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Water for Life

Board of Water Supply
City and County of Honolulu

**WAI'ANAE AND KO'OLAU LOA
WATERSHED MANAGEMENT PLANS
O'AHU WATER MANAGEMENT PLAN**

**City Council
Planning Committee**

March 4, 2010

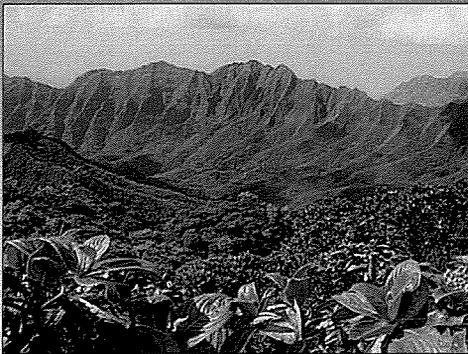
Department of Planning and Permitting
Board of Water Supply

Consultants:
 Group 70 International (Ko'olau Loa)
 Townscape, Inc. (Wai'anae)

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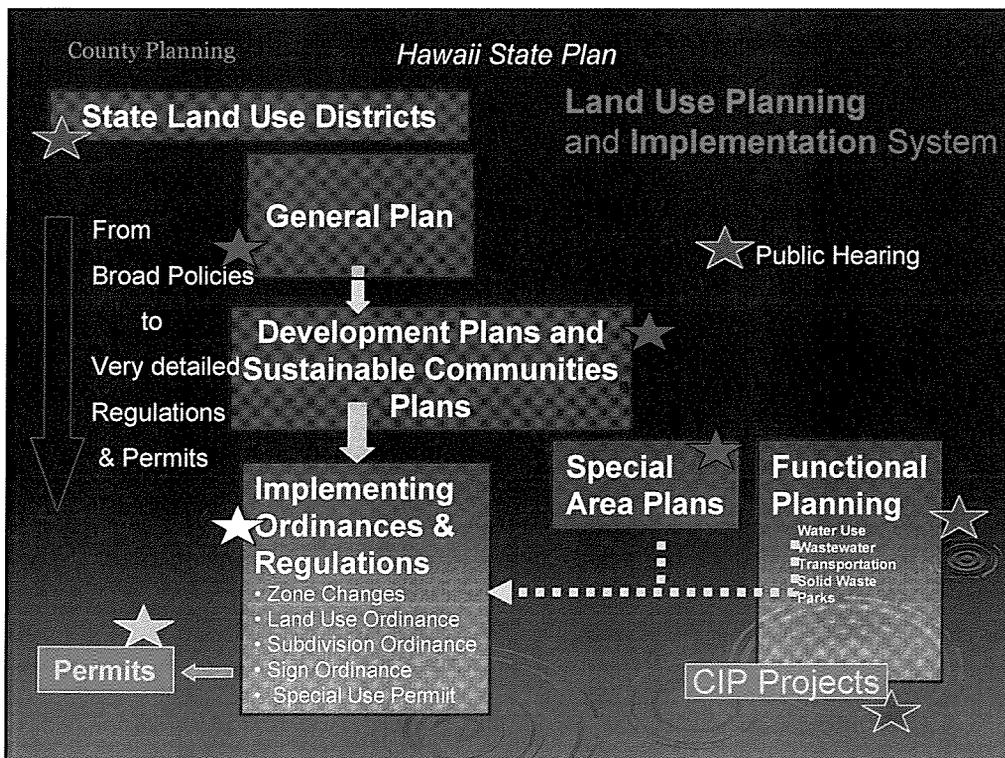
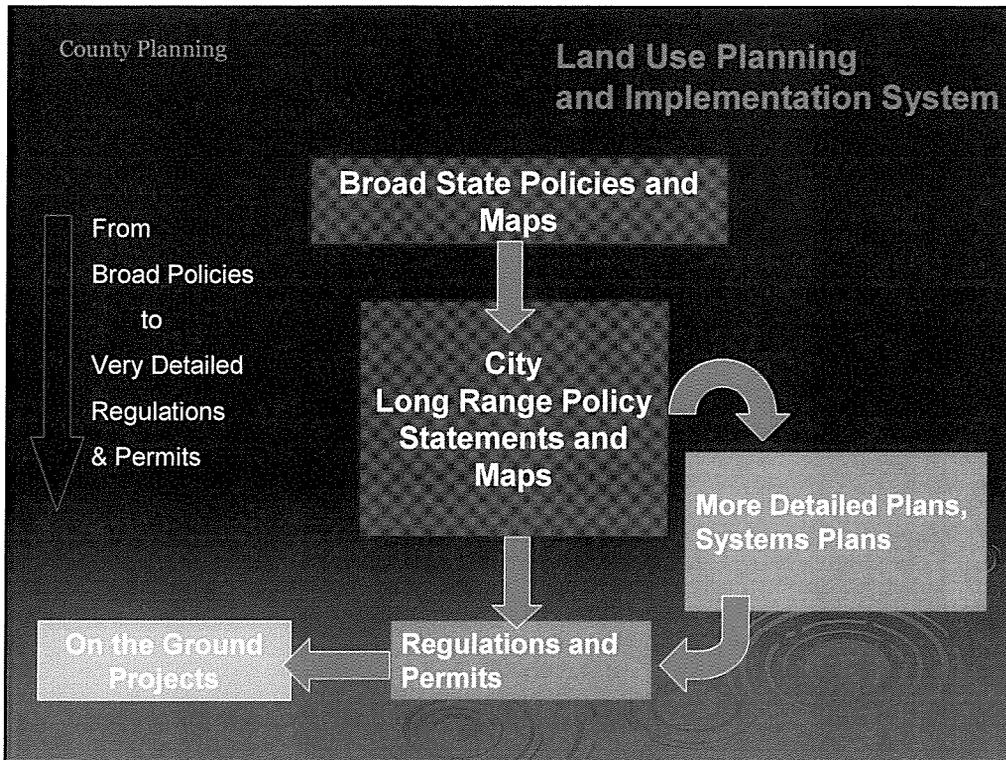
Presentation Outline

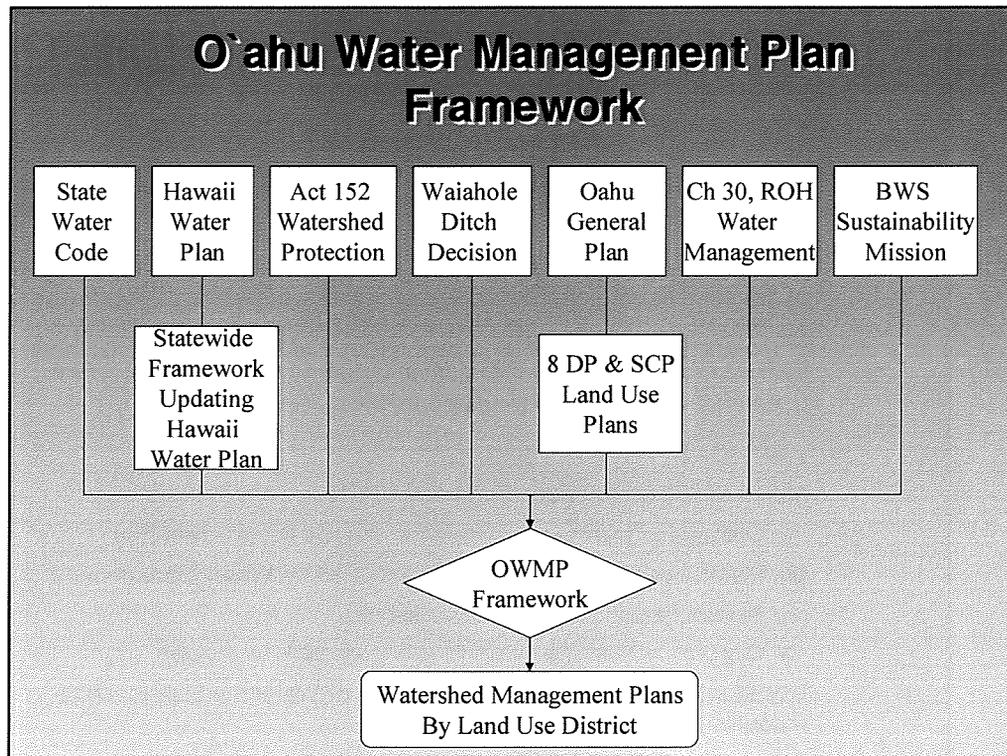
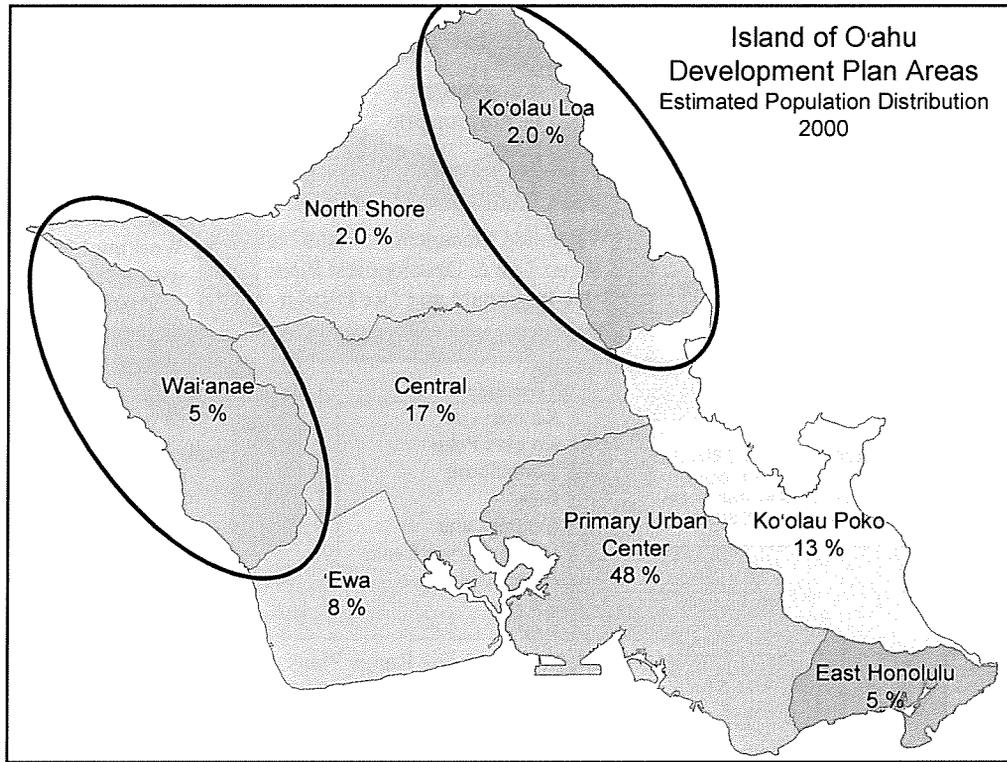


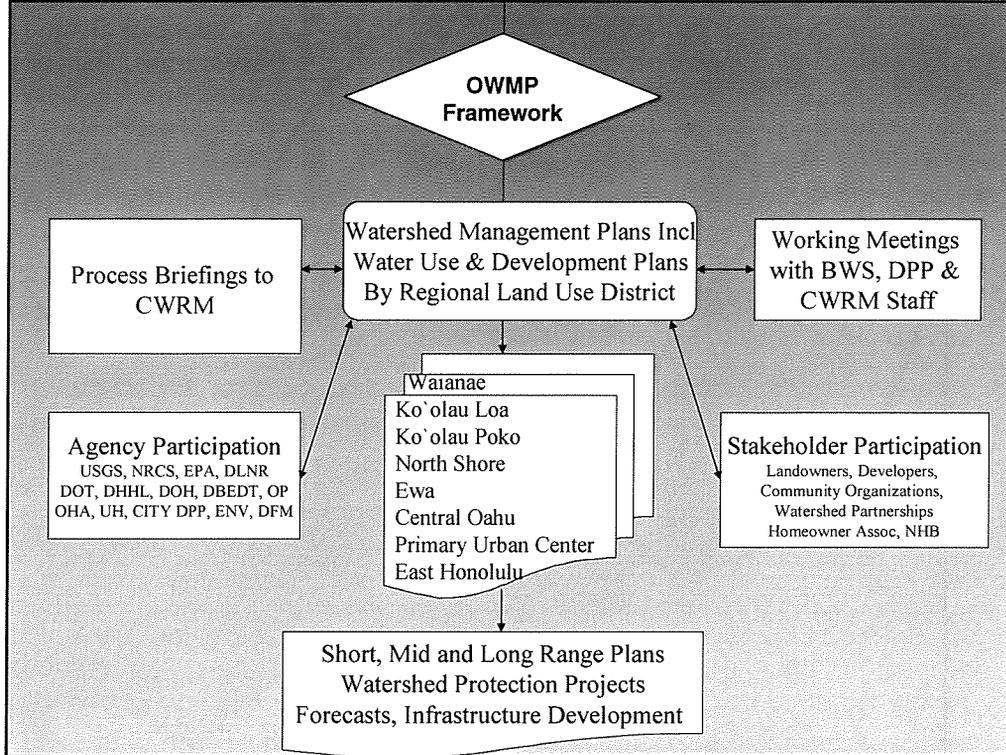
- Planning Framework
- Background
- Goal and Objectives
- Plan Structure
- Highlights of Note
- Findings by District
- Plan Approval Process

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Background

- **What is the Plan?**
 - County long-range water management plan that consists of policies and strategies that guide future water use and development and watershed management actions of City, State, landowners and organizations
 - Each district's watershed management plan collectively will form the updated O'ahu Water Management Plan
- **Why are we doing it?**
 - Mandated by State Water Code, 174-C HRS
 - County must prepare a County Water Use and Development Plan
 - Mandated by City Ordinance Chapter 30, ROH, Water Management
 - Named the Oahu Water Management Plan
 - City Dept. of Planning & Permitting is responsible for the plan.
 - BWS funded update using the Ahupua'a or Watershed approach to resource management

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Background: Plan Status

- Public Participation: Over 40 individual & community meetings conducted in each district.
- Public Review Draft
 - Wai'anae June 2006
 - Ko'olau Loa October 2006
- Neighborhood Board Endorsement
 - Wai'anae July 2006
 - Ko'olau Loa August 2007
- CWRM revised aquifer sustainable yields August 2008.
- Final revisions and formatting completed 2009.

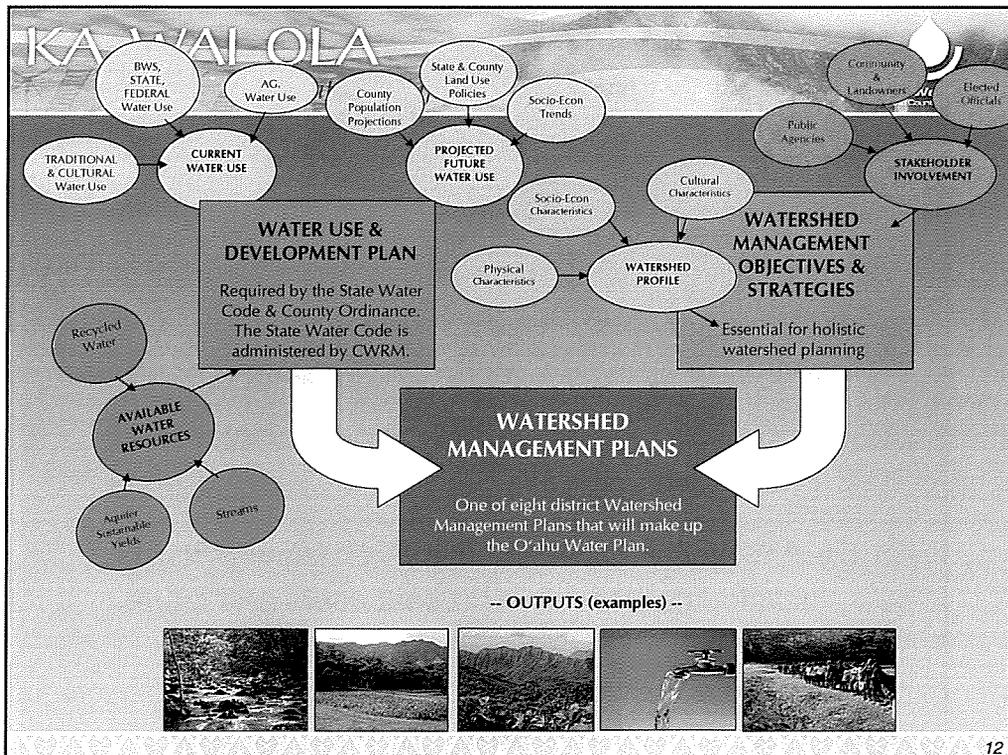
Watershed Management Plan Goal

To formulate an **environmentally holistic, community-based, and economically viable** watershed management plan that will provide a balance between:

- (1) the protection, preservation and management of O'ahu's watersheds
- (2) sustainable ground and surface water use and development to serve present users and future generations

Watershed Management Plan Objectives

1. Promote Sustainable Watersheds
2. Protect and Enhance Water Quality & Quantity
3. Protect Native Hawaiian Rights and Traditional & Cultural Practices
4. Facilitate Public Participation, Education & Project Implementation
5. Meet Future Water Demands at Reasonable Costs



Watershed Management Plan Structure

- **O'ahu Water Management Plan Overview**
- **Executive Summary**
- **Chapter 1:** Overview of O'ahu's Hydrogeology
- **Chapter 2:** Watershed Profile
- **Chapter 3:** Water Use and Projected Demand
- **Chapter 4:** Objectives, Sub-Objectives, and Strategies
- **Chapter 5:** Watershed and Water Supply Projects
- **Chapter 6:** Implementation Plan

Watershed Management Plan Structure

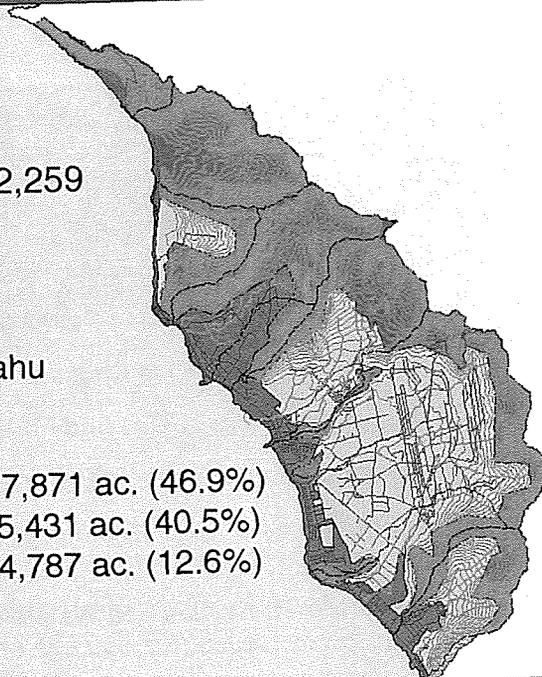
- **Appendix A:** Approval of Watershed Management Plan Scope and Approach
- **Appendix B:** Plans, Policies, Guidelines, and Controls
- **Appendix C:** Water Use Permit Index
- **Appendix D:** Well Use Data
- **Appendix E:** Water Demand Forecasting Methodology
- **Appendix F:** BWS Six-Year Construction Program 2006-2011
- **Appendix G:** Neighborhood Board Meeting Minutes Endorsing the Watershed Management Plans
- **Appendix H:** Ko'olau Loa Watershed Plan Working Group Unresolved Issues (*Ko'olau Loa only*)

O'ahu Water Management Plan Highlights

- Plan protects watersheds, promotes water efficiency & conservation for Urban & Ag and diversifies natural & alternative water supplies to preserve natural resources
- Inventories groundwater and surface water supply, existing water use, availability and demand forecasts with 3 growth scenarios for Urban & Ag, (low, mid and high growth)
- Identifies Uncertainties & Contingencies: Groundwater estimates, recoverability, climate change, drought & source water contamination
- Plan Implementation describes the water allocation process and the adequate facilities requirement for land use approval
- Conclusion: There is enough water supply on Oahu for urban and ag demands through the 2030 planning horizon

Wai'anae Moku

- Population (2000): 42,259
– (4.8% of O'ahu)
- Size: 38,089 acres
– approx. 10% of O'ahu
- Land Use
 - Conservation: 17,871 ac. (46.9%)
 - Agriculture: 15,431 ac. (40.5%)
 - Urban: 4,787 ac. (12.6%)



Wai'anae Watersheds

- 9 ahupua'a
- 9 watersheds
- 6 major streams

Aquifer Sustainable Yields / Pumpage '05

- Keaau 4 MGD / 0 MGD
- Makaha 3 MGD / 1.8 MGD
- Waianae 3 MGD / 2.5 MGD
- Luualualei 4 MGD / 0.6 MGD
- Nanakuli 2 MGD / 0 MGD



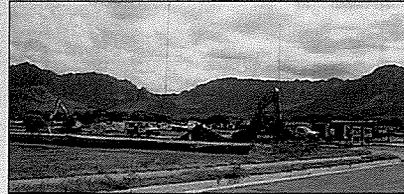
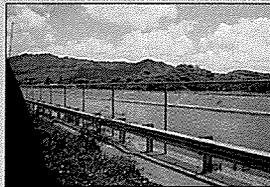
Wai'anae Watershed – Guiding Principles

- Access to watersheds requires a sense of kuleana
- Self sufficiency, dignity, and health
- Sensitivity to species and habitats
- Appropriate application of new water development technology
- Rural lifestyle and agricultural preservation
- Exercise of traditional and customary rights
- Water justice



Wai'anae Watershed Issues & Concerns

- Flooding / concrete channels
- Forest restoration & wildfires
- Streamflow restoration
- Traditional & customary uses and availability of resources
- Educating communities
- Conservation, recycling, & alternative water development
- Growth & development
- Water quality and quantity
- Funding Watershed Protection



Wai'anae Watershed Management Plan Water Supply Findings

- Continue water conservation efforts
- Develop non-potable water for agricultural demand.
- Surface water – limited potential water source in upper valleys (Amend interim instream flow standards first).
- New BWS potable well development in Wai'anae not feasible (low yield & high cost).
- Import water from Pearl Harbor
- Update the Pearl Harbor Aquifer Numerical Groundwater model to locate new water sources and optimize the pumping of existing sources.

Wai'anae Watershed Management Projects

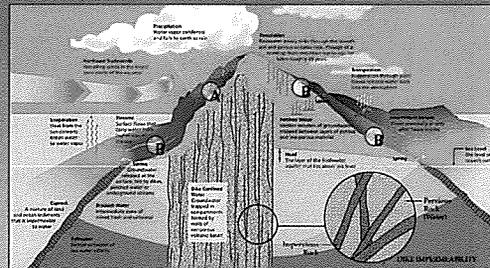
WATER SUPPLY OPTIONS

- 01) Import Additional Pearl Harbor Aquifer Potable Water
- 02) Develop Additional Wai'anae Aquifer Potable Groundwater
- 03) Develop Additional Wai'anae Aquifer Non-Potable Brackish Groundwater
- 04) Develop Surface Water Sources
- 05) Capture Storm Water
- 06) Recycled Water: Wai'anae Wastewater Treatment Plant
- 07) Recycled Water: MBRs for Single Users
- 08) Kalaeloa Desalination Plant
- 09) New Wai'anae Desalination Plant
- 10) Water Conservation Programs

Wai'anae Watershed Management Projects

GROUND WATER

- 11) Hydrogeology Study
- 12) Wai'anae Source Water Protection Plan



SURFACE WATER

- 13) Spring and Stream Flow Restoration
- 14) Stream Conservation Corridors
- 15) Wetlands Restoration and Protection
- 16) Concrete Flood Channel Redesign



Wai'anae Watershed Management Projects



Rapid biological assessment of an O'ahu Stream.



Trash in a Wai'anae drainage canal.

SURFACE WATER

- 17) Stream Biological Assessments
- 18) Water Quality Testing & Monitoring
- 19) Stream Dumping Prevention and Clean-Up
- 20) Surface Water Inventory & Registration
- 21) Surface Water Quality Improvement

Wai'anae Watershed Management Projects

LAND MANAGEMENT

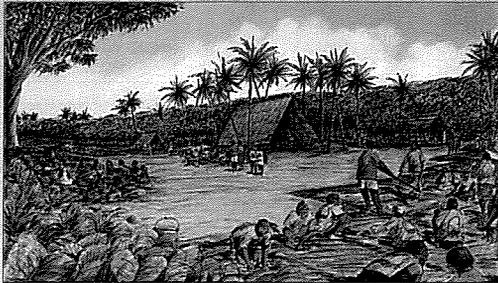
- 22) Forest Restoration Program
- 23) Wildfire Management Plan and Protocol for Action
- 24) Lo'i Kalo Expansion Program
- 25) Mākaha Research Watershed
- 26) Agricultural Support Program
- 27) Flood Mitigation Program
- 28) Mākaha Special Area Plan



Wai'anae Watershed Management Projects

CULTURAL/EDUCATION SUPPORT

- 29) Wai'anae Watershed Partnership
- 30) Cultural Learning Centers
- 31) Community Watershed Education Program
- 32) Wai'anae Rural Landscape Study



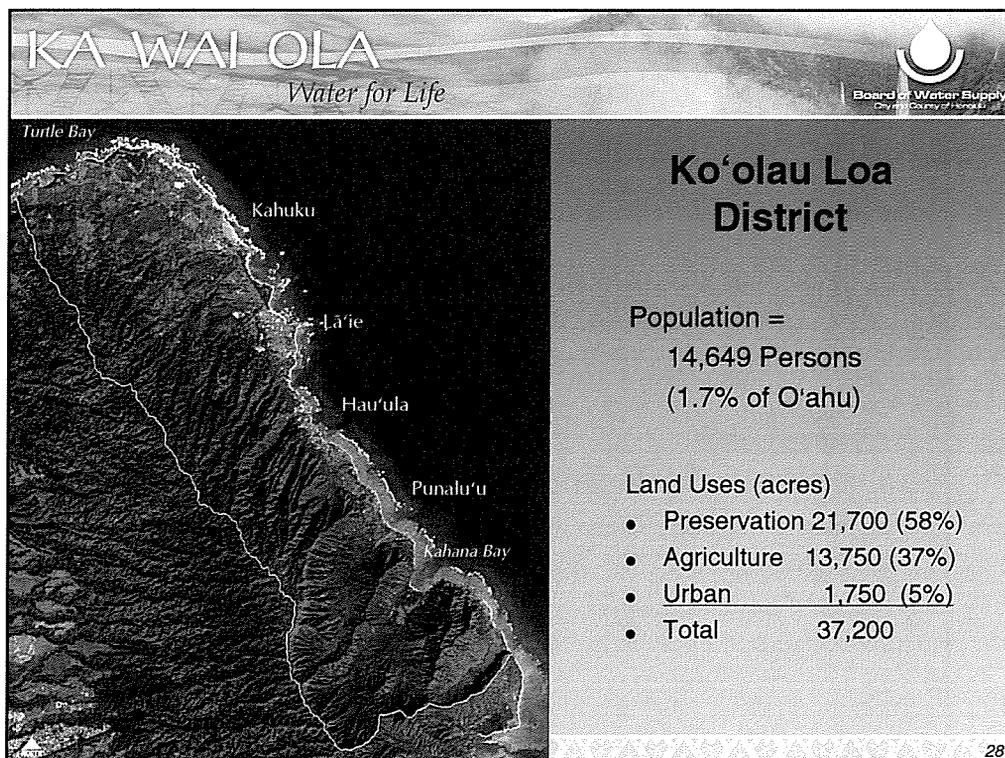
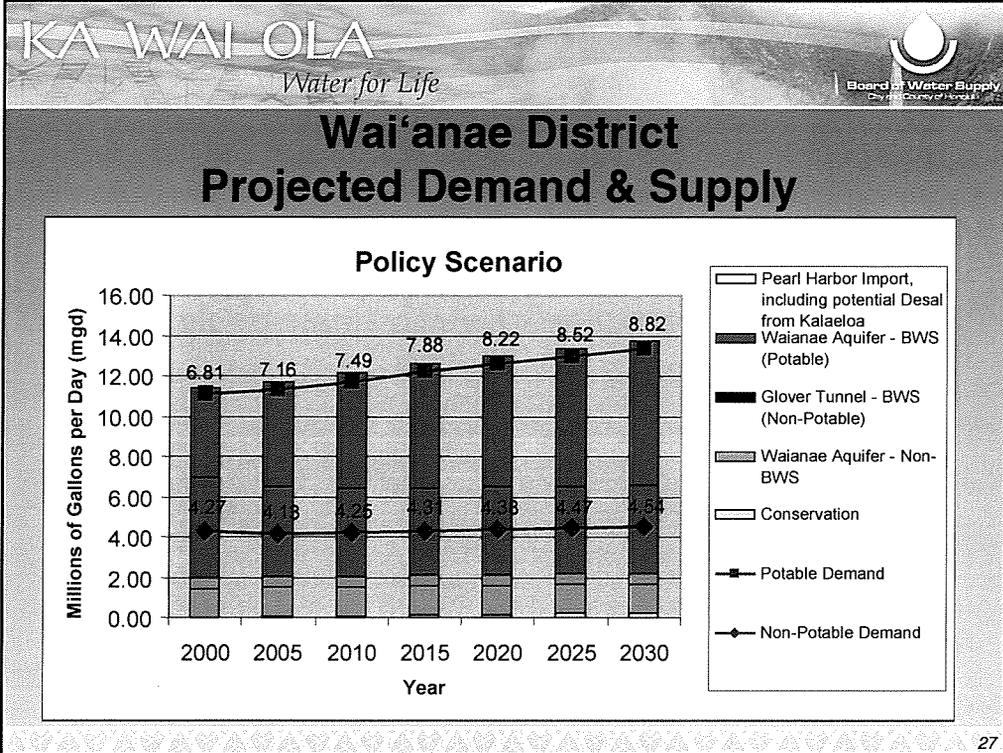
Wai'anae Water Supply Options

GROUND WATER

- Reduce BWS withdrawals from Wai'anae area wells based on sustainable pumping data
- Additional import from Pearl Harbor Aquifer

OTHER

- Desalination at Kalaeloa
- Surface water
- Conservation



Ko'olau Loa Aquifers (Ground Water)

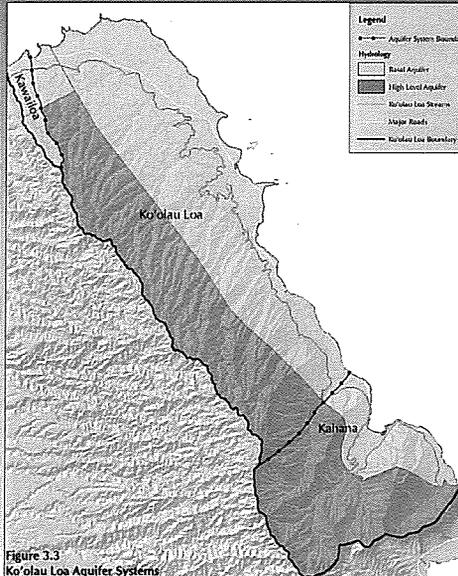


Figure 3.3
Ko'olau Loa Aquifer Systems

Sustainable Yields

- Ko'olau Loa 36 MGD
- Kahana 15 MGD

Permitted Wells

- Ko'olau Loa 21.0 MGD
- Kahana 2.5 MGD

Pumpage (2000)

- Ko'olau Loa 16.0 MGD
- Kahana 0.6 MGD

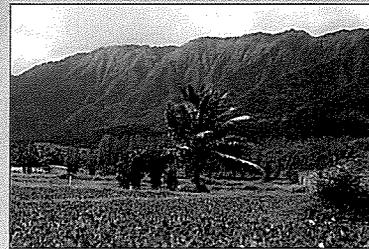
Ko'olau Loa Watershed – Key Values

- Rural Lifestyle
- Cultural and Traditional Water Uses
- Watershed Resources (holistic view)
- Plentiful Water (waiwai)
- Preserving Agricultural Water Supply
- Watershed Management Responsibilities



Ko'olau Loa Watershed Issues & Concerns

- Ko'olau Loa Land Use Plan (SCP) Growth
- Reliability of Groundwater Yield Potential
- Water Uses and Allocation: BWS and Private
- Instream Flow Standards
- Flooding Issues
- Limits on Future Source Development
- Limits on Export of Water
- Aquifer Protection
- Assurance Plan will be Implemented
- Dedicated Source of Funding



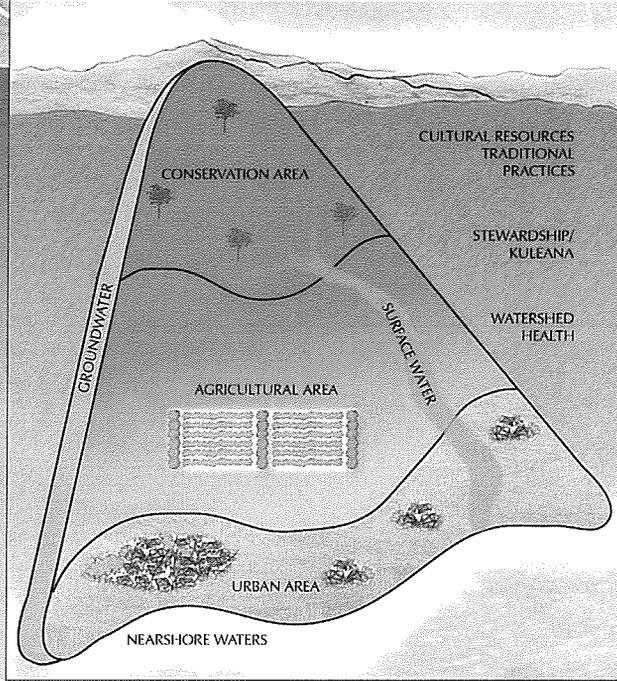
Ko'olau Loa Watershed Management Plan Water Supply Findings

- **No new stream diversions** (until measurable interim instream flow standards are amended).
- **Increase water efficiency of stream diversions** & return water to streams.
- The **Ko'olau Loa GWMA will be the primary water source.**
- **No Kahana GWMA development** is planned.
- **Water conservation and agricultural water savings** will lessen the amount of water needed.
- **Punalu'u Wells pumpage can decrease with conservation and new source in Ko'olau Poko.**

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Ko'olau Loa  Board of Water Supply
County of Honolulu

Watershed Management Projects & Programs



The diagram illustrates a watershed with the following zones and water types:

- CONSERVATION AREA**: Located at the top, near the mountain peak.
- AGRICULTURAL AREA**: Located in the middle, showing fields and irrigation.
- URBAN AREA**: Located at the bottom, showing buildings and infrastructure.
- NEARSHORE WATERS**: Located at the very bottom, near the coastline.
- GROUNDWATER**: Indicated on the left side, flowing from the mountain.
- SURFACE WATER**: Indicated on the right side, flowing from the mountain.

Management programs are listed on the right side of the diagram:

- CULTURAL RESOURCES TRADITIONAL PRACTICES
- STEWARDSHIP/ KULEANA
- WATERSHED HEALTH

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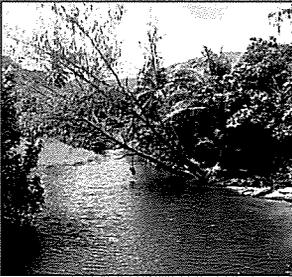
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Ko'olau Loa Watershed Management Projects

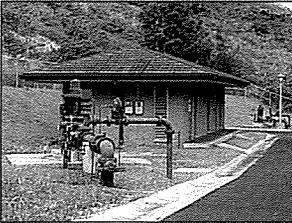
SURFACE WATER

- 1a) Flood Control / Stormwater Management
- 1b) Flood Channel Redesign
- 1c) Measurable Instream Flow Standards
- 1d) Stream Water Quality Testing
- 1e) Nearshore Water Monitoring



GROUNDWATER

- 2a) Sustainable Yield Estimates
- 2b) Groundwater Source Protection
- 2c) Drought Mitigation Strategies
- 2d) Punalu'u Pumpage Optimization

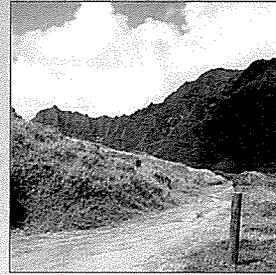


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Ko'olau Loa Watershed Management Projects

LAND MANAGEMENT

- 3a) Stream Clearing / Management
- 3b) Stream Conservation Buffers
- 3c) Cesspool Inventory / Greywater Reuse
- 3d) Pollution Prevention / Low Impact Development
- 3e) Invasive Species Assessment / Control
- 3f) Feral Pig Management Plan
- 3g) Muliwai / Wetland Restoration
- 3h) Conservation District Boundary Review
- 3i) Wildfire Management Plan
- 3j) Crop Water Demand



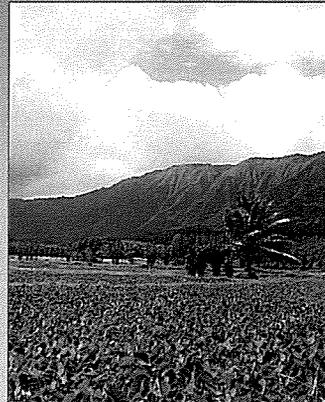
Ko'olau Loa Watershed Management Projects

CULTURAL RESOURCES / TRADITIONAL PRACTICES

- 4a) Lo'i Kalo Expansion
- 4b) Watershed Oral History Studies
- 4c) Cultural Educational Programs
- 4d) Fishpond (Loko I'a) Restoration
- 4e) Cultural Monitoring Program

IMPLEMENTATION

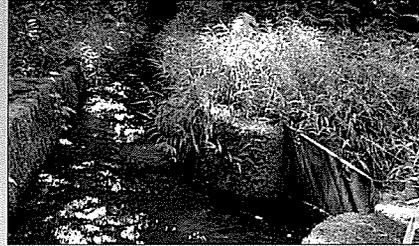
- 5a) Watershed Partnerships
- 5b) Water & Watershed Education
- 5c) Ko'olau Loa Implementation Entity
- 5d) Grant Funding



Ko'olau Loa Watershed Management Projects

WATER SUPPLY

- 6a) Potable Well Development
- 6b) Agriculture (Non-Potable) Well Development
- 6c) Increased Recycled Water
- 6d) Conservation Measures
- 6e) Agricultural Water Loss Minimization
- 6f) Surface Water Use



Ko'olau Loa District Water Supply Options

GROUND WATER



- 1) New Municipal Well Development in Ko'olau Loa
- 2) New Municipal Well Development in Ko'olau Poko
- 3) Additional Private Agriculture Wells

RECYCLED WATER



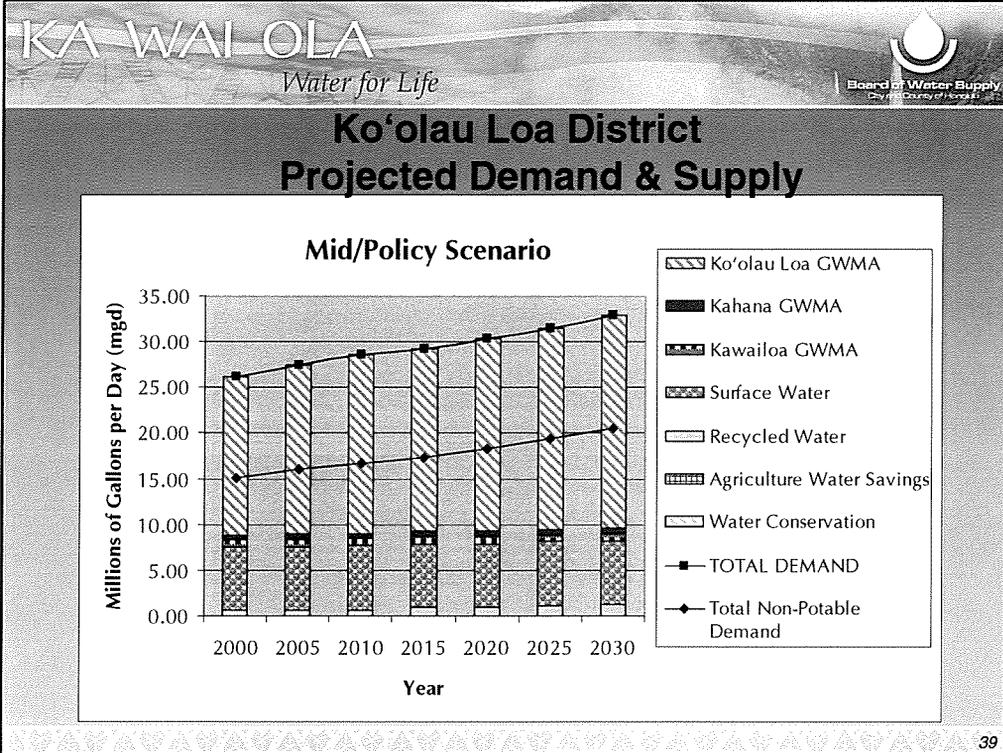
- 4) Increased Recycled Water

OTHER



- 5) Conservation in Ko'olau Loa, Ko'olau Poko and N. Shore
- 6) Agricultural Water Loss Minimization
- 7) Surface Water Use





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City & County of Honolulu
- ### Implementation of Water Supply and Watershed Projects
- Proposed strategies and projects result from comprehensive watershed analysis and stakeholder consultation and are intended to guide agencies and organizations in implementing the most important initiatives.
 - The implementation and funding of these strategies and projects are not the sole responsibility of the BWS, the City & County of Honolulu or the State of Hawaii.
 - Plan implementation and timing will likely depend on budgetary priorities, grant availability and partnering efforts over the long term.
 - Funding limitations should not prohibit the City from planning.
 - The Plan guides public and private investment and provides opportunities for agency/community collaboration.
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Next Steps: Approval Process

2009		2010						
NOV	DEC	JAN	FEB	MAR	APR	MAY	MAR	JUL

- BRIEFINGS:**
- BWS Manager & Board
 - City and County
 - CWRM

- CITY COUNCIL Adoption by Ordinance**
- 3 Council Readings
 - Public Hearing
 - Committee Meetings

CWRM 90
Day Notice

Public
Hearing

CWRM
Agenda &
Adoption

Mahalo

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Wai'anae Watershed Management Plan
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Ko'olau Loa Watershed Management Plan
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