Ala Wai Watershed Project

Quarterly Stakeholder Meeting

March 19, 2010

Agenda

- Overview and meeting purpose (5 min.)
- Update on Ala Wai Watershed Project (20 min.)
  - Project goal and objectives
  - Recently completed and ongoing activities
  - Path forward
- Update on associated projects (10 min.)
  - Ala Wai golf course study
  - Woodlawn bridge chute structure (FEMA/DLNR)
  - Others?
- Discussion of future without-project condition (80 min.)
- Next steps (5 min.)

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 flood damage
  - Flood risk management
  - Water quality
  - Stakeholder involvement
  - Recreation
  - Ecosystem restoration
  - Infrastructure maintenance
  - Water supply
- Upcoming deliverable
  - Feasibility Scoping Meeting Report (FSMR)

Definition of “Project” and “Plan”

- “Project” - the alternatives to be presented in Feasibility Report/EIS
  - USACE/DLNR/C&C joint funded actions (within USACE authority)
  - Actions by others – including only those where there is commitment to implement and those entities provide documentation to insert into Report
- “Plan” - the “project” plus broader/related actions for holistic watershed management
  - Long-term ownership
  - Actions include terrestrial efforts, LID activities in community, education and outreach
  - Comprehensive list of actions will not be identified in Report, only the concept of the “plan”
  - Report will identify the need for this long-term ownership

Project Status

- ✓ Problems and opportunities identified
- ✓ Sub-objectives and metrics identified
- ✓ Inventory of watershed conditions (resource assessments)
- ➢ Modeling (Hydrology, hydraulics, water quality)
  - √ Existing conditions – completed
  - Future without-project conditions
  - Habitat quality (to be modeled in next phase)
  - WARMf water quality (baseline information)
- ➢ Economic analysis
  - √ First floor elevations
  - Damage curves (in progress)

Resource Assessments

- ✓ Completed:
  - Hazardous, Toxic and Radioactive Waste (HTRW)
  - Geotechnical Assessment
  - Stakeholder Assessment
  - Historic Properties Inventory
  - Natural Resources Assessment
  - Recreational Assessment
  - Literature Review of Water Supply Issues
  - Literature Review of Coastal Resources (draft)
- ➢ In progress:
  - Cultural Resources Assessment (draft to be submitted)

Path Forward

- Complete modeling
  - Future without-project condition
- Complete economic analysis
- Identification of conceptual measures
- Feasibility Scoping Meeting Report
- Alternatives Formulation
  - To be completed in next phase
- Feasibility Report and EIS
  - Draft expected (2011)
  - Final expected (2012)


EARTH MONTH
MAUKA TO MAKAI CLEAN WATER EXPO
SATURDAY, APRIL 10, 2010
9AM-2PM
WAIKIKI AQUARIUM
HONOLULU, HAWAII
E MALAMA I KA WAI OLA * PROTECT OUR WATERS ... FOR LIFE!

Associated Projects

- Ala Wai golf course study
- Woodlawn bridge chute structure (FEMA/DLNR)
- Others?

Future Without-Project Condition

- Time period for projection = 2070
  - 50 years after anticipated date construction is complete
  - Projected construction dates for project
    - Start 2015 Finish 2020
- What should be included:
  - Present day actions, laws, policies
    - Assume regular maintenance of all existing structures
  - Reasonably foreseeable actions
    - Projects already budgeted (i.e. CIP budgeted items)
    - Regulations already passed but waiting implementation guidance

Future Without-Project Condition

- What should not be included:
  - Conjecture
    - Changes we think may happen based on changing condition (e.g., increased invasive species control because invasive species will become a bigger problem)
    - Changes we think may happen because of current movements (e.g., strict requirements for Low Impact Development activities, but not current law or policy)
- Reference or documented best professional judgment (BPJ) required
  - BPJ must be from subject matter experts not just project team

USACE Policy

- Policy issued in July 2009 for all USACE projects that could be affected by sea-level rise
  - Three scenarios – low, intermediate, high
- Honolulu District Policy
  - Timeframe = 50 years
  - Apply the same timeframe across conditions (i.e. for future economic, hydraulic, and environmental)
  - For Ala Wai – coordinate informally with the State for defining scenario (via TATs)
  - For future projects – work formally with State process (ORMP, ICAP, PICCC) to define climate change scenario(s)

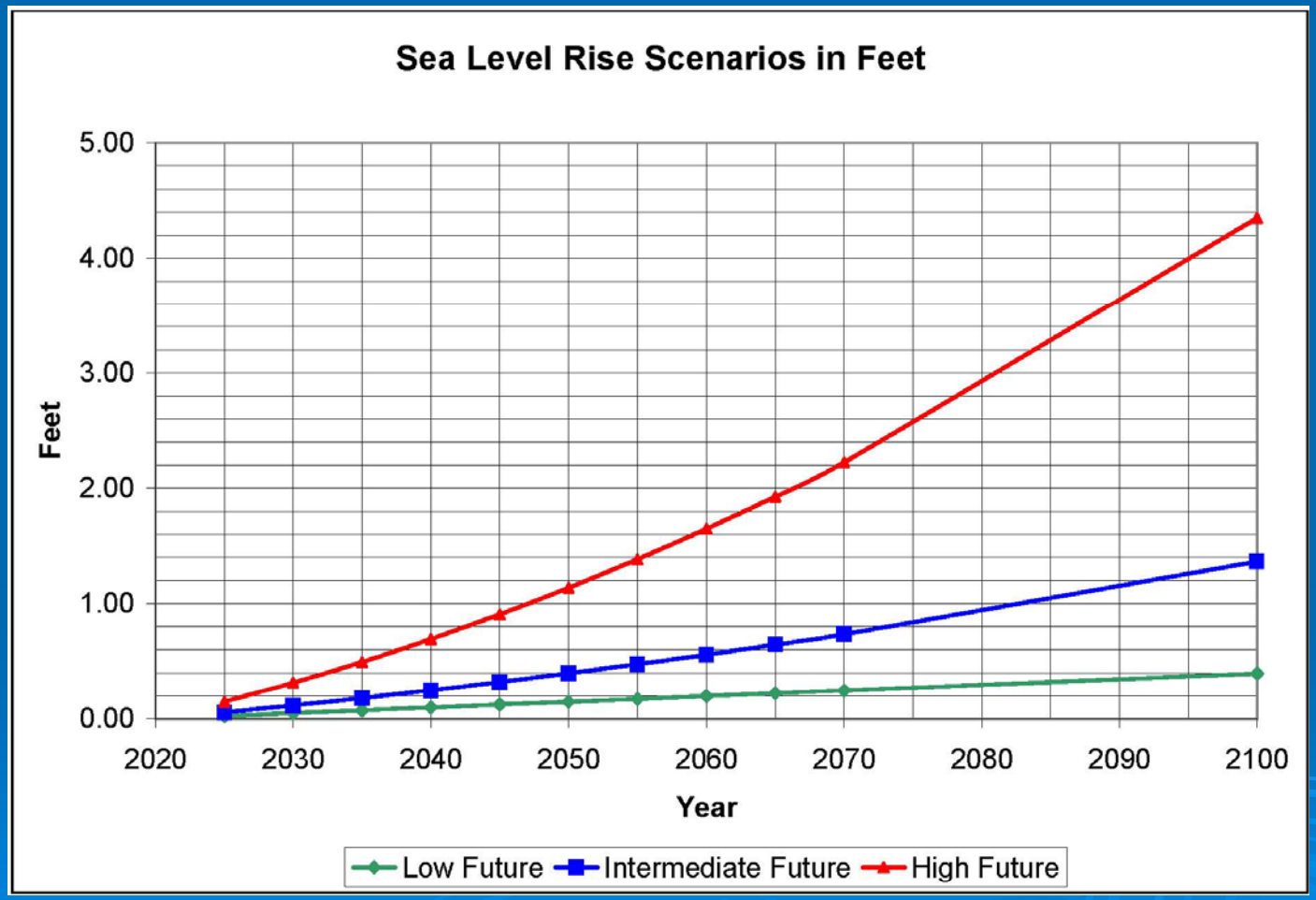
Approach for Ala Wai Project

- Step 1: Define physical conditions
  - Define multiple scenarios (low, intermediate and high)
  - Use to define other conditions once consensus is reached
- Step 2: Define economic/social conditions
- Step 3: Define environmental conditions
- Review with TATs and subject experts
- Additional review/input during Feasibility Scoping Meeting and Peer Review

Future Without-Project Conditions

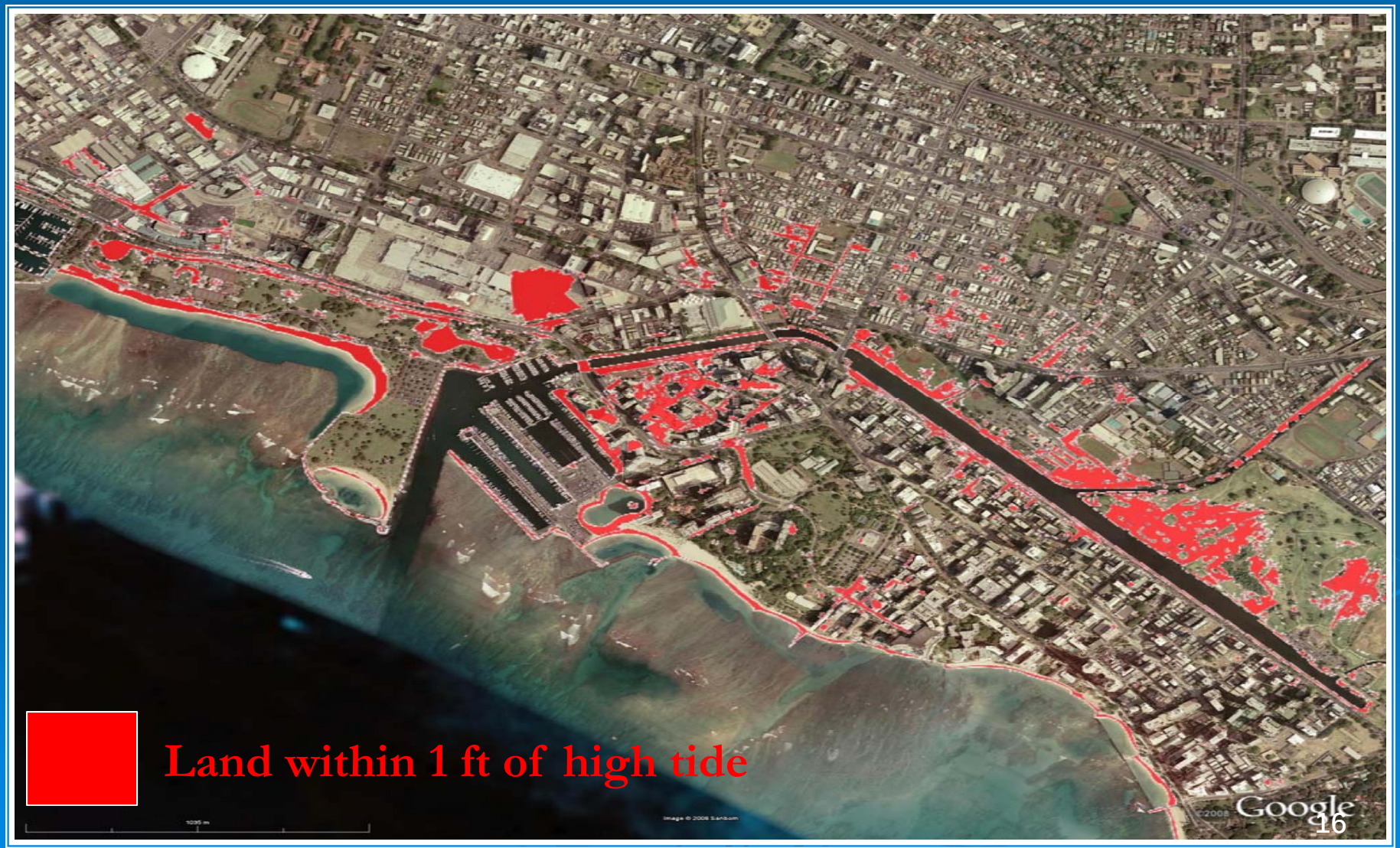
- Sea Level Rise
  - Honolulu Harbor tide gage data (data dating from 1905)
  - Low rate of vertical uplift (Fletcher and Jones 1996), so scenarios do not account for vertical land movement
  - Low scenario = NOAA CO-OPS value (1.50 +/- 0.25 mm/year)
  - Intermediate scenario = NRC Curve I
  - High scenario = NRC Curve III

Future Without-Project Conditions



- Intermediate and high rates fall within range presented in recent studies accounting for accelerated glacial ice melting (Fletcher, 2009)

Future Without-Project Conditions



Future Without-Project Conditions

- Hurricanes
  - Storm intensity expected to increase (no change in frequency or movement) (Christensen et al., 2007)
  - Assume no coincidence between hurricanes and high rainfall intensity flood producing storm systems (Based on literature/historic information)
  - Project will not address hurricane coastal flooding
  - Assume surge impacts within Canal are minimal (protected by harbor)

Future Without-Project Conditions

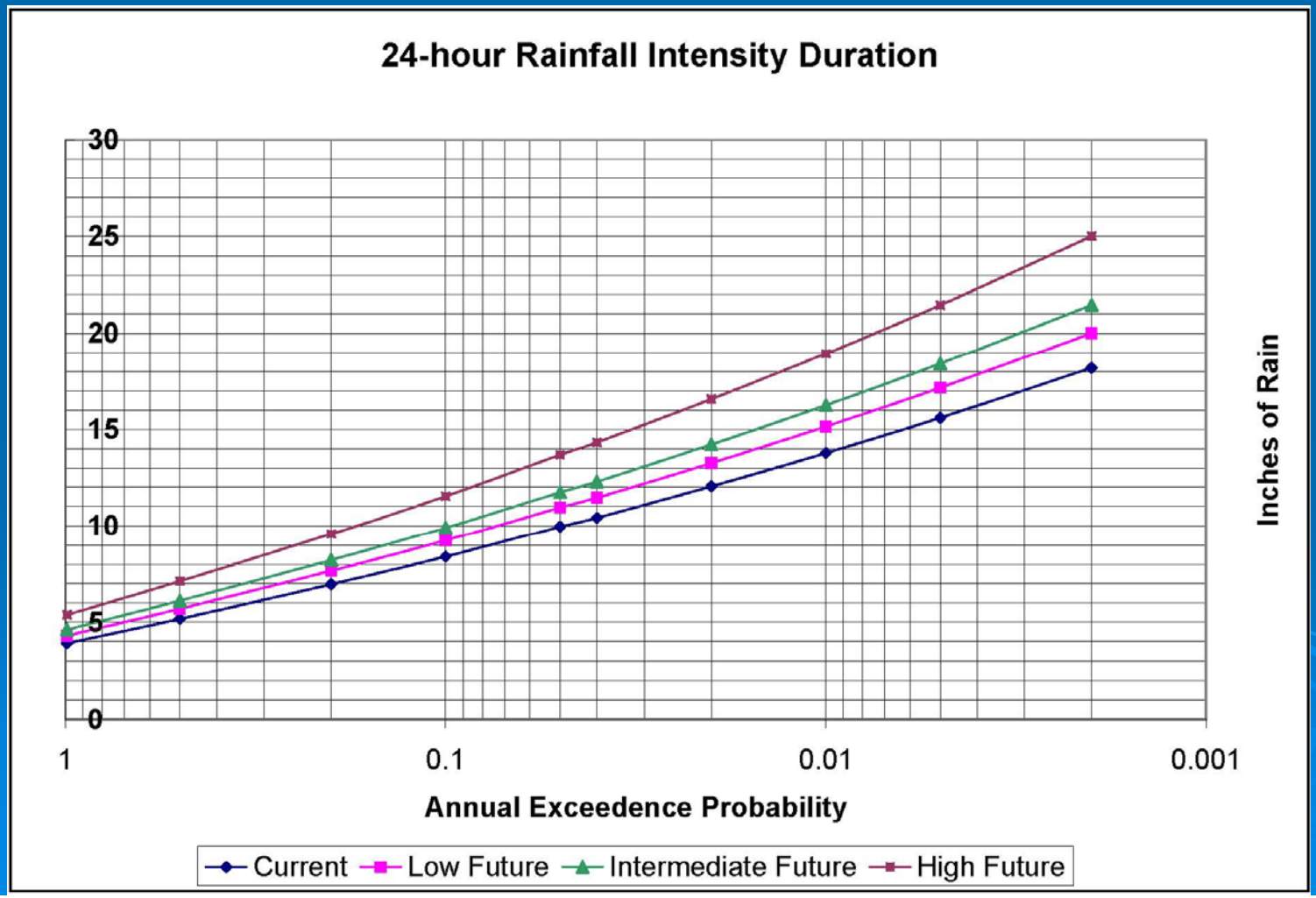
- Amount of Rainfall
  - Annual rainfall expected to decrease 0-5% (5-10% decrease in winter months) (Christensen et al. 2007)
  - Aggravated by coincident ENSO events
  - Decreased rainfall assumed to impact rate of groundwater recharge

Future Without-Project Conditions

- Rainfall Frequency and Intensity
  - Frequency of light rainfall events expected to decrease
  - Frequency of heavy rainfall events expected to increase
    - 20-year storm expected to be 10-25% heavier (Global Climate Change Impacts in the US, 2009)
  - NOAA Atlas 14 (2009) values to be used for base values and modeling
    - Consistently higher values compared to Report R-73 (Giambelluca et al., 1984)

Future Without-Project Conditions

- Rainfall frequency intensity scenarios to assume 10%, 18% and 25% increase over existing without-project condition



Future Without-Project Conditions

- Debris Generation (Vegetation/Sediment)
  - Minimal ability to predict
  - Assume no significant change in land use district boundaries
  - Assumptions about future changes in erosion associated with invasive species to be discussed with relevant agencies
  - Account for blockages at specific bridges (consistent with current without-project condition)
  - Modeling to account for changes through use of bulking factor (i.e. Manning's n-value, or channel roughness)
    - Low scenario = No increase
    - Intermediate = 5% increase
    - High scenario = 10% increase

Future Without-Project Conditions

- Impervious Areas
  - Population expected to increase minimally
    - ~7% by 2035 (DPP, 2009)
  - Construction trends assumed to continue
    - Redevelopment of existing lots with higher density residential units
    - Minimal contributions to increased runoff
  - Assumptions about future development standards (e.g., LID, LEED, etc.) to be discussed with relevant agencies

Future Without-Project Conditions

- Changes in imperviousness to be reflected by increasing Curve Number (CN) values to account for reduced infiltration
  - Low scenario = No change in CN
  - Intermediate = Increase CN value by 2
  - High scenario = Increase CN value by 5

Curve Numbers used in HEC-HMS Hydrologic Model for the Ala Wai Watershed, Oahu, Hawaii

Sub-Basin in HEC-HMS Model	Existing and Low Scenario Curve Number	Intermediate Scenario Curve Number	High Scenario Curve Number
A1	84	86	89
A2	90	92	95
A3	89	91	94
A4	85	87	90
A5	88	90	93
A7	85	87	90

Future Without-Project Conditions

- Limited set of scenarios to be selected for hydrology and hydraulic modeling
  - Low
  - High
  - Composite of most probable scenarios for each condition

Future 50-year Without-Project Scenarios
Ala Wai Watershed Project, Oahu, Hawaii

Component	Low	Intermediate	High	Most Probable
Sea Level Rise	Low	Intermediate	High	High
Rainfall Intensity	Low	Intermediate	High	Intermediate
Debris Generation	Low	Intermediate	High	Low
Impervious Area	Low	Intermediate	High	Intermediate

Future Without-Project Conditions

- Water Quality
  - Assumes no significant change in land use district boundaries
  - Assumptions about future changes in erosion associated with invasive species to be discussed with relevant agencies
  - Assumptions about future regulatory requirements relative to various constituents to be discussed with relevant agencies
    - Water Quality Standards
    - TMDLs
    - NPDES permit requirements
  - Assumes frequency of Canal dredging will be consistent with past practices

Future Without-Project Conditions

- Habitat Quality
  - Specific impacts in Hawaii not currently known to be quantified
  - More detailed information about impacts assumed to be made available through upcoming State efforts (ORMP, ICAP, PICCC)
  - Changes within Ala Wai watershed to be quantified using ecosystem model
    - Modeling to be completed in next phase
    - General future habitat conditions and basic assumptions for model metrics to be described in the FSM Report

Future Without-Project Conditions

- General Habitat Conditions
  - Habitat loss and degradation
  - Decreased biodiversity
    - Decline and extinction of T&E species (USFWS, 2009)
    - Loss and migration of native species
    - Increased avian malaria (USFWS, 2009)
  - Increased extent and presence of invasive species
  - Impacts to coral reef habitat
    - Coral bleaching due to increasing ocean temperatures (~2-6^{o} by 2100) (Vecchi and Soden, 2007)
    - Conditions for corals assumed to be marginal by 2070 due to ocean acidification (Hoegh-Guldberg et al. 2007, and others)

Future Without-Project Conditions

- Habitat Quality Metrics
  - Instream habitat quality and connectivity
    - Assume no significant changes in channel conditions (e.g., channel hardening)
    - Assume increase in passage barriers (e.g., changes in flow conditions)
    - Assume decreased base flows
    - Assume increased water temperatures
  - Floodplain function
    - Floodplain function already minimal; assume no change

Future Without-Project Conditions

- Habitat Quality Metrics (cont.)
  - Riparian habitat quality and connectivity
    - Extent and connectivity of riparian habitat already minimal, assume no change (confirm with relevant agencies)
    - Assume increase of invasive species and decline of native species
  - Sediment and debris inputs
    - Assume no change in bed and bank stability
    - Assume no change in substrate embeddedness
    - Assumptions about future changes in debris/erosion associated with invasive species to be discussed with relevant agencies

Future Without-Project Conditions

- Water Supply
  - Groundwater recharge expected to decrease
    - Decreased annual rainfall (0-5%, higher in winter months)
    - Increased evaporation rates caused by rising temperatures
  - Sea-level rise may contribute to increased salt water intrusion into freshwater lens (United Global States Research Program 2009)
    - Potential for intrusion on Oahu not well understood, given presence of cap rock
  - No known quantification of impact on water supply
  - Demand expected to increase by ~34% by 2030 (CWRM, 2008)

Future Without-Project Conditions

- Flood Damages
  - Assume no significant changes in land use district boundaries
  - Assume redevelopment trends
    - Increase in housing density
    - No significant change in commercial activities or densities
- Regional economic considerations

Future Without-Project Conditions

- Social Conditions
  - Population projections
  - Housing density forecast
- Recreation
  - Assume present type of activity and per capita use levels remain constant
  - Determine use levels
  - Include future projects only if already a CIP budgeted item

Questions?