Chapter 20204

Nāpali Aquifer System Area

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20204 NĀPALI AQUIFER SYSTEM AREA

20204-1 SYSTEM AREA PROFILE

20204-1.1 General

The Nāpali [20204] Aquifer System Area (ASYA) is roughly bound on the north and west by the Pacific Ocean from about Kaʻīlio Point to about Hāʻeleʻele Valley, along the south by the south ridge above Hāʻeleʻele Valley until it meets up with Kōkeʻe Road, and along the east roughly following Kōkeʻe Road and back to Kaʻīlio Point. Except for residential areas located along the last stretch of Kūhiō Highway (Hāʻena to about Limahuli Stream) most of the Nāpali ASYA is largely uninhabited and undeveloped.

Average annual rainfall ranges from 35 inches per year along the coast to 140 inches in the mountains. The sustainable yield is 20 mgd.

20204-1.2 Economy and Population

20204-1.2.1 Economy

The Nāpali ASYA is largely uninhabited and undeveloped. The relatively small rural residential areas are located in relatively close proximity to Kuhio Highway and the shoreline. The area includes Hāʻena Beach Park and Hāʻena State Park – both popular tourist destinations.

20204-1.2.2 Population

The population within the Nāpali ASYA is very small and is not projected to increase significantly through the year 2035. Historical population data for the Nāpali ASYA is summarized in **Table 20204-1**. Population projections through the year 2035 are summarized in **Table 20204-2a**. As shown in **Table 20204-2b**, it is estimated that the area will continue to experience growth rates between 2 and 6 percent per decade.

Table 20204-1: Historical Population – Nāpali ASYA

	Year		
	1990	2000	2010
Population	22	25	28
Percent Change		15.8	10.2

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

Table 20204-2a: Population Projection – Nāpali ASYA

Growth Rate	Population by Year								
	2015	2016	2017	2018	2019	2020	2025	2030	2035
A – Low	28	28	28	29	29	29	29	29	30
B – Med.	29	29	29	29	29	29	30	31	32
C – High	29	29	29	29	29	29	30	31	32

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

Table 20204-2b: Population Projection – Percent Change – Nāpali ASYA

Growth Rate	2015-2025 % Change	2025-2035 % Change
A – Low	2.4	3.0
B – Medium	5.4	6.4
C – High	5.9	6.9

20204-1.3 Land Use

20204-1.3.1 2000 Kaua'i General Plan

The 2000 Kaua'i County General Plan Land Use Designation Map for the Nāpali ASYA is shown on **Figure 20204-1**. The estimated land use allocation acreage for each land use designation within the system area is listed in **Table 20204-3**.

Table 20204-3: General Plan Estimated Land Use Allocation Acreage – Nāpali ASYA

General Plan Land Use Designation	Acreage	Percent of Total
Agricultural	0	0.0
Military	0	0.0
Open	22,580	100.0
Park	0	0.0
Residential Community	0	0.0
Resort	0	0.0
Transportation	0	0.0
Urban Center	0	0.0
DHHL	0	0.0
TOTAL	**22,580**	**100.0**

20204-1.3.2 Kaua'i Zoning

Kaua'i County Zoning Map for the Nāpali ASYA is shown on **Figure 20204-2**. The estimated land use allocation acreage for each zoning district within the system area is listed in **Table 20204-4**.

Table 20204-4: County Zoning Estimated District Allocation Acreage – Nāpali ASYA

Zoning District	Acreage	Percent of Total
Agriculture	0	0.0
Commercial – General	0	0.0
Commercial - Neighborhood	0	0.0
Conservation	23,005	100.0
Industrial – General	0	0.0
Industrial - Limited	0	0.0
Open	0	0.0
Residential	0	0.0
Resort	0	0.0
Project Development	0	0.0
Special Planning Area	0	0.0
Special Treatment	0	0.0
No Zoning	0	0.0
DHHL	0	0.0
TOTAL	**23,005**	**100.0**

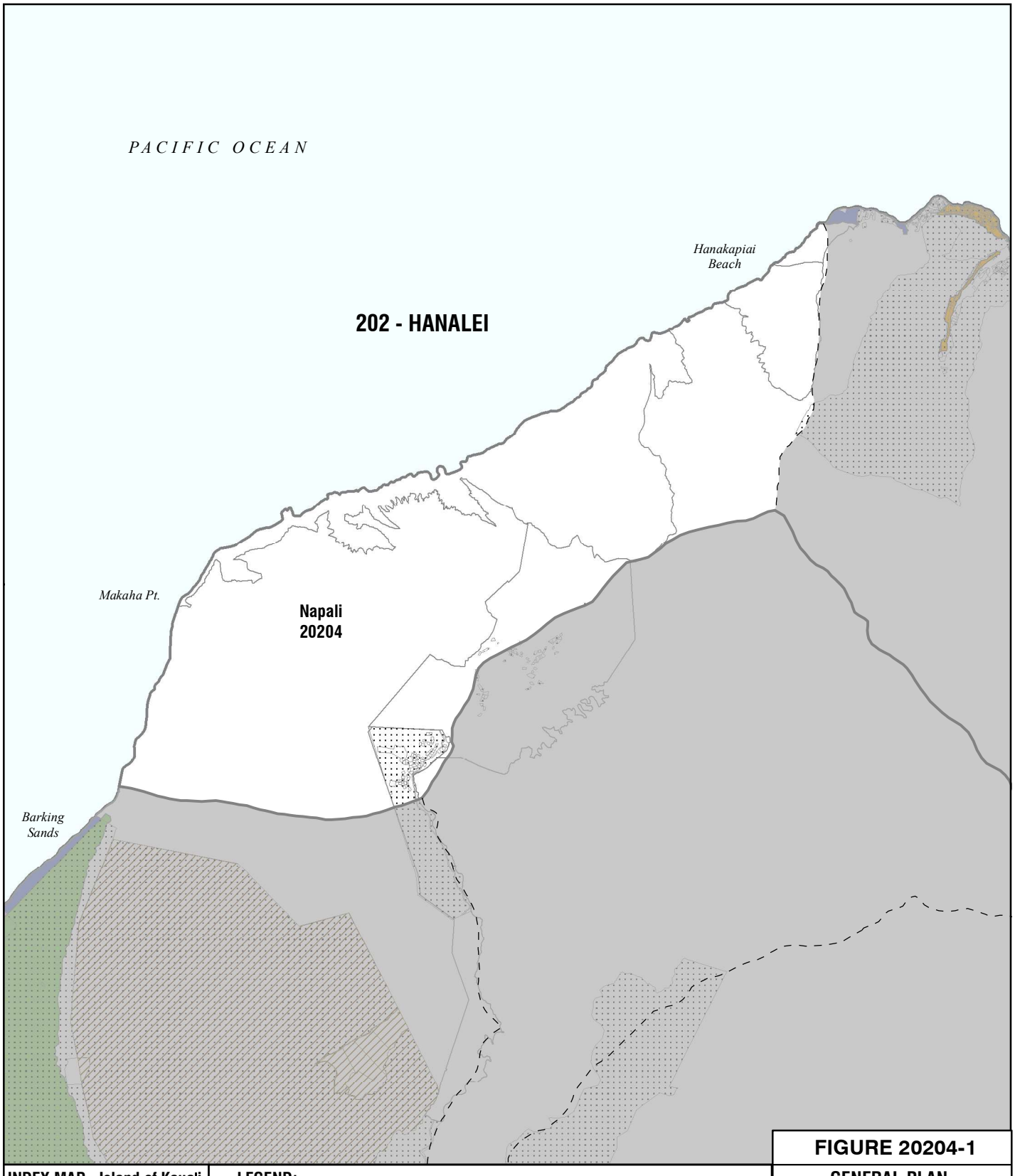
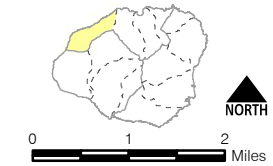


FIGURE 20204-1

GENERAL PLAN LAND USE MAP
Aquifer Sector: HANALEI - 202
Aquifer System: NAPALI - 20204

INDEX MAP - Island of Kaua'i



LEGEND:

- Aquifer Sector Areas
- Aquifer System Areas
- Hawaiian Home Lands
- Developed Properties

Land Use Allocation Guide

- Agricultural
- Open
- Park
- Military
- Residential Community
- Resort
- Transportation
- Urban Center

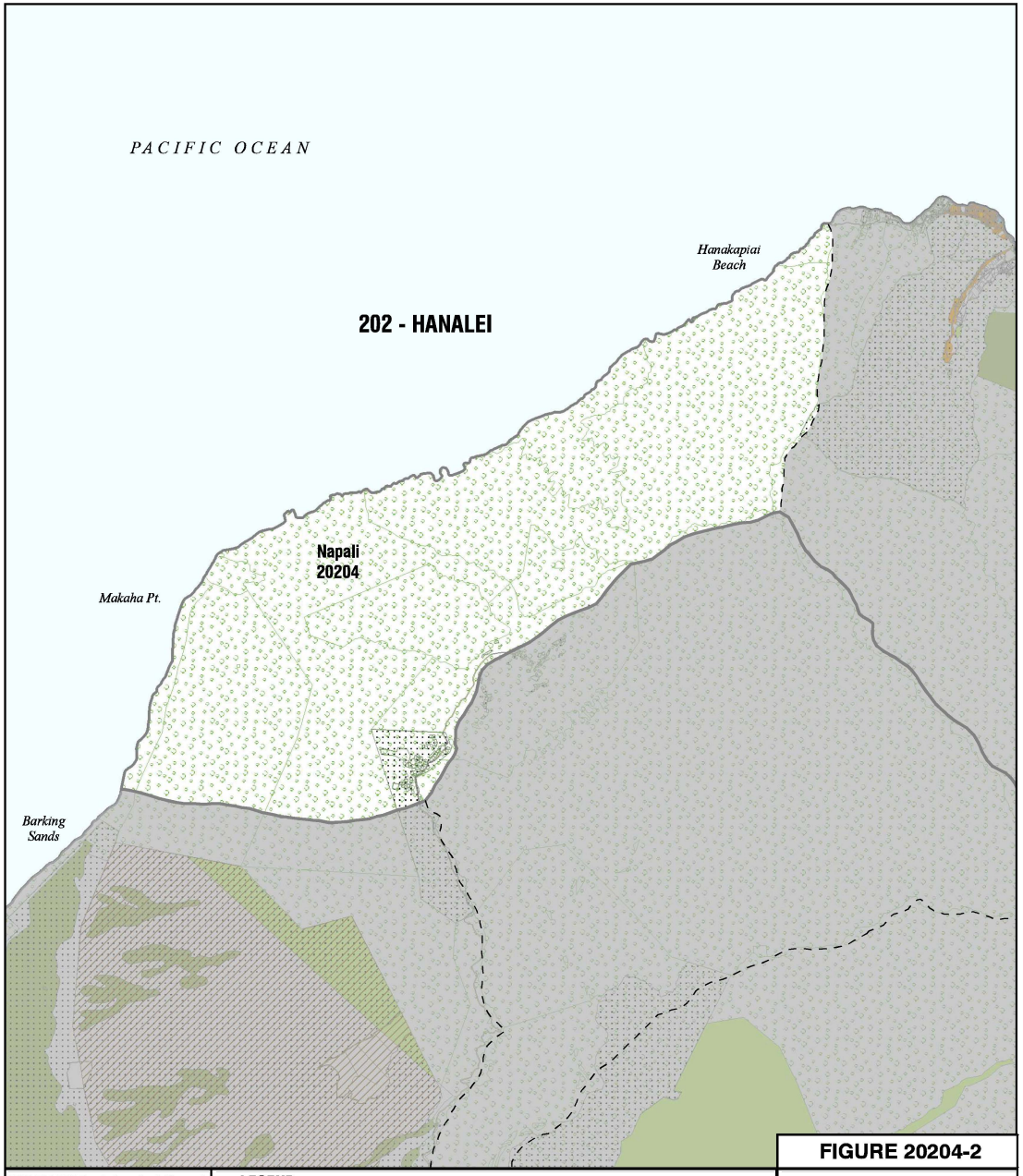


FIGURE 20204-2

COUNTY ZONING

Aquifer Sector: HANALEI - 202
Aquifer System:
NAPALI - 20204

Fukunaga & Associates, Inc.
Consulting Engineers

Kaua'i County - Department of Water

KAUA'I WATER USE AND DEVELOPMENT PLAN UPDATE

20204-2 EXISTING WATER RESOURCES

20204-2.1 Ground Water

The Nāpali ASYA has a sustainable yield of 20 mgd. According to the 2014 CWRM database, there are 2 production wells in the system, 1 domestic and 1 military well. Refer to **Appendix A** for this database. **Figure 20204-3** shows the well locations.

20204-2.2 Surface Water

There are 14 streams classified as perennial in the Nāpali ASYA, 13 of which are considered continuous and 1 considered intermittent. The continuous streams are: Awaʻawapuhi Stream, Honopū Stream, Nakeikionaiwi Stream, Kalalau Stream, Pōhakuao Stream, Waiolaʻa Stream, Hanakoa Stream, Waiahuakua Stream, Hoʻolulu Stream, Hanakāpīʻai Stream, Maunapuluo Stream, Miloliʻi Stream, and Nuʻalolo Stream. The intermittent stream is the Kauhao Stream. The USGS has 3 active surface water gages in the system area. The gages are located on Kalalau Stream, Hanakoa Stream, and Hanakāpīʻai Stream, which were previously listed in **Table 1-19**.

There are 2 declared stream diversions in the CWRM database shown on **Figure 20204-4**, which accounts for 1 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 Nāpali ASYA is 19 mgd.

20204-2.3 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.

20204-2.4 Rainwater Catchment

Rainwater catchment is a viable resource for areas that are not served by ground water or surface water. **Figure 20204-5** 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.

20204-2.5 Recycled Water

There are no wastewater reclamation facilities in the Nāpali ASYA.

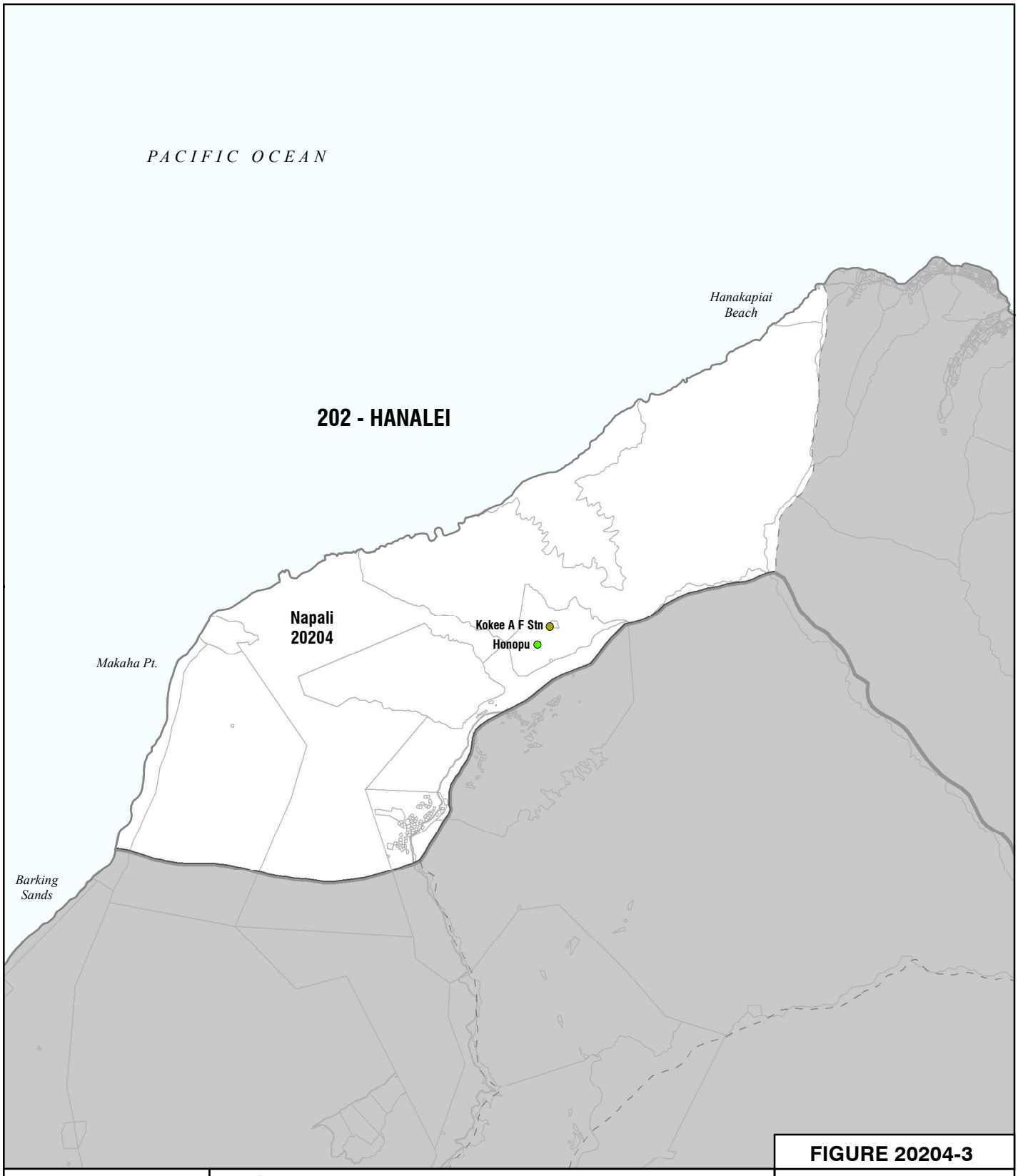
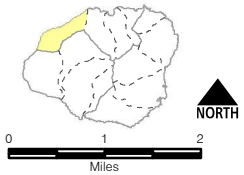


FIGURE 20204-3

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: HANALEI - 202
Aquifer System:
NAPALI - 20204

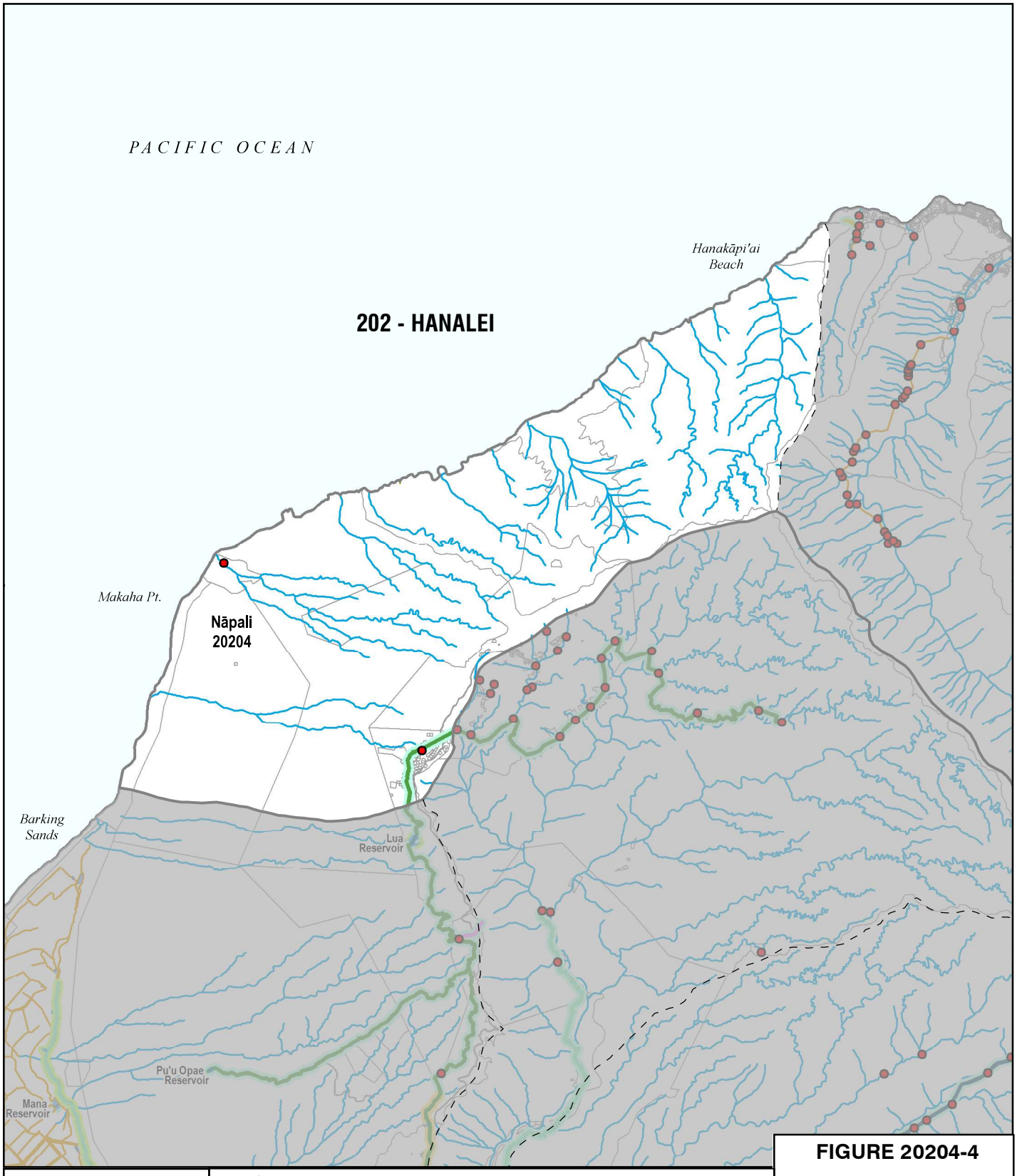


FIGURE 20204-4

STREAMS & DIVERSIONS

Aquifer Sector: HANALEI - 202
Aquifer System:
NĀPALI - 20204

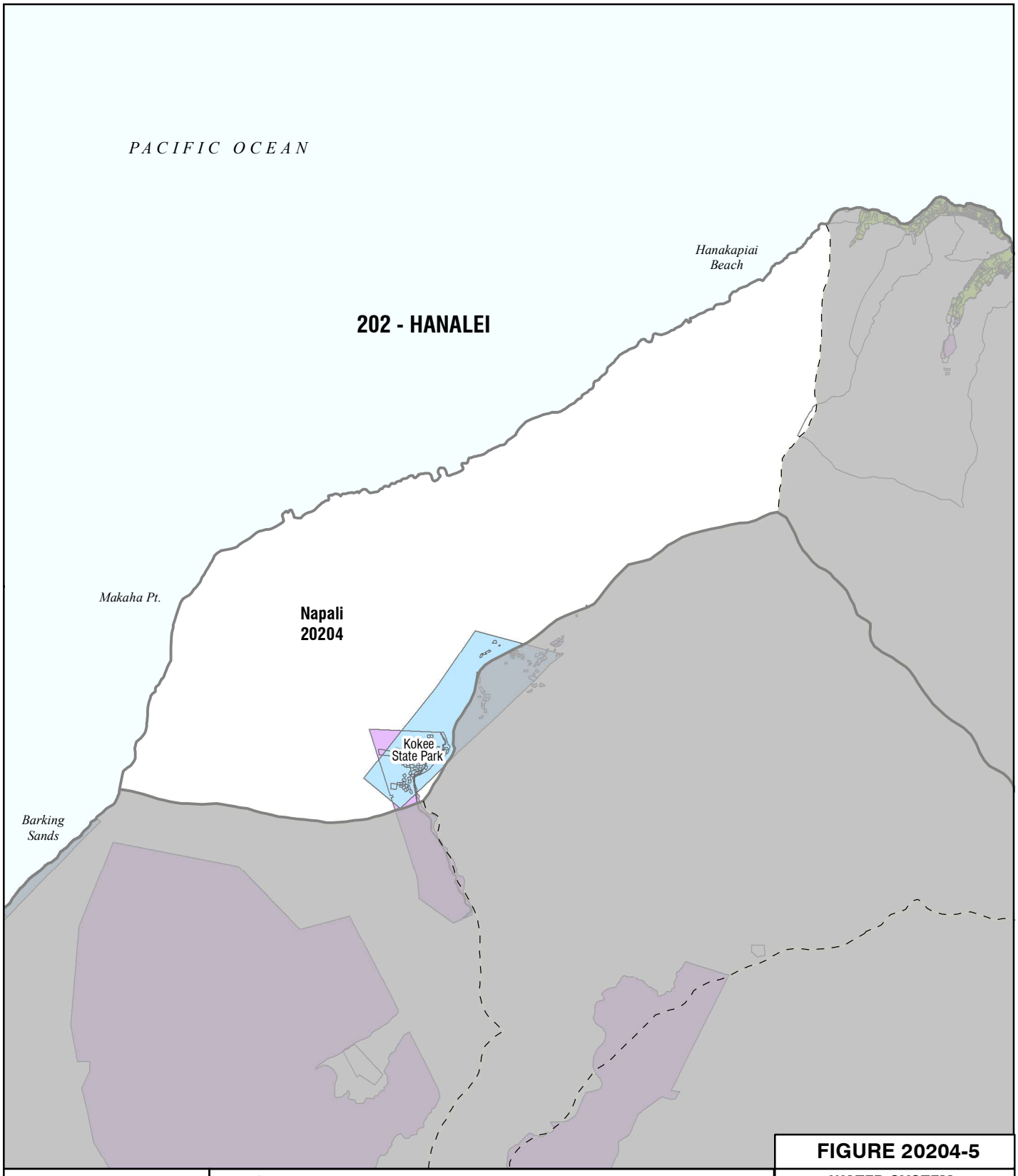
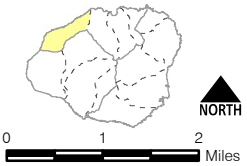


FIGURE 20204-5

WATER SYSTEM & SERVICE AREA
Aquifer Sector: HANALEI - 202
Aquifer System: NAPALI - 20204

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)

20204-3 EXISTING WATER USE

20204-3.1 General

The following section presents the total estimated average water use within the Nāpali 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 20204-5** summarize the water use in accordance with CWRM categories.

Table 20204-5: Existing Water Use by Category – Nāpali ASYA

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

[1] Surface Water – TBD from AWUDP

20204-3.2 Domestic Use

There is 1 well classified as "Domestic" in the CWRM database; however, it has not reported pumpage.

20204-3.3 Industrial Use

There are no wells classified as "Industrial" in the Nāpali ASYA.

20204-3.4 Irrigation Use

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

20204-3.4.1 Ground Water

There are no wells classified as "Irrigation" in the Nāpali ASYA.

20204-3.4.2 Recycled Water

There is no recycled water use in the Nāpali ASYA.

20204-3.4.3 Surface Water

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

20204-3.5 Agricultural Use

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

20204-3.5.1 Ground Water

There are no wells classified as "Agriculture" in the Nāpali ASYA.

20204-3.5.2 Recycled Water

There is no recycled water use in the Nāpali ASYA.

20204-3.5.3 Surface Water

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

20204-3.6 Military Use

There is 1 well classified as "Military" in the CWRM database owned by the United States Air Force; however, it has not reported any pumpage.

20204-3.7 Municipal Use

There is no municipal water use in the Nāpali ASYA.

20204-3.7.1 County Water Systems

There are no County water systems in the Nāpali ASYA regulated by the DOH.

20204-3.7.2 State Water Systems

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

20204-3.7.3 Federal Water Systems

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

20204-3.7.4 Private-Public Water Systems

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

20204-3.8 Existing Water Use by Resource

20204-3.8.1 Ground Water

Table 20204-6 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 20204-6: Pumpage – Nāpali ASYA

Pumpage (mgd)	SY (mgd)	Pumpage Portion of SY
0	20	0%

Based on available information from the CWRM database, the current ground water use is 0 percent of the sustainable yield.

20204-3.8.2 Surface Water

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

20204-3.8.3 Water Conservation

Water conservation, including water loss management, may reduce water use. See **Section 20204-2.3** for discussion of existing conservation efforts.

20204-3.8.4 Rainwater Catchment

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

20204-3.8.5 Recycled Water

There is no recycled water use in the Nāpali ASYA.

20204-4 FUTURE WATER USE

20204-4.1 Full Build-Out Water Demand Projections

The full build-out water demand projections based on the General Plan and County Zoning for the Nāpali ASYA is listed in **Table 20204-7** and **Table 20204-8**, respectively. Each land use class is associated with the most appropriate CWRM water use category.

Table 20204-7: General Plan Full Build-Out Water Demand Projection – Nāpali ASYA

GP Category	CWRM Category	Water Demand (mgd)
Agriculture	Agriculture/Domestic	0
Open	Domestic	0
Military	Military	0
Park	Irrigation	0
Residential	Domestic/Municipal	0
Resort	Domestic/Irrigation/Municipal	0
Transportation	Municipal	0
Urban Center	Domestic/Industrial/Municipal	0
DHHL	Domestic	0
	TOTAL	**0**

Table 20204-8: Zoning Full Build-Out Water Demand Projection – Nāpali ASYA

Zoning Class	CWRM Category	Water Demand (mgd)
Agriculture	Agriculture/Domestic	0
Commercial	Municipal	0
Industrial	Industrial/Municipal	0
Open	Domestic	0
Residential	Domestic/Municipal	0
Resort	Domestic/Irrigation/Municipal	0
DHHL	Domestic	0
	TOTAL	**0**

20204-4.1.1 Refined Land Use Based Water Projection

State Water Projects Plan

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

State Department of Hawaiian Home Lands

There are no DHHL tracts in the Nāpali 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

There are no agricultural lands in the Nāpali ASYA that received a score of 28 or better in the County of Kauaʻi IAL Study.

20204-4.1.2 Water Use Unit Rates

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

20204-4.2 Water Demand Projections to the Year 2035

The following section presents water demand projections to the year 2035 for the Nāpali ASYA. The projected low, medium, and high growth rates are listed in **Table 20204-9** and are graphed in **Figure 20204-6**. Potable (domestic, industrial, municipal, and military water uses) and non-potable (irrigation) water demands are also differentiated.

Table 20204-9: Water Demand Projection – Nāpali ASYA

Water Use Category	Water Demand by Year (mgd)								
	2015	2016	2017	2018	2019	2020	2025	2030	2035
GROWTH RATE C (HIGH)									
TOTAL	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Potable	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
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	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Potable	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
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	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Potable	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Non-Potable	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Figure 20204-6: Water Demand Projection Summary – Nāpali ASYA

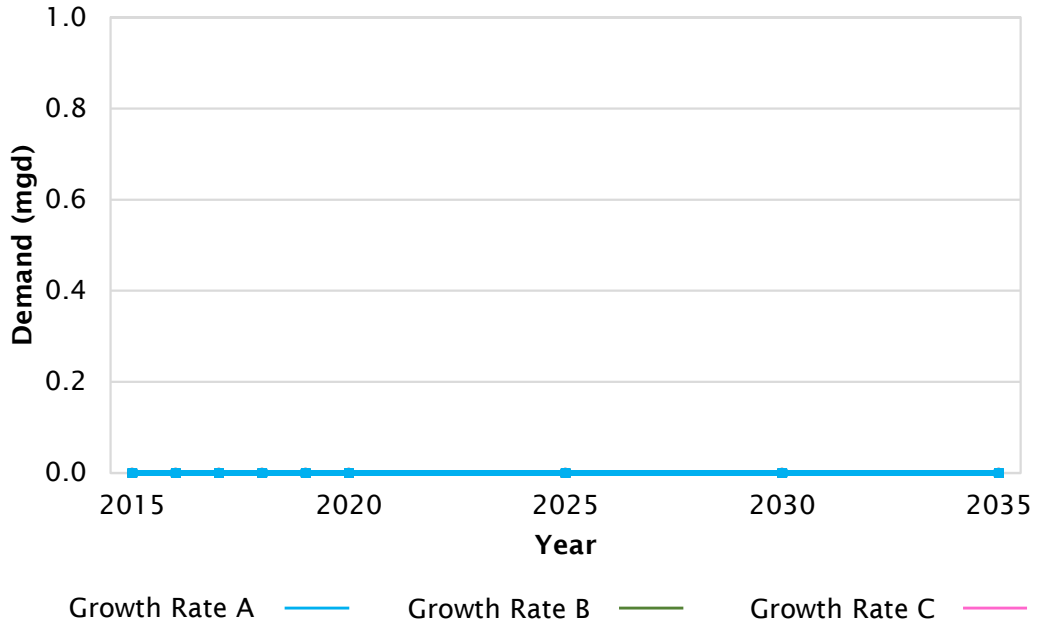


Table 20204-10 shows the breakdown of water demand projections for a medium growth rate by CWRM categories through the year 2035.

Table 20204-10: Medium Growth Rate B Water Demand Projection by Category – Nāpali ASYA

Water Use Category	Water Use by Year (mgd)								
	2015	2016	2017	2018	2019	2020	2025	2030	2035
Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Potable	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
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	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
DOW	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

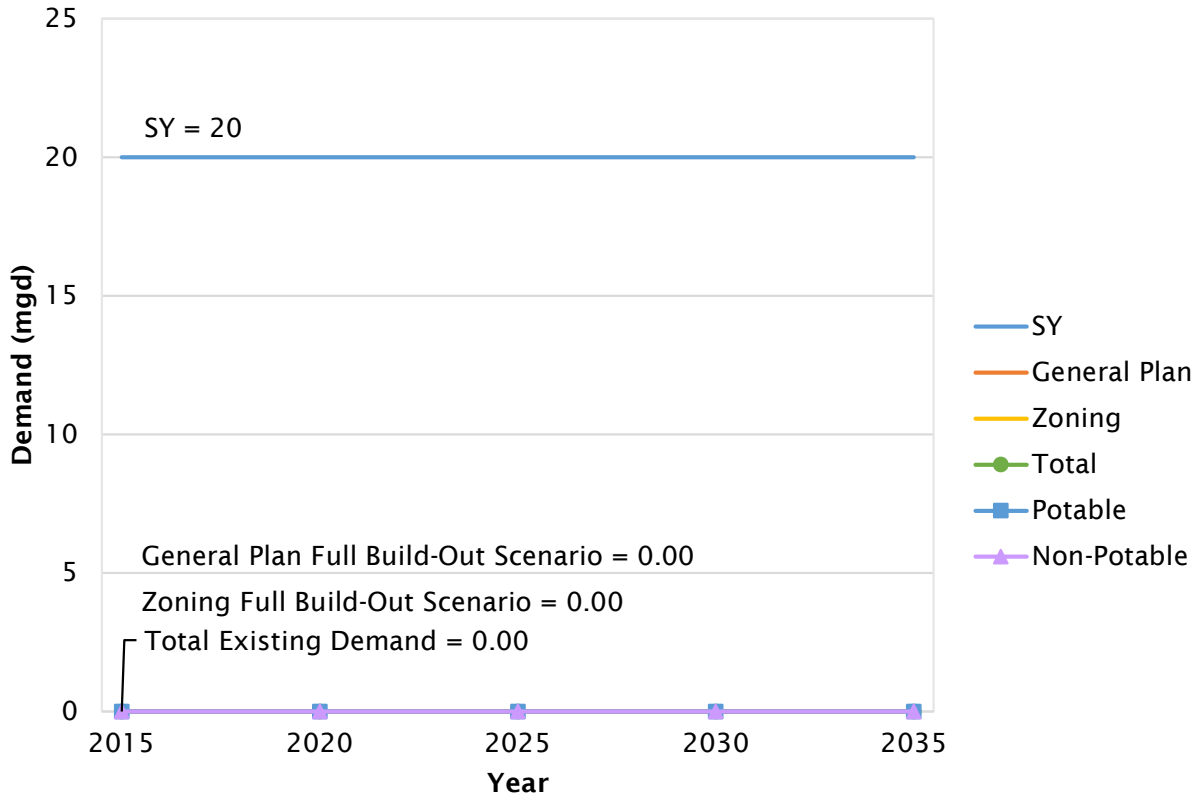
20204-4.3 Summary

Figure 20204-7 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 20204-11** summarizes the General Plan, Zoning, and 20-year water demand projection scenarios for the Nāpali ASYA. The sustainable yield is presented to draw comparisons. All demands are in mgd.

Table 20204-11: Summary of Demand Projections

SY (mgd)	FBO (mgd)		Medium Growth Rate by Year (mgd)								
	GP	Zoning	2015	2016	2017	2018	2019	2020	2025	2030	2035
20	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Figure 20204-7: Medium Growth Rate B Water Demand Projections and Full Build-Out – Nāpali ASYA



Note: Total existing demand includes municipal, domestic, industrial, military, and irrigation water uses. It does not include agriculture water use.

20204-5 RESOURCE AND FACILITY RECOMMENDATIONS

20204-5.1 Water Source Adequacy

20204-5.1.1 Full Build-Out

Development to the highest extent allowed by the General Plan and County Zoning within the Nāpali ASYA is sustainable, with General Plan and County Zoning full build-out water demands both requiring 0 percent of the 20 mgd sustainable yield due to the remote location of the ASYA.

20204-5.1.2 Twenty-Year Projection

The 2035 water demand projection for the Nāpali ASYA is sustainable and is 0 percent of the 20 mgd sustainable yield.

20204-5.2 Source Development Requirements

20204-5.2.1 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

There are two existing wells in the Nāpali ASYA. Both wells are located in the high-level zone and have no reported pumpage. The Nāpali ASYA is largely uninhabited and undeveloped, and there is no projected demand to be met based on population or land use. Therefore, no additional wells are needed.

Surface Water

The Nāpali ASYA has 2 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 offstream 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 Kōke‘e Ditch Irrigation System (KODIS) passes through the Nāpali ASYA, bringing surface water from the Waimea ASYA to its service area in the Kekaha ASYA. The KODIS gaging station is listed as one of the two diversions in the Nāpali ASYA and has a declared flow of 19 mgd. This

declared flow is representative of the sum of flows diverted in the Waimea ASYA upstream of the gaging station.

Water Transfer

As aforementioned, the KODIS transfers water from the Waimea ASYA through the Nāpali ASYA to the Kekaha ASYA.

Water resources can also be transferred between ASYAs through public water systems. The Kōkeʻe State Park water system is partially in the Nāpali ASYA and partially in the Waimea ASYA. The sources for this water system are in the Waimea ASYA, and the water is then distributed to its service area in the Waimea ASYA and Nāpali ASYA.

Water Conservation

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.

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 should be concentrated within existing urban areas. Therefore, use of rainwater catchment systems is not anticipated to increase significantly.

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 Hawaiʻi (Storm Water Report) in 2008 but did not identify any storm water reclamation and reuse opportunities in the Nāpali ASYA.

Recycled Water

Recycled water is a valuable resource. However, there are no wastewater reclamation facilities (WWRFs) in the Nāpali 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.

20204-5.2.2 Demand-Side Management

Development Density Control

As previously mentioned, the Nāpali ASYA is largely uninhabited and undeveloped, and there are no projected water demands.

20204-5.3 Recommended Alternatives

The Nāpali ASYA is largely uninhabited and undeveloped, and there are no projected water demands to be met. Rainwater catchment is the likely alternative for any remote domestic users in this area.