/debris management

**= Alternative Type 1  
- Alternative 1A**

# Alternatives Development

## ➤ Flood Damage Reduction

- Peak flow reduction
- Increase channel, storm drain and bridge capacities
- Minimize damages (non-structural)

### STEP 1: Group measure categories

*Peak flow reduction + fish passage / min. stream flows / sed. management*

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NEXT PHASE  
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### STEP 2: Site primary measures

*Detention basin at Manoa District Park + low-flow channel on Palolo Stream*

### STEP 3: Add secondary measures

*Add recreational trail + stormwater reuse*

### STEP 4: Iterate

## ➤ Ecosystem Restoration

- Channel morphology
- Fish passage improvement
- Hydraulic complexity
- Minimum stream flows
- Invasive vegetation control
- Invasive fish/wildlife control
- Vegetation enhancement
- Channel stability
- Sediment/debris management

**= Alternative Type 1**

- Alternative 1A
- Alternative 1B
- Alternative 1C

# Round-Robin Update on Associated Projects

# Path Forward

- Complete District Quality Review
- Agency Technical Review (Fall 2010)
- Public Distribution Process for FSM Report
- Alternatives Formulation
  - Next Phase

# Wrap-Up