



AGENDA

'EWA WATERSHED MANAGEMENT PLAN
COMMUNITY MEETING #3

- Watershed Management Plan Background
- The 'Ewa District
- 'Ewa Water Demand and Sources: Existing (2010)
- 'Ewa Water Demand and Sources: Future (2035)
- Watershed Management Projects and Strategies
- WMP Approvals Process

September 12, 2017

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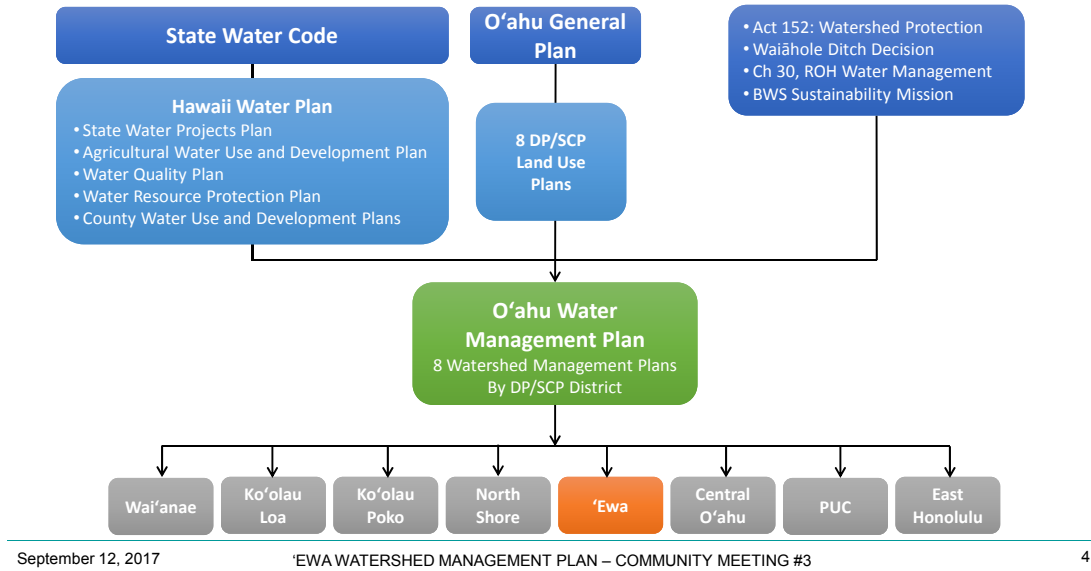
WATERSHED MANAGEMENT PLAN BACKGROUND

EWA WATERSHED MANAGEMENT PLAN
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Planning Framework



- County **“Water Use and Development Plans”** are required by the **State Water Code**
- **“O’ahu Water Management Plan”** is required by **Revised Ordinances of Honolulu Chapter 30**
- Honolulu Plans are district specific and called **“Watershed Management Plans”** (WMPs). District-level water and land use plans allow for community-specific actions and strategies
- Guidance is provided by the **Hawai’i Water Plan** and the City’s **‘Ewa Development Plan**.
- WMPs require approval by BWS, DPP, City Council, and CWRM

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.

The WMP Goal applies to all of the Districts

Watershed Management Plan Objectives

1. Promote sustainable watersheds;
2. Protect and enhance water quality and quantity;
3. Protect Native Hawaiian rights and traditional and customary practices;
4. Facilitate public participation, education, and project implementation; and
5. Meet future water demands at reasonable costs.

The WMP Objectives apply to all of the Districts

'Ewa WMP Table of Contents

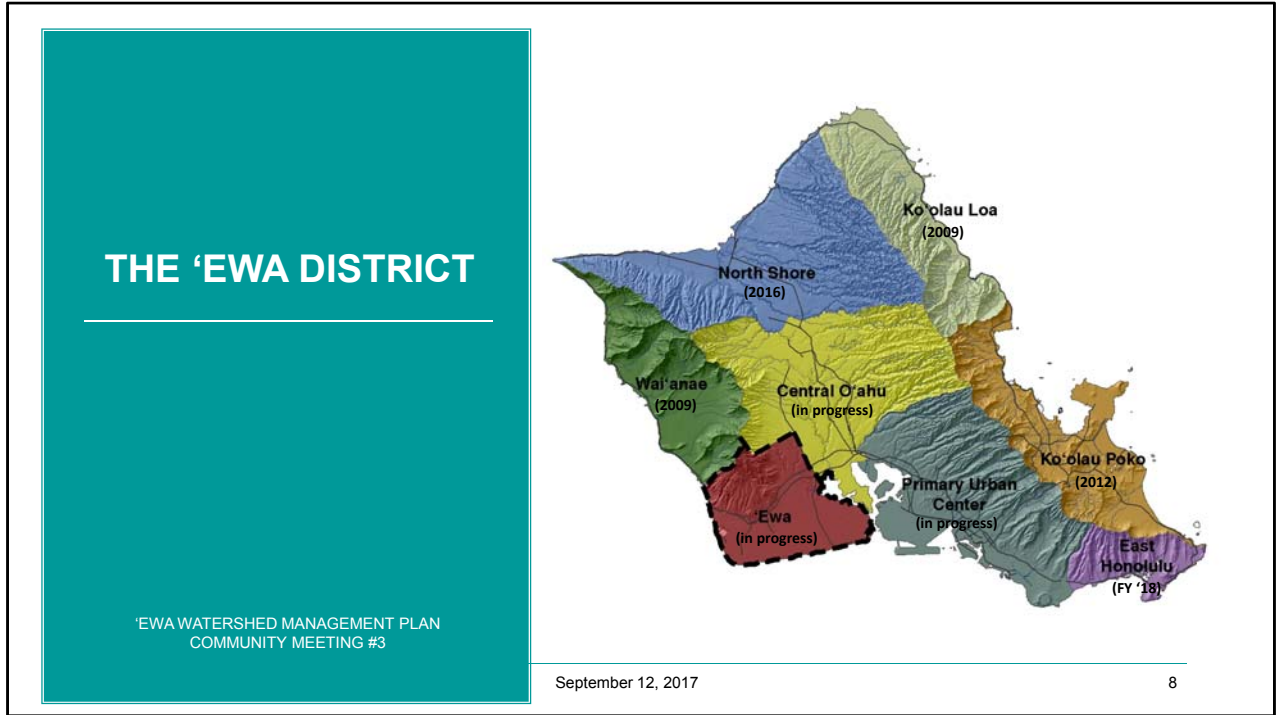
Chapters

Executive Summary

1. O'ahu Water Management Plan Overview
2. 'Ewa Watershed Profile
3. Water Use and Projected Demand
4. Plan Objectives and Water Supply, and Watershed Management Projects and Strategies
5. Implementation

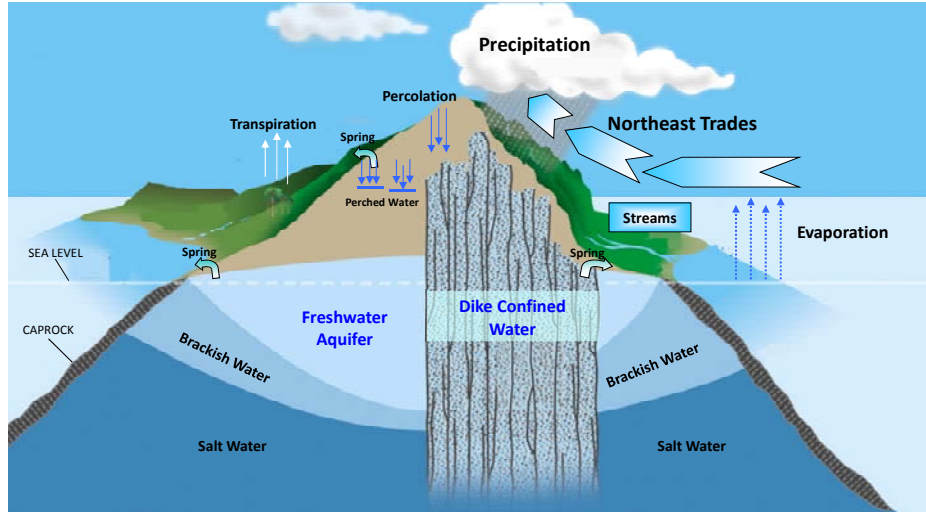
Appendices

- A. O'ahu Watershed Management Plan Framework
- B. Plans, Policies, Guidelines, and Controls
- C. O'ahu Water Use Permit Index
- D. Overview of O'ahu Hydrogeology

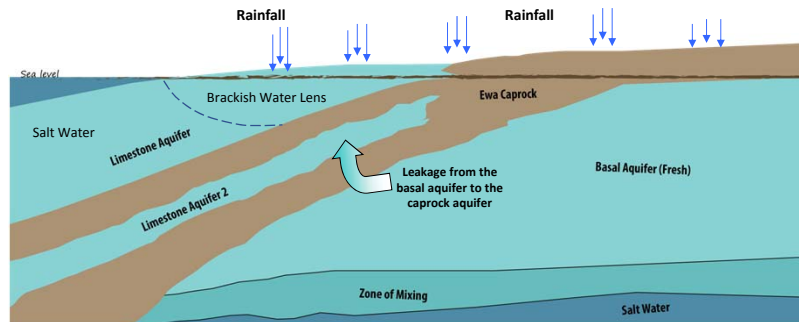


Size: 33,677 acres (52.6 square miles)
almost 1/10 of O'ahu

Hydrology and Water Sources



Hydrology and Water Sources

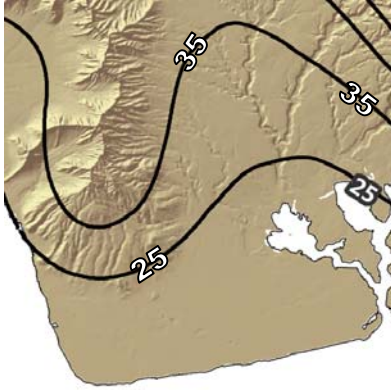


- Impermeable caprock holds the fresh basal water inland.
- Caprock also holds water from rainfall and leakage from the basal aquifer in its limestone layers

In Ewa, there is a special geologic formation called “caprock.”

- The coastal plain is made up of sediments that form a relatively impermeable sedimentary material, or “caprock.”
- The caprock restricts the seaward flow of fresh ground water.
- Caprock also holds water within its limestone layers. This water is fed by rainfall and leakage from the basal aquifer.
- Irrigation from sugar plantations used to enhance the caprock aquifer, but since the closing of Oahu Sugar Company (OSCo), the brackish caprock lens shrank.

Climate

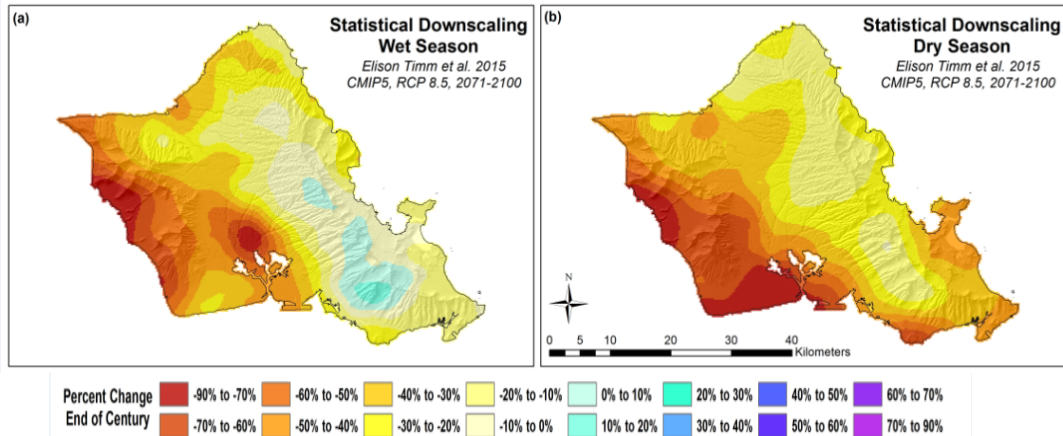


**Mean Annual Rainfall
Island of O'ahu**
2011 Rainfall Atlas of Hawai'i
Department of Geography
University of Hawai'i at Mānoa

- Low rainfall
 - Average annual rainfall in 'Ewa = 20" - 40"
 - Average annual rainfall on O'ahu = 20" - 300"
 - Average annual rainfall for the State = 10" - 440"
- Within the district, rainfall decreases when going mauka to makai
- Average temperatures: 60° to 91°

Climate Change

Rainfall: Dry areas will get drier by 2100



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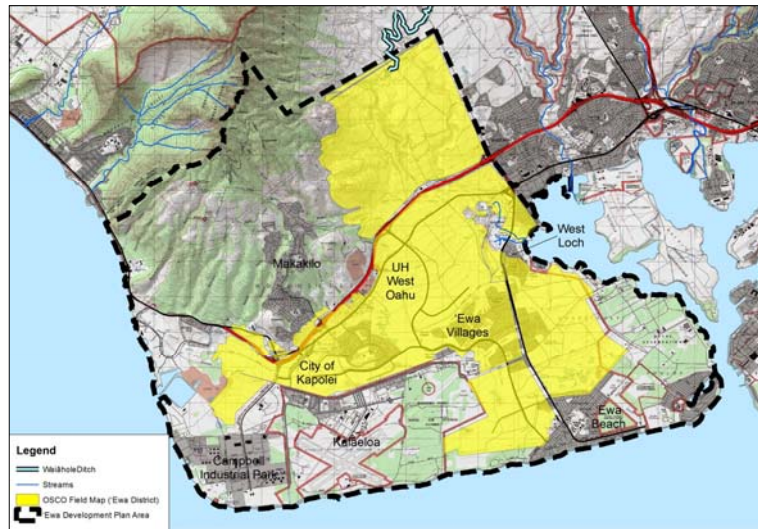
Past

- Air temperature is increasing (0.3°F/decade over the past 30 years)¹
- Rainfall has decreased by -15% over the past 20 years
- Rainstorm intensity has increased (+12%, 1958-2007)¹

Future

- There will be less rainfall by 2100 in leeward areas in both wet and dry seasons.
- Rainfall in the Ko'olau Mountains, especially in the Honolulu area, will increase in the wet season.
- Implication: Leeward sources will deplete and more water will need to be transported from the Pearl Harbor aquifer.
- 'Ewa will need to diversify it's water sources, conservation, recycled water and limited desalination.

'Ewa's Sugar History



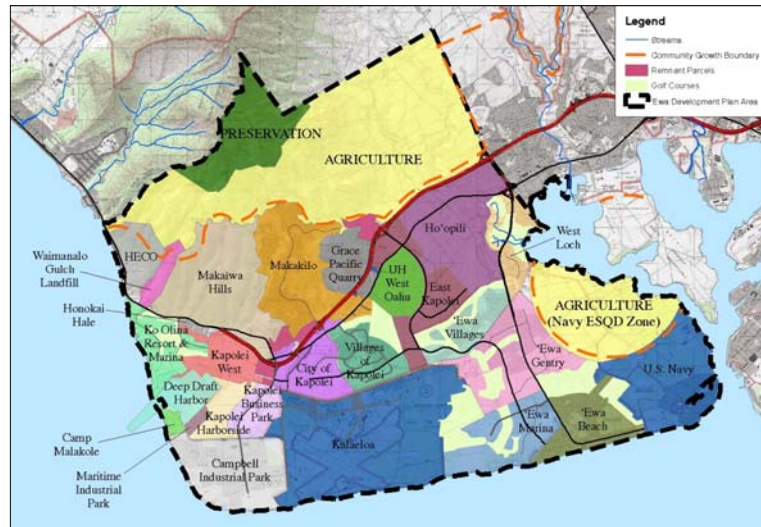
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- 1897, Oahu Sugar Company established on the 'Ewa Plains
- 1925, 50,000 tons of sugar produced by 'Ewa Sugar Plantation
- Sugar is a very thirsty crop, consuming 6,700 gpad (2004 WUDP) or 1,400-5,000 gad (IWREDSS duty), compared with 3,400 gpad for diversified ag in relatively dry areas
- By the 1930s, 'Ewa Plantation, O'ahu Sugar Company, Honolulu Plantation = over 200 mgd from Pearl Harbor Aquifer to irrigate sugar on the 'Ewa Plains. (source: Sugar Water, p. 108)
- 1939-1944, ~3,000 acres converted to military use
- 1970 Oahu Sugar Company acquired 'Ewa Plantation
- 1988 OSCo Map of sugar lands; 13, 536 acres (out of 33,677 acres in 'Ewa)
- 1990, OSCo produced 76,925 tons of sugar on 11,526 cultivated acres ('Ewa and Central), yielding 13.66 tons per acre.
- 1995, OSCo harvested last crop

Full Buildout of Master Plans



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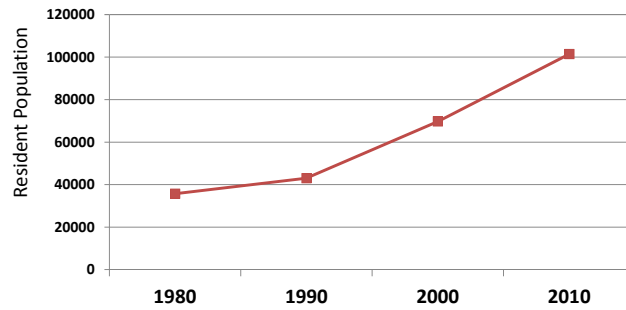
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As sugar has declined, it has been replaced with many different land uses:

- Resort
- Industrial
- Residential
- Agriculture
- Military
- Kalaeloa

There are master plans for the development of most of 'Ewa

'Ewa Population: 1980-2010



	1980	1990	2000	2010	Change (1980-2010)	Percent Change
'Ewa DP Area	35,709	42,983	68,696	101,397	65,688	184%
O'ahu Total	762,564	836,231	876,156	953,207	193,211	25%
% of O'ahu	5%	5%	8%	11%		

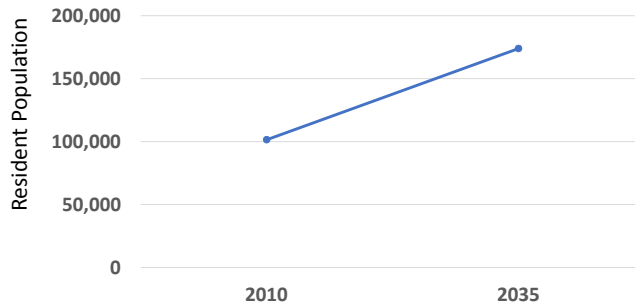
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- Over the past 30 years (1980 – 2010), 'Ewa population increased 184%
- It's share of the total O'ahu population increased from 5% to 11%

'Ewa Projected Population: 2010 - 2035



	2010	2035	Change (2010-2035)	Percent Change
'Ewa DP Area	101,397	173,846	72,449	71%
O'ahu Total	953,207	1,071,225	118,017	12%
% of O'ahu	11%	16%		

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- Over the next 25 years, the 'Ewa population is expected to grow by 71% and increase its share of the total O'ahu population from 11% to 16%

Issues and Questions Raised

- Non-BWS water systems need to be accounted for
- What are the flooding issues?
- What is the state of the BWS water system in 'Ewa?
- Is our drinking water safe?
- Desalinated water: what will it be used for?
- Is there enough water for planned development?
- Protect traditional and customary practices
- Education and community engagement is important
- Land use and water planning needs to be integrated

Issues raised in interviews and in previous community meetings

'EWA WATER SOURCES

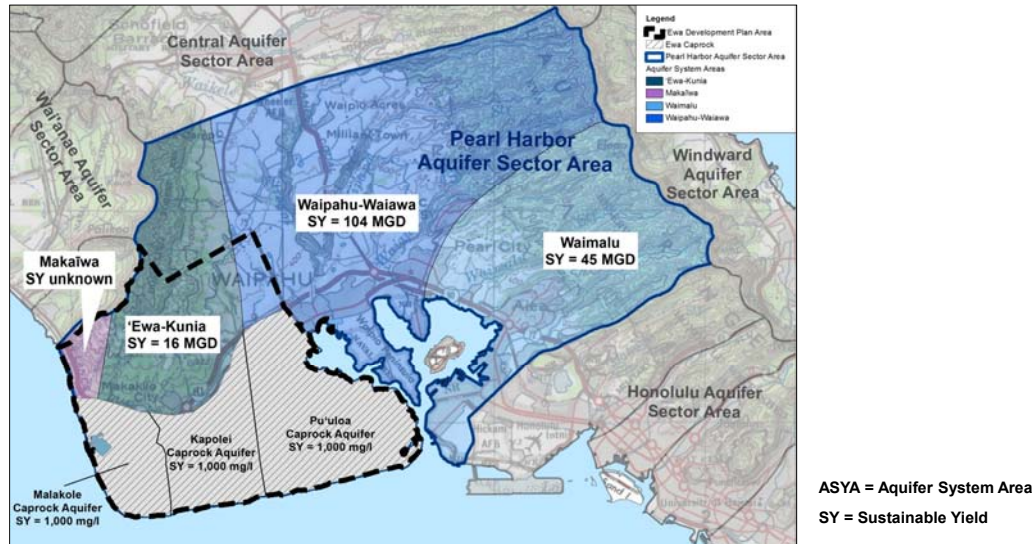
- Ground Water
- Surface Water
- Storm Water
- Waiāhole Ditch
- Recycled Water
- Desalinated Water
- Salt Water

Ground Water

- Sustainable Yield (SY): the maximum rate at which water may be withdrawn without impairing the utility or quality of the water source as determined by CWRM.
- Ground Water Management Area: special areas where additional regulation is required
 - The Pearl Harbor Aquifer Sector Area (ASA) is a Ground Water Management Area.
 - A CWRM water use permit is required for all ground water uses.

SY basically sets the limits of what we can sustainably withdraw from that particular ground water aquifer

Ground Water



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- The 'Ewa Planning District overlays the Pearl Harbor Aquifer Sector Area.
- Aquifer Sector Areas are broken up into smaller units called Aquifer System Areas (ASAs).
- 'Ewa overlays Maka'iwa and a portion of the 'Ewa-Kunia and Waipahu-Waiawa ASAs.
- Additionally, there is an 'Ewa Caprock Aquifer with three ASAs: Kapolei, Malakole, and Pu'uloa.
- SY for the Caprock aquifers is set by a chloride limit of 1,000 mg/l and is specific to irrigation wells because it is the chloride level that is considered acceptable for irrigation.

Basal Ground Water – PU and Pumpage (2010)

Aquifer System Area	Sustainable Yield in MGD	Permitted Use (PU) in MGD (% of SY)	Pumpage in MGD (% of SY)	Unallocated Sustainable Yield in MGD (% of SY)	SY Minus Pumpage in MGD (% of SY)
'Ewa-Kunia	16	14.3 (89% of SY)	12.3 (77% of SY)	1.7 (11% of SY)	3.7 (23% of SY)
Waipahu-Waiawa ('Ewa only)	104	15.8 (15% of SY)	3.2 (3% of SY)	19.1 (18% of SY)	74.9 (72% of SY)
Waipahu-Waiawa (Entire ASYA)		84.9 (82% of SY)	29.1 (28% of SY)		
TOTAL ('Ewa only)	120	30.1 (25% of SY)	15.5 (13% of SY)	20.8 (17% of SY)	78.6 (65% of SY)
TOTAL (Entire ASYA)		99.2 (83% of SY)	41.4 (35% of SY)		

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- Permitted Use is the amount of water that CWRM has allocated to water users in the form of permits
- Pumpage is what CWRM has on record from self-reporting
- Unallocated SY = SY – PU
- Pumpage is generally less than the permitted amount
- We are currently permitting and pumping less than the SY for both aquifers

Caprock Ground Water – PU and Pumpage (2010)

Aquifer System Area	Permitted Use (MGD)	Pumpage (MGD)
Makaīwa	0.072	0.00
Malakole	7.011	2.76
Kapolei	2.333	0.75
Pu‘uloa	11.924	3.18
TOTAL	58.865	6.69

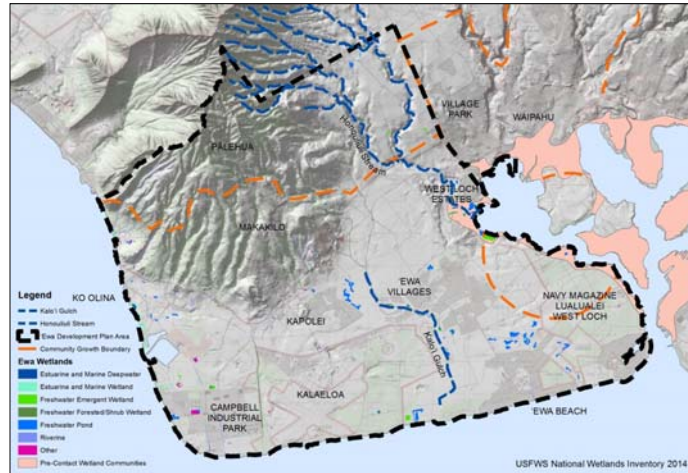
Sustainable Yields for these caprock aquifers are set by a chloride limit of 1,000 mg/L.

Ground Water – Import from Central O’ahu (2010)

Water System	Import (MGD)	ASYA
BWS	7.2	Waipahu-Waiawa
JBPHH	0.6	Waipahu-Waiawa
TOTAL	7.8	

Surface Water

- One (1) perennial Stream
- 16 dry streams or gulches
- Wetlands in the Honouliuli and Kalaeloa units of the Pearl Harbor National Wildlife Refuge
- No current offstream use

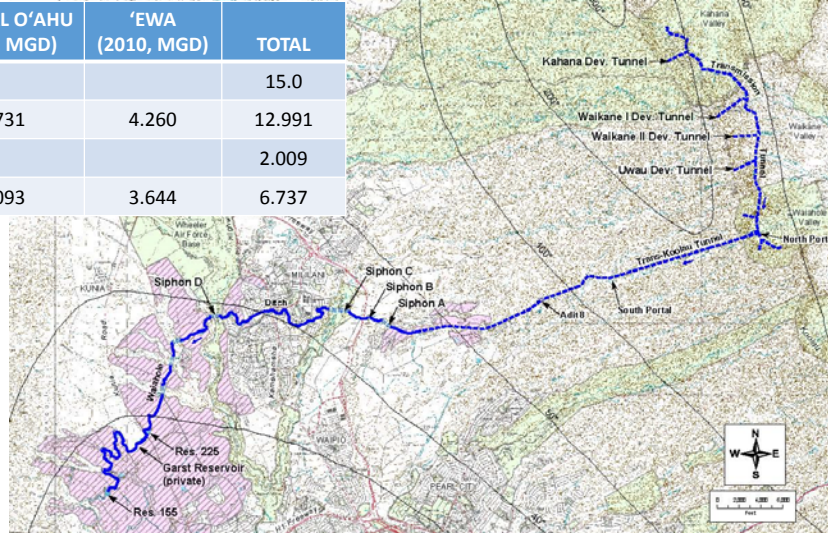


Storm Water

- Currently limited use of storm water for golf course irrigation
- Challenges: low average rainfall
- Opportunities:
 - Deep infiltration trench to capture storm water for recharging the shallow brackish aquifer
 - Storm water from Wheeler Army Air Force Base could be made available for use in Kunia and 'Ewa

Waiāhole Ditch: SY = 15 MGD

USE	CENTRAL O'AHU (2010, MGD)	'EWA (2010, MGD)	TOTAL
Sustainable Yield			15.0
Permitted Offstream Uses	8.731	4.260	12.991
Unallocated Water			2.009
Reported Use	3.093	3.644	6.737



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Recycled Water – Honouliuli Water Recycling Facility

RECYCLED WATER CLASSIFICATION	CAPACITY IN 2010 (MGD)	DEMAND IN 2010 (MGD)	END USE
R-1	10	7.012	dust control, industrial, golf course and landscape irrigation
R-O	2	1.385	industrial
TOTAL	12	8.397	

Desalinated Water

- BWS Recycled Water Facility
 - Desalinates R-O water for industrial uses
- Private Desalination Facilities
 - Small, demineralizing facilities for industrial uses
- Proposed Desalination Plants (BWS)
 - Kalaeloa Seawater Desalination Plant
 - Kapolei Brackish Water Desalination Plant

Salt Water

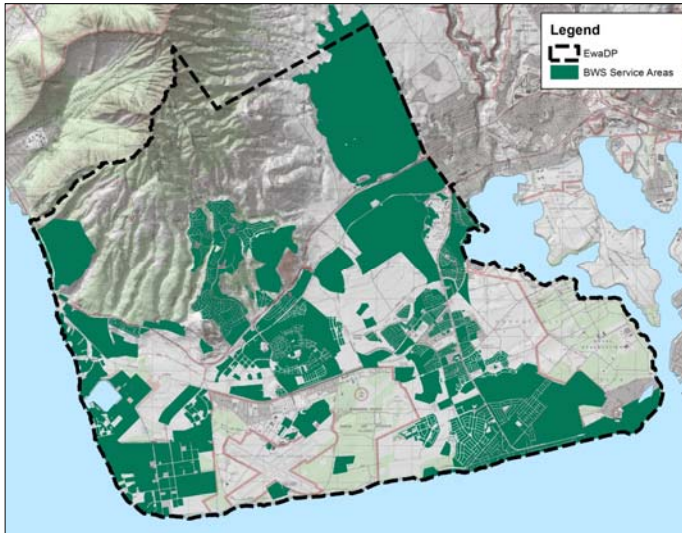
- 37.5 MGD of salt water permitted for industrial cooling in 2010
- 12.2 MGD reported salt water pumpage in 2010
- Salt water is not counted against aquifer sustainable yield

'EWA WATER SYSTEMS

'EWA WATERSHED MANAGEMENT PLAN
COMMUNITY MEETING #3

- Honolulu Board of Water Supply
- City and County of Honolulu
- State of Hawai'i
- Federal
- Private

Honolulu BWS: Potable Water System



- Sources: basal ground water
 - Within the 'Ewa District
 - Imported from Central O'ahu
- Quality: potable
- Use: domestic residential and non-residential

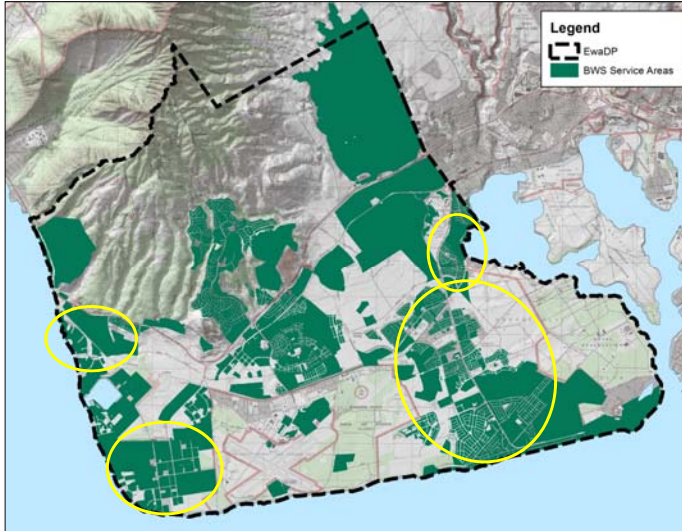
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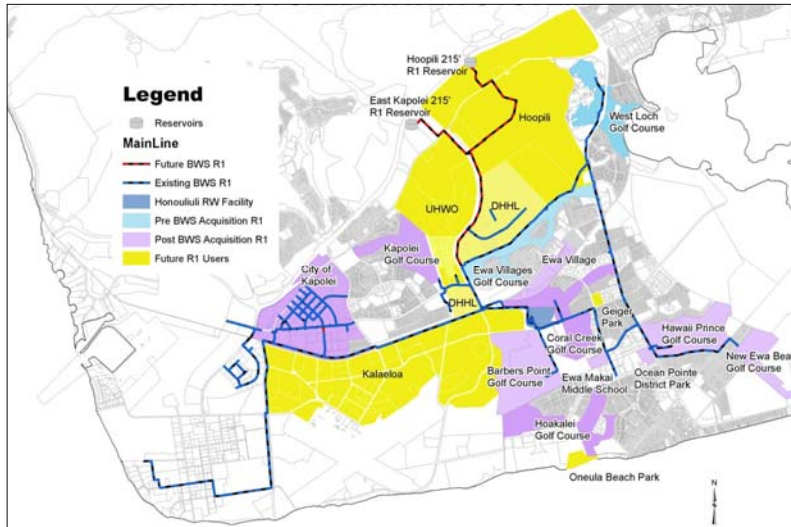
This map generally shows where BWS services, although it does not service quite as far mauka along Kunia Road.

Honolulu BWS: Non-Potable Water System



- Sources:
 - Basal ground water ('Ewa-Kunia ASYA)
 - Caprock aquifer (Kapolei ASYA)
- Use:
 - landscape irrigation

Honolulu BWS: Recycled Water System



- Source: Honouliuli Water Recycling Facility
- Quality: R-1, R-O
- Uses: irrigation, industrial

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R-1 Quality Recycled Water (10 mgd capacity)

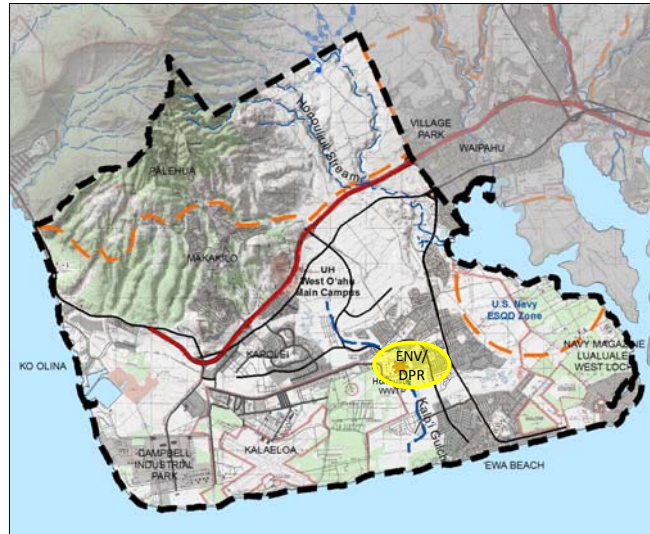
- Dust control, industrial, golf course irrigation, landscape irrigation

R-O Quality Recycled Water (2 mgd capacity)

- Refineries, Power Plants

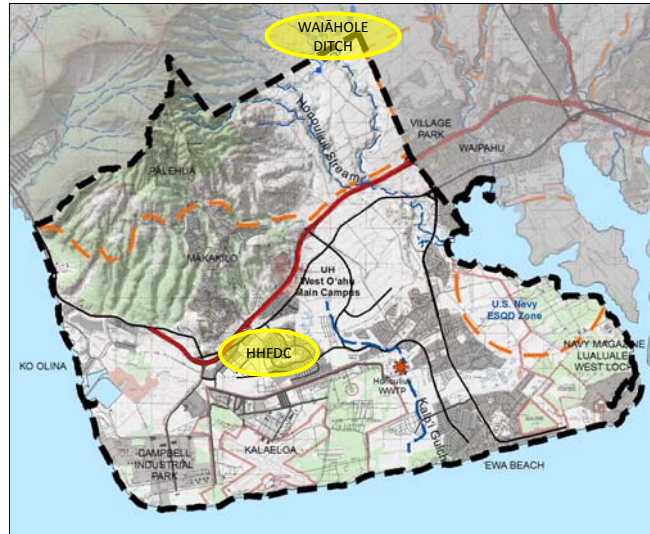
City and County of Honolulu Water Systems

- Department of Environmental Services
 - Source: caprock aquifer (Pu'uloa ASYA)
 - Quality: non-potable
 - Use: industrial
- Department of Parks and Recreation
 - Source: caprock aquifer (Pu'uloa ASYA)
 - Quality: non-potable
 - Use: landscape irrigation



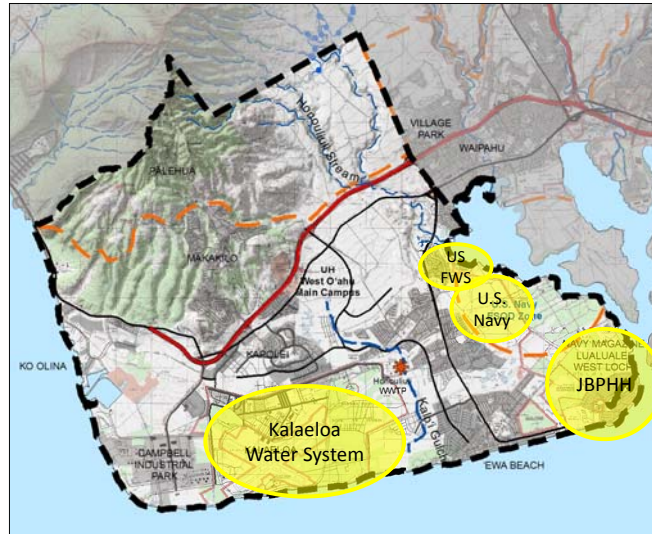
State of Hawai'i Water Systems

- Waiāhole Ditch (Agribusiness Development Corporation)
 - Source: ground water imported from Windward O'ahu
 - Quality: non-potable
 - Use: agriculture
- Hawai'i Housing Finance and Development Corporation
 - Source: caprock aquifer (Kapolei ASYA)
 - Quality: non-potable
 - Use: landscape irrigation



Federal Water Systems

- Kalaeloa Water System
 - Source: basal aquifer
 - Quality: potable
 - Use: residential, non-residential, irrigation
- Joint Base Pearl Harbor-Hickam
 - Source: basal aquifer (imported from Central O'ahu)
 - Quality: potable
 - Use: residential
- U.S. Navy
 - Source: caprock aquifer (Pu'uloa ASYA)
 - Quality: non-potable
 - Use: agriculture
- USFWS
 - Source: caprock aquifer (Pu'uloa ASYA)
 - Quality: non-potable
 - Use: irrigation



Private Water Systems

- Source: basal aquifers
 - Quality: non-potable
 - Uses: agriculture, industrial, golf course, landscape irrigation
-
- Source: caprock aquifers
 - Quality: non-potable
 - Uses: industrial, golf course, landscape irrigation

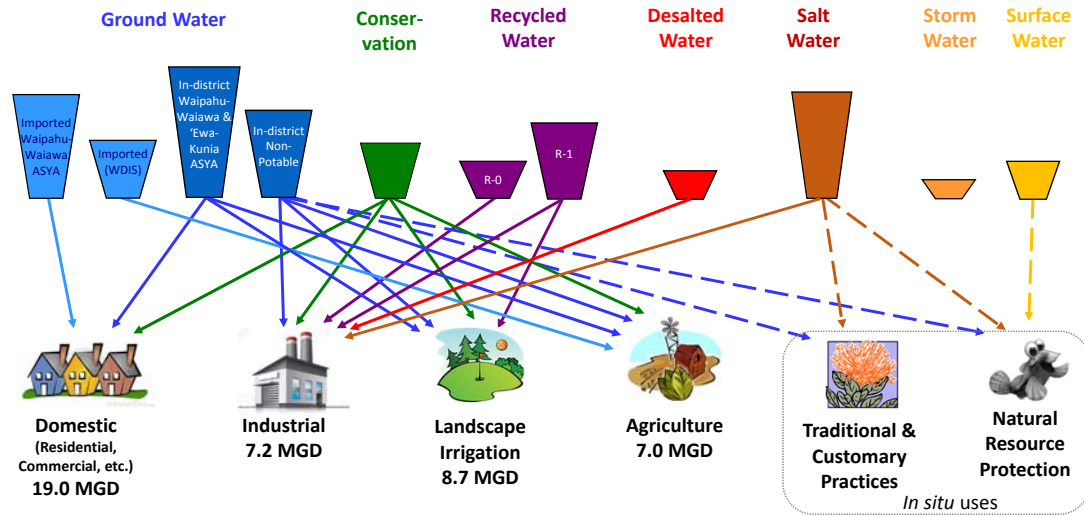
**'EWA WATER
DEMAND AND
SOURCES:
EXISTING (2010)**

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Existing Water Demand in 'Ewa (2010)



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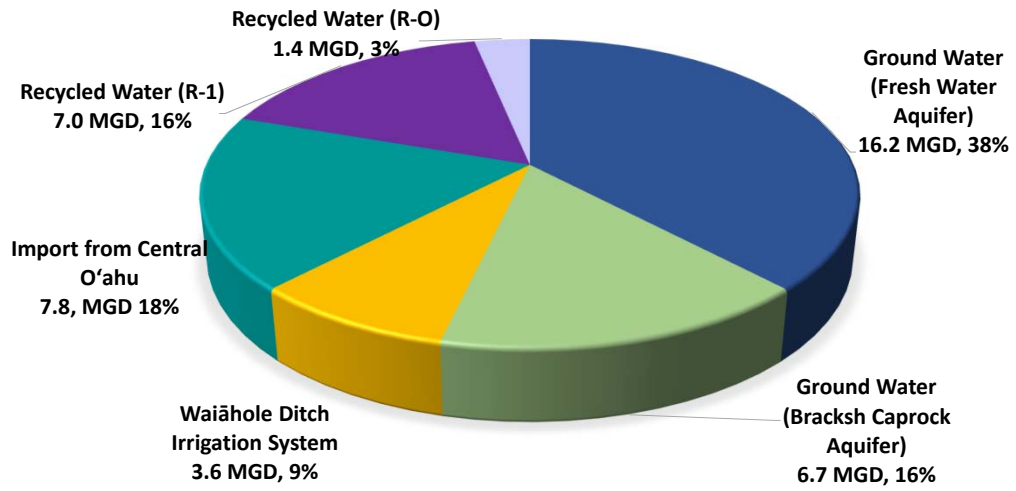
Existing (2010) 'Ewa Water Demand: Use Categories

Water Use Category	2010 Water Demand (MGD)	Demand (%)
Domestic Residential	12.5	30%
Domestic Non-Residential	6.5	15%
Industrial ^{1, 2}	7.2	17%
Agriculture	7.0	17%
Golf Course Irrigation ²	7.5	18%
Landscape Irrigation ²	1.2	3%
TOTAL	41.9	100%

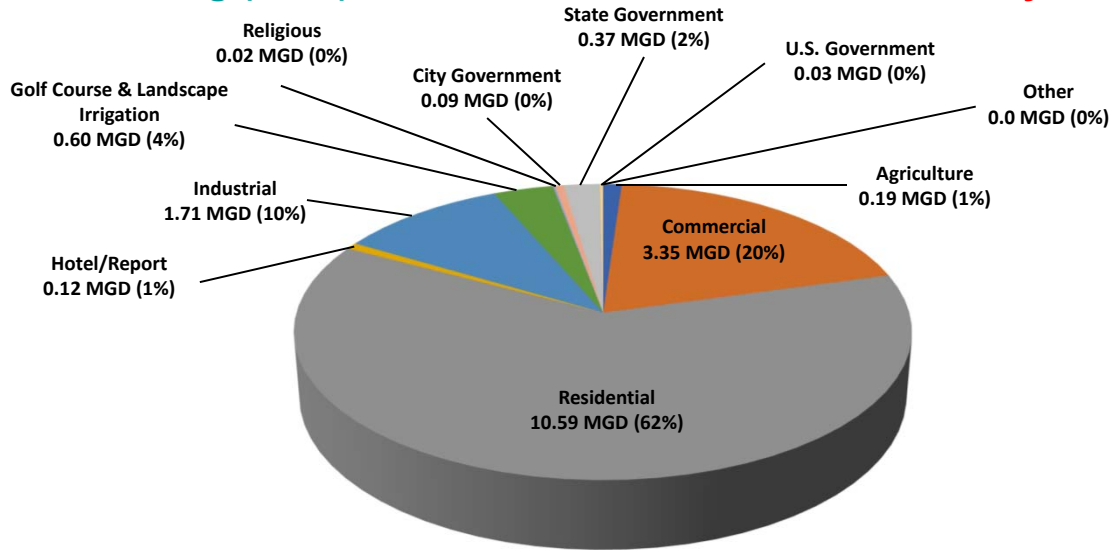
1 Industrial water demands do not include demands for salt water.

2 Industrial and irrigation demands include demands for recycled water.

Existing (2010) 'Ewa Water Supply



Existing (2010) 'Ewa Water Demand: BWS Potable System



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BWS Existing (2010) water demand = 19 MGD

'EWA WATER DEMAND AND SOURCES: FUTURE (2035)

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- Water Demand Projections
- Water Demand Scenarios
- Base Case (Mid-Growth) Scenario
- Ultimate-Growth Scenario

Future 'Ewa Water Demand: Projections

- The Statewide Framework for Updating the Hawai'i Water Plan (Statewide Framework)
- All water producers: BWS, Federal, State, and Private
- Develop "a range of forecasts"
 - (1) Low-growth
 - (2) Mid-growth
(City projections based on land use policies)
 - (3) High-growth
- 'Ewa WMP also developed an "Ultimate-growth" scenario



Ultimate growth scenario is in addition to the recommended "range of forecasts" prescribed by the Framework

Future 'Ewa Water Demand: Scenarios

Scenario	Description	Population Increase 2010 - 2035
Low-Growth	'Ewa does not develop into the Secondary Urban Center and O'ahu residents continue to work and reside in the Primary Urban Center.	+ 37,540 people
Mid-Growth	City population projections based on the General Plan and 'Ewa Development Plan recognize that Kapolei becomes the Secondary Urban Center of O'ahu.	+ 62,567 people
High-Growth	The Second City of Kapolei has come into its own. 'Ewa is a successful job center and Kalaeloa is being developed.	+ 104,278 people
Ultimate-Growth	Kapolei and Kalaeloa rival Downtown Honolulu as job centers and all planned residential units have been developed.	+ 243,341 people (2010 - ~2080)

Future 'Ewa Water Demand in MGD

SCENARIO	DOMESTIC	AGRICULTURE	INDUSTRIAL	GOLF COURSE	LANDSCAPE IRRIGATION	TOTAL (% increase)
Existing (2010)	19.0	7.0	7.2	7.5	1.2	41.9
Low-Growth (2035)	21.7	5.1	8.2	7.5	1.7	44.2 (5%)
Mid-Growth (2035)	26.9	4.0	8.5	7.5	3.4	50.2 (20%)
High-Growth (2035)	34.3	6.1	11.4	8.3	3.8	63.9 (53%)
Ultimate-Growth	42.7	7.6	11.9	9.5	5.9	77.6 (85%)

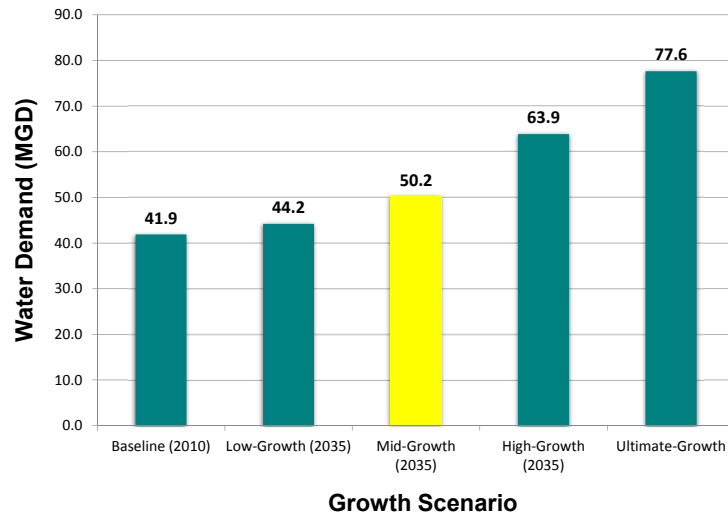
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Mid-growth = base case (“most likely”) scenario

Future 'Ewa Water Demand: Mid-Growth Scenario



‘Ewa Development Plan Policies

‘Ewa’s Role in O‘ahu’s Development Pattern

- Second urban center for O‘ahu;
- Wide range of master planned residential;
- Diversified agriculture on prime agricultural lands along Kunia Road and in the Explosive Safety Quantity Distance arc; and
- Resort areas at Ko‘Olina and at Ocean Pointe.

Water Use Efficiency and Conservation

- Implement water conservation measures and reduce water loss;
- Prioritize recycled water and brackish ground water as non-potable irrigation sources;
- Meet agricultural water needs with such potential sources as caprock, surface water, spring waters, Waiāhole Ditch Water, and recycled water.

The ‘Ewa Development Plan helped to shape the Watershed Management Plan policies regarding water supply.

'Ewa Development Plan Policies

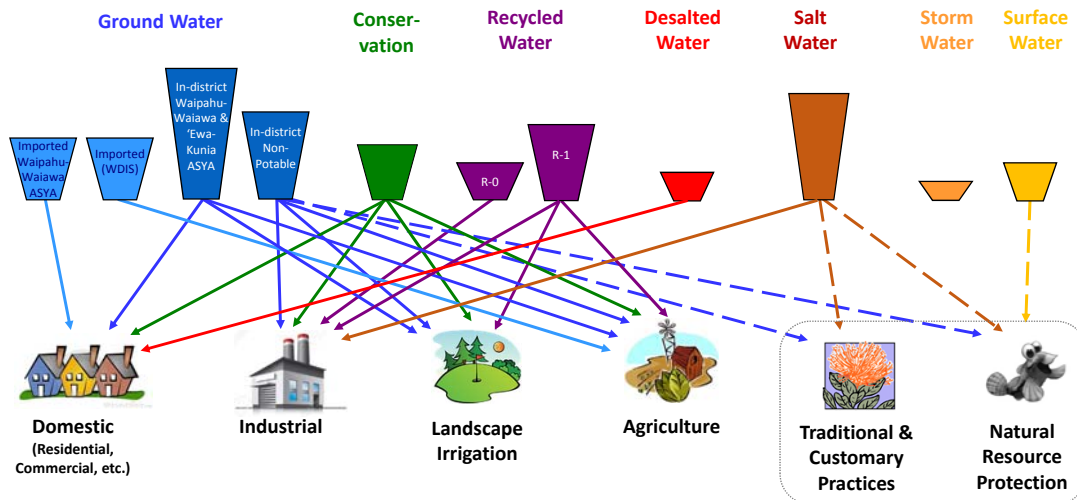
Alternative Water Supplies

- Develop alternative water supplies using new technologies
 - water reclamation
 - desalination
 - deep ocean water applications
- Encourage use of technologies conserving water and using renewable energy that could support alternative water supplies
 - seawater air conditioning
 - photovoltaics
 - efficient plumbing and lighting fixtures
 - wave energy
 - bio-fuels.

‘Ewa WMP Water Policies

1. Continue to reduce ‘Ewa’s per capita water demand, to the amount feasible, by implementing water conservation programs at all levels of use: domestic, industrial, agricultural, and irrigation.
2. Reserve potable water sources for potable needs.
3. Incrementally convert non-potable uses that are currently using potable water to non-potable sources.
4. Maximize the use of recycled water.
5. Minimize the need for increased import of potable water from Central O‘ahu ground water aquifers.
6. Replenish the ‘Ewa caprock aquifer and use this source for non-potable uses.
7. Continue efforts to provide economically-competitive desalinated water that allows us to adapt to climate change.

Future 'Ewa Water Supply: Mid-Growth Scenario



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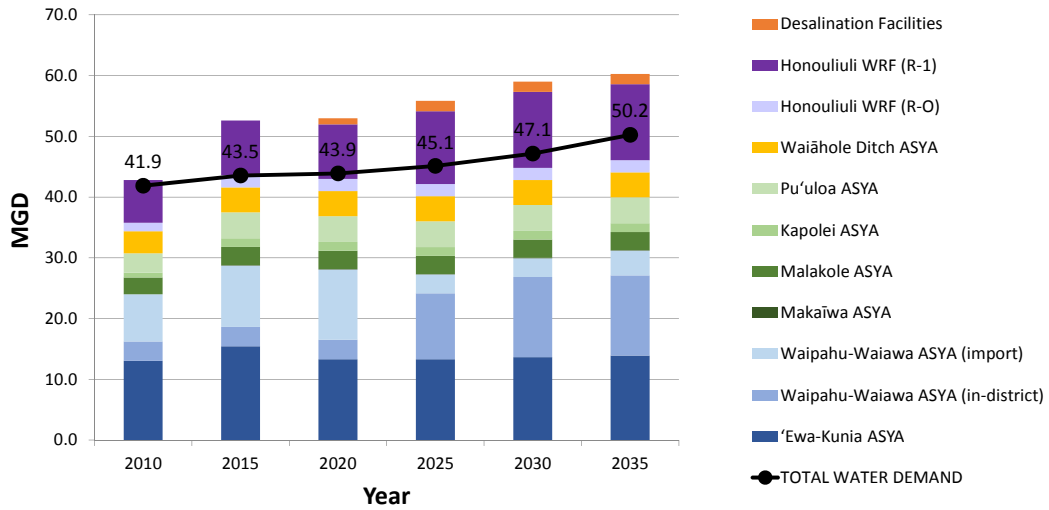
‘Ewa Water Supply: Mid-Growth Scenario

WATER SOURCE	DOMESTIC	AGRI-CULTURE	INDUSTRIAL	GOLF COURSE	LANDSCAPE IRRIGATION	TOTAL
BASAL GROUND WATER	21.8	3.2	0.2	---	1.0	26.2
CAPROCK GROUND WATER	---	0.5	3.0	2.7	3.5	9.7
IMPORT: PEARL HARBOR AQUIFER	4.1	---	---	---	---	4.1
WAIĀHOLE DITCH	---	4.1	---	---	---	4.1
RECYCLED WATER (R-1, R-O)	---	---	6.0	5.0	3.5	14.5
DESALINATED WATER	1.7	---	---	---	---	1.7
STORM WATER	---	---	---	---	---	---
TOTAL SUPPLY	27.6	7.8	9.2	7.8	8.0	60.3
TOTAL DEMAND	26.9	4.0	8.5	7.5	3.4	50.2

NOTE: Total supply figures are rounded

- No basal ground water for golf course irrigation
- Use caprock for all non-potable demands
- Import only for domestic use (Pearl Harbor aquifer) or agriculture (Waiāhole Ditch)
- Increase use of recycled water
- Diversify domestic source with desalinated water
- No use of storm water due to the unreliable nature of rainfall in ‘Ewa

'Ewa Water Supply: Mid-Growth Scenario



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- Increase in-district ground water use allows decrease in import
- No change in Waiāhole Ditch water
- Increase in recycled water use and desalinated water

‘Ewa Water Supply: Two Ultimate-Growth Scenarios

Moderate Application of Water Policies

- BWS per capita water demand of 160 gallon per capita day (GPCD) – same as in Mid-Growth Scenario
- Irrigation per acre water demand same as in Mid-Growth Scenario

Aggressive Application of Water Policies

- Aggressive application of conservation efforts decrease domestic water demand
 - Decrease BWS per capita water demand from 160 GPCD to 150 GPCD
 - Decrease Kalaeloa and JBPHH demand by 10% from “Moderate Ultimate” Scenario
- Climate change causes a 15% increase in agriculture and landscape irrigation water demand from “Moderate Ultimate” Scenario due to less rainfall and higher temperatures

The Ultimate-Growth Scenario was developed to stress the limits of water resources to see what we could and should do.

The first pass at an Ultimate-Growth Scenario assumed full buildout of all of the known land use master plans, but no other changes in calculating water demand. We found that these water demands could be met with a moderate application of the water policies.

A second Ultimate-Growth Scenario was developed to see what it would look like if we were aggressive in our application of the water policies.

BWS per capita demand

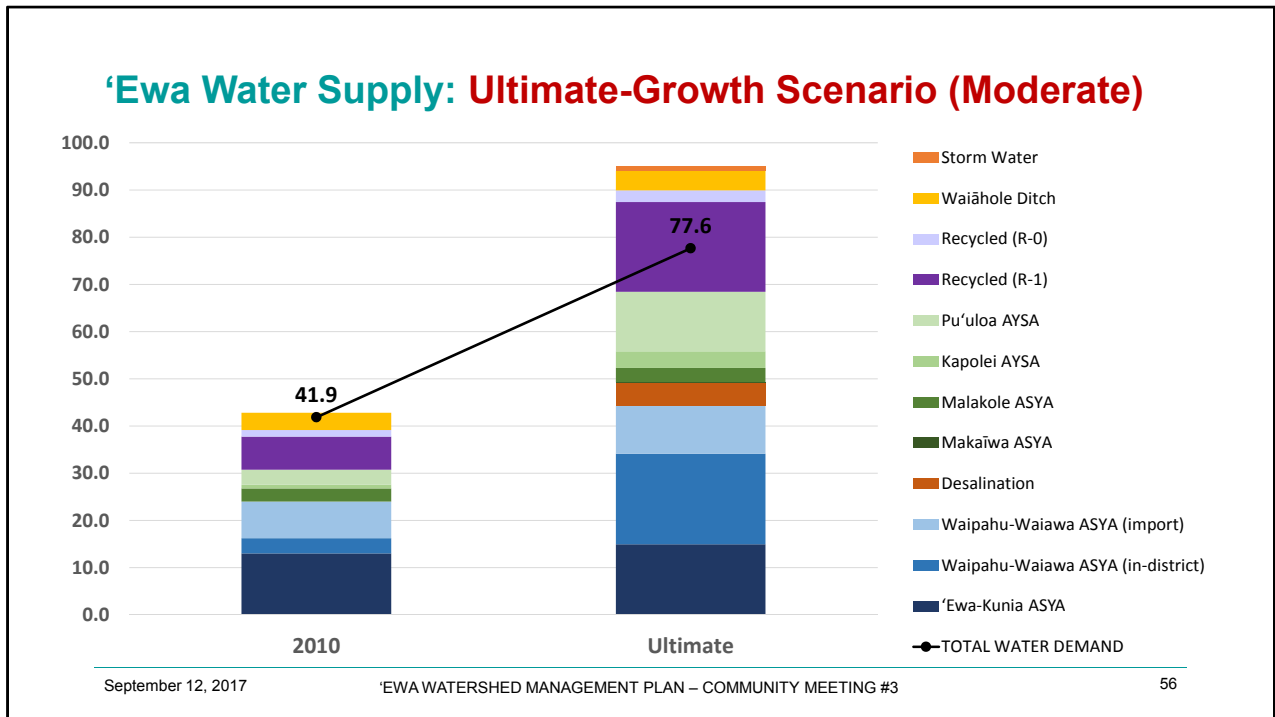
- 185 GPCD (2010)
- 160 GPCD (2035, all scenarios, incl. moderate Ultimate)
- 150 GPCD (aggressive Ultimate)

‘Ewa Water Supply: Ultimate-Growth Scenario (Moderate)

WATER SOURCE	DOMESTIC	AGRI-CULTURE	INDUSTRIAL	GOLF COURSE	LANDSCAPE IRRIGATION	TOTAL
BASAL GROUND WATER	26.8 +2 (unknown source)	4.2	0.2	---	1.0	34.2
CAPROCK GROUND WATER	---	1.5	3.5	6.6	7.6	19.2
IMPORT: PEARL HARBOR AQUIFER	10.1	---	---	---	---	10.1
WAIĀHOLE DITCH	---	4.1	---	---	---	4.1
RECYCLED WATER (R-1, R-O)	---	1.5	8.5	6.5	5.0	21.5
DESALINATED WATER	5.0	---	---	---	---	5.0
STORM WATER	---	1.0	---	---	---	1.0
TOTAL SUPPLY	43.9	12.3	12.2	13.1	13.6	95.1
TOTAL DEMAND	42.7	7.6	11.9	9.5	5.9	77.6

NOTE: Total supply figures are rounded

- Note that Kalaeloa may exceed its ground water permit and will need to find additional source
- Still no basal ground water used for golf course irrigation
- Use caprock for all non-potable demands
- Import only for domestic use (Pearl Harbor aquifer) or agriculture (Waiāhole Ditch). Import from Pearl Harbor increases.
- Increase use of recycled water. Begin to use recycled water for agriculture.
- Diversify domestic source with desalinated water.
- Begin to use storm water for agriculture.



- Increased in-district ground water use allows a decrease in imported water
- Increase use of caprock water
- Increase in recycled water use and desalinated water
- Add storm water

‘Ewa Water Supply: Ultimate-Growth Scenario (Aggressive)

WATER SOURCE	DOMESTIC	AGRI-CULTURE	INDUSTRIAL	GOLF COURSE	LANDSCAPE IRRIGATION	TOTAL
BASAL GROUND WATER	27.8 +1.5 (unknown source)	---	---	---	1.0	30.3
CAPROCK GROUND WATER	---	---	0.5	---	1.6	2.1
IMPORT: PEARL HARBOR AQUIFER	6.6	---	---	---	---	6.6
WAIĀHOLE DITCH	---	4.1	---	---	---	4.1
RECYCLED WATER (R-1, R-O)	---	4.2	11.5	10	4.7	30.4
DESALINATED WATER	5.0	---	---	---	---	5.0
STORM WATER	---	1.0	---	---	---	1.0
TOTAL SUPPLY	40.9	9.4	12.0	10.0	7.3	79.6
TOTAL DEMAND	39.8	7.8	11.9	9.5	6.4	75.5

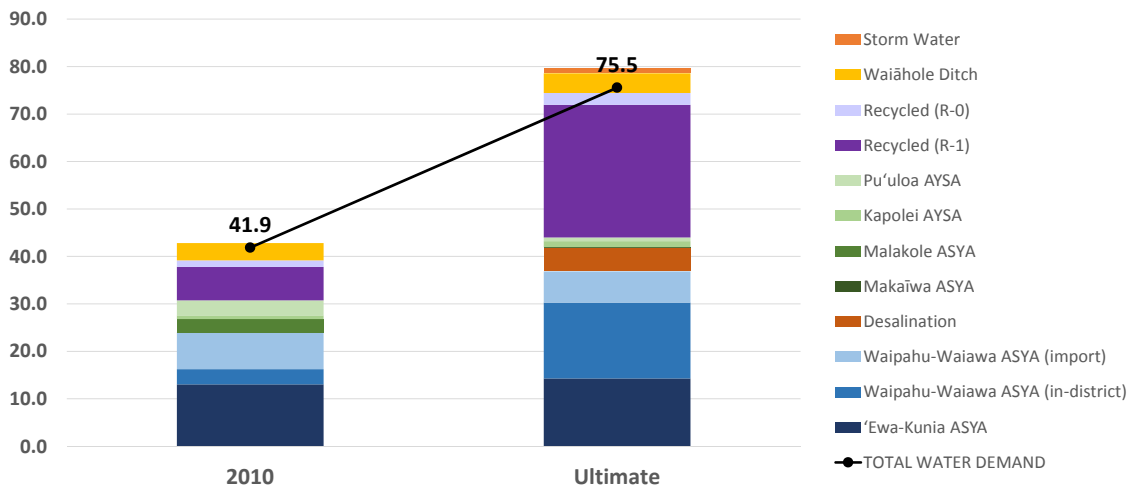
The previous supply scenario was able to meet the Ultimate demand by moderately applying the water policies. This supply scenario looked at what supply would look like if we were to be more aggressive in applying the water policies.

NOTE: Total supply figures are rounded

Supply

- With additional conservation, Kalaeloa may still exceed its ground water permit and will need to find additional source
- No basal ground water for golf course, agriculture, and industrial uses
- Less import needed from Pearl Harbor
- Import only for domestic use (Pearl Harbor aquifer) or agriculture (Waiāhole Ditch). Import from Pearl Harbor decreases from moderate application of water policies.
- Recycled water helps supply all non-potable demand categories, replacing basal and caprock ground water for ag and golf course and lessening landscape irrigation and industrial demands for caprock water.
- Diversify domestic source with desalinated water.
- Use storm water for agriculture.

'Ewa Water Supply: Ultimate-Growth Scenario (Aggressive)



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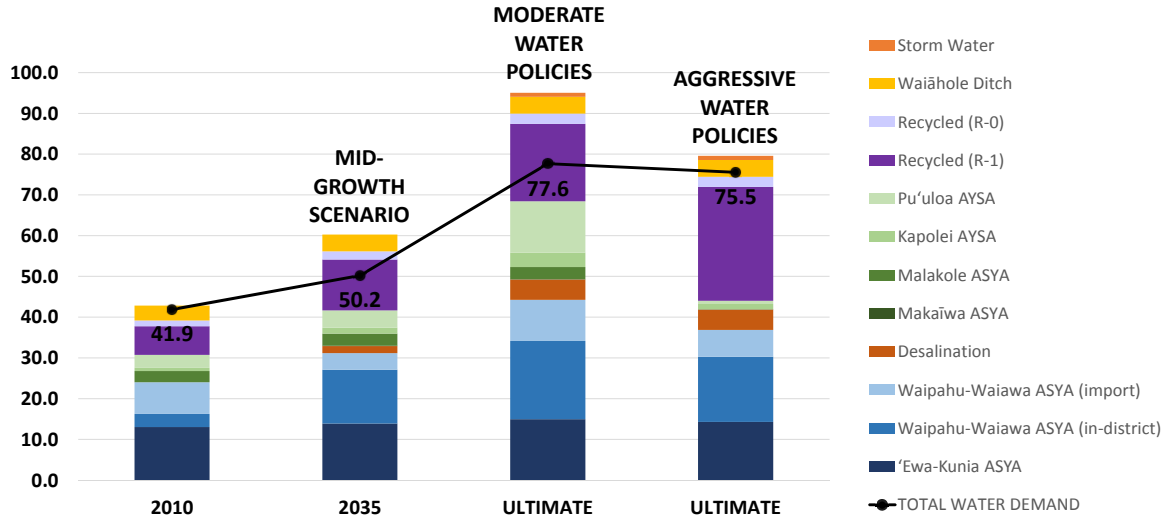
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Maximizing use of recycled water allows for :

- Decreased import from Pearl Harbor
- Replacement of in-district basal ground water for agriculture, industrial uses, and golf course irrigation, and a decrease in its use for landscape irrigation
- Replacement of in-district caprock water for agriculture and golf course irrigation, and a decrease in its use for industrial and landscape irrigation

'Ewa Water Demand and Supply



WATERSHED MANAGEMENT PROJECTS AND STRATEGIES

EWA WATERSHED MANAGEMENT PLAN
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Projects with Champions

Specific projects that are being planned and/or that are being implemented by a particular agency or agencies or by a particular group or non-profit entity.

Strategies

Potential actions that would serve to implement the overall goal, objectives, and sub-objectives of the WMP, but that do not currently have a project champion.

Projects with Champions

Water Supply Projects

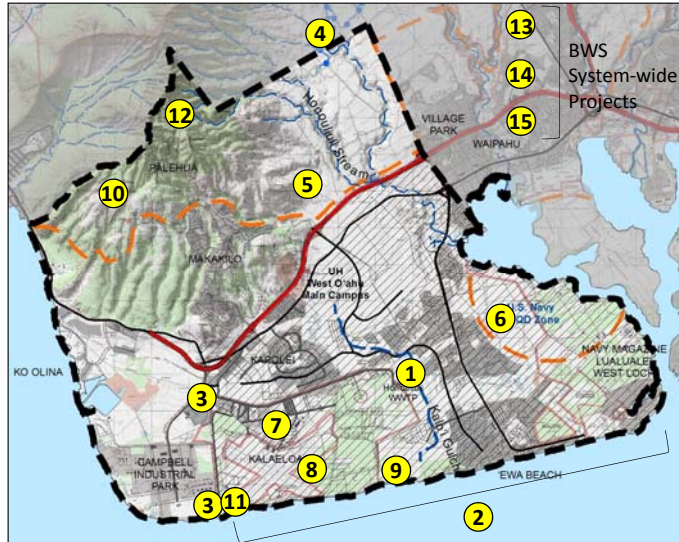
1. Honouliuli Water Recycling Facility
2. Caprock Aquifer Storage and Recovery (ASR)
3. Brackish and Seawater Desalination
4. Waiāhole Ditch Water Loss Minimization
5. Water Infrastructure for Agricultural Expansion Mauka of H-1 Freeway
6. Water Infrastructure for Navy ESQD Zone
7. Kalaeloa Water System Improvements

Watershed Management Projects

8. Kalaeloa Heritage Park
9. Hoakalei Coastal Village Restoration
10. Mālama Learning Center
11. Anchialine Pool Restoration
12. Wai'anae Mountains Watershed Partnership

BWS "System-Wide" Projects

13. Potable Source Water Protection
14. Assess Resiliency of Critical Water Infrastructure
15. BWS Infrastructure Renewal and Replacement Program



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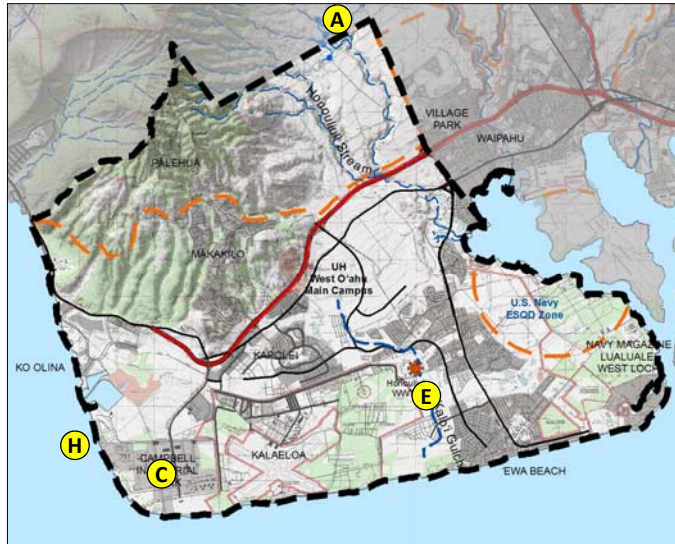
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Watershed Management Strategies

- A. Waiāhole Ditch Augmentation
- B. Brackish Well Development
- C. Industrial Cooling Using Seawater
- D. Grey Water Reuse
- E. Kalo'i Gulch Regional Drainage Plan Evaluation
- F. Stormwater Retention/Detention – including golf course detention
- G. Renewable Energy Opportunities
- H. 'Ewa Caprock District Cooling
- I. Convert Cesspools to Municipal Sewer System
- J. Integrate Planning for Land Use and Water Resources Management
- K. 'Ewa Sustainability Dialogues
- L. Potable Source Water Protection

B
D
F
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} Broad Geographic Distribution
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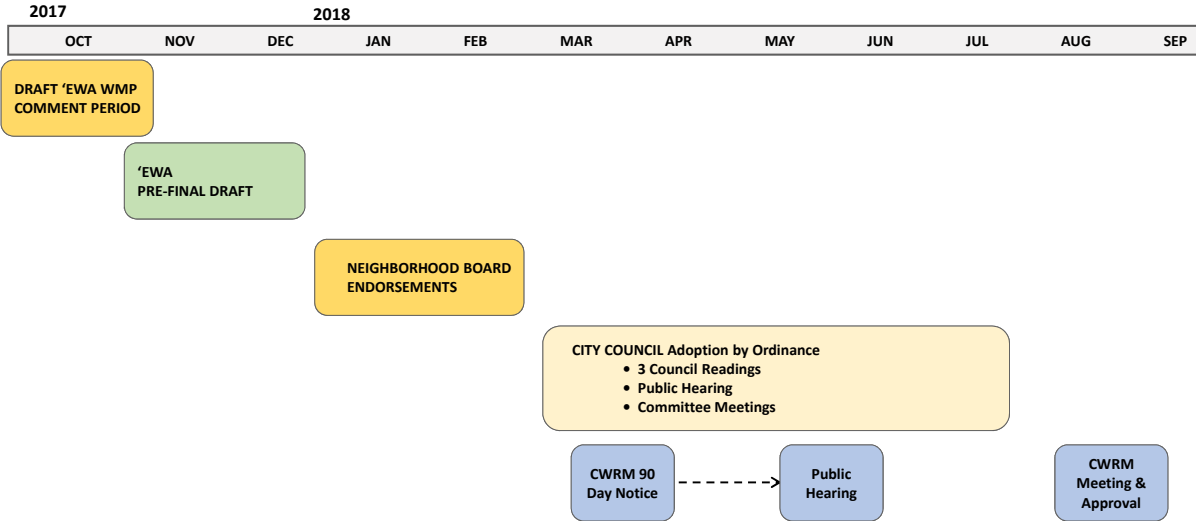
WATERSHED MANAGEMENT PLAN APPROVALS PROCESS

EWA WATERSHED MANAGEMENT PLAN
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'Ewa WMP Approvals Process



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HARD COPIES

'Ewa Beach Public and School Library

91-950 North Road
'Ewa Beach, HI 96706

Kapolei Public Library

1020 Manawai Street
Kapolei, HI 96707

Hawai'i State Library

478 S. King Street
Honolulu, HI 96813

PDF COPY

<http://www.boardofwatersupply.com/water-resources/watershed-management-plan/ewa-plan>

**Please submit comments by
October 31, 2017 to:**

Email: sherri@townscapeinc.com

Townscape, Inc.

Attn: Sherri Hiraoka

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**DRAFT 'EWA WATERSHED MANAGEMENT PLAN AND PREVIOUS COMMUNITY MEETING
PRESENTATIONS AND NOTES MAY BE FOUND ON-LINE AT:**

<http://www.boardofwatersupply.com/water-resources/watershed-management-plan/ewa-plan>