
Chapter 20304

Hanapēpē Aquifer System Area

CHAPTER 20304 - TABLE OF CONTENTS

20304 HANAPĒPĒ AQUIFER SYSTEM	20304-1
20304-1 SYSTEM AREA PROFILE.....	20304-1
20304-1.1 General.....	20304-1
20304-1.2 Economy and Population	20304-1
20304-1.2.1 Economy	20304-1
20304-1.2.2 Population	20304-1
20304-1.3 Land Use.....	20304-2
20304-1.3.1 2000 Kauaʻi General Plan	20304-2
20304-1.3.2 Kauaʻi Zoning.....	20304-2
20304-2 EXISTING WATER RESOURCES.....	20304-6
20304-2.1 Ground Water.....	20304-6
20304-2.2 Surface Water.....	20304-6
20304-2.3 Water Conservation	20304-6
20304-2.4 Rainwater Catchment.....	20304-6
20304-2.5 Recycled Water	20304-7
20304-3 EXISTING WATER USE.....	20304-11
20304-3.1 General.....	20304-11
20304-3.2 Domestic Use.....	20304-12
20304-3.3 Industrial Use.....	20304-12
20304-3.4 Irrigation Use	20304-12
20304-3.4.1 Ground Water	20304-12
20304-3.4.2 Recycled Water.....	20304-12
20304-3.4.3 Surface Water.....	20304-13
20304-3.5 Agricultural Use.....	20304-13
20304-3.5.1 Ground Water	20304-13
20304-3.5.2 Recycled Water.....	20304-13
20304-3.5.3 Surface Water.....	20304-13
20304-3.6 Military Use	20304-13
20304-3.7 Municipal Use	20304-13
20304-3.7.1 County Water Systems	20304-13
20304-3.7.2 State Water Systems.....	20304-15
20304-3.7.3 Federal Water Systems	20304-15
20304-3.7.4 Private Public Water Systems.....	20304-15
20304-3.7.5 Per Capita Use	20304-15

20304-3.8	Existing Water Use by Resource.....	20304-16
20304-3.8.1	Ground Water	20304-16
20304-3.8.2	Surface Water.....	20304-16
20304-3.8.3	Water Conservation	20304-16
20304-3.8.4	Rainwater Catchment	20304-16
20304-3.8.5	Recycled Water.....	20304-16
20304-4	FUTURE WATER USE.....	20304-17
20304-4.1	Full Build-Out Water Demand Projections.....	20304-17
20304-4.1.1	Refine Land Use Based Projection.....	20304-18
20304-4.1.2	Water Use Unit Rates	20304-18
20304-4.2	Water Demand Projections to the Year 2035	20304-19
20304-4.3	Summary	20304-22
20304-5	RESOURCE AND FACILITY RECOMMENDATIONS	20304-23
20304-5.1	Water Source Adequacy	20304-23
20304-5.1.1	Full Build-Out	20304-23
20304-5.1.2	Twenty-Year Projection	20304-23
20304-5.2	Source Development Requirements	20304-23
20304-5.2.1	Supply-Side Management.....	20304-23
20304-5.2.2	Demand-Side Management	20304-25
20304-5.3	Recommended Alternatives	20304-26

FIGURES

Figure 20304-1: General Plan Land Use Map	20304-4
Figure 20304-2: County Zoning	20304-5
Figure 20304-3: Well Location	20304-8
Figure 20304-4: Streams & Diversions.....	20304-9
Figure 20304-5: Water Sytem & Service Area	20304-10
Figure 20304-6: Existing Water Use by Category – Hanapēpē ASYA.....	20304-12
Figure 20304-7: DOW Existing Water Use by Category – Hanapēpē ASYA.....	20304-15
Figure 20304-8: Water Demand Projection Summary – Hanapēpē ASYA	20304-20
Figure 20304-9: Medium Growth Rate B Water Demand Projection by Category – Hanapēpē ASYA.....	20304-21
Figure 20304-10: Medium Growth Rate B Water Demand Projections and Full Build-Out – Hanapēpē ASYA.....	20304-22

TABLES

Table 20304-1: Historical Population – Hanapēpē ASYA	20304-1
Table 20304-2a: Population Projection – Hanapēpē ASYA	20304-2
Table 20304-2b: Population Projection – Percent Change – Hanapēpē ASYA	20304-2
Table 20304-3: General Plan Estimated Land Use Allocation Acreage – Hanapēpē ASYA	20304-2
Table 20304-4: County Zoning Estimated District Allocation Acreage – Hanapēpē ASYA	20304-3
Table 20304-5: Existing Water Use by Category – Hanapēpē ASYA	20304-11
Table 20304-6: DOW Hanapēpē-‘Ele‘ele Water System Water Sources	20304-14
Table 20304-7: DOW Existing Water Use by Category – Hanapēpē ASYA	20304-14
Table 20304-8: Per Capita Use – Hanapēpē ASYA	20304-16
Table 20304-9: Pumpage – Hanapēpē ASYA	20304-16
Table 20304-10: General Plan Full Build-Out Water Demand Projection – Hanapēpē ASYA.....	20304-17
Table 20304-11: Zoning Full Build-Out Water Demand Projection – Hanapēpē ASYA.....	20304-17
Table 20304-12: Irrigation of Agricultural Lands	20304-18
Table 20304-13: Water Demand Projection – Hanapēpē ASYA	20304-19
Table 20304-14: Medium Growth Rate B Water Demand Projection by Category – Hanapēpē ASYA.....	20304-21
Table 20304-15: Summary of Demand Projections	20304-22

20304 HANAPĒPĒ AQUIFER SYSTEM

20304-1 SYSTEM AREA PROFILE

20304-1.1 General

The Hanapēpē [20304] Aquifer System Area (ASYA) is roughly equivalent to the Hanapēpē drainage basin, encompassing a drainage area of about 26 square miles¹. The Hanapēpē drainage basin is relatively long and narrow, approximately 11.5 miles long by about 2.5 miles wide and drains the southwest summit slopes of Mount Waialeale. The upper reach of the drainage basin is located through agricultural lands and extends through urbanized lands in its lower reaches.

Average annual rainfall in the Hanapēpē ASYA is approximately 127 inches. The sustainable yield for the Hanapēpē ASYA is 22 mgd.

20304-1.2 Economy and Population

20304-1.2.1 Economy

The largest industry/employment component in Hanapēpē is related to accommodations and food service making up about 20 percent of the jobs in the area.

20304-1.2.2 Population

Historical population data for the Hanapēpē ASYA is summarized in **Table 20304-1**. Population projections through the year 2035 are summarized in **Table 20304-2a**. As summarized in **Table 20304-2b**, it is estimated that the area will experience growth rates between 2 to 6 percent per decade.

Table 20304-1: Historical Population – Hanapēpē ASYA

	Year		
	1990	2000	2010
Population	683	769	1,085
Percent Change		12.6	41.1

Data Source: Socioeconomic Analysis and Forecasts (2014) Technical Report.
Data redistributed and evaluated for Hanapēpē ASYA.

¹ https://waterdata.usgs.gov/hi/nwis/inventory/?site_no=16052000&agency_cd=USGS

Table 20304-2a: Population Projection – Hanapēpē ASYA

Growth Rate	Population by Year								
	2015	2016	2017	2018	2019	2020	2025	2030	2035
A – Low	1,101	1,104	1,107	1,109	1,112	1,115	1,131	1,148	1,168
B – Med.	1,109	1,115	1,121	1,127	1,133	1,139	1,173	1,209	1,251
C – High	1,111	1,117	1,123	1,130	1,136	1,143	1,180	1,220	1,265

Data Source: Socioeconomic Analysis and Forecasts (2014) Technical Report. Data redistributed and evaluated for Hanapēpē ASYA.

Table 20304-2b: Population Projection – Percent Change – Hanapēpē ASYA

Growth Rate	2015-2025 % Change	2025-2035 % Change
A – Low	2.7	3.3
B – Medium	5.8	6.7
C – High	6.2	7.2

20304-1.3 Land Use

20304-1.3.1 2000 Kaua‘i General Plan

The 2000 Kaua‘i County General Plan Land Use Designation Map for the Hanapēpē ASYA is shown on **Figure 20304-1**. The estimated land use allocation acreage for each land use designation is listed in **Table 20304-3**.

Table 20304-3: General Plan Estimated Land Use Allocation Acreage – Hanapēpē ASYA

General Plan Land Use Designation	Acreage	Percent of Total
Agricultural	638	4.5
Military	0	0.0
Open	13,512	94.1
Park	13	0.1
Residential Community	178	1.2
Resort	0	0.0
Transportation	1	0.0
Urban Center	1	0.0
DHHL	9	0.1
TOTAL	14,352	100.0

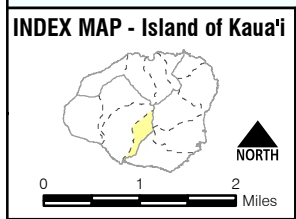
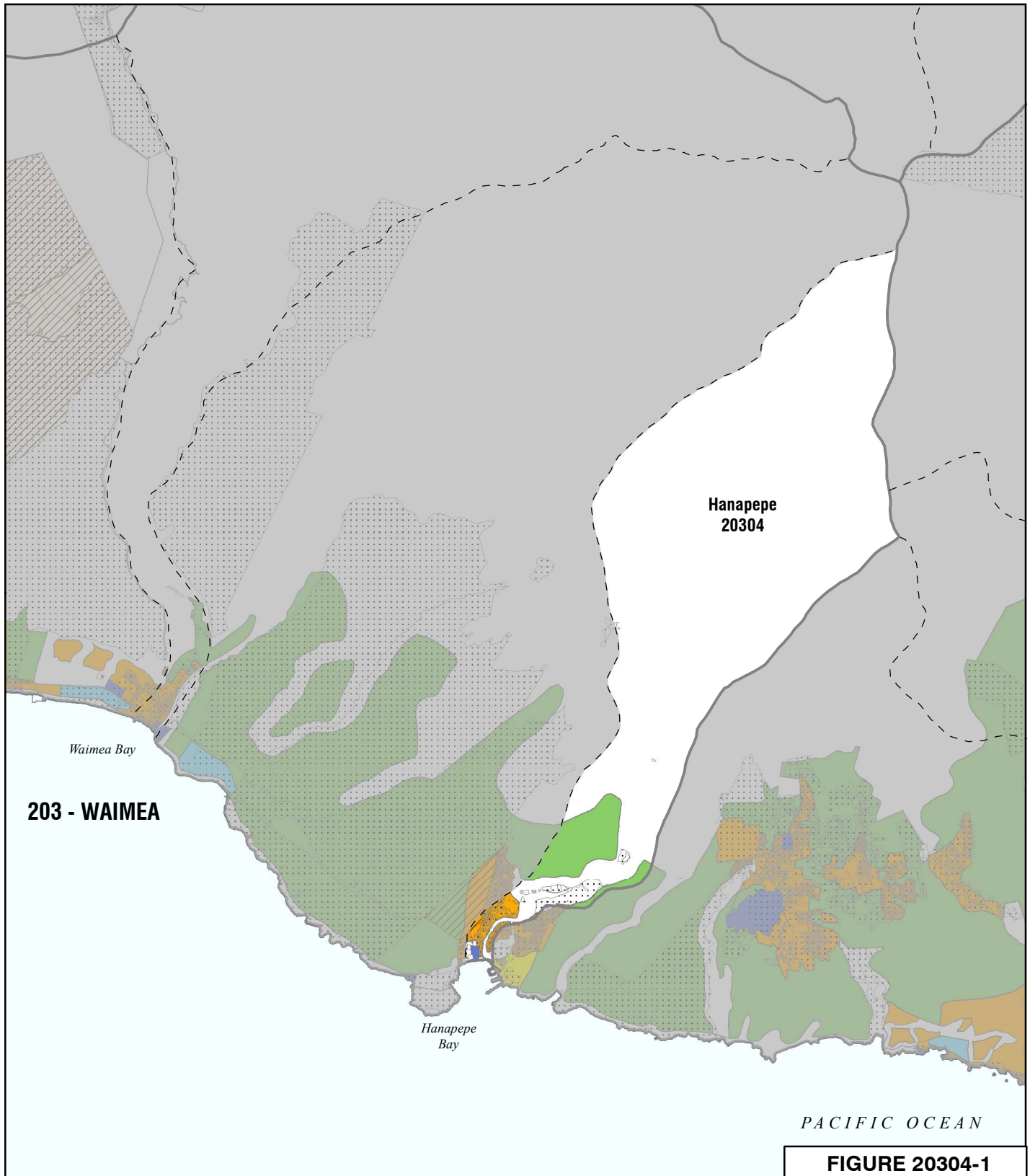
20304-1.3.2 Kaua‘i Zoning

Kaua‘i County Zoning Map for the Hanapēpē ASYA is shown on **Figure 20304-2**. The estimated land use allocation acreage for each zoning district within the system area is listed in **Table 20304-4**.

Table 20304-4: County Zoning Estimated District Allocation Acreage – Hanapēpē ASYA

Zoning District	Acreage	Percent of Total
Agriculture	2,582	17.9
Commercial – General	26	0.2
Commercial - Neighborhood	0	0.0
Conservation	10,999	76.2
Industrial – General	0	0.0
Industrial - Limited	0	0.0
Open	718	5.0
Residential	92	0.6
Resort	0	0.0
Project Development	0	0.0
Special Planning Area	0	0.0
Special Treatment	0	0.0
No Zoning	19	0.1
DHHL	1	0.0
TOTAL	14,437	100.0

The number of dwelling units allowed in residential and resort districts varies by the type of residential or resort district. The average number of dwelling units allowed in residential districts in the Hanapēpē ASYA is 3.58 dwelling units per acre.



LEGEND:		
— Aquifer Sector Areas	Land Use Allocation Guide	
- - - Aquifer System Areas	Green Agricultural	Orange Residential Community
Hatched Hawaiian Home Lands	White Open	Light Blue Resort
Dotted Developed Properties	Blue Park	Pink Transportation
	Purple Military	Yellow Urban Center

FIGURE 20304-1

**GENERAL PLAN
LAND USE MAP**

Aquifer Sector: WAIMEA - 203
Aquifer System:
HANAPEPE - 20304

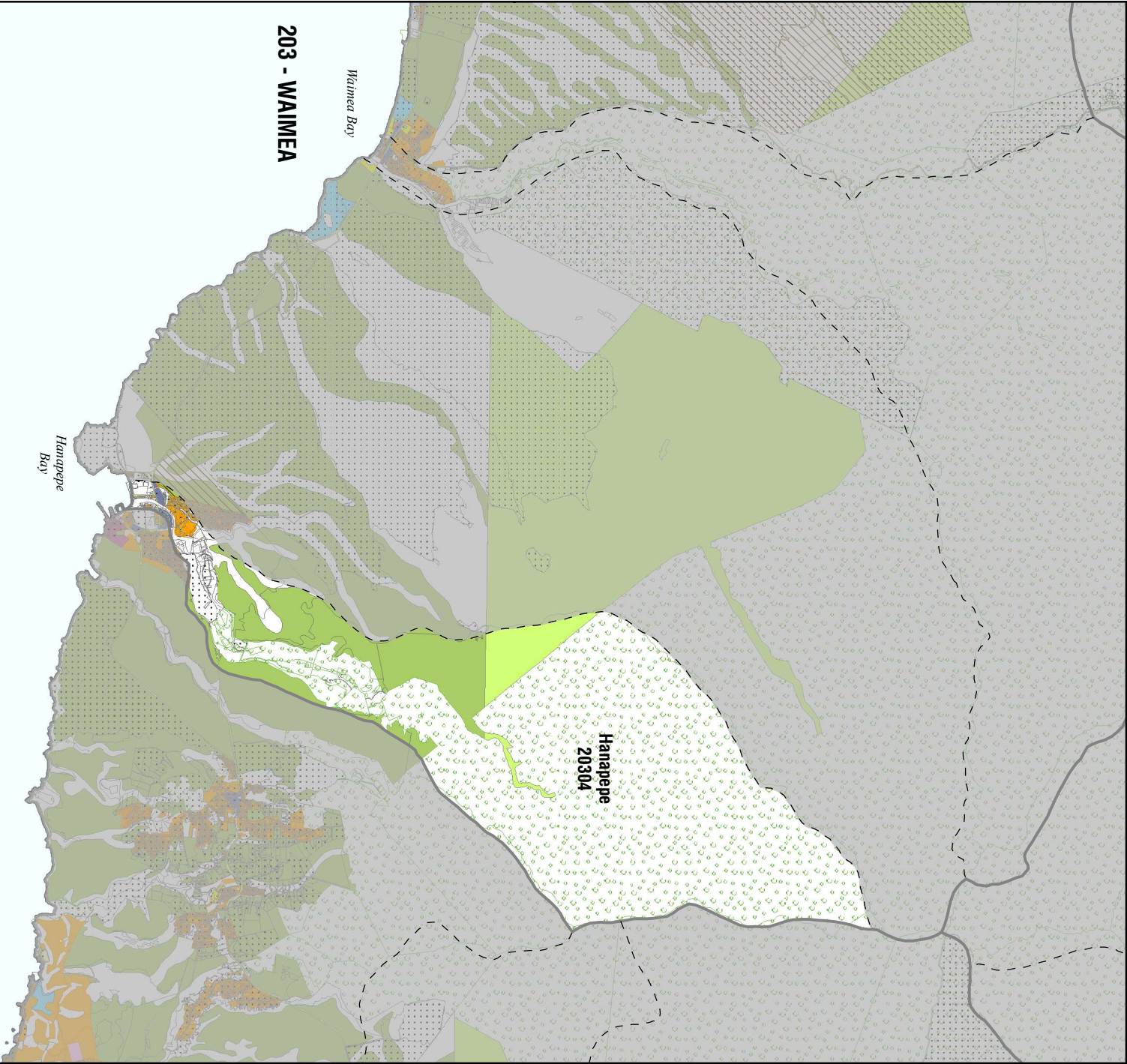


FIGURE 20304-2

INDEX MAP - Island of Kauaʻi



0 1 2 Miles

NORTH

LEGEND:

— Aquifer Sector Areas

- - Aquifer System Areas

 Hawaiian Home Lands

 Developed Properties

Zoning Designations:

 Agriculture

 Commercial - General

 Commercial - Neighborhood

 Conservation

 Industrial - General

 Industrial - Limited

 No Zoning

 Open

 Residential

 Resort

 Special District

COUNTY ZONING

Aquifer Sector: WAIIMEA - 203

Aquifer System:
HANAPEPE - 20304

20304-2 EXISTING WATER RESOURCES

20304-2.1 Ground Water

The Hanapēpē ASYA has a sustainable yield of 22 mgd. According to the 2014 CWRM database, there are 4 production wells, 1 agriculture and 3 municipal wells. There are also 2 wells drilled and categorized as “unused”. Refer to **Appendix A** for this database. **Figure 20304-3** shows the well locations.

20304-2.2 Surface Water

The Hanapēpē stream is classified as a continuous, perennial stream and is the only perennial stream in the Hanapēpē ASYA. The USGS has 1 active surface water gauge in the system area. The gauge is located on Hanapēpē River, below Manuahi Stream, which was previously listed in **Table 1-19**.

In accordance with the Code, the CWRM must establish and administer instream flow standards (IFS) on a stream-by-stream basis as necessary to protect public interests. IFS is defined as “a quantity or flow of water or depth of water which is required to be present at a specific location in a stream system at certain specified times of the year to protect fishery, wildlife, recreational, aesthetic, scenic, and other beneficial instream uses.” Considerably more research and study need to be completed to accumulate the data and perspective necessary to conduct a thorough and meaningful assessment of IFS. Until permanent IFS are established, interim IFS have been adopted. The interim IFS are defined as the amount of water flowing in each stream at the time the administrative rules governing them were adopted in 1988 and 1989. In order to assess surface water sustainability, this KWUDP assumes that no additional diversions will be allowed from any stream without amendment of the interim IFS.

There are 7 declared stream diversions in the CWRM database shown on **Figure 20304-4**, which accounts for 2 percent of the 292 declared stream diversions on the island. The declared stream diversions are listed in **Appendix B**. The total declared flow for the Hanapēpē ASYA is 19.32 mgd. In addition, some existing irrigation systems have the capability to transfer surface water to adjacent ASYAs. 16.32 mgd of declared flow from diversions in the Hanapēpē ASYA appear to be associated with irrigation lines that transfer water out of the Hanapēpē ASYA.

20304-2.3 Water Conservation

Water conservation increases the amount of water available and helps to ensure the long-term viability of water resources. Water conservation measures for this ASYA are as described in **Section 1.5.7** of this report. There are no ASYA specific special conservation measures in place at this time.

20304-2.4 Rainwater Catchment

Rainwater catchment is a viable resource for areas that are not served by ground water or surface water. **Figure 20304-5** shows the possible catchment areas, or parcels with a building value greater than \$20,000 and assumed to be developed but without a ground water or surface water source.

20304-2.5 Recycled Water

There are no wastewater reclamation facilities in the Hanapēpē ASYA.

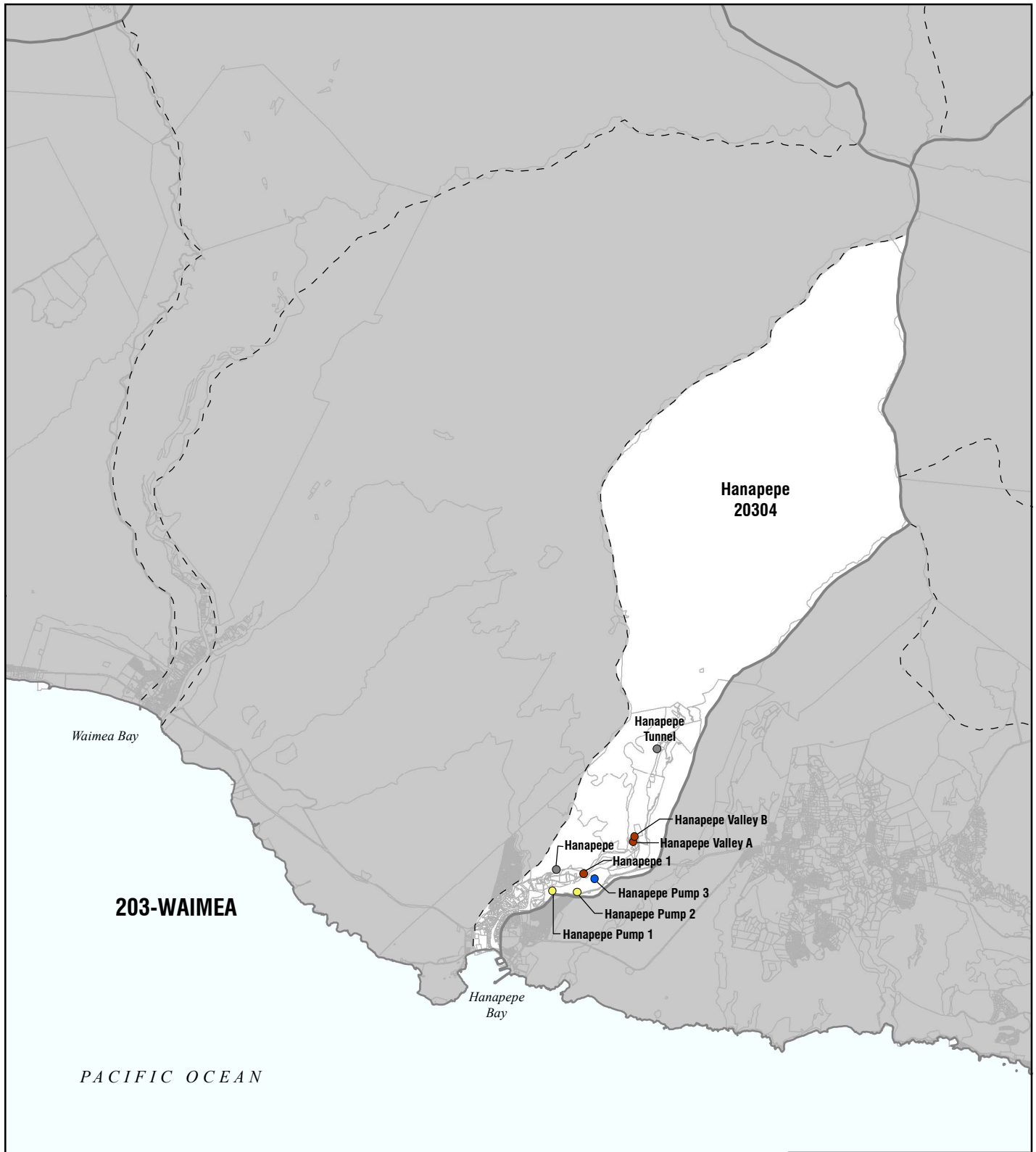
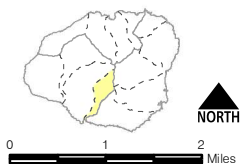


FIGURE 20304-3

INDEX MAP - Island of Kaua'i



LEGEND:

- Aquifer Sector Areas
- - Aquifer System Areas
- TMK

Well Use Types

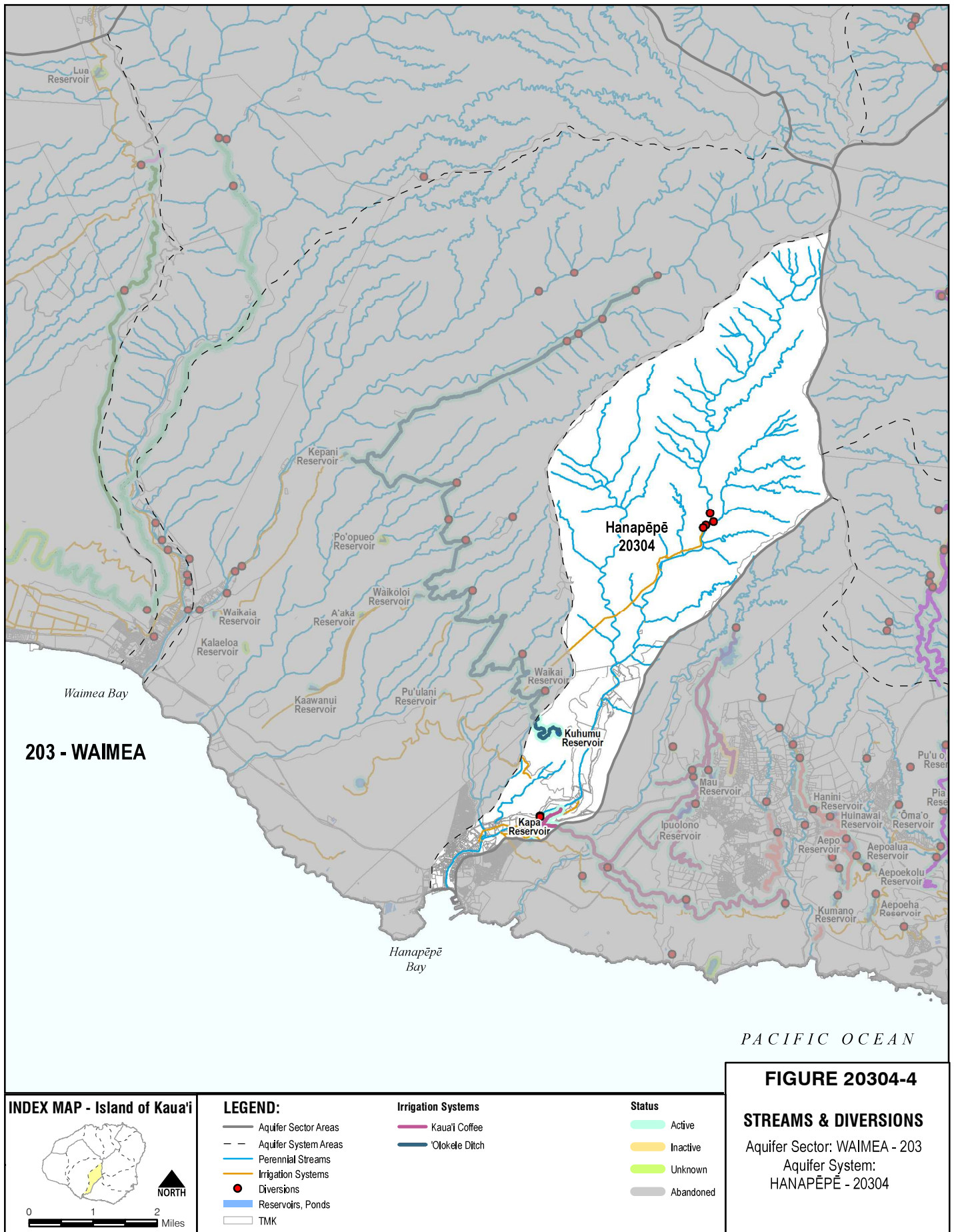
- Abandoned
- Agriculture
- Domestic
- Industrial

- Irrigation
- Military
- Municipal
- Observation
- Other

- Unused

WELL LOCATION

Aquifer Sector: WAIMEA - 203
 Aquifer System:
 HANAPEPE - 20304



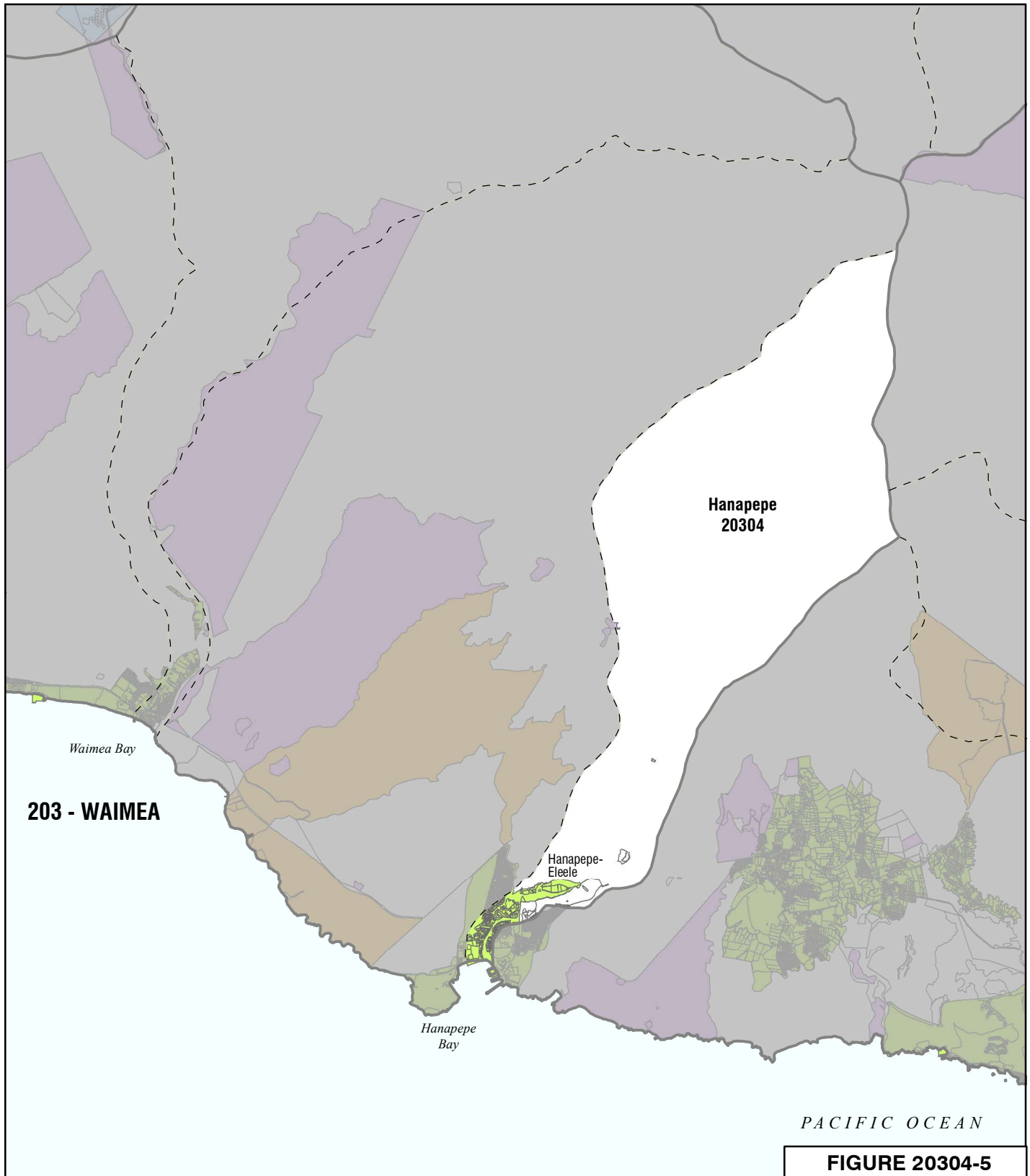
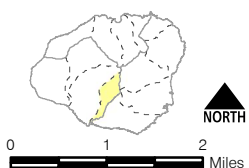


FIGURE 20304-5

**WATER SYSTEM
& SERVICE AREA**

Aquifer Sector: WAIMEA - 203
 Aquifer System:
 HANAPEPE - 20304

INDEX MAP - Island of Kaua'i



LEGEND:

- Aquifer Sector Areas
- - Aquifer System Areas
- DOW Service Area
- Private Water System
- State Water System
- Federal Water System
- Possible Catchment Area (Building Value > \$20,000)

20304-3 EXISTING WATER USE

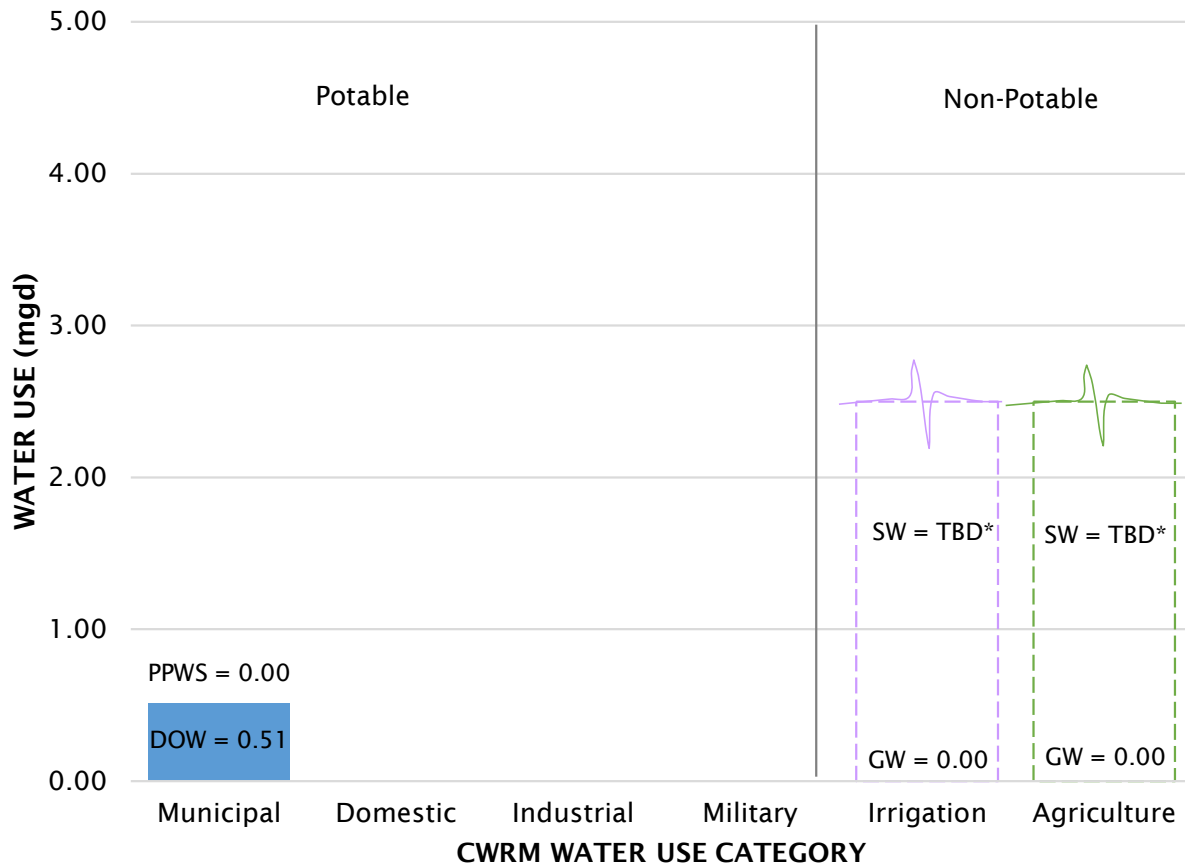
20304-3.1 General

The following section presents the total estimated average water use within the Hanapēpē ASYA. The total estimated average water use was based on data from CWRM (well pumpage) and DOH (Sanitary Surveys for Public Water Systems and estimated recycled water usage) for the year of 2014. **Table 20304-5** and **Figure 20304-6** summarize the water use in accordance with CWRM categories.

Table 20304-5: Existing Water Use by Category – Hanapēpē ASYA

CWRM Category	Ground Water (mgd)	Other Sources (mgd)	Total (mgd)	Percent of Total
Domestic	0	TBD ¹	0.00	0.0
Industrial			0.00	0.0
Irrigation			0.00	0.0
Agriculture			0.00	0.0
Military			0.00	0.0
Municipal	0.51			
DOW System			0.51	100.0
Private-Public WS			0.00	0.0
TOTAL	0.51		0.51	100.0

¹ Surface Water – TBD from AWUDP

Figure 20304-6: Existing Water Use by Category – Hanapēpē ASYA

*Values to be determined by other components of the Hawai'i Water Plan

20304-3.2 Domestic Use

There are no wells classified as “Domestic” in the Hanapēpē ASYA.

20304-3.3 Industrial Use

There are no wells classified as “Industrial” in the Hanapēpē ASYA.

20304-3.4 Irrigation Use

Irrigation use has been divided into ground water, recycled water, and surface water.

20304-3.4.1 Ground Water

There are no wells classified as “Irrigation” in the Hanapēpē ASYA.

20304-3.4.2 Recycled Water

There is no recycled water use in the Hanapēpē ASYA.

20304-3.4.3 Surface Water

Information on surface water use for irrigation is to be determined by the AWUDP. However, typically, due to the location of parks and other landscaped areas within communities, it is assumed that it is unlikely for landscaping to be irrigated with surface water.

20304-3.5 Agricultural Use

Agricultural use has been divided into ground water, recycled water, and surface water.

20304-3.5.1 Ground Water

There is 1 well classified as “Agriculture” (AGRCP - crops and processing), owned by McBryde Sugar Company, Ltd. The well has not reported any pumpage.

20304-3.5.2 Recycled Water

There is no recycled water use in the Hanapēpē ASYA.

20304-3.5.3 Surface Water

Information on surface water use for agriculture is to be determined by the AWUDP.

20304-3.6 Military Use

There is no military water use in the Hanapēpē ASYA.

20304-3.7 Municipal Use

There are 3 wells in the CWRM database classified as “Municipal” (MUNCO – Municipal County). Municipal can be subcategorized into the other water use categories: Domestic, Industrial, Agricultural, Military, and Municipal.

20304-3.7.1 County Water Systems

Hanapēpē-‘Ele‘ele Water System

The DOW has one major water system that serves the Hanapēpē ASYA. The Hanapēpē-‘Ele‘ele water system is DOH Public Water System (PWS) No. 404 and services areas in the Makaweli, Hanapēpē, and Koloa ASYA. The water system service area includes Hanapēpē, Hanapēpē Heights, and ‘Ele‘ele Nani. It also includes the Port Allen Harbor facilities and nearby industrial support areas. This water system serves 4,430 people through 1,710 service connections. Water for this system is supplied by 3 wells. **Table 20304-6** lists the water sources, well numbers, pumping capacities, pressure zones, and pumpage amount.

Table 20304-6: DOW Hanapēpē-‘Ele‘ele Water System Water Sources

WELL NAME	WELL NUMBER	PUMPING CAPACITY (gpm)	PRESSURE ZONE (ft)	PUMPAGE (mgd)
Hanapēpē Valley Well A	2-5533-001	470	212' & 340' Hanapēpē	0.22
Hanapēpē Valley Well B	2-5533-002	800	212' & 340' Hanapēpē	0.29
Hanapēpē 4*	2-5634-002	700	212' & 402' Hanapēpē	0.21

* Well located in Makaweli ASYA

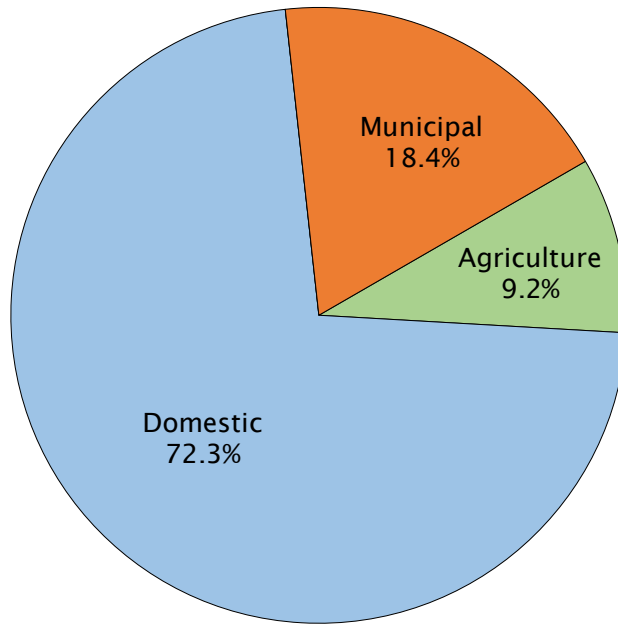
There are four primary pressure zones (212', 340', 402' Hanapēpē, 402' 'Ele‘ele) and five storage tanks in the Hanapēpē-‘Ele‘ele Water System. Water is delivered to 'Ele‘ele via booster pump stations since all of the water sources are located on the Hanapēpē side of the service area.

DOW Water Use by Category

DOW water use is subcategorized in **Table 20304-7** to the extent possible based on available meter data and is depicted in **Figure 20304-7**.

Table 20304-7: DOW Existing Water Use by Category – Hanapēpē ASYA

CWRM Water Use Category	DOW Metered Water Use (mgd)	Percent of Total
Agricultural	0.014	9.2
Domestic	0.110	72.3
Industrial	0.000	0.0
Military	0.000	0.0
Municipal	0.028	18.4
Total	0.152	100.0

Figure 20304-7: DOW Existing Water Use by Category – Hanapēpē ASYA

20304-3.7.2 State Water Systems

There are no State water systems in the Hanapēpē ASYA regulated by the DOH.

20304-3.7.3 Federal Water Systems

There are no Federal water systems in the Hanapēpē ASYA regulated by the DOH.

20304-3.7.4 Private-Public Water Systems

There are no private-public water systems in the Hanapēpē ASYA regulated by the DOH.

20304-3.7.5 Per Capita Use

The per capita existing water use consumption based on domestic DOW metered water use and private-public water system use is presented in **Table 20304-8**. The per capita use in the Hanapēpē ASYA is approximately 43.2% lower than the overall County of Kauaʻi per capita use.

Table 20304-8: Per Capita Use – Hanapēpē ASYA

	DOW Metered Water Use – Domestic (mgd)	Private-Public Water System (mgd)	90% of 2015 Population	Per Capita Use (gpd)
Hanapēpē ASYA	0.110	0	998	110
County of Kauaʻi	9.360	2.951	63,462	194

20304-3.8 Existing Water Use by Resource

20304-3.8.1 Ground Water

Table 20304-9 summarizes the current production, sustainable yield (SY), and percentage of SY for the current production. Current production is represented by the 2014 average yield calculated from the actual pumping data.

Table 20304-9: Pumpage – Hanapēpē ASYA

Pumpage (mgd)	SY (mgd)	Pumpage Portion of SY
0.51	22	2.3%

Based on available information from the CWRM database, the current ground water use is 2.3 percent of the sustainable yield.

20304-3.8.2 Surface Water

Information on surface water use for agriculture is to be determined by the AWUDP.

20304-3.8.3 Water Conservation

Water conservation, including water loss management, may reduce water use. See **Section 20304-2.3** for existing conservation efforts.

20304-3.8.4 Rainwater Catchment

Developed parcels that are not supplied by ground water or surface water are assumed to be supplied by rainwater catchment.

20304-3.8.5 Recycled Water

There is no recycled water use in the Hanapēpē ASYA.

20304-4 FUTURE WATER USE

20304-4.1 Full Build-Out Water Demand Projections

The full build-out water demand projections based on the General Plan and County Zoning for the Hanapēpē ASYA is listed in **Tables 20304-10** and **20304-11**, respectively. Each land use class is associated with the most appropriate CWRM water use category.

Table 20304-10: General Plan Full Build-Out Water Demand Projection – Hanapēpē ASYA

General Plan Category	CWRM Category	Water Demand (mgd)
Agriculture	Agriculture/Domestic	0.12
Open	Domestic	0.02
Military	Military	0.00
Park	Irrigation	0.05
Residential	Domestic/Municipal	0.32
Resort	Domestic/Irrigation/Municipal	0.00
Transportation	Municipal	0.00
Urban Center	Domestic/Industrial/Municipal	0.01
DHHL	Domestic	0.00
TOTAL		0.52

Table 20304-11: Zoning Full Build-Out Water Demand Projection – Hanapēpē ASYA

Zoning Class	CWRM Category	Water Demand (mgd)
Agriculture	Agriculture/Domestic	0.12
Commercial	Municipal	0.13
Industrial	Industrial/Municipal	0.00
Open	Domestic	0.02
Residential	Domestic/Municipal	0.16
Resort	Domestic/Irrigation/Municipal	0.00
DHHL	Domestic	0.00
TOTAL		0.43

20304-4.1.1 Refined Land Use Based Water Projection

State Water Projects Plan

There are no future State water projects through the year 2034 within the Hanapēpē ASYA according to the 2021 SWPP Update.

State Department of Hawaiian Home Lands

There are no DHHL tracts in the Hanapēpē ASYA.

Agricultural Water Use and Development Plan

The AWUDP dated 2003 (revised 2004) was limited in scope. More recent, comprehensive information on agricultural lands is available in the County of Kauaʻi Important Agricultural Lands (IAL) Study.

In 2019, a public review draft of the AWUDP was released and it is anticipated that the next phase of the AWUDP will provide agricultural water demand projections in greater detail and will supersede information in the KWUDP when it becomes available.

County of Kauaʻi Important Agricultural Lands Study

904 acres of agricultural lands within the Hanapēpē ASYA received a score of 28 or better in the County of Kauaʻi Important Agricultural Lands (IAL) Study. Lands that receive a score of 28 or better were determined to have met all eight IAL criteria to some degree. Only a subset of lands with a score of 28 or better is expected to be designated as IALs. **Table 20304-12** compares these lands that received a score of 28 or better to the declared surface water use from diversions and to the diversified water use rate of 3,400 gallons per acre per day (gpad) estimated in the 2004 AWUDP.

Table 20304-12: Irrigation of Agricultural Lands

(1) Declared Surface Water Use from Diversions (mgd)	3.00
(2) Agricultural Lands with a Score $\geq$ 28 (acres)	904
- How many acres can be sustained by (1) at a water rate of 3,400 gpad? (Acres)	882
- What percent of (2) can be sustained with a water rate of 3,400 gpad?	98%
- If all of (2) were to be irrigated, what is the water unit rate? (gpad)	3,319

20304-4.1.2 Water Use Unit Rates

Water use unit rates are based on the *Water System Standards* (WSS), as discussed in Chapter 2.

The General Plan provides only broad density guidelines for residential and resort designations. For these designations, under the assumption that most residents would like their communities,

including the development density, to remain similar in the future, the average number of dwelling units as allowed by zoning was used as the density (i.e., 3.58 dwelling units per acre for residential designation).

20304-4.2 Water Demand Projections to the Year 2035

The following section presents water demand projections to the year 2035 for the Hanapēpē ASYA. The projected low, medium, and high growth rates are listed in **Table 20304-13** and are graphed in **Figure 20304-8**. Potable (domestic, industrial, municipal, and military water uses) and non-potable (irrigation) water demands are also differentiated.

Table 20304-13: Water Demand Projection – Hanapēpē ASYA

Water Use Category	Water Demand by Year (mgd)								
	2015	2016	2017	2018	2019	2020	2025	2030	2035
GROWTH RATE C (HIGH)									
TOTAL	0.51	0.51	0.51	0.52	0.52	0.52	0.54	0.56	0.58
Potable	0.51	0.51	0.51	0.52	0.52	0.52	0.54	0.56	0.58
Non-Potable	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GROWTH RATE B (MEDIUM)									
TOTAL	0.51	0.51	0.51	0.52	0.52	0.52	0.54	0.56	0.57
Potable	0.51	0.51	0.51	0.52	0.52	0.52	0.54	0.56	0.57
Non-Potable	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GROWTH RATE A (LOW)									
TOTAL	0.51	0.51	0.51	0.51	0.51	0.52	0.52	0.53	0.54
Potable	0.51	0.51	0.51	0.51	0.51	0.52	0.52	0.53	0.54
Non-Potable	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Figure 20304-8: Water Demand Projection Summary – Hanapēpē ASYA

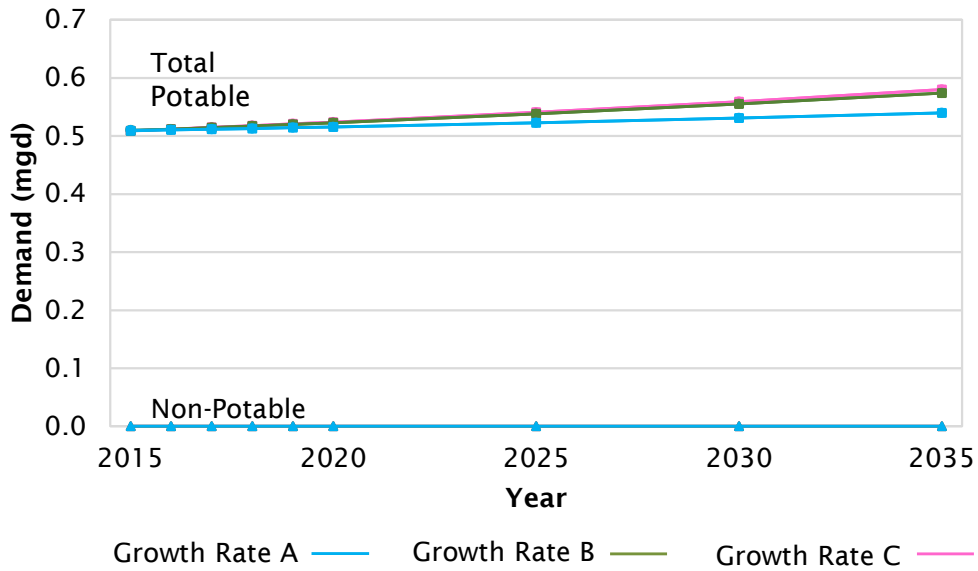
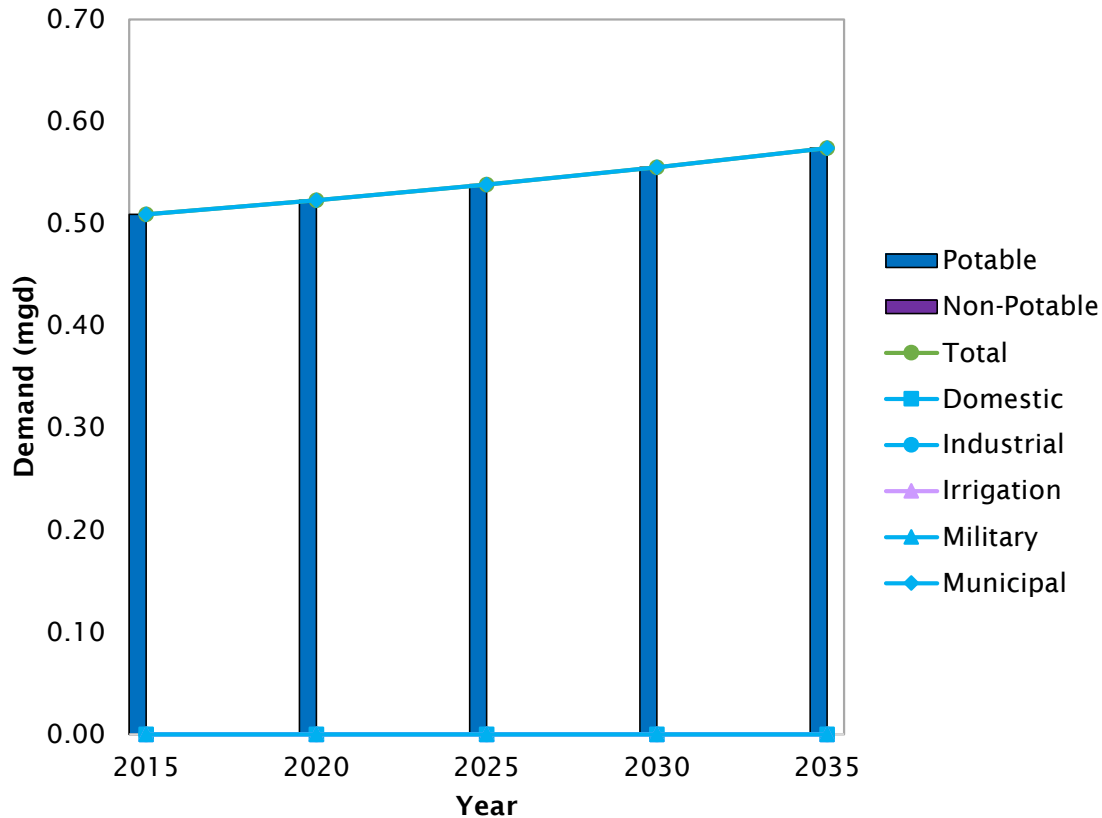


Figure 20304-9 shows the breakdown of water demand projections for a medium growth rate by CWRM categories through the year 2035. **Table 20304-14** summarizes this figure.

Figure 20304-9: Medium Growth Rate B Water Demand Projection by Category – Hanapēpē ASYA**Table 20304-14: Medium Growth Rate B Water Demand Projection by Category – Hanapēpē ASYA**

Water Use Category	Water Use by Year (mgd)								
	2015	2016	2017	2018	2019	2020	2025	2030	2035
Total	0.51	0.51	0.51	0.52	0.52	0.52	0.54	0.56	0.57
Potable	0.51	0.51	0.51	0.52	0.52	0.52	0.54	0.56	0.57
Non-Potable	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Domestic	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Irrigation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Military	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Municipal	0.51	0.51	0.51	0.52	0.52	0.52	0.54	0.56	0.57
DOW	0.51	0.51	0.51	0.52	0.52	0.52	0.54	0.56	0.57

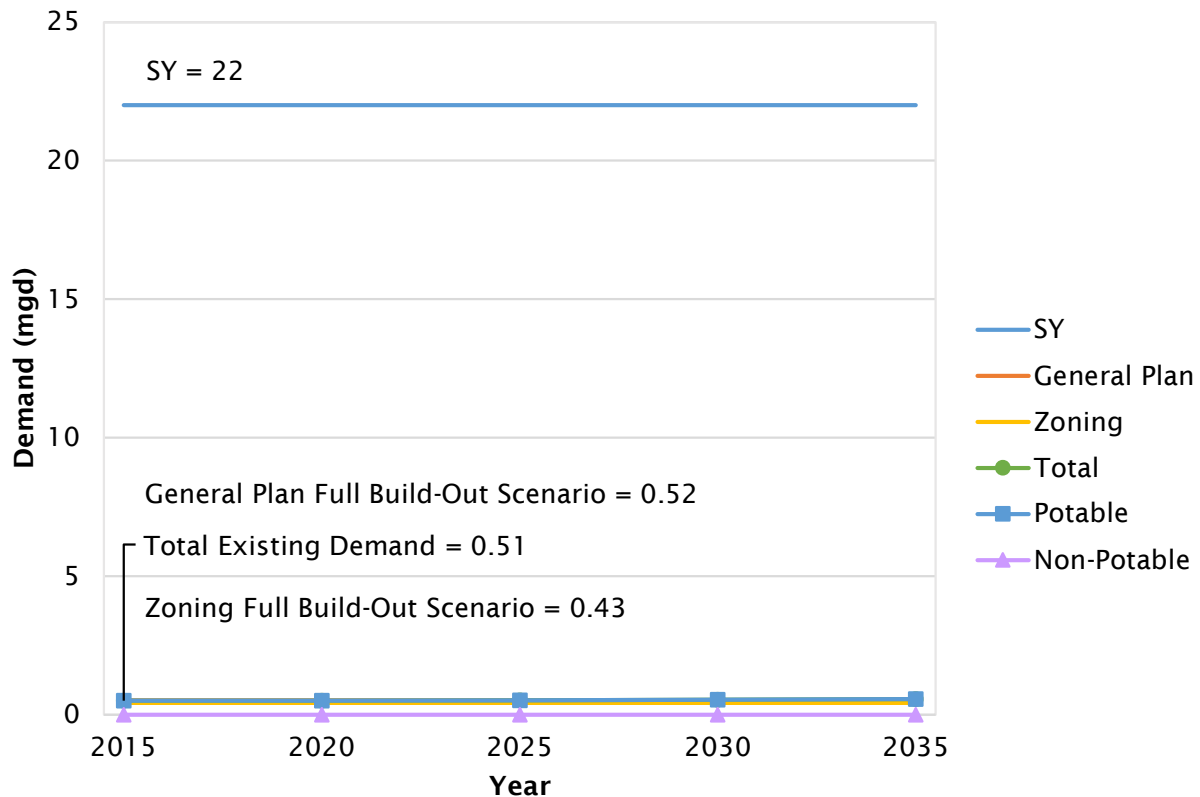
20304-4.3 Summary

Figure 20304-10 illustrates the magnitude of the sustainable yield, both General Plan and Zoning full build-out water use projections, and water use projection through the year 2035 focusing on Medium Growth Rate B. **Table 20304-15** summarizes the General Plan, Zoning, and 20-year water demand projection scenarios for the Hanapēpē ASYA. The sustainable yield is presented to draw comparisons. All demands are in mgd.

Table 20304-15: Summary of Demand Projections

SY (mgd)	FBO (mgd)		Medium Growth Rate Demand by Year (mgd)								
	GP	Zoning	2015	2016	2017	2018	2019	2020	2025	2030	2035
22	0.52	0.43	0.51	0.51	0.51	0.52	0.52	0.52	0.54	0.56	0.57

Figure 20304-10: Medium Growth Rate B Water Demand Projections and Full Build-Out – Hanapēpē ASYA



Note: Total existing demand includes municipal, domestic, industrial, military, and irrigation water uses. It does not include agriculture water use. For future agricultural water use analysis, please see Section 20304-4.1.1 County of Kaua'i Important Agricultural Lands Study.

20304-5 RESOURCE AND FACILITY RECOMMENDATIONS

20304-5.1 Water Source Adequacy

20304-5.1.1 Full Build-Out

Development to the highest extent allowed by the General Plan and County Zoning within the Hanapēpē ASYA is sustainable, with General Plan and County Zoning full build-out water demands requiring 2.4 and 2.0 percent of the 22 mgd sustainable yield, respectively.

20304-5.1.2 Twenty-Year Projection

The 2035 water demand projection for the Hanapēpē ASYA is sustainable and is only 2.6 percent of the 22 mgd sustainable yield.

20304-5.2 Source Development Requirements

20304-5.2.1 Supply-Side Management

Supply-side management, including conventional water resource measures, water conservation, and alternative water resource measures, were evaluated to meet projected water demands.

Conventional Water Resource Measures

Ground Water

The Hanapēpē ASYA contains basal and perched ground water. There is likely also high-level water but it currently isn't utilized. Most reported pumpage is from the basal zone.

The 2035 water demand projection for the Hanapēpē ASYA is only 2.6 percent of the 22 mgd sustainable yield. This indicates that theoretically, more water could be pumped from the aquifer without impairing the utility or quality of the water resource if wells are optimally placed and the proper due diligence with regard to traditional and customary rights and impacts has been completed. However, it is noted that sustainable yield does not consider the feasibility of developing the ground water resources, and that the safe yield of an individual production well may be limited by localized ground water behavior near the well as a result of pumpage. Water supply reliability and quality, feasibility, environmental and cultural impacts, and water rights shall be considered as projects and programs develop. More detailed and site-specific evaluation of these impacts shall be required and accomplished through the environmental review process (HRS Chapter 343) for source development projects and programs utilizing public funding, and CWRM could consider requiring compliance with the environmental review process for private source development projects and programs also. **Section 1.5.3.1** provides additional information regarding the protection of traditional and customary rights.

The DOW's Hanapēpē-'Ele'ele water system serves Hanapēpē, Hanapēpē Heights, 'Ele'ele Nani, and Port Allen and services areas in the Makaweli ASYA and Hanapēpē ASYA. Two of the three water sources for the system are in the Hanapēpē ASYA. The DOW's Water Plan 2020 did not propose development of any additional ground water sources to meet projected demands. The

DOW's Water Plan 2020 did, however, identify potential storage and distribution system upgrades, including the rehabilitation of the Hanapēpē Heights tank and replacement of a water main in Hanapēpē Road.

Surface Water

The Hanapēpē ASYA has 7 declared diversions. Until permanent instream flow standards are established, interim instream flow standards have been adopted. According to Section 13-169-46, Hawai'i Administrative Rules, "Interim Instream Flow Standard for all streams on Hawai'i, as adopted by the commission on water resource management on June 15, 1988, shall be that amount of water flowing in each stream on the effective date of this standard, and as that flow may naturally vary throughout the year and from year to year without further amounts of water being diverted off-stream through new or expanded diversions, and under the stream conditions existing on the effective date of the standard, except as may be modified [by the commission]." Therefore, for the purposes of assessing surface water availability, it is assumed that no additional diversions will be allowed without amendment of the interim IFS.

The existing declared diversions have the potential to meet additional demands. However, a challenge with developing surface water is transmission of these resources from source to location of need. Farmers generally grow what is feasible for the area; therefore, it is anticipated that agricultural water use will follow the availability of irrigation water. Increase in the availability of surface water would likely promote additional usage and could thereby minimize ground water being used for irrigation.

There are only a couple of small existing irrigation lines in the Hanapēpē ASYA, as shown on **Figure 20304-4**, but there are no major irrigation systems.

Water Transfer

Some existing irrigation systems have the capability to transfer surface water to adjacent ASYAs. The AWUDP should study irrigation system service areas and provide information on irrigation systems' water transfer.

Water can also be transferred between ASYAs through public water systems. The DOW's Hanapēpē-ʻEleʻele water system extends through the Makaweli ASYA, Hanapēpē ASYA, and Koloa ASYA. Source wells are located in the Makaweli ASYA and Hanapēpē ASYA. Water is transferred to ʻEleʻele via booster pump stations.

Water Conservation

The per capita use in the Hanapēpē ASYA is approximately 43.2% lower than the overall County of Kaua'i per capita use. There are no ASYA-specific conservation measures in place at this time; however, there are general water conservation programs that are described in **Section 1.5.7**. Water conservation, including water loss management, can increase the amount of water available and help to ensure the long-term viability of water resources.

In the DOW's Water Plan 2020, instituting water conservation measures in the Hanapēpē-ʻEleʻele water system service area was proposed to avoid a slight supply and storage deficit.

Alternative Water Resource Measures

Rainwater Catchment

Rainwater can be utilized as a water resource in several ways.

Rainwater can be harvested in rainwater catchment systems which can be utilized to supply domestic potable water needs. These systems are viable in areas that receive abundant rainfall and are a suitable source of potable water for individual domestic users in areas outside the limits of municipal water systems. Generally, these are remote areas and are not expected to expand significantly because most development is anticipated to be concentrated within existing urban areas. Therefore, use of rainwater catchment systems is not anticipated to increase significantly.

Rainwater can also be used to supplement or satisfy agricultural non-potable water needs through ambient rainfall.

See the Storm Water Reuse section below to see how rainwater as storm water runoff can be reclaimed and reused.

Storm Water Reuse

Rainfall can turn into storm water runoff. Storm water runoff from impervious surfaces in urban areas can be significant. This water could be captured, treated, and used as a source of non-potable water (e.g., irrigation), integrated with recycled water, or even as potable and/or non-potable ground water recharge. However, due to the lack of storm water reuse standards, the high initial infrastructure costs, and the treatment requirements, storm water reclamation and reuse on a small or large scale may not be feasible and requires further assessment as noted in the Water Resource Protection Plan. The U.S. Department of the Interior, Bureau of Reclamation published An Appraisal of Stormwater Reclamation and Reuse Opportunities in Hawai'i (Storm Water Report) in 2008 but did not identify any storm water reclamation and reuse opportunities in the Hanapēpē ASYA.

Recycled Water

Recycled water is a valuable resource, and increase on its use may lower the dependence on potable sources. However, there are no wastewater reclamation facilities (WWRFs) in the Hanapēpē ASYA.

Desalination

Desalination of brackish ground water is a potential alternative; however, due to its high capital and operational costs, it likely would not be considered when other potable water sources are available.

20304-5.2.2 Demand-Side Management

Development Density Control

The full build-out demand for the Hanapēpē ASYA based on County Zoning is 0.43 mgd which is 2 percent of the sustainable yield. This indicates that there are adequate water resources to sustain the

level of development that is allowed by law. In the Hanapēpē ASYA, the average number of dwelling units allowed by County Zoning is 3.58 dwelling units per acre in residential districts.

The full build-out demand for the Hanapēpē ASYA based on the General Plan is 0.52 mgd which is 2.4 percent of sustainable yield. Therefore, development density control likely may not be necessary. However, the County Planning Department could consider development density control for areas where there is the flexibility to do so, such as areas that are not yet zoned as residential or resort, and promote sustainable development. Further, it is noted that the full build-out scenario is unlikely to occur since it assumes all land is developed to the maximum extent.

20304-5.3 Recommended Alternatives

To optimize appropriate use of water resources, the quality of the water source should be matched to the quality of water required. The highest quality of water shall be reserved for the most valuable end use. Potable water is considered the highest quality water, and the sustenance of life is the most valuable end use. Recycled water, brackish water, untreated surface water, and other lower quality water sources should be used for landscaping and agriculture when available, thereby reserving potable water for human consumption. If there is a practical alternative water source available, that alternative source should be used in lieu of ground water or surface water. With this in mind, the following recommendations are made for the Hanapēpē ASYA:

Alternative Water Resources

Use of alternative water sources can reduce demands on both ground and surface water resources and conserve water resources as a whole. However, aside from rainwater, there are no available alternative water sources in the area. Alternative water sources are unlikely to be developed when other water resources are readily available.

Conservation

Water resources are a finite resource that should be managed and used wisely. It should be conserved and not wasted. Implementation of conservation measures should continue to be encouraged.

Ground Water

Meeting future demands at a reasonable cost is a planning objective, and conventional sources, such as ground water, are typically the most cost-effective means for meeting projected water demands. Projected potable water needs are within the sustainable yield for this area. Therefore, ground water resources could continue to be used and developed to meet potable water needs now and into the future. However, as noted above, development of conventional water resource measures can have challenges, and water supply reliability and quality, feasibility, environmental and cultural impacts, and water rights shall be considered as projects and programs develop.

Development of ground water resources is the primary strategy to serve future potable demands in the Hanapēpē ASYA.

Surface Water

Surface water, where available, should be used to meet non-potable demands if alternative water resources are not available. To achieve this, it will be critical to maintain and improve existing irrigation systems. Making surface waters more readily available to meet non-potable water demands has the potential to minimize future dependence on the use of ground water. It is therefore recommended that the AWUDP provide information on the rehabilitation and maintenance needs of large irrigation systems.

Demand-Side Management

Full build-out demand based on the General Plan is 2.4 percent of sustainable yield. At this projection, implementation of development density control by the County Planning Department is not needed in this area.

Although the projection is sustainable, the County Planning Department will need to consider potential impacts on available water resources when considering any future zoning modifications. Modifications that may result in increased development density within the area will increase demands on water resources.