
Chapter 20104

Anahola Aquifer System Area

CHAPTER 20104 - TABLE OF CONTENTS

20104 ANAHOLA AQUIFER SYSTEM AREA.....	20104-1
20104-1 SYSTEM AREA PROFILE.....	20104-1
20104-1.1 General.....	20104-1
20104-1.2 Economy and Population	20104-1
20104-1.2.1 Economy	20104-1
20104-1.2.2 Population	20104-1
20104-1.3 Land Use.....	20104-2
20104-1.3.1 2000 Kauaʻi General Plan	20104-2
20104-1.3.2 Kauaʻi Zoning.....	20104-2
20104-2 EXISTING WATER RESOURCES.....	20104-6
20104-2.1 Ground Water.....	20104-6
20104-2.2 Surface Water.....	20104-6
20104-2.3 Water Conservation	20104-7
20104-2.4 Rainwater Catchment.....	20104-7
20104-2.5 Recycled Water	20104-7
20104-3 EXISTING WATER USE.....	20104-11
20104-3.1 General.....	20104-11
20104-3.2 Domestic Use.....	20104-12
20104-3.3 Industrial Use.....	20104-12
20104-3.4 Irrigation Use	20104-13
20104-3.4.1 Ground Water	20104-13
20104-3.4.2 Recycled Water.....	20104-13
20104-3.4.3 Surface Water.....	20104-13
20104-3.5 Agricultural Use	20104-13
20104-3.5.1 Ground Water	20104-13
20104-3.5.2 Recycled Water.....	20104-13
20104-3.5.3 Surface Water.....	20104-14
20104-3.6 Military Use	20104-14
20104-3.7 Municipal Use	20104-14
20104-3.7.1 County Water Systems	20104-14
20104-3.7.2 State Water Systems.....	20104-16
20104-3.7.3 Federal Water Systems	20104-16
20104-3.7.4 Private Public Water Systems.....	20104-17
20104-3.7.5 Per Capita Use	20104-17

20104-3.8	Existing Water Use by Resource.....	20104-18
20104-3.8.1	Ground Water	20104-18
20104-3.8.2	Surface Water.....	20104-18
20104-3.8.3	Water Conservation	20104-18
20104-3.8.4	Rainwater Catchment	20104-18
20104-3.8.5	Recycled Water	20104-18
20104-4	FUTURE WATER USE.....	20104-19
20104-4.1	Full Build-Out Water Demand Projections.....	20104-19
20104-4.1.1	Refined Land Use Based Water Projection.....	20104-20
20104-4.1.2	Water Use Unit Rates	20104-22
20104-4.2	Water Demand Projections to the Year 2035	20104-22
20104-4.3	Summary	20104-25
20104-5	RESOURCE AND FACILITY RECOMMENDATION	20104-26
20104-5.1	Water Source Adequacy	20104-26
20104-5.1.1	Full Build-Out	20104-26
20104-5.1.2	Twenty-Year Projection	20104-26
20104-5.2	Source Development Requirements	20104-26
20104-5.2.1	Supply-Side Management.....	20104-26
20104-5.2.2	Demand-Side Management	20104-29
20104-5.3	Recommended Alternatives	20104-30

FIGURES

Figure 20104-1: General Plan Land Use Map	20104-4
Figure 20104-2: County Zoning	20104-5
Figure 20104-3: Well Location	20104-8
Figure 20104-4: Streams & Diversions.....	20104-9
Figure 20104-5: Water System & Service Area	20104-10
Figure 20104-6: Existing Water Use by Category – Anahola ASYA	20104-12
Figure 20104-7: DOW Existing Water Use by Category – Anahola ASYA.....	20104-16
Figure 20104-8: Water Demand Projection Summary – Anahola ASYA	20104-23
Figure 20104-9: Medium Growth Rate B Water Demand Projection by Category – Anahola ASYA.....	20104-24
Figure 20104-10: Medium Growth Rate B Water Demand Projections and Full Build-Out – Anahola ASYA.....	20104-25

TABLES

Table 20104-1: Historical Population – Anahola ASYA	20104-1
Table 20104-2a: Population Projection – Anahola ASYA	20104-2
Table 20104-2b: Population Projection – Percent Change – Anahola ASYA	20104-2
Table 20104-3: General Plan Estimated Land Use Allocation Acreage – Anahola ASYA	20104-2
Table 20104-4: County Zoning Estimated District Allocation Acreage – Anahola ASYA	20104-3
Table 20104-5: Existing Water Use by Category – Anahola ASYA	20104-11
Table 20104-6a: DOW Anahola Water System Water Sources	20104-14
Table 20104-6b: DOW Wailua-Kapa‘a Subsystem Water Sources	20104-15
Table 20104-8: DOW Existing Water Use by Category – Anahola ASYA	20104-16
Table 20104-9: Per Capita Use – Anahola ASYA	20104-18
Table 20104-10: Pumpage – Anahola ASYA	20104-18
Table 20104-11: General Plan Full Build-Out Water Demand Projection – Anahola ASYA	20104-19
Table 20104-12: Zoning Full Build-Out Water Demand Projection – Anahola ASYA	20104-19
Table 20104-12: Future State Water Projects – Anahola ASYA	20104-20
Table 20104-13: Irrigation of Agricultural Lands	20104-22
Table 20104-14: Water Demand Projection – Anahola ASYA	20104-22
Table 20104-15: Medium Growth Rate B Water Demand Projection by Category – Anahola ASYA	20104-24
Table 20104-16: Summary of Demand Projections	20104-25

20104 ANAHOLA AQUIFER SYSTEM AREA

20104-1 SYSTEM AREA PROFILE

20104-1.1 General

The Anahola [20104] Aquifer System Area (ASYA) is roughly bound to the north by the north ridge of the Moloa'a Stream, and extends roughly to Mount Namahana and the peak of the Makaleha Mountains to the west, Olohena Road and Konohiki Stream on the south, and the Pacific Ocean on the east. The Anahola ASYA encompasses the town of Kapa'a, and includes the DHHL Anahola and Moloa'a tracts.

Average annual rainfall ranges from about 50 inches per year along the coast to about 140 inches in the upper mountain elevations. The sustainable yield for the Anahola ASYA is 21 mgd.

20104-1.2 Economy and Population

20104-1.2.1 Economy

Kapa'a town is the largest town on the island and is one of the main shopping areas on the island. The largest industries in Kapa'a are related to accommodations and food services, health care and social assistance, and retail trade. The higher concentration of commercial and hotel/condominium facilities are typically located along the coast, bordering Kūhiō Highway. The areas further mauka (west) of Kūhiō Highway are primarily comprised of residential communities.

Anahola is a smaller more rural area, as compared to Kapa'a and much of the land is owned by DHHL. Like Kapa'a, the higher portion of commercial facilities are located nearer to the coast, boarding Kūhiō Highway. Residential areas, including DHHL homesteads, are located in areas mauka of Kūhiō Highway.

20104-1.2.2 Population

This ASYA is home to the largest portion of the population on the island, comprising over 20 percent of the island's population. Historical population data for the Anahola ASYA is summarized in **Table 20104-1**. Population projections through the year 2035 are summarized in **Table 20104-2a**. As shown in **Table 20104-2b**, it is estimated that the area will continue to experience growth rates between 4 and 8 percent per decade.

Table 20104-1: Historical Population – Anahola ASYA

	Year		
	1990	2000	2010
Population	12,086	14,021	15,669
Percent Change		16.0	11.8

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

Table 20104-2a: Population Projection – Anahola ASYA

Growth Rate	Population by Year								
	2015	2016	2017	2018	2019	2020	2025	2030	2035
A – Low	16,031	16,095	16,159	16,225	16,291	16,359	16,713	17,094	17,504
B – Med.	16,155	16,264	16,376	16,489	16,605	16,722	17,340	18,010	18,743
C – High	16,175	16,293	16,412	16,534	16,658	16,784	17,447	18,167	18,957

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

Table 20104-2b: Population Projection – Percent Change – Anahola ASYA

Growth Rate	2015-2025 % Change	2025-2035 % Change
A – Low	4.3	4.7
B – Medium	7.3	8.1
C – High	7.9	8.7

20104-1.3 Land Use

20104-1.3.1 2000 Kauaʻi General Plan

The 2000 Kauaʻi County General Plan Land Use Designation Map for the Anahola ASYA is shown on **Figure 20104-1**. The estimated land use allocation acreage for each land use designation within the system area is listed in **Table 20104-3**.

Table 20104-3: General Plan Estimated Land Use Allocation Acreage – Anahola ASYA

General Plan Land Use Designation	Acreage	Percent of Total
Agricultural	11,045	33.9
Military	0	0.0
Open	15,103	46.4
Park	36	0.1
Residential Community	1,429	4.4
Resort	149	0.5
Transportation	0	0.0
Urban Center	374	1.2
DHHL	4,403	13.5
TOTAL	32,539	100.0

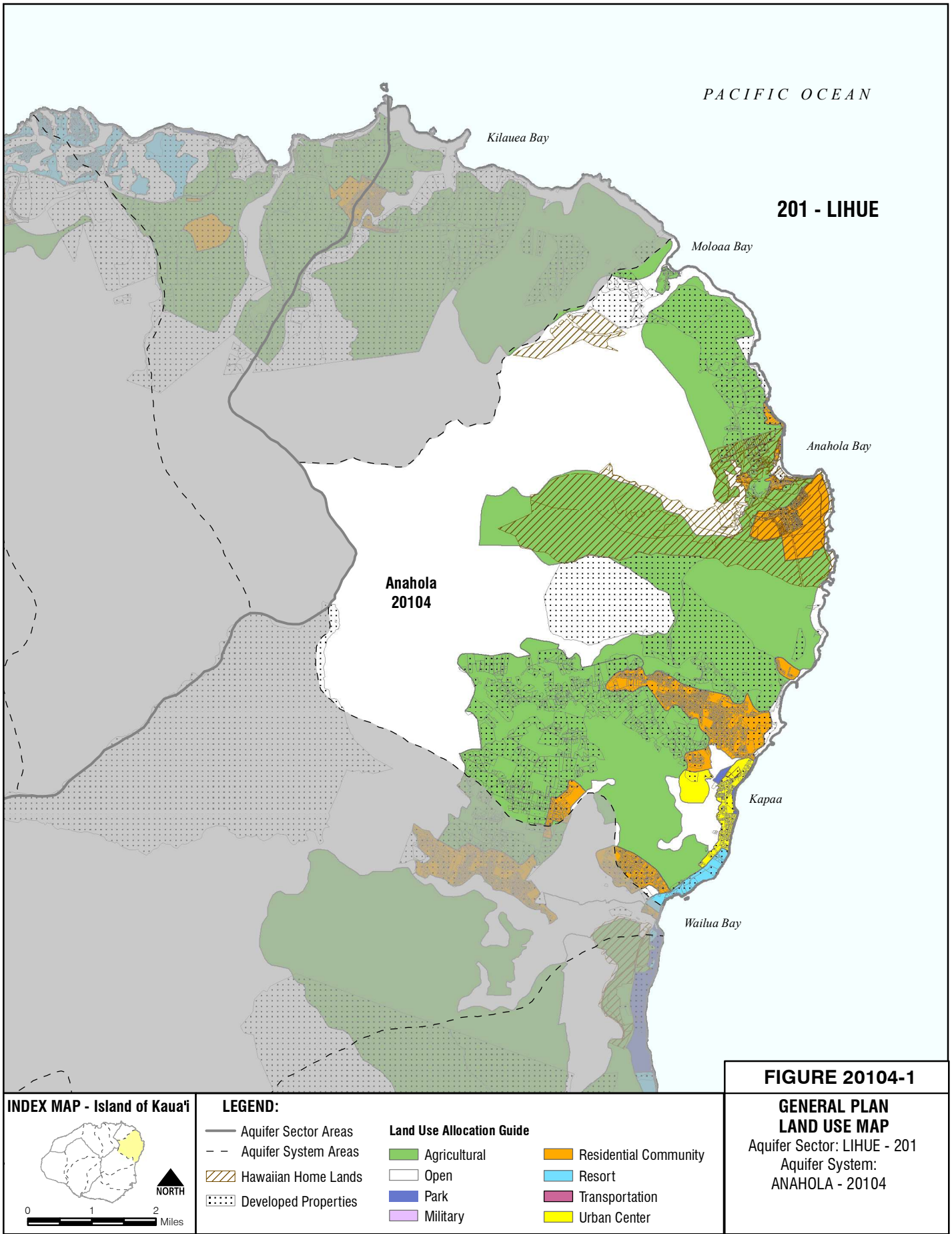
20104-1.3.2 Kauaʻi Zoning

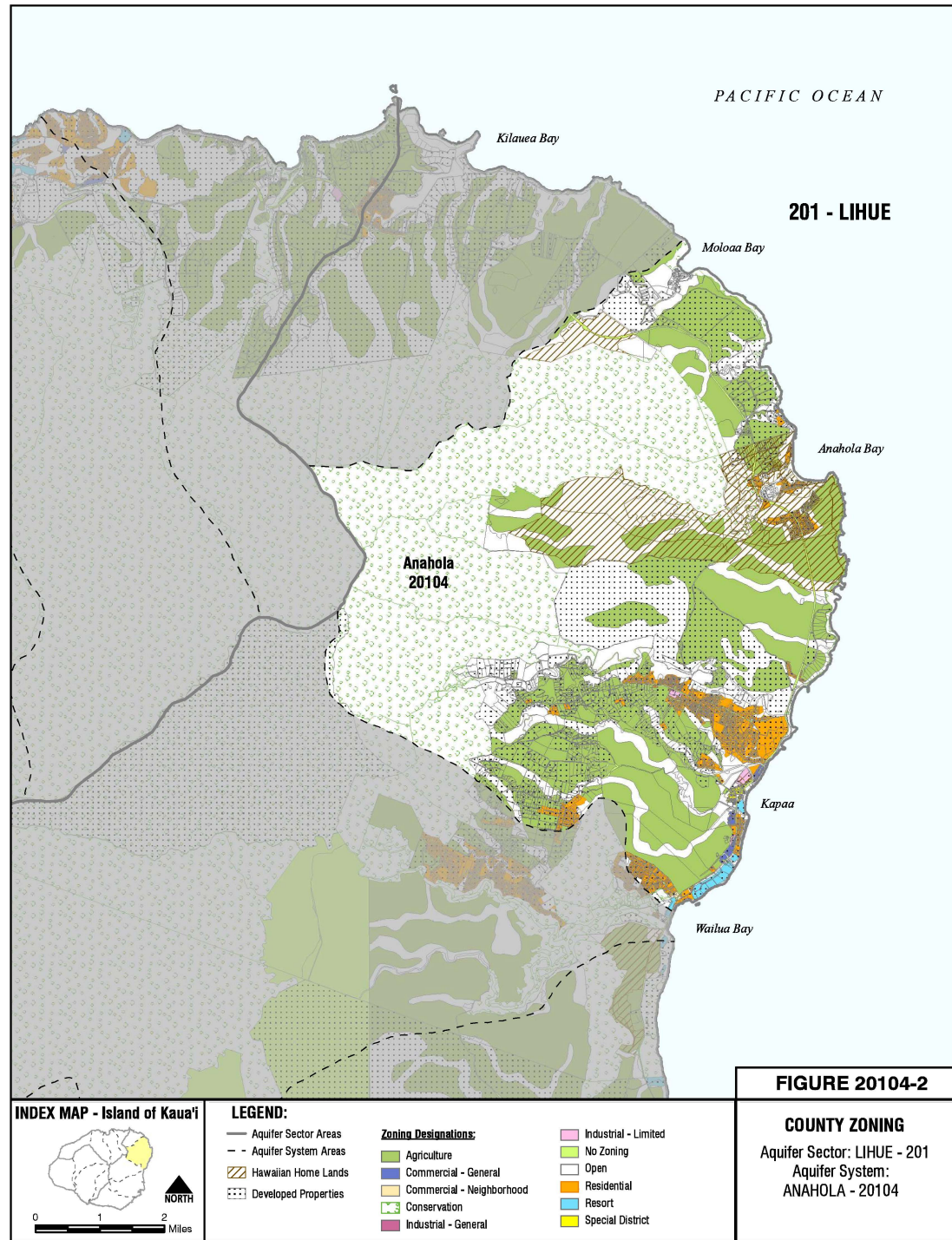
Kauaʻi County Zoning Map for the Anahola ASYA is shown on **Figure 20104-2**. The estimated land use allocation acreage for each zoning district within the system area is listed in **Table 20104-4**.

Table 20104-4: County Zoning Estimated District Allocation Acreage – Anahola ASYA

Zoning District	Acreage	Percent of Total
Agriculture	8,473	25.7
Commercial – General	42	0.1
Commercial - Neighborhood	7	0.0
Conservation	12,690	38.6
Industrial – General	1	0.0
Industrial - Limited	25	0.1
Open	5,843	17.7
Residential	1,110	3.4
Resort	113	0.3
Project Development	0	0.0
Special Planning Area	26	0.1
Special Treatment	0	0.0
No Zoning	197	0.6
DHHL	4,420	13.4
TOTAL	32,947	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 Anahola ASYA is 4.83 dwelling units per acre. The average number of dwelling units allowed in resort districts in the Anahola ASYA is 20.00 dwelling units per acre.





20104-2 EXISTING WATER RESOURCES

20104-2.1 Ground Water

The Anahola ASYA has a sustainable yield of 21 mgd. According to the 2014 CWRM database, there are 86 production wells in the system, 6 agriculture, 10 municipal, 4 non-DOW municipal, 55 domestic, 1 industrial, 5 irrigation, and 5 wells with a use type of “other”. There are also 26 wells drilled and categorized as “unused”. Refer to **Appendix A** for this database. **Figure 20104-3** shows the well locations.

Review of available USGS ground water level data from two wells, Nonou W-B and Anahola C located in the Anahola ASYA (record years 1970 through 2018 and 1990 through 2018, respectively), shows an overall drop in ground water level of about 1.5 to 2 feet over the span of all respective record years.

20104-2.2 Surface Water

There are 8 streams classified as perennial in the Anahola ASYA, of which 6 are considered continuous and 2 are considered intermittent. Moloa‘a Stream, Pāpa‘a Stream, Anahola Stream, Kapa‘a Stream, Moikeha Canal, and Waikaena Canal are classified as continuous streams. ‘Aliomanu Stream and Kumukumu Stream are classified as intermittent streams. The USGS has 9 active surface water gages in the system area. The gages are located on Kapa‘a Stream, Kapahi Ditch, Kaneha Ditch, Konohiki Stream, ‘Ōpaeka‘a Stream, North Fork Wailua River, and South Fork Wailua River, 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 34 declared stream diversions in the Anahola ASYA identified in the CWRM database shown on **Figure 20104-4**, which accounts for 12 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 Anahola ASYA is 2.96 mgd.

The Anahola Ditch was formerly owned by the Līhu‘e Plantation to irrigate the northern section of the sugarcane fields. This ditch is now under the jurisdiction of the Department of Hawaiian Home Lands (DHHL) and a private landowner. A condition assessment of the DHHL portion was performed in 2015 as part of the 2019 draft AWUDP update. The Upper Anahola Ditch from the intake to the Kaneha Reservoir was reported as active in 2015. The remainder of the Upper

Anahola Ditch is disconnected and is in poor condition. The Lower Anahola Ditch is inactive and in poor condition and may not be feasible for rehabilitation.

The East Kauaʻi Irrigation System (EKIS) is a complex system of interconnecting ditches, tunnels, flumes, and reservoirs and consists of three sections: the Kapaʻa Section, the Kālepa Section (see **Section 20102**), and the Hanamāʻulu-Līhuʻe Section (see **Section 20102**).

The Kapaʻa Section of the East Kauaʻi Irrigation System (EKIS) is the northernmost section. The Wailua Ditch Intake diverts water from the North Fork of Wailua River to the Wailua Reservoir, then to the Upper and Lower Kapahi Reservoirs in Kapaʻa. The Kapaʻa Stream Intake diverted water to the Upper and Lower Kapahi Reservoirs. Eight separate earthen ditches and control gates directed water from the Wailua Ditch to the sugarcane fields.

20104-2.3 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.

20104-2.4 Rainwater Catchment

Rainwater catchment is a viable resource for areas that are not served by ground water or surface water. **Figure 20104-5** 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.

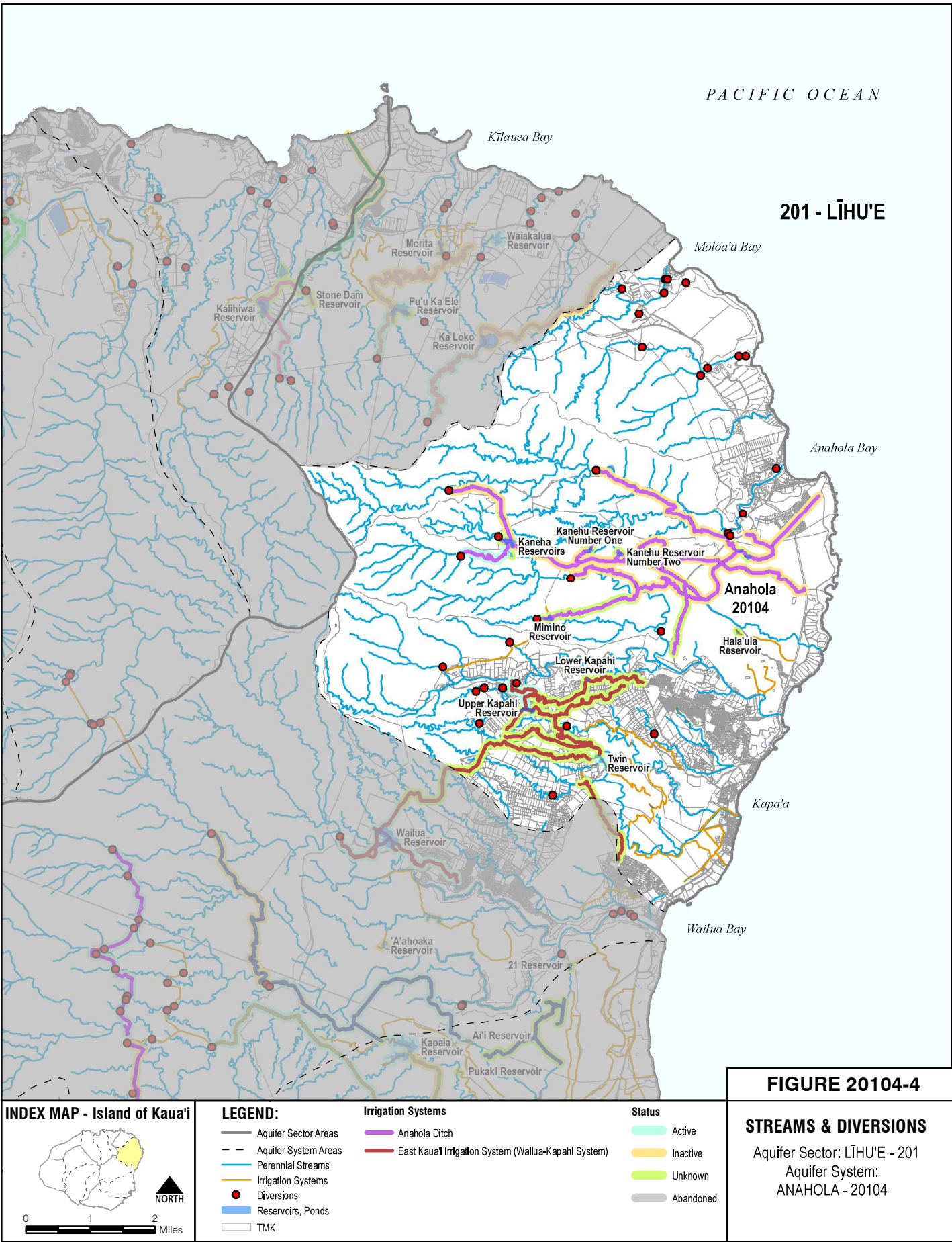
20104-2.5 Recycled Water

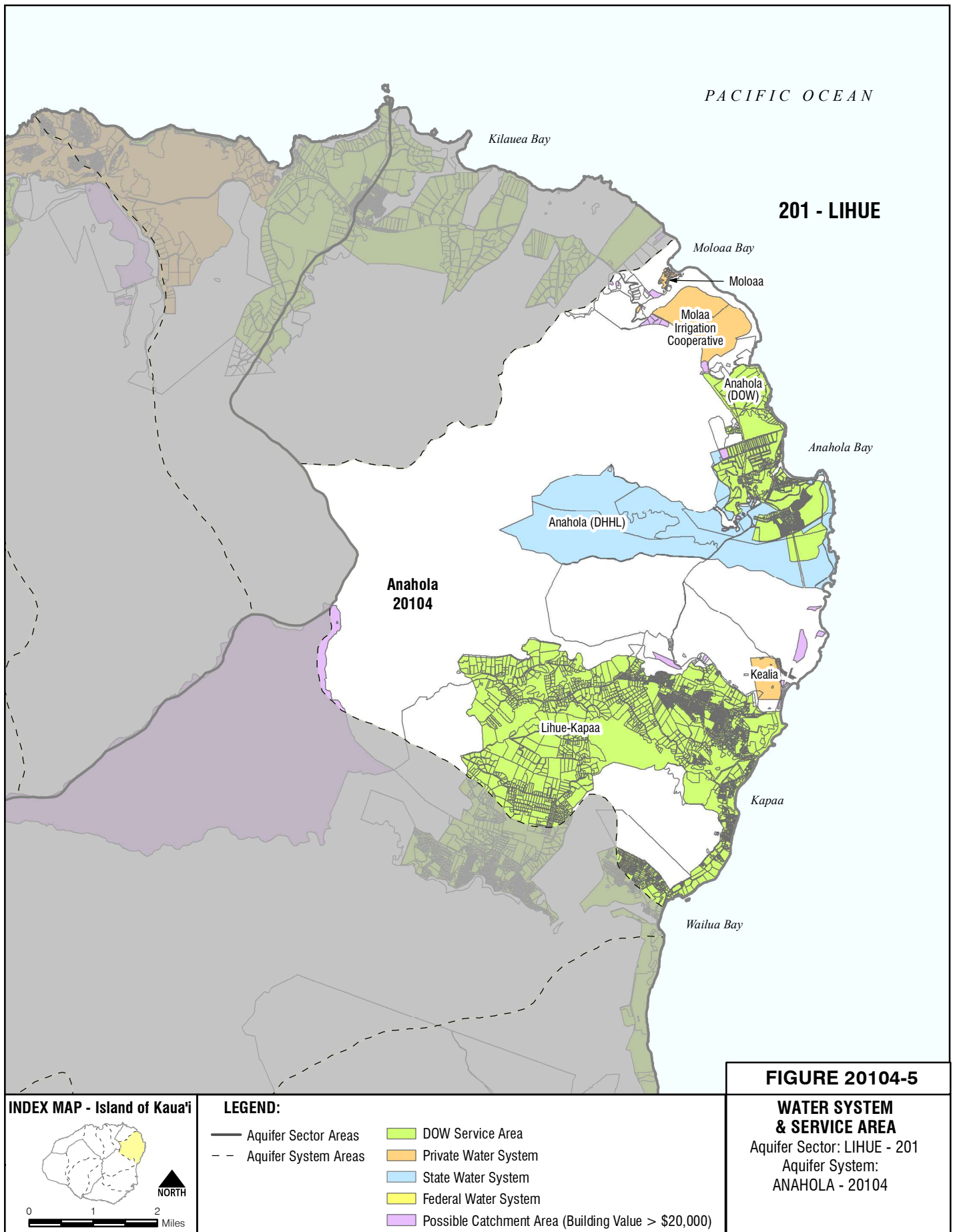
There are no wastewater reclamation facilities in the Anahola ASYA.



PACIFIC OCEAN

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20104-3 EXISTING WATER USE

20104-3.1 General

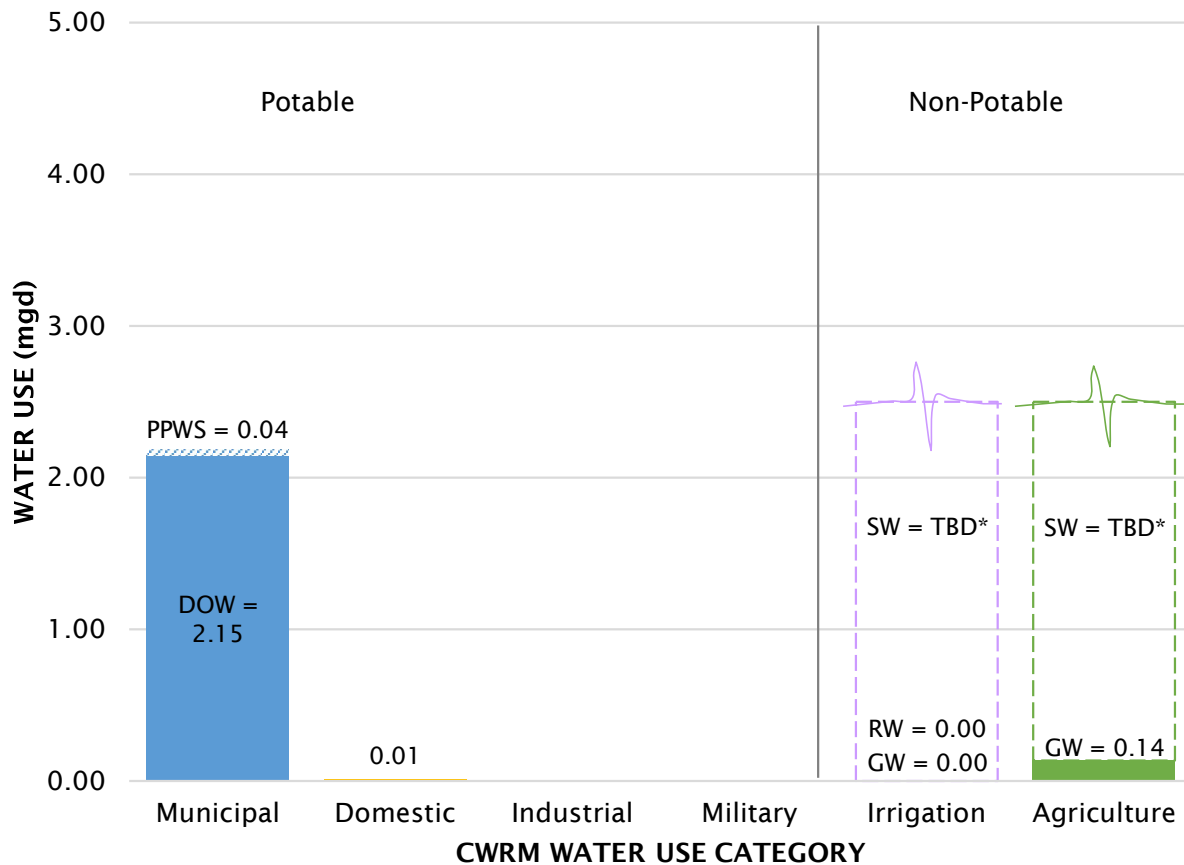
The following section presents the total estimated average water use within the Anahola ASYA. The total estimated average water use was based on data from CWRM (well pumpage) and DOH (Sanitary Surveys for Public Water Systems and estimated recycled water usage) for the year of 2014. Well classification changes since 2014 are noted in the sub-sections below. **Table 20104-5** and **Figure 20104-6** summarize the water use in accordance with CWRM categories.

Table 20104-5: Existing Water Use by Category – Anahola ASYA

CWRM Category	Ground Water (mgd)	Other Sources (mgd)	Total (mgd)	Percent of Total
Domestic	0.01	TBD ¹	0.01	0.4
Industrial	0.00		0.00	0.0
Irrigation	0.00		0.00	0.0
Agriculture	0.14		0.14	6.0
Military			0.00	0.0
Municipal				
DOW System	2.15		2.15	91.9
State System	0.00		0.00	0.0
Private-Public WS	0.04		0.04	1.7
TOTAL	2.34		2.34	100.0

¹ Surface Water – TBD from AWUDP

Figure 20104-6: Existing Water Use by Category – Anahola ASYA



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

20104-3.2 Domestic Use

There are 55 wells classified as “Domestic” in the CWRM database in 2014. The total reported pumpage is 0.01 mgd. It is noted that pumpage reporting in the Moloaa area is less than ideal; however, even though majority of the small domestic wells are not reporting their pumpage to CWRM, well pumpage reporting is relatively high with large users. Better reporting is needed for non-municipal wells.

Five additional wells were drilled and registered since then, according to the CWRM database in 2017. In addition, a well formerly owned by Makaleha Gardens was re-classified to “Irrigation,” increasing the “domestic” well total to 59 wells.

20104-3.3 Industrial Use

There is one well classified as “Industrial” in the CWRM database and is owned by Kaua'i Natural Waters, LLC with no reported pumpage.

20104-3.4 Irrigation Use

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

20104-3.4.1 Ground Water

There are five wells classified as “Irrigation” in the CWRM database, with three wells further classified as IRRLA – landscape irrigation. Two of the IRRLA wells are owned by private landowners. The third IRRLA well was owned by Mandalay Properties Hawai‘i, LLC but has changed ownership to Kaua‘i Makai, LLC as of 2017. The other two irrigation wells are separately owned by a private landowner and by Hawaiian Trust Co., Ltd. All five wells have not reported pumpage.

As mentioned in the 20104-4.2 Domestic Use section, a well that was previously classified as “Domestic” has been re-classified as IRRLA in the CWRM database as of 2017. In addition, a well also classified as IRRLA was drilled and added to the CWRM database in 2015 under the ownership of a private landowner. The addition of these two wells increases the “irrigation” well total to 7.

20104-3.4.2 Recycled Water

There is no recycled water use in the Anahola ASYA.

20104-3.4.3 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.

20104-3.5 Agricultural Use

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

20104-3.5.1 Ground Water

There are six wells classified as “Agriculture” in the CWRM database, with five wells further classified as AGRCP - crops and processing. The well classified as “agriculture” is owned by a private landowner, with reported pumpage of 0.01 mgd. Two wells classified as AGRCP are owned by DLNR and are operated by a private landowner, with reported pumpage totaling 0.13 mgd. This private landowner is the operator of the Moloa‘a water system, discussed in **Section 20104-3.7.4** below. The other three AGRCP wells are separately owned by two private landowners and LPC Corporation, with no reported pumpage.

Two wells, classified as AGRCP, were added to the 2017 CWRM Well Database, owned by Oasis Water Systems and Moloa‘a Valley, increasing the “agriculture” well total to 8.

20104-3.5.2 Recycled Water

There is no recycled water use in the Anahola ASYA.

20104-3.5.3 Surface Water

Information on surface water use for agriculture is to be determined by the AWUDP. However, it is noted that the agricultural lands from Hanamā‘ulu to Anahola are only lightly used.

20104-3.6 Military Use

There is no military use in the Anahola ASYA.

20104-3.7 Municipal Use

There are 14 wells in the CWRM database classified as “Municipal.” 10 are further classified as MUNCO – Municipal County, and the other 4 are further classified as MUNPR – Municipal Private. Municipal can be subcategorized into the other water use categories: Domestic, Industrial, Agricultural, Military, and Municipal.

20104-3.7.1 County Water Systems

The DOW has two major water systems that serve the Anahola ASYA: the Anahola Water System and the Līhu‘e-Kapa‘a water system (Wailua-Kapa‘a subsystem).

Anahola Water System

The Anahola water system (PWS 401) serves 2,174 people through 620 service connections with an average daily flow of 0.255 mgd per the 2013 DOH Sanitary Survey. The Anahola water system serves the DHHL residential areas in Anahola, Anahola Valley, and the ‘Aliomanu areas. Water for this system is supplied by 3 wells. **Table 20104-6a** lists the water sources, well number, pumping capacity, pressure zone and pumpage amount.

Table 20104-6a: DOW Anahola Water System Water Sources

WELL NAME	WELL NUMBER	PUMPING CAPACITY (gpm)	PRESSURE ZONE (ft)	PUMPAGE (mgd)
Anahola Well A	2-0818-001	400	288	0.15
Anahola Well B	2-0818-002	200	288	0.08
Anahola Well C	2-0818-003	350	288	0.09

The 288-foot pressure zone is the only pressure zone in the Anahola water system. Two storage tanks are included in the Anahola water system. The water sources are located approximately at the same elevation as the existing storage tanks. To regulate water pressure in the distribution system, several pressure reducing valves are incorporated into the distribution system.

This water system and the Department of Hawaiian Home Lands-owned (DHHL) water system (PWS No. 432) described in **Section 20104-3.7.2** serve as backup for each other.

Wailua-Kapa‘a Subsystem

The Līhu‘e-Kapa‘a water system (PWS 400) consists of three subsystems: 1) Līhu‘e-Hanamā‘ulu subsystem, 2) Puhi subsystem, and 3) Wailua-Kapa‘a subsystem. The Līhu‘e-Hanamā‘ulu subsystem and Puhi subsystem are entirely within the Hanamā‘ulu ASYA and are discussed in **Section 20102**.

The Wailua-Kapa‘a Subsystem services areas in the Hanamā‘ulu, Wailua, and Anahola ASYAs. The largest portion of this subsystem service area is located within the Anahola ASYA. The subsystem serves the Wailua River-Waipouli Resort area, Wailua Houselots, Wailua Homesteads, Kapa‘a Town, and Kapa‘a Homesteads. Water for this subsystem is supplied by six wells and two tunnels. **Table 20104-6b** lists the water sources, well number, pumping capacity, pressure zone, and pumpage amount.

Table 20104-6b: DOW Wailua-Kapa‘a Subsystem Water Sources

WELL NAME	WELL NUMBER	PUMPING CAPACITY (gpm)	PRESSURE ZONE (ft)	PUMPAGE (mgd)
Moelepe Tunnel	2-0623-002	650	538	0.43
Makaleha Tunnel	2-0623-001		530	0.46
Wailua Homesteads Well A*	2-0421-001	500	538	0.06
Wailua Homesteads Well B*	2-0421-002	500	538	0.07
Kapa‘a Homesteads Well 1	2-0623-004	1000	530	0.38
Kapa‘a Homesteads Well 2	2-0622-002	500	530	0.21
Nonou Well B	2-0320-003	1000	214	0.07
Nonou Well C*	2-0321-001	1000	214	0.12

*Well located in Wailua ASYA

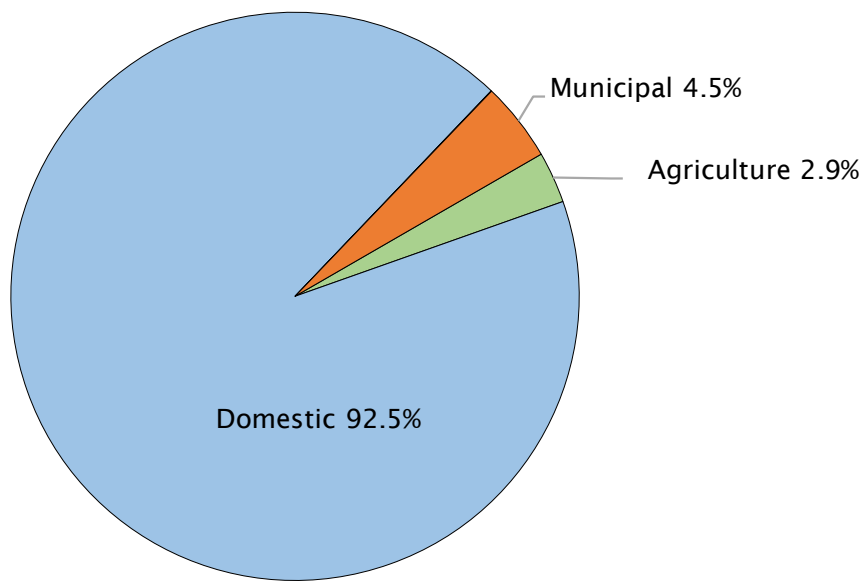
There are eight primary pressure zones (214, 233, 268, 313, 428, 530, 538, 605 feet) and seven storage tanks in the Wailua-Kapa‘a subsystem. The Pu‘upilo Pump Station pumping from the 538’ zone to the 605’ zone is the only booster pump station in the service area. All other zones are dependent on sources that are located in that zone or by supply fed through pressure reducing valves from higher elevations.

DOW Water Use by Category

DOW water use is subcategorized in **Table 20104-7** to the extent possible based on available meter data and is depicted in **Figure 20104-7**.

Table 20104-7: DOW Existing Water Use by Category – Anahola ASYA

CWRM Water Use Category	DOW Metered Water Use (mgd)	Percent of Total
Agricultural	0.054	2.9
Domestic	1.709	92.5
Industrial	0.001	0.0
Military	0.000	0.0
Municipal	0.083	4.5
Total	1.847	100.0

Figure 20104-7: DOW Existing Water Use by Category – Anahola ASYA

20104-3.7.2 State Water Systems

The Anahola Farm Lots water system (PWS 432) is the only State water system in the Anahola ASYA regulated by the DOH. The water system is owned by the State of Hawai'i Department of Hawaiian Home Lands (DHHL) and is operated by Aqua Engineers, Inc. The water system serves 385 people through 77 service connections with an average daily demand of 0.098 mgd per the 2017 State Water Projects Plan – DHHL Update. This water system serves 50 agricultural parcels (farm lots) and 27 base lots in the Bay View residential subdivision through its sole water source, well 2-0919-003. This well was classified as unused in 2014 but has since been reclassified as MUNST – municipal state. The DOW Anahola water system (PWS No. 401) serves as a backup for this water system, and reciprocally, this water system serves as a backup for the DOW Anahola water system.

20104-3.7.3 Federal Water Systems

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

20104-3.7.4 Private-Public Water Systems

There are three private-public water systems in the Anahola ASYA regulated by the DOH: the Keālia water system (PWS 423), the Molokaʻa water system (PWS 436), and the Molokaʻa Irrigation Cooperative water system (PWS 437).

Keālia Water System

The Keālia water system (PWS 423) is owned by Keālia Water Co. Holdings, LLC and is operated by Aqua Engineers, Inc. The water system serves 260 customers through 69 service connections. Two wells serve the Keālia water system, Keālia Well 1A (2-0618-009) and Keālia Well 2A (2-0618-010) with reported pumpage of 0.04 mgd.

Molokaʻa Water System

The Molokaʻa water system (PWS 436) is owned by DLNR and operated by a private landowner. The private landowner holds a month-to-month revocable permit issued by DLNR to operate the one well that serves the water system; Molokaʻa Well No. 1 (2-1020-002). This well is classified as “agriculture” from the CWRM database and has reported pumpage is 0.13 mgd. Non-potable water from the well is treated and sold to 29 people through 3 service connections. In addition, the private landowner sells the treated water to the Molokaʻa Irrigation Cooperative for their water system (PWS 437) and up to 5,000 gallons of water per day to DOW.

Molokaʻa Irrigation Cooperative Water System

The Molokaʻa Irrigation Cooperative water system (PWS 437) was established in 2010 by a group of farmers to distribute water to over 60 farmers in Molokaʻa. The water system receives its water from the Molokaʻa water system (PWS 436) and serves over 600 acres of farms in an area called the Molokaʻa Hui Lands for both irrigation and domestic uses. Water from the Molokaʻa water system is measured at a master water meter and then piped to a 0.5 MG water tank before distribution. The State Legislature has allocated funds in 2015 to help replace the existing non-potable well (Molokaʻa Well No. 1) with a new potable well, upgrade the existing 0.5 MG tank and distribution system, and install a photovoltaic system. Construction is anticipated to be complete by the end of 2024. In addition, the water system’s agricultural water meters were recently replaced with “smart” meters as a way to remotely monitor water use and identify undetected leaks. The agricultural water meter replacement was partially funded by the State.

20104-3.7.5 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 20104-8**. The per capita use in the Anahola ASYA is approximately 38.1% lower than the overall County of Kauaʻi per capita use.

Table 20104-8: Per Capita Use – Anahola ASYA

	DOW Metered Water Use – Domestic (mgd)	Private-Public Water System (mgd)	90% of 2015 Population	Per Capita Use (gpd)
Anahola ASYA	1.709	0.036	14,540	120
County of Kauaʻi	9.360	2.951	63,462	194

20104-3.8 Existing Water Use by Resource

20104-3.8.1 Ground Water

Table 20104-9 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 20104-9: Pumpage – Anahola ASYA

Pumpage (mgd)	SY (mgd)	Pumpage Portion of SY
2.34	21	11.1%

Based on available information from the CWRM database, the current ground water use is 11.1 percent of the sustainable yield.

20104-3.8.2 Surface Water

Information on surface water use for agriculture is to be determined by the AWUDP. However, it is noted that the agricultural lands from Hanamāʻulu to Anahola are only lightly used.

20104-3.8.3 Water Conservation

Water conservation, including water loss management, may reduce water use. See Section 20104-2.3 for existing conservation efforts.

20104-3.8.4 Rainwater Catchment

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

20104-3.8.5 Recycled Water

There is no recycled water use in the Anahola ASYA.

20104-4 FUTURE WATER USE

20104-4.1 Full Build-Out Water Demand Projections

The full build-out water demand projections based on the General Plan and County Zoning for the Anahola ASYA is listed in **Table 20104-10** and **Table 20104-11**, respectively. Each land use class is associated with the most appropriate CWRM water use category.

Table 20104-10: General Plan Full Build-Out Water Demand Projection – Anahola ASYA

General Plan Category	CWRM Category	Water Demand (mgd)
Agriculture	Agriculture/Domestic	1.17
Open	Domestic	0.11
Military	Military	0.00
Park	Irrigation	0.14
Residential	Domestic/Municipal	3.45
Resort	Domestic/Irrigation/Municipal	2.08
Transportation	Municipal	0.00
Urban Center	Domestic/Industrial/Municipal	1.87
DHHL	Domestic	1.47
TOTAL		10.29

Table 20104-11: Zoning Full Build-Out Water Demand Projection – Anahola ASYA

Zoning Class	CWRM Category	Water Demand (mgd)
Agriculture	Agriculture/Domestic	1.17
Commercial	Municipal	0.25
Industrial	Industrial/Municipal	0.10
Open	Domestic	0.11
Residential	Domestic/Municipal	2.55
Resort	Domestic/Irrigation/Municipal	1.58
Special Planning Area		0.08
DHHL	Domestic	1.47
TOTAL		7.31

20104-4.1.1 Refined Land Use Based Water Projection

State Water Projects Plan

Table 20104-12 lists future State water projects reported in the 2021 SWPP update. The total projected demand to the year 2034 for these 16 State projects within the Anahola ASYA is 9.6173 mgd, 1.532 mgd using potable and 8.086 mgd using non-potable sources.

Table 20104-12: Future State Water Projects – Anahola ASYA

Project Name	State of Hawai'i Department	Primary Use	Water Development Strategy	2034 Demand (mgd)
Kapa'a Elementary School New Administration	DOE	Potable	REMAIN	0.0003
Kapa'a Elementary School New Library	DOE	Potable	REMAIN	0.0005
Kapa'a High School New Administration	DOE	Potable	REMAIN	0.0005
Kapa'a II Elementary School	DOE	Potable	REMAIN	0.0600
Anahola 1	DHHL	Potable	COUNTY-CREDIT	0.0932
Anahola 2	DHHL	Potable	EXSWWS	0.0585
Anahola 3	DHHL	Potable	REMAIN	1.1518
Anahola (Non-Potable 1)	DHHL	Non-potable	NONE-AMBIENT RAINFALL	2.5959
Anahola (Non-Potable 2)	DHHL	Non-potable	NEWSWS	1.2799
Anahola (Non-Potable 3)	DHHL	Non-potable	NEWSWS	1.2799
Kapa'a	DHHL	Potable	REMAIN	0.0674
Moloka'a	DHHL	Potable	OTHER-CATCHMENT	0.0235
Moloka'a (Non-Potable 1)	DHHL	Non-potable	OTHER-STREAM DIVERSION	2.2500
Moloka'a (Non-Potable 2)	DHHL	Non-potable	NONE-AMBIENT RAINFALL	0.6800
Pi'ilani Mai Ke Kai – Phase 2	DHHL	Potable	COUNTY-CREDIT	0.0235
Pi'ilani Mai Ke Kai – Phase 3	DHHL	Potable	COUNTY-CREDIT	0.0505
TOTAL REMAIN				1.2805
TOTAL ANAHOLA ASYA SWPP 2034 DEMAND				9.6173

As mentioned in **Section 2.2.2.5.1**, State water projects with the water development strategy of REMAIN are located within the service areas of County water systems which need to be coordinated with the respective County water departments. Six of the 16 State projects within the Anahola ASYA were assigned the REMAIN water development strategy and results in a total 2034 demand of 1.2805 mgd. This accounts for 6.10 percent of the 21 mgd sustainable yield for the Anahola ASYA. See the following paragraph for more information on the DHHL projects within the Anahola ASYA.

State Department of Hawaiian Home Lands

Three DHHL tracts are located within the Anahola ASYA: the Anahola Tract, Moloa'a Tract, and Kapa'a Tract. The State Water Projects Plan – DHHL Update (SWPP), dated May 2017, provides information related to projected DHHL water demands and the related water development strategies being proposed to meet these water demands. The DHHL demands have also been incorporated into the SWPP Update, dated May 2021. See **Table 20104-12** for a breakdown of the demands. The projected potable water demands for the Anahola, Moloa'a, and Kapa'a tracts is 1.38 mgd, 0.02 mgd, and 0.07 mgd, respectively.

As provided in the 2017 SWPP, the projected Anahola Tract water demand can be met using the DOW Anahola Water System utilizing the existing water credit agreement between DHHL and the DOW. The projected Moloa'a Tract water demand can be met by installing and utilizing a rainwater catchment system - the annual ambient rainfall should be sufficient to supply the projected water demand. The Kapa'a Tract water demand can be supplied by the existing DOW Anahola Water System.

The 2017 SWPP also included a discussion related to meeting non-potable water demands. This discussion projected that non-potable demands for the Anahola and Moloa'a tracts will be 5.16 and 2.93 mgd, respectively. As indicated in the 2017 SWPP, the projected non-potable water demand for the Anahola Tract can be met by utilizing ambient rainfall and water from the Anahola Irrigation System (once it is reinstated). Similarly, the projected non-potable water demands for the Moloa'a Tract can be met by utilizing ambient rainfall and waters from the Moloa'a Stream.

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 Kaua'i 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 Kaua'i Important Agricultural Lands Study

4,567 acres of agricultural lands within the Anahola ASYA received a score of 28 or better in the County of Kaua'i 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 20104-13** 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 20104-13: Irrigation of Agricultural Lands

(1) Declared Surface Water Use from Diversions (mgd)	2.96
(2) Agricultural Lands with a Score ≥ 28 (acres)	4,567
- How many acres can be sustained by (1) at a water rate of 3,400 gpad? (Acres)	871
- What percent of (2) can be sustained with a water rate of 3,400 gpad?	19%
- If all of (2) were to be irrigated, what is the water unit rate? (gpac)	648

20104-4.1.2 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., 4.83 dwelling units per acre for residential designation and 20.00 dwelling units per acre for resort designation).

20104-4.2 Water Demand Projections to the Year 2035

The following section presents water demand projections to the year 2035 for the Anahola ASYA. The projected low, medium, and high growth rates are listed in **Table 20104-14** and are graphed in **Figure 20104-8**. Potable (domestic, industrial, municipal, and military water uses) and non-potable (irrigation) water demands are also differentiated.

Table 20104-14: Water Demand Projection – Anahola ASYA

Water Use Category	Water Demand by Year (mgd)								
	2015	2016	2017	2018	2019	2020	2025	2030	2035
GROWTH RATE C (HIGH)									
TOTAL	2.20	2.21	2.23	2.25	2.26	2.28	2.37	2.47	2.58
Potable	2.20	2.21	2.23	2.25	2.26	2.28	2.37	2.47	2.58
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	2.20	2.21	2.23	2.24	2.26	2.28	2.36	2.45	2.55
Potable	2.20	2.21	2.23	2.24	2.26	2.28	2.36	2.45	2.55
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	2.20	2.21	2.22	2.22	2.23	2.24	2.29	2.34	2.40
Potable	2.20	2.21	2.22	2.22	2.23	2.24	2.29	2.34	2.40
Non-Potable	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

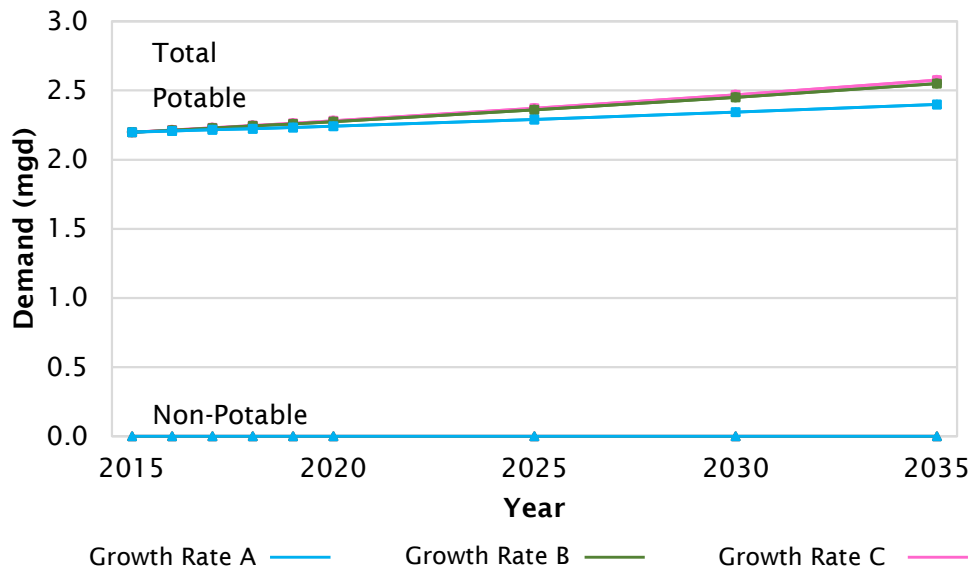
Figure 20104-8: Water Demand Projection Summary – Anahola ASYA

Figure 20104-9 shows the breakdown of water demand projections for a medium growth rate by CWRM categories through the year 2035. **Table 20104-15** summarizes this figure.

Figure 20104-9: Medium Growth Rate B Water Demand Projection by Category – Anahola ASYA

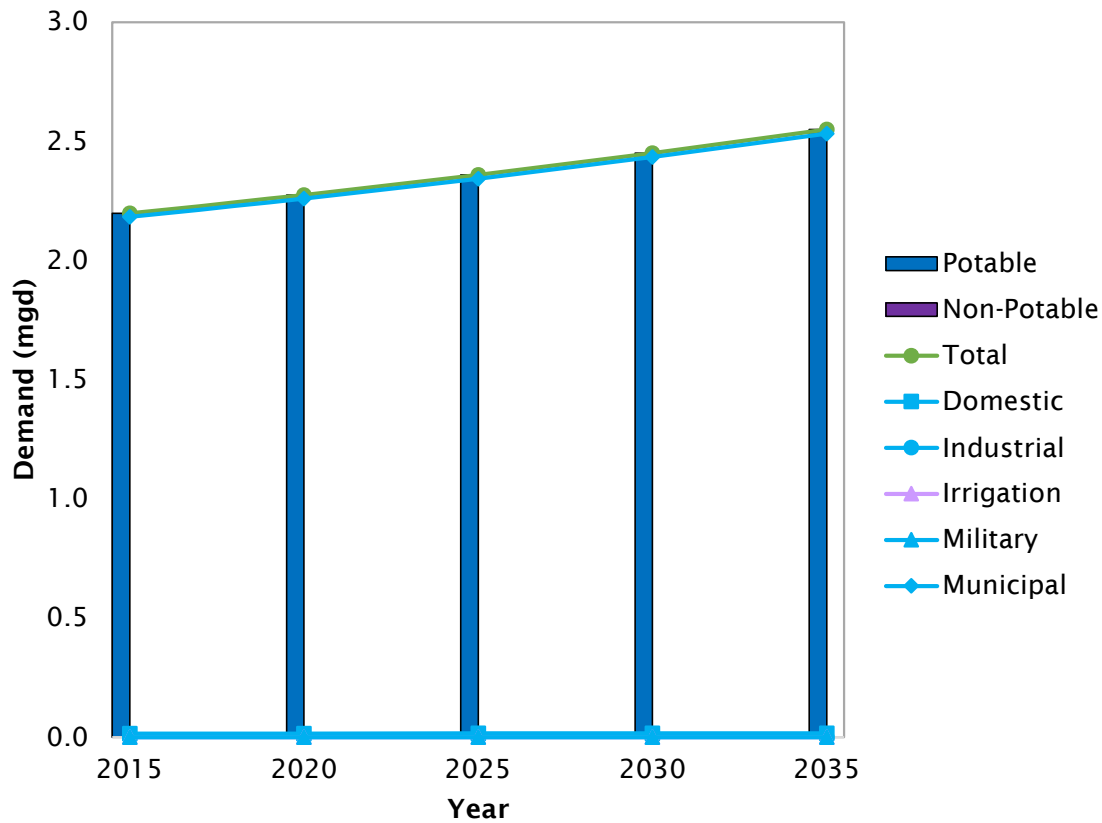


Table 20104-15: Medium Growth Rate B Water Demand Projection by Category – Anahola ASYA

Water Use Category	Water Use by Year (mgd)								
	2015	2016	2017	2018	2019	2020	2025	2030	2035
Total	2.20	2.21	2.23	2.24	2.26	2.28	2.36	2.45	2.55
Potable	2.20	2.21	2.23	2.24	2.26	2.28	2.36	2.45	2.55
Non-Potable	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Domestic	0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.02	0.02
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	2.19	2.20	2.21	2.23	2.24	2.26	2.34	2.43	2.53
DOW	2.15	2.16	2.18	2.19	2.21	2.22	2.31	2.39	2.49

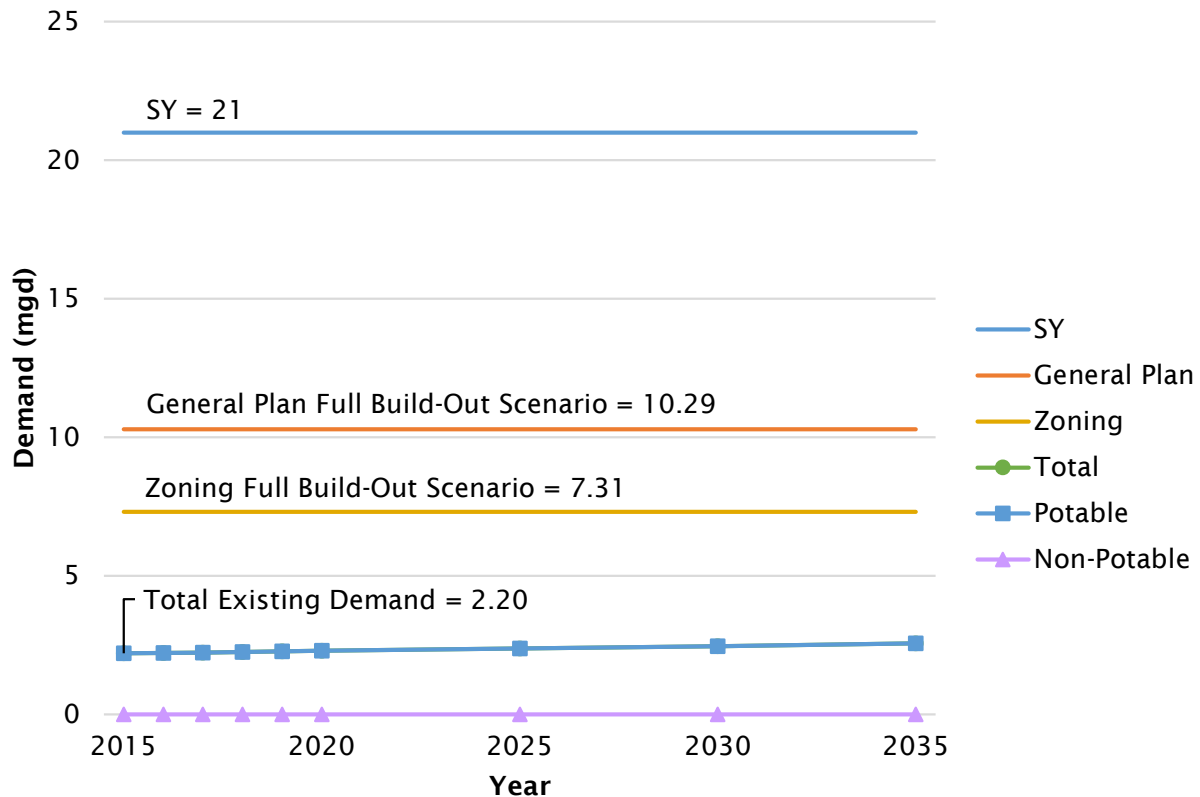
20104-4.3 Summary

Figure 20104-10 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 20104-16** summarizes the General Plan, Zoning, and 20-year water demand projection scenarios for the Anahola ASYA. The sustainable yield is presented to draw comparisons. All demands are in mgd.

Table 20104-16: 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
21	10.29	7.31	2.20	2.21	2.23	2.24	2.26	2.28	2.36	2.45	2.55

Figure 20104-10: Medium Growth Rate B Water Demand Projections and Full Build-Out - Anahola 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 20104-4.1.1 County of Kaua'i Important Agricultural Lands Study.

20104-5 RESOURCE AND FACILITY RECOMMENDATION

20104-5.1 Water Source Adequacy

20104-5.1.1 Full Build-Out

Development to the highest extent allowed by the General Plan and County Zoning within the Anahola ASYA is sustainable, with General Plan and County Zoning full build-out water demands requiring 49 and 35 percent of the 21 mgd sustainable yield (SY), respectively.

20104-5.1.2 Twenty-Year Projection

The 2035 water demand projection for the Anahola ASYA is sustainable, requiring only 12 percent of the 21 mgd sustainable yield.

20104-5.2 Source Development Requirements

20104-5.2.1 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 Anahola ASYA contains basal, perched, and high level ground water. Most reported pumpage is from the high level, followed by basal and then perched.

The 2035 water demand projection for the Anahola ASYA is only 12 percent of the 21 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.

There are several public water systems that pump ground water from the Anahola ASYA. Development of additional wells to meet future demands may be considered for the DOW's Wailua-Kapa'a subsystem and DOW's Anahola water system. In addition, the State Legislature allocated

funds in 2015 to replace the existing Moloa'a Well No. 1, which serves the Moloa'a Water System and Moloa'a Irrigation Cooperative Water System. The funding was to provide a new potable well and to upgrade the existing storage and distribution system. Construction is anticipated to be completed by the end of 2024.

The DOW's Water Plan 2020 identified water projects to meet the growing demand of its service areas. For DOW's Wailua-Kapa'a subsystem, Kapa'a Homesteads Well 4 is currently under construction. For DOW's Anahola water system, an additional 300-gpm well in north Anahola is proposed.

The DOW's Water Plan 2020 also identified potential storage and distribution system upgrades. Several storage deficiencies in the Wailua-Kapa'a subsystem were identified under maximum day demand conditions. A few new tanks have been constructed and more new tanks are planned to address these deficiencies. Many water main projects have been completed in the Wailua-Kapa'a subsystem. Several more water main projects have been proposed in both the Wailua-Kapa'a subsystem and the Anahola system, including replacing mains in Kapa'a town and replacing a main along Anahola Road.

Surface Water

The Anahola ASYA has 34 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 a couple of existing irrigation systems in the Anahola ASYA, including the East Kaua'i Irrigation System (EKIS) and the Anahola Ditch. Due to the cessation of sugarcane cultivation, many of these irrigation systems may not be functioning as efficiently as they once were. It is noted that maintaining these valuable existing irrigation systems requires significant effort and funding, and agreements regarding how this is to occur will need to be developed. The Agricultural Water Use and Development Plan (AWUDP) should include an inventory of large irrigation systems and provide information on their rehabilitation and maintenance needs. The AWUDP should also include a more detailed assessment of agricultural water demand projections that will supersede information in the KWUDP when it becomes available. The 2017 SWPP identifies EKIS as the

source of non-potable water for DHHL's Wailua tract and recommends reinstating the Anahola Irrigation System to meet the non-potable demands of DHHL's Anahola tract.

Water Transfer

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

Water can also be transferred between ASYAs through public water systems. The Wailua-Kapa'a subsystem consists of eight pressure zones. The 538' zone, located in the Wailua ASYA, can provide water to the 530' zone during an emergency when a source in the 530' zone is out of service. Also, DOW's Wailua-Kapa'a subsystem is interconnected with the Līhu'e-Hanamā'ulu subsystem. Currently, there is some water transfer from the Līhu'e-Hanamā'ulu subsystem to the Wailua-Kapa'a subsystem. Flow between these subsystems is regulated by a valve. In the past, water from the Wailua-Kapa'a subsystem was boosted into the Līhu'e-Hanamā'ulu system by the Hanamā'ulu Booster Station. To meet future demands, DOW could utilize the interconnection between these two subsystems to transfer any surplus supply from one system to the other.

Water Conservation

The per capita use in the Anahola ASYA is approximately 38.1% 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.

The DOW's Water Plan 2020 proposed instituting water conservation measures in the Anahola water system service area as a strategy to avoid a projected storage deficit in the system.

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. The 2017 SWPP proposes rainwater catchment as the strategy to meet the projected potable water demand for DHHL's Moloa'a tract.

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 Anahola ASYA.

Recycled Water

Recycled water is a valuable resource; an increase in its use may lower the dependence on potable sources. However, there are no wastewater reclamation facilities (WWRFs) in the Anahola 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 readily available.

20104-5.2.2 Demand-Side Management

Development Density Control

The full build-out demand for the Anahola ASYA based on County Zoning is 7.31 mgd, which is 35 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 Anahola ASYA, the average number of dwelling units allowed by County Zoning is 4.83 dwelling units per acre in residential districts and 20.00 dwelling units per acre in resort districts.

The full build-out demand for the Anahola ASYA based on the General Plan is 10.29 mgd which is 49 percent of sustainable yield. Although it is unlikely that full build-out will occur within the time frame of the General Plan, the full build-out demand is sustainable; there are adequate water resources to sustain the long-range land use vision for this area. Therefore, development density control 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.

20104-5.3 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 Anahola 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 Anahola 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 49 percent of sustainable yield. At this projection, implementation of development density control by the County Planning Department is not needed. 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.