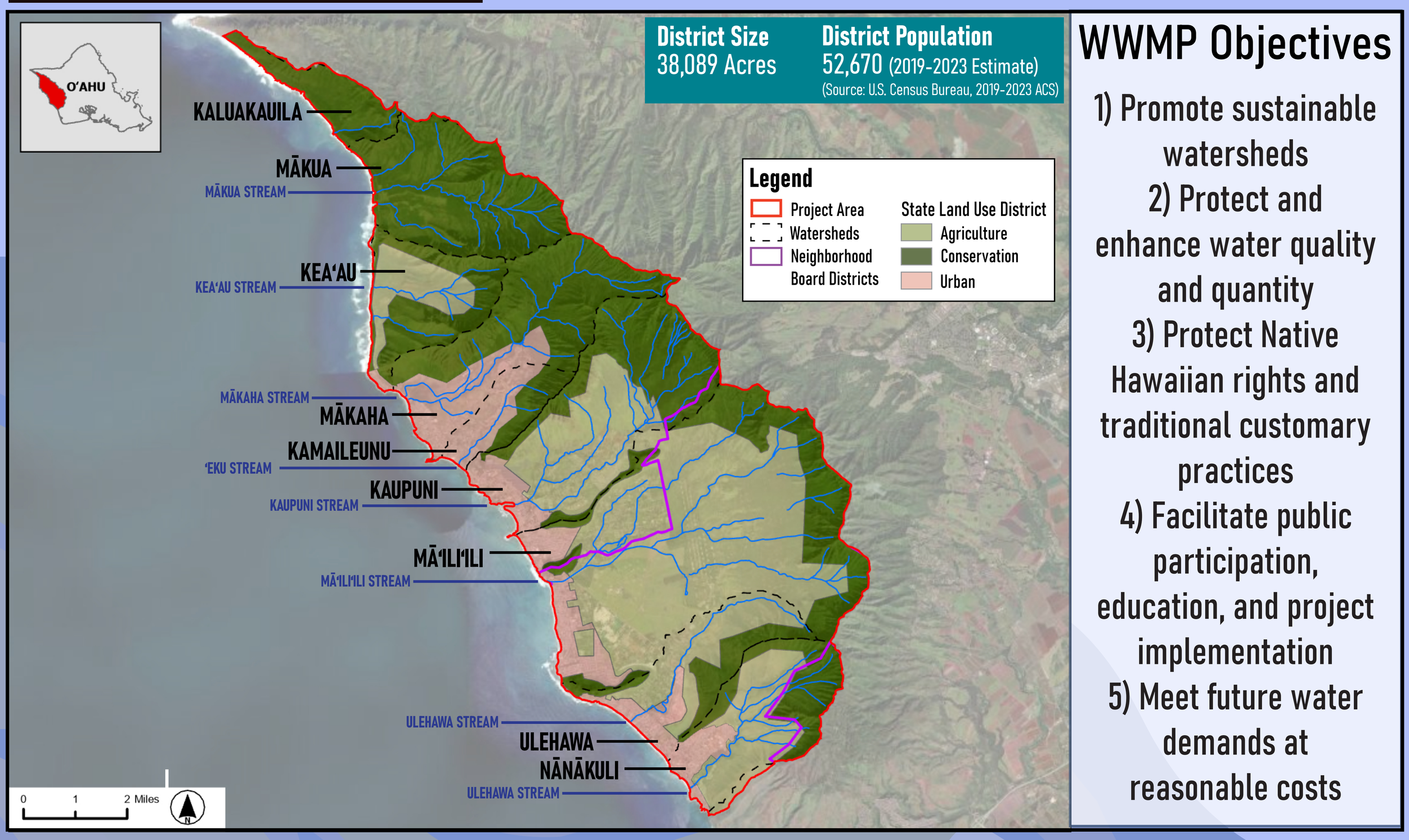
Wai‘anae Watershed Management Plan
Background

The Honolulu Board of Water Supply (BWS) and Department of Planning and Permitting (DPP) is developing the the Wai‘anae Watershed Management Plan (WWMP). The WWMP will be prepared in accordance with the State Water Code Chapter 174C, HRS and the City and County of Honolulu Ordinance Chapter 30, ROH. The WWMP will be one of eight district water management plans that together will comprise the O‘ahu Water Management Plan.

Goal of the O‘ahu Water Management Plan:

To formulate an environmentally holistic, community-based, and economically viable watershed management plan that will provide a balance between: (1) the preservation and management of Oahu's watersheds, and (2) sustainable ground water and surface water use and development to serve present users and future generations.

WAI‘ANAE PLANNING DISTRICT



WWMP Objectives

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

Planning Process

Research & Identify Key Water Resource Issues → Preliminary Watershed Analysis & Water Demand Forecasting → Water Supply Options & Watershed Management Policies, Projects & Strategies → Preliminary & Public Review Draft WWMP → Final WWMP

Stakeholder Consultation →

Wai‘anae Watershed Management Plan

Existing Water Demand & Supply

O‘ahu’s Water System

Regulatory

Commission on Water Resource Management

- Establishes sustainable yield (SY) of groundwater aquifers and instream flow standards for streams
- Approves regulatory permits
- Wai‘anae Water Designation currently in process

Supply

Board of Water Supply

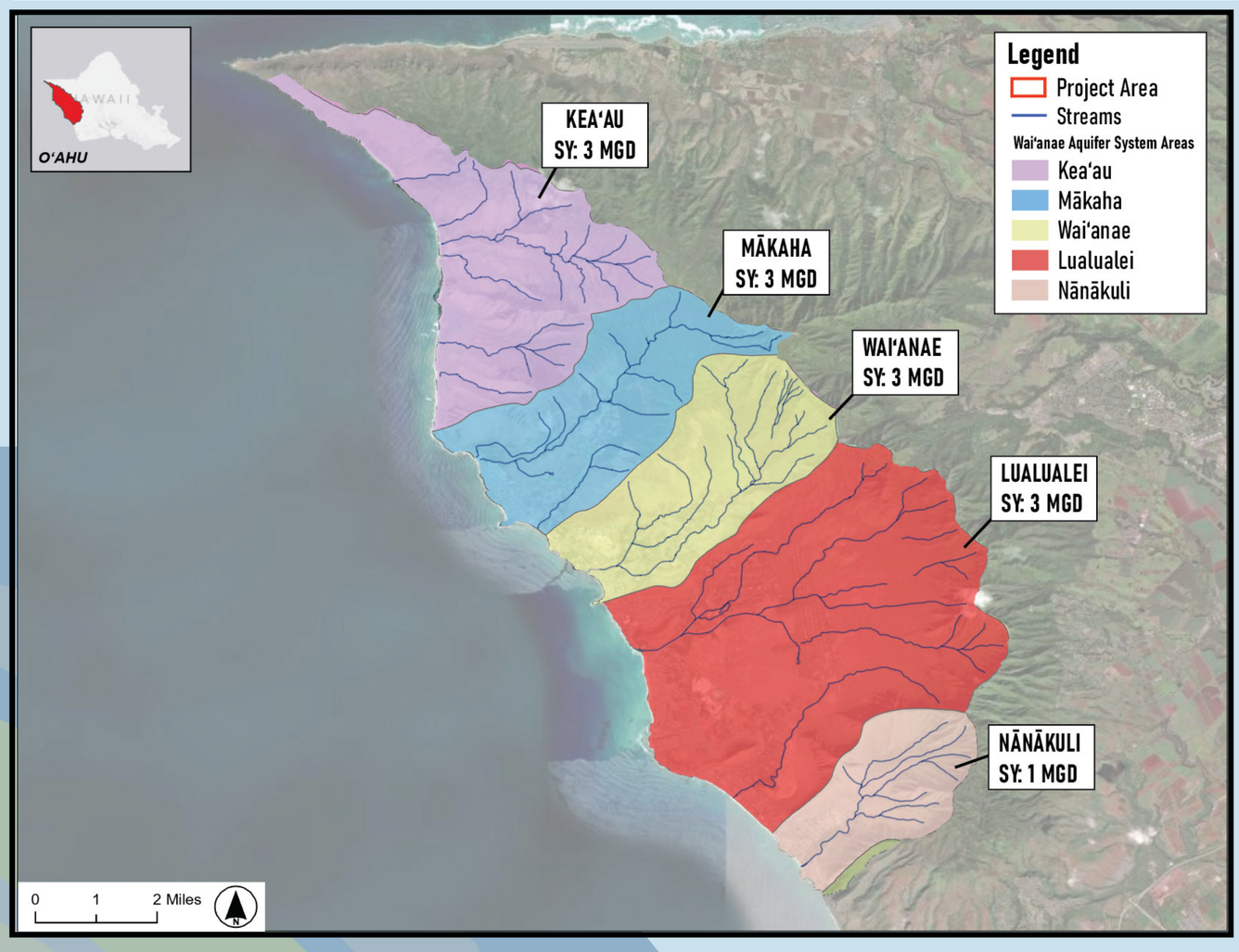
- Operates potable water infrastructure
- Supplies water to 93% of O’ahu’s population(residents & visitors)
- Accounts for ~88% of Wai‘anae’s potable water needs

Supply

Private & Military Sources

- Private sources account for ~5% and military sources account for ~7% of Wai‘anae’s potable water needs

WAI‘ANAE’S AQUIFER SYSTEM AREAS & SUSTAINABLE YIELDS



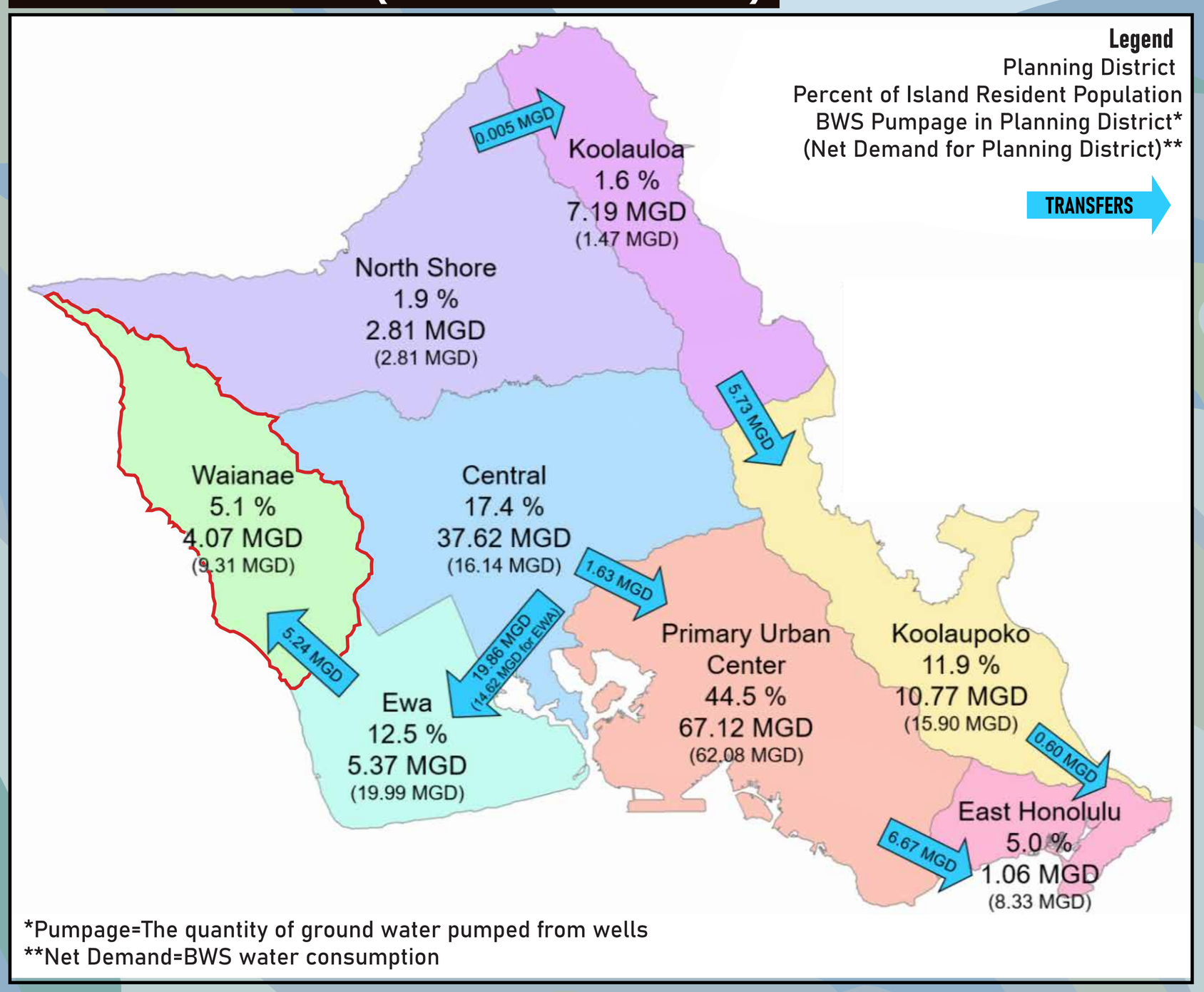
Wai‘anae’s Average Annual Pumpage (2024)

Private & Military Wells

- Mākaha: 1.98 MGD
- Wai‘anae: 3.00 MGD
- Lualualei, Nānākuli, and Kea‘au: Not Reported

MGD = Millions of Gallons Per Day
GPCD= Gallons Per Capita Per Day

BWS TRANSFER MAP (2020-2024 AVERAGE)



*Pumpage=The quantity of ground water pumped from wells
**Net Demand=BWS water consumption

Wai‘anae’s Water Demand & Supply

Pumpage in Wai‘anae: 4.07 MGD

- Water transferred from ‘Ewa: 5.24 MGD

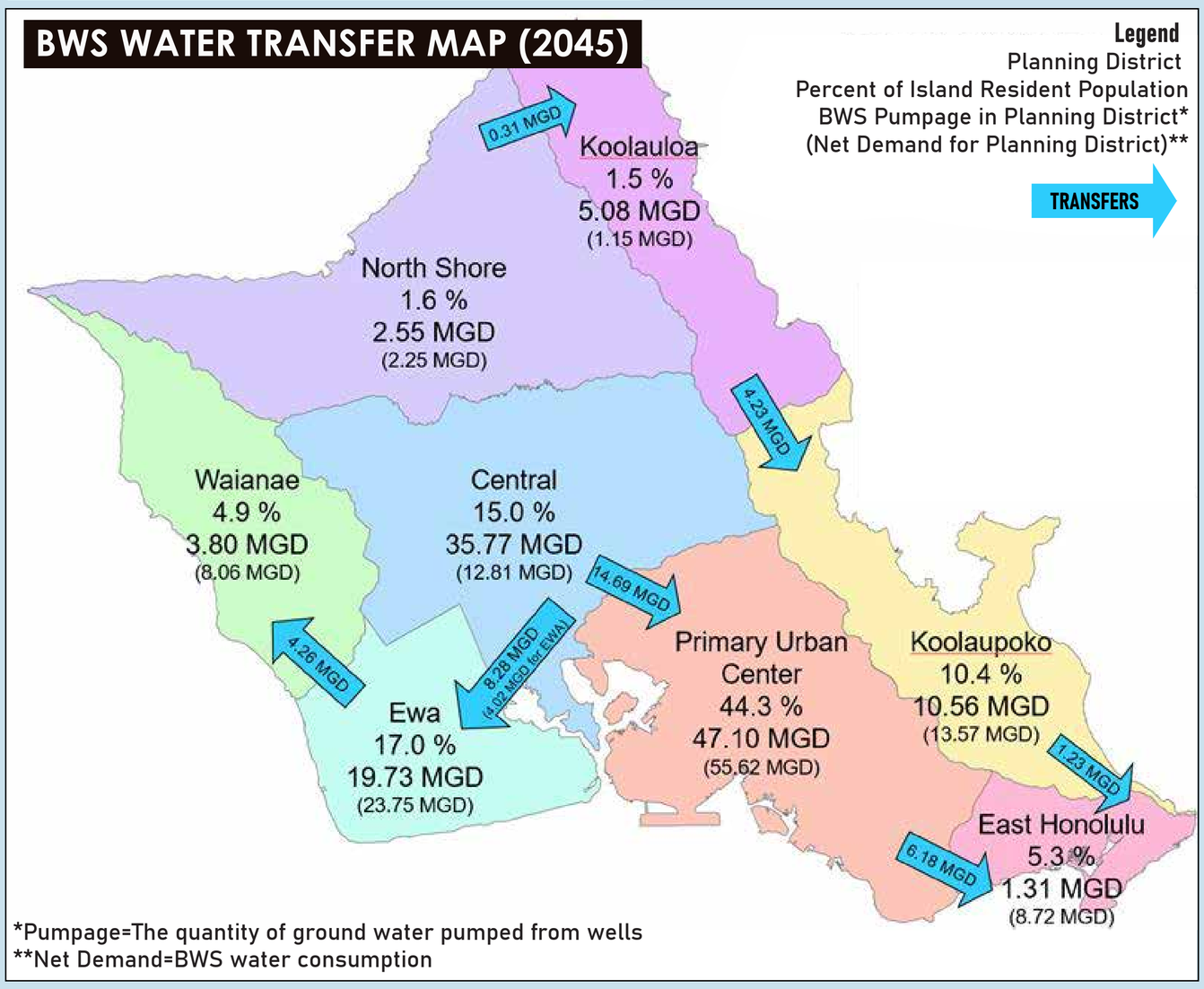
Water Demand:

- 2020 Per Capita Water Demand: 185.68 GPCD
- 2024 Per Capita Water Demand: 180.48 GPCD
- 2024 Total Water Demand 9.33 MGD

Wai‘anae Watershed Management Plan

Future Water Demand Scenarios & Planning Implications

2045 Water Supply

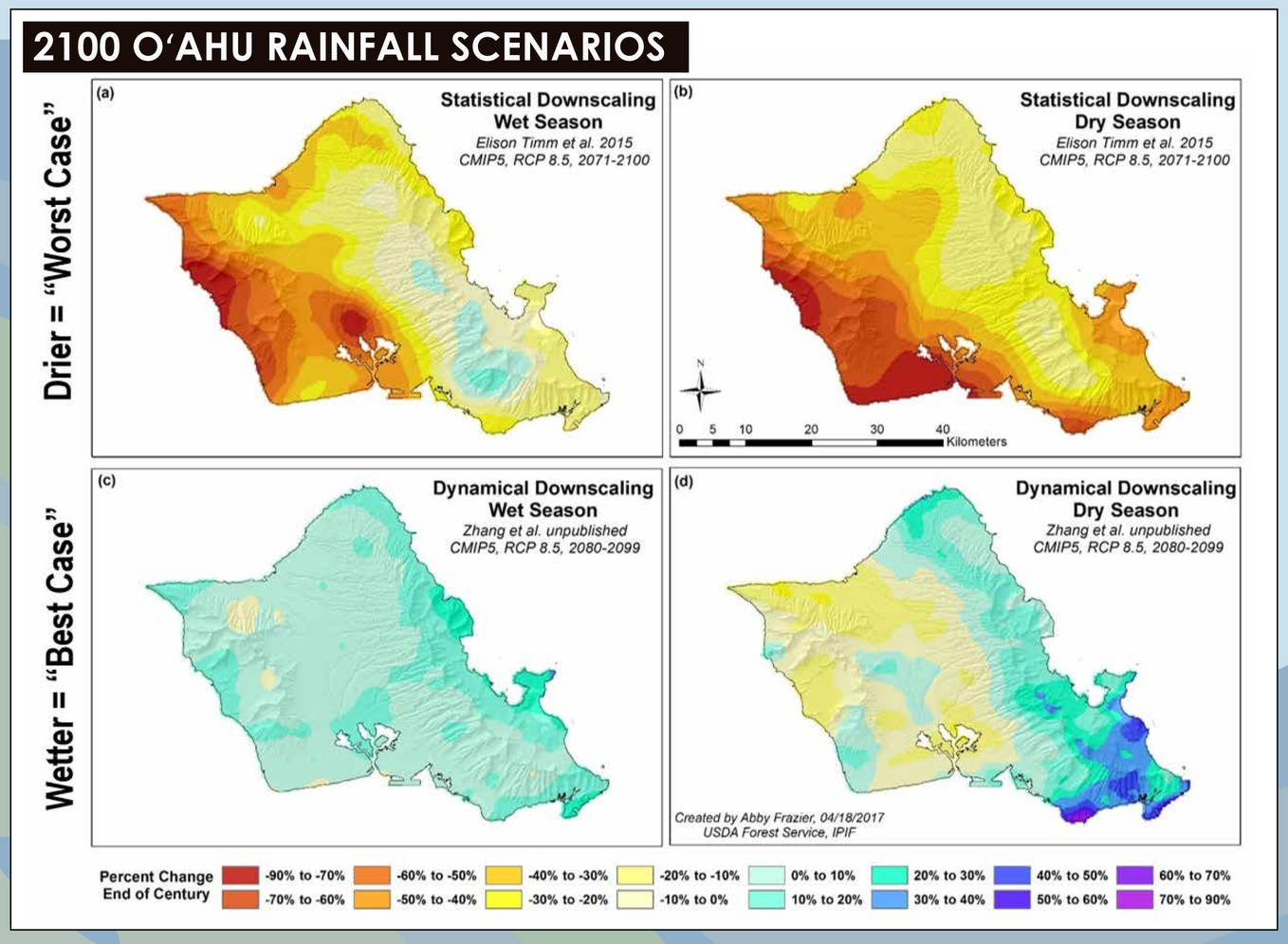


2045 Projected Wai‘anae Water Demand: 8.06 MGD

- Pumpage in Wai‘anae: 3.80 MGD
- Water imported from ‘Ewa and Central: **4.26 MGD*** (*proportions of ‘Ewa & Central transfers subject to change)

Takeaway: 60% of supply is imported to meet in district demand. For the Mid and High Demand Scenario, water conservation and efficient water use remains unchanged from 2020 through 2045.

2100 Water Supply



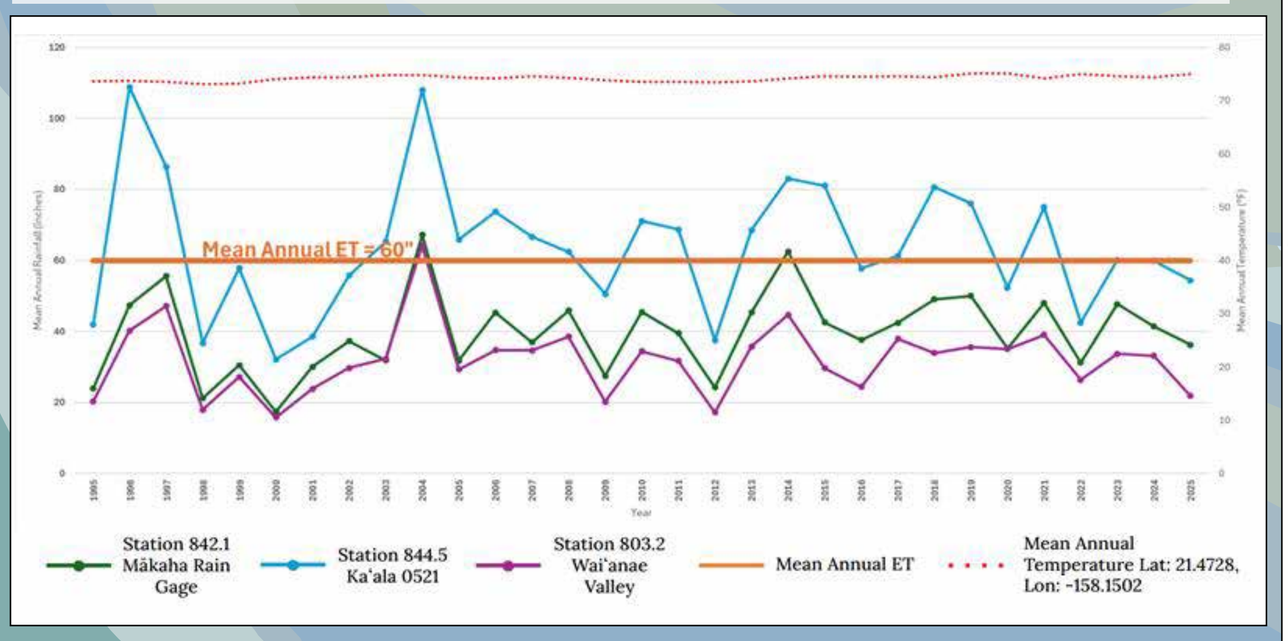
Wai‘anae 2100 Precipitation Projection Supply in the 2100 Dry Rainfall Scenario:

- Rainfall may decrease by 50% in Wai‘anae (dry season).
- CWRM Sustainable Yield for Wai‘anae aquifers anticpiated to decrease because of reduced rainfall and increased heat

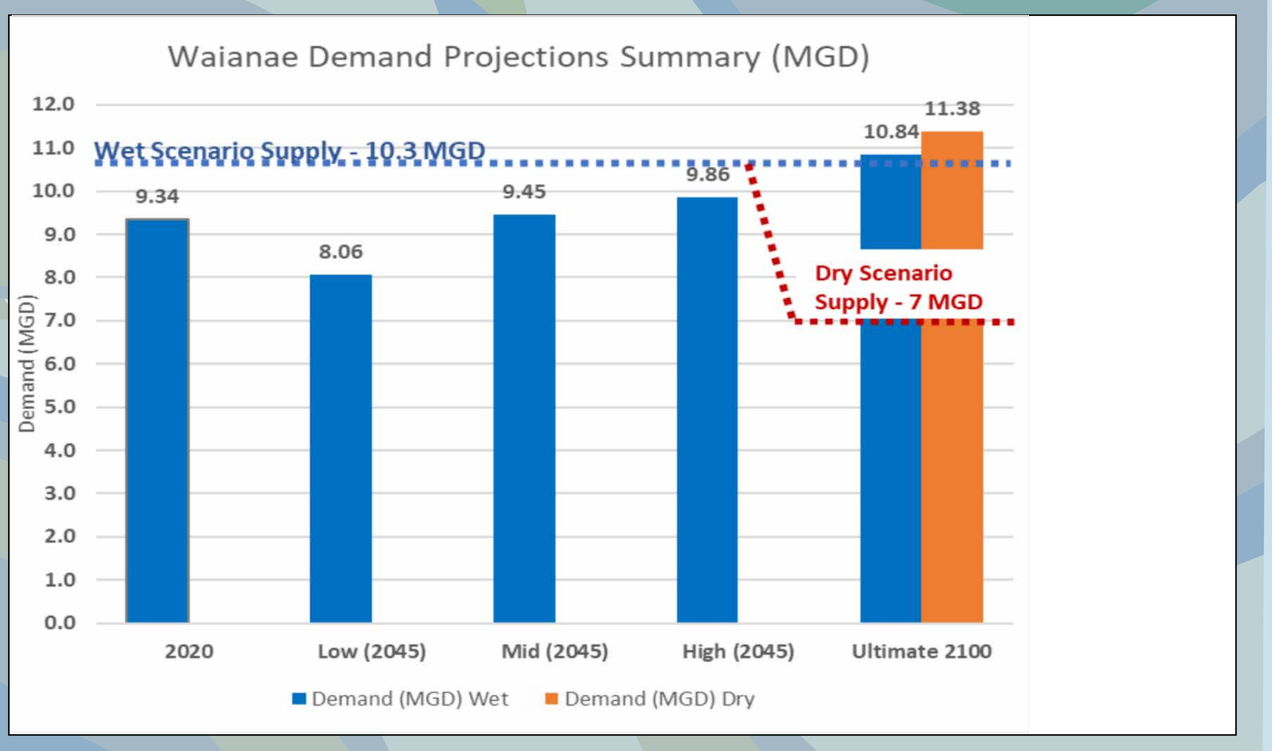
Wai‘anae 2100 Precipitation Projection Supply in the 2100 Wet Rainfall Scenario:

- Rainfall likely to stay the same, may increase slighty in Wai‘anae (wet scenario)
- CWRM Sustainable Yield for Wai‘anae aquifers anticpiated to remain the same in

Wai‘anae Aquifer System Rain Gages 1995-2025 Annual Rainfall Totals (inches)



2100 Projected Supply + Demand Comparison



Wai‘anae Watershed Management Plan

Future Water Demand Scenarios

As part of the Wai‘anae Watershed Management Plan (WWMP), four Future Water Demand Scenarios were developed. Three scenarios project water demand in 2045: Low (most probable), Mid, and High. The Ultimate Demand Scenario projects water demand in 2100 - the Ultimate Scenario includes projections for both “Dry” and “Wet” rainfall scenarios.

2045
Low Demand Scenario

Most Probable

Description:
- Water conservation programs will continue to reduce residential, commercial and agriculture water demand.

- Population and demand is projected to decrease by 2045

2045 BWS-Served Population:
- 49,858 (decrease by 0.01% from 2020)

Per-Capita Water Demand:
- 161.71 GPCD (decrease by 13% from 2020)

Mid Demand Scenario

Description:
- Assumes that there is no improvements to water conservation or efficiency since 2020

-All of DHHL housing is assumed developed and half of all known planned housing development is built by 2045

-The population increases with the added housing, but so does the overall demand

2045 BWS-Served Population:
- 50,901 (increase by 0.01% from 2020)

Per-Capita Water Demand:
- 185.68 GPCD

High Demand

Description:
- Water conservation and efficient water use remains unchanged from 2020 through 2045

- Includes all known future housing develpment built by 2045

- 100% of all viable agriculture zoned land is used for agriculture

2045 BWS-Served Population:
- 53,093 (incorporates +3000 population growth)

Per-Capita Water Demand:
- 185.68 GPCD

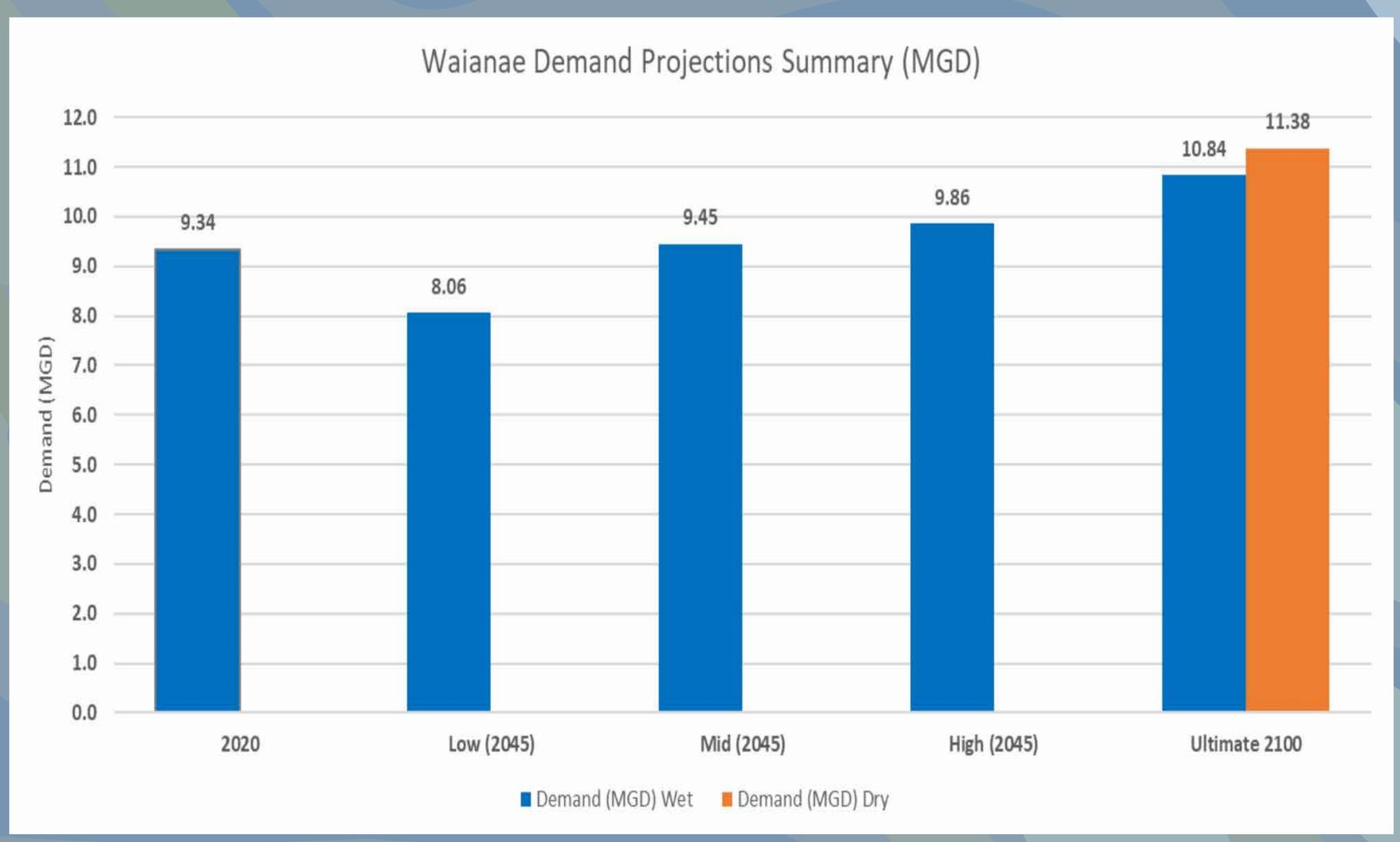
2100
Ultimate Demand Scenario

Description:
- UH 2100 rainfall forecast a dry and wet future. Wai‘anae’s aquifers will decrease with less rainfall and recharge and higher evapotranspiration in hydrologic cycle

Water demand:
- Dry: 11.4 MGD
- Wet: 10.8 MGD

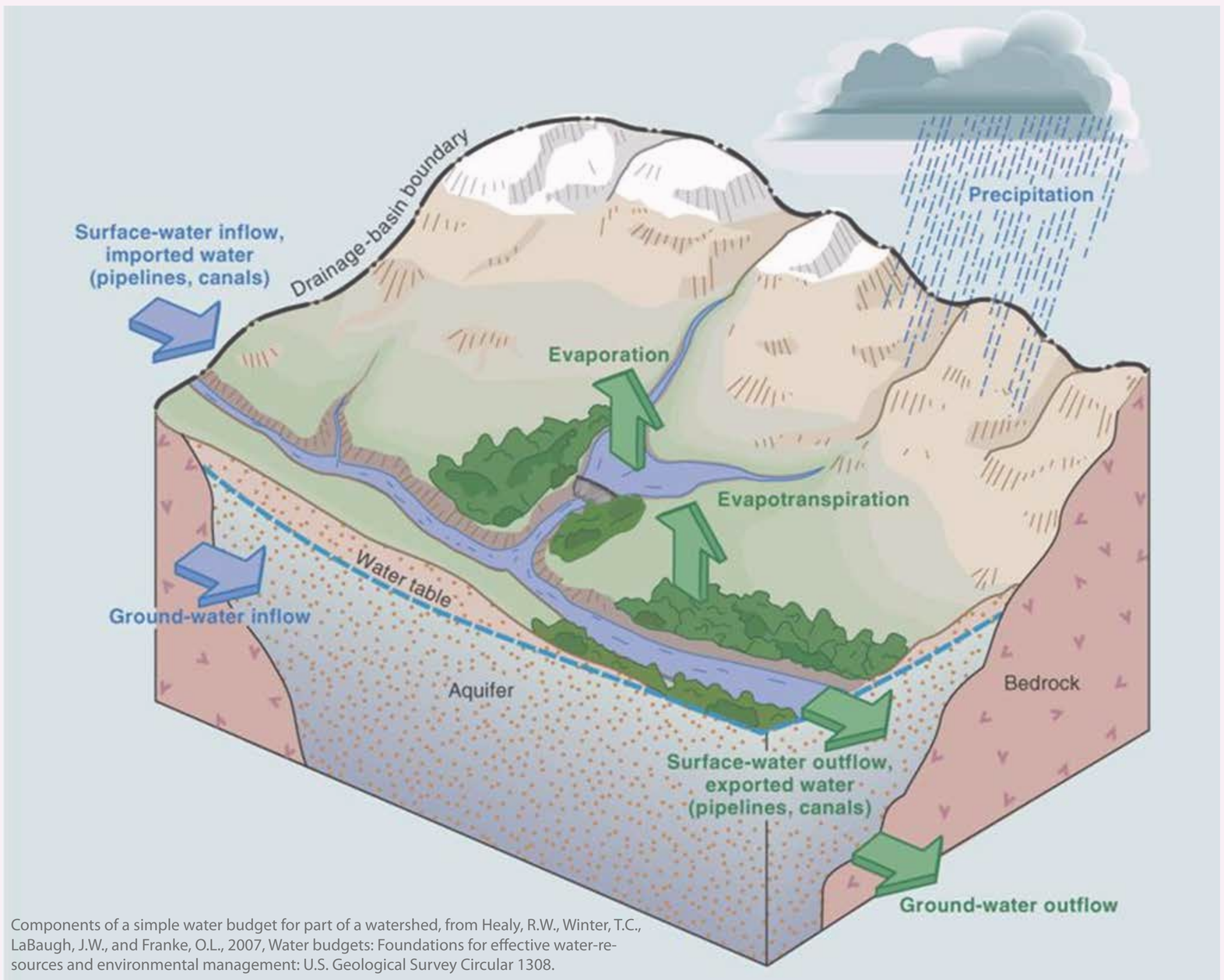
Per-Capita Water Demand Target:
- Decrease from 185.68 GPCD to 140 GPCD, a 25% reduction

Initial Water Demand Projections



Wai‘anae Watershed Management Plan

Water Budget, Sustainable Yield & Water Users



Components of a simple water budget for part of a watershed, from Healy, R.W., Winter, T.C., LaBaugh, J.W., and Franke, O.L., 2007, Water budgets: Foundations for effective water-resources and environmental management: U.S. Geological Survey Circular 1308.

Water Budget Analysis

The Water Budget calculates the **total inflow** - **the total outflow** in an area in order to determine how much **recharge** there is and what the **total supply** is.

Total inflow-total outflow = total recharge

Primary Inflow: Rainfall
Primary Outflows: Evapotransiration and runoff

Healthy watersheds will **capture** the runoff, and reduce evapotranspiration. Recharge happens primarily in the mauka areas, but can also happen in the urban areas. **Low impact development** and **green infrastructure** can **reduce** the **outflows** in urban environments.

Wai‘anae Aquifer System

Future Sustainable Yields

This graphic highlights the ranges of sustainable yield in 2100 for the island of O‘ahu. Wai‘anae could have a sustainable yield increase as high as **17 MGD**, or as low as **5 MGD.**

Source: Water Research Foundation Project No. 4637 Impacts of Climate Change on Honolulu Water Supplies and Planning Strategies for Mitigation (2019) Prepared by: Nakano D., Stephens L., Turk J., Mukai S., Stultz J., Brown and Caldwell. Co-sponsored by: Honolulu Board of Water Supply. Chapter 4: Vulnerability Assessment, 4.3 Water Supply Vulnerabilities page 48 (pdf page 69/177)

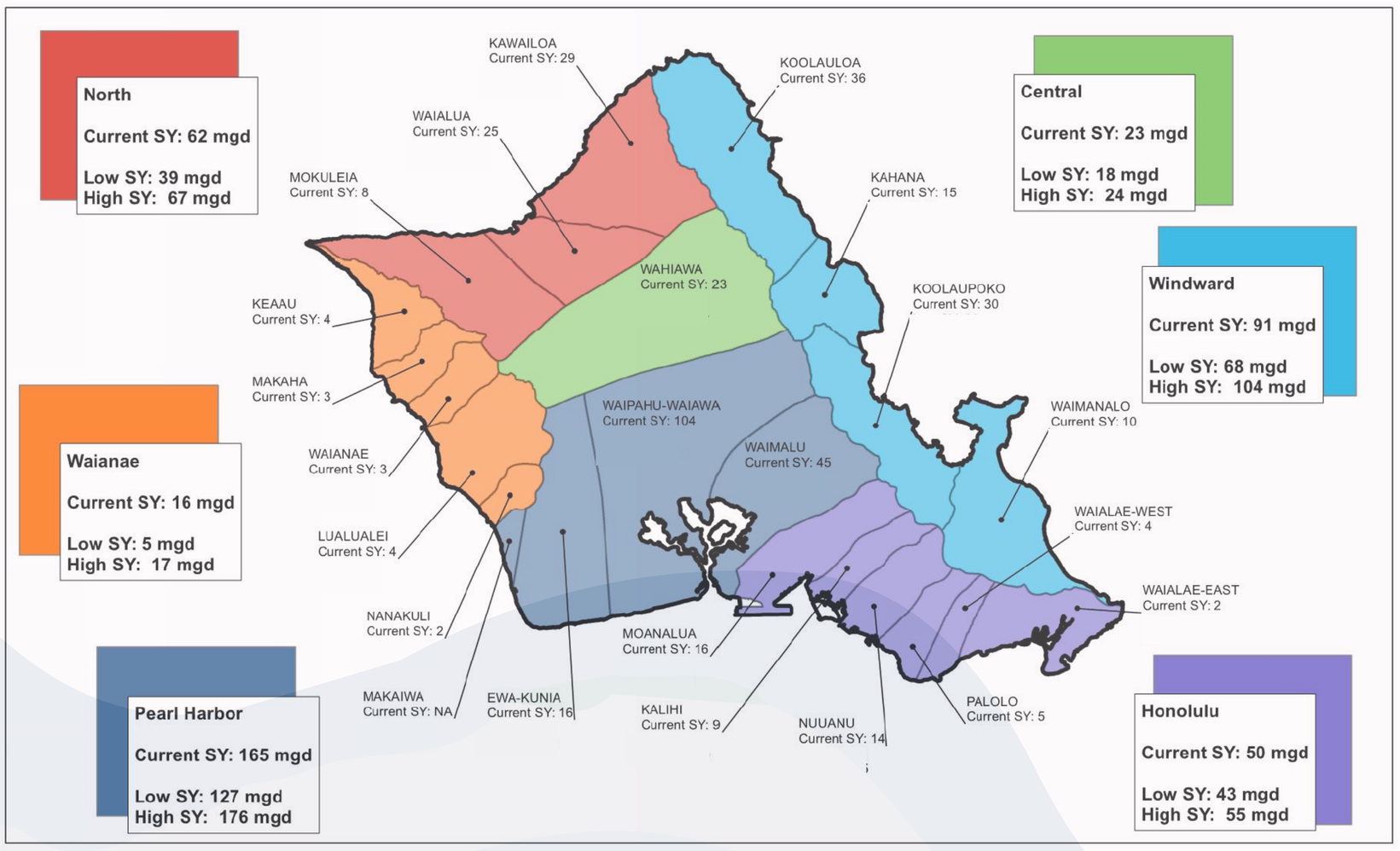


Figure 4-16. Current Sustainable Yields and Potential Range of Sustainable Yields from Climate Forecasts.

Top 25 Largest BWS Water Users in Wai‘anae 2024 Average (MGD)

Rank	Water User	Water Type	2024 Average Demand (MGD)
1	Mākaha Golf & Resort LLC	Golf (Non-Potable)	0.243
2	DOE Wai‘anae High School	State Govt	0.110
3	DOE Wai‘anae Intermediate School	State Govt	0.100
4	AOAO Mākaha Surfside	Low-Rise	0.068
5	DOE Nānākuli High School	State Govt	0.060
6	DRM Wai‘anae Kai Military Reservation	Federal Govt	0.059
7	Dong, Dan	Agricultural	0.055
8	Mountain View Dairy Inc	Agricultural	0.054
9	Golden Herbs Farm LLC	Agricultural	0.054
10	Kadohiro, Ken K	Agricultural	0.050

Rank	Water User	Water Type	2024 Average Demand (MGD)
11	He, Wei Xiang	Agricultural	0.049
12	Nānākuli Kauhale Development L.P.	Commercial Mixed Use	0.049
13	Hawai‘i Affordable Properties Inc	Mixed Residential	0.048
14	Wai‘anae Comm Redevelopment Corp	Agricultural	0.047
15	Wai‘anae Coast Comprehensive Health	Commercial	0.046
16	Glory Herb Hawaii LLC	Agricultural	0.046
17	Makai Vistas at Mākaha LLC - Cottages at Mauna ‘Olu	Residential	0.046
18	PVT Land Co LTD	Agricultural	0.045
19	Hawai‘i Public Housing Authority	State Govt	0.045
20	ENV Wai‘anae Wastewater Treatment Plant	City Govt	0.045
21	DSP Wa‘ianae District Park	State Govt	0.045
22	AOAO Holomoana	Residential	0.044
23	Wailana Association AOAO	Residential	0.043
24	Ka Waihona o Ka Na‘auao PCS	State Govt	0.043
25	Wai‘anae Comm Redevelopment Corp	Agricultural	0.043

Waiʻanae Watershed Management Plan

Strategies for Water Conservation + Shared Water Kuleana

How can Waiʻanae use its water more efficiently & lower its per capita water demand?

Write your strategies and manaʻo below: What are other water issues you want addressed in shared kuleana?

Issues

- Waiʻanae and Pearl Harbor water supplies can be impacted by contamination and climate change induced drought
- Competition for Pearl Harbor aquifer water can impact transfers into Waiʻanae
- Potential single transmission main failure for Waiʻanae's current water supply
- Reductions in Waiʻanae source pumping to accommodate climate change and provide oppoturnities for stream restoration will require much greater conservation efficiencies

Kuleana: Responsibility to use all water efficiently

Example Strategies

- Reduce water loss in BWS system from 19.1% to < 10%

Alternative Water Sources

- Stormwater retention
- Improve mauka forest health to sustain recharge and reduce stormwater runoff
- Rain barrels for yard and plant irrigation
- Reduce water loss through infrastructure improvements (i.e. Pipeline rehabilitation and replacement and leak detection
- Demineralize R-1 water from Waiʻanae Wastewater Treatment Plant for irrigation
- Potable reuse at Honoluliuli Water
- Seawater Desalination in Kalaeloa

Encourage water reuse

- On-site non-potable water reuse (i.e. on-site grey water reuse for landscape irrigation)

Wai‘anae Watershed Management Plan

Strategies & Projects

Based on what you learned tonight, what strategies and projects could improve Wai‘anae’s supply or demand?

Write your ideas and/or provide project details using the QR code below!