

South Maui R-1 Recycled Water Verification Study



Prepared for:
County of Maui, County Council

Prepared by:
Department of Environmental Management,
Wastewater Reclamation Division

Department of Water Supply
Water Resource Planning Division

December, 2009

South Maui R-1 Recycled Water Verification Study

Table of Contents

CHAPTER 1 - INTRODUCTION	2
Background.....	2
Objectives	3
Report Outline.....	3
CHAPTER 2 – KIHEI WWRF AVAILABLE R-1 WATER CAPACITY	5
CHAPTER 3 - R-1 WATER DISTRIBUTION SYSTEM EXPANSION OPTIONS IN THE SOUTH MAUI AREA.....	7
Utilization of Existing Distribution System.....	7
Planned Utilization of Private R-1 Line	9
Option 1: Extend Waipulani Street 12” Line to South Kihei Road	9
Option 2: Extend Liloa Drive 12” Line Down Halekauai Street to South Kihei Road	10
Option 3: Extend Liloa Drive 12” Line to Proposed Kihei High School	10
Option 4: Extend East Welakahao Road 12” Line along Future North-South Collector Road.....	11
Option 5a and 5b: Extend 12” and/or 18” Line to North Kihei	11
Option 5a: Extend 18” R-1 Line above Piilani Highway to North Kihei	11
Option 5b: Extend 12” R-1 Line below Piilani Highway to North Kihei	12
Option 6: Extend 18” R-1 Line above Piilani Highway to Wailea Resorts.....	12
CHAPTER 4 - SUMMARY OF R-1 WATER EXPANSION OPPORTUNITIES.....	14

List of Figures

Figure 1-1: Kihei WWRF Existing R-1 Water Distribution System.....	4
Figure 2-1: Kihei WWRF Available R-1 Water Supply.....	5
Figure 3-1: South Maui Potential R-1 Recycled Water Expansion Options.....	8

List of Tables

Table 3-1: Utilization of Existing Distribution System – Properties Served.....	7
Table 3-2: Planned Utilization of Private R-1 Line – Property Served.....	9
Table 3-3: Option 1 – Properties Served.....	9
Table 3-4: Option 2 – Properties Served.....	10
Table 3-5: Option 3 – Properties Served.....	10
Table 3-6: Option 4 – Properties Served.....	11
Table 3-7a: Option 5a – Properties Served.....	12
Table 3-7b: Option 5b – Properties Served.....	12
Table 3-8: Option 6 Properties Served.....	13
Table 4-1: Option Summary of Potable Water Displacement.....	15

CHAPTER 1 - INTRODUCTION

This study was prepared as required by a fiscal year 2010 budget provision that stated:

“Provided, that Department of Environmental Management shall work with the Department of Water Supply on a new verification study relating to extending the transmission and optimization of R-1 recycled water from the existing South Maui R-1 water distribution system, Kihei Wastewater Reclamation Facility (WWRF), to North Kihei and commercial properties near the WWRF in order to displace potable water currently used for landscape irrigation and provide a source of irrigation water for planned and future projects. The Department of Environmental Management shall transmit a status report regarding this study to the Council by January 1, 2010.”

This study includes data on the current status of R-1 water usage in the Kihei area, as well as, information regarding developing planned and potential future projects.

Background

The Kihei WWRF serves the South Maui area from Wailea to Sugar Beach. The current dry weather flow capacity and R-1 water production capacity of the facility is 8.0 million gallons per day (mgd). R-1 water is the highest quality of recycled water identified by the State of Hawaii’s Department of Health. It can be used for a multitude of purposes with very few restrictions.

The current average dry weather wastewater flow to the Kihei WWRF is 3.58 mgd. The volume of R-1 water reused from the facility ranges from 20 to 52% of the incoming wastewater flow depending upon the time of year. The daily average volume of R-1 water used is 1.38 mgd or 38% of the total daily R-1 water produced.

The County of Maui’s Wastewater Reclamation Division (WWRD) developed its water reuse program to proactively supplement Maui’s limited water supplies and to reduce the use of injection wells for effluent disposal. To support this program, the County established an ordinance (Chapter 20.30 of the Maui County Code) that requires commercial properties to utilize recycled water for irrigation purposes if it is available. Currently, the water reuse program saves over 400 million gallons of potable water each year. The WWRD has developed R-1 water distribution systems in South and West Maui. The South Maui distribution system now provides recycled water to twenty-four commercial properties in South Maui. At these properties, R-1 water is used for various purposes including landscape irrigation, agricultural irrigation, cooling, fire control, toilet/urinal flushing, composting, erosion control, and as a source of drinking water for cattle. In addition, construction companies utilize the R-1 water for dust control. **Figure 1-1** shows the current layout of the Kihei WWRF’s R-1 water distribution system.

The water reuse program is currently funded through a combination of recycled water fees and sewer user fees. To make the R-1 water competitive with other conventional water sources, sewer user fees pay for approximately 75% of program costs including debt service and operation/maintenance expenses. Fees for recycled water service are set in the County's annual budget. For FY2010, the recycled water consumer classes with respective fees are:

- Major Agriculture: \$0.14 per 1,000 gallons
- Agriculture: \$0.30 per 1,000 gallons
- All Others: \$1.16 per 1,000 gallons

Most of the funding for the Kihei WWRF's R-1 water production and distribution infrastructure was obtained through either the State Revolving Fund (SRF) program or general obligation bonds. In several instances, developers are now being required to fund improvements to the County of Maui's recycled water systems. For example, as a condition of development, the Maui Highland Partners extended the R-1 distribution system to their project in 2006 at their expense.

Objectives

The main purpose of this report is to identify and evaluate options for expanding the County of Maui's R-1 water distribution system in the South Maui area. Such action would replace current or projected future potable water use at commercial properties and reduce the use of injection wells for effluent disposal.

Report Outline

The remainder of this report includes the following chapters:

- Chapter 2 provides a discussion on the available R-1 water capacity at the Kihei WWRF.
- Chapter 3 identifies options for expanding the Kihei WWRF's R-1 water distribution system. Each option that is identified lists commercial properties that could be served, the peak volume of R-1 water that each property requires and the estimated cost for developing the required infrastructure to deliver the R-1 water to these properties.
- Chapter 4 provides a summary of the expansion opportunities.

Pacific Ocean

Kihei WWPS No. 4

Kihei WWPS No. 5

Kihei WWPS No. 6

Waipuilani Road

Lipoa Drive

S. Kihei Road

North - South Collector Road

Pihani Highway

Hokulani Golf Villas

Kihei Tech Park

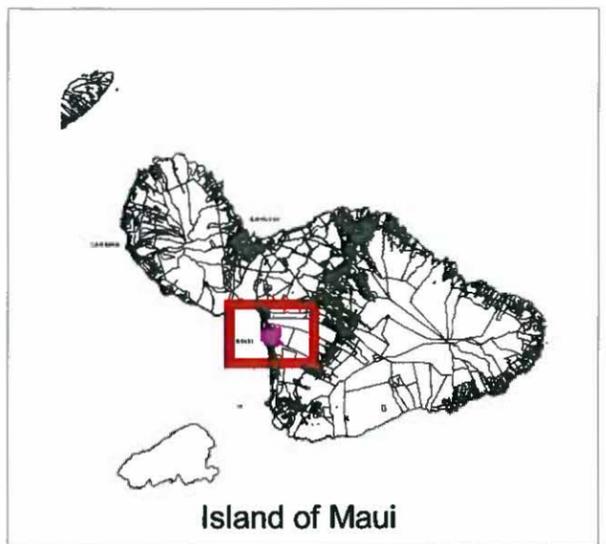
Elleaire Golf Course

Hope Chapel

Kalama Park

Kihei Wastewater Reclamation Facility

County of Maui Reclaimed Water Tank (300' elevation)



LEGEND

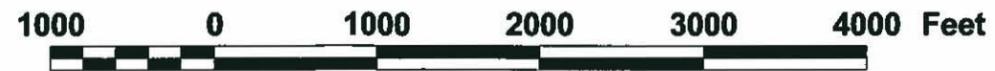
Private County		Pump Station
		Manhole
		Sewer
		Force main
		WWRF
		Recycled Water
		Injection well



DECEMBER 2009

KIHEI WASTEWATER RECLAMATION FACILITY RECLAIMED WATER SYSTEM

Figure 1-1
4



CHAPTER 2 – KIHAI WWRF AVAILABLE R-1 WATER CAPACITY

The purpose of this chapter is to discuss the available R-1 water capacity at the Kihei WWRF. The available R-1 water capacity is determined by incoming wastewater flow and the remaining R-1 water that is left over after existing reuse customer's water demands are met. Seasonal climatic conditions dramatically impact each respective commercial property's irrigation demands. During the cooler, wetter winter months, more R-1 water produced at the Kihei WWRF is available than during the warmer, drier summer months when peak R-1 water demand occurs. **Figure 2-1** shows the Kihei WWRF's incoming wastewater flow as compared to the outgoing R-1 water that is reused for the period of July 2008 through October 2009.

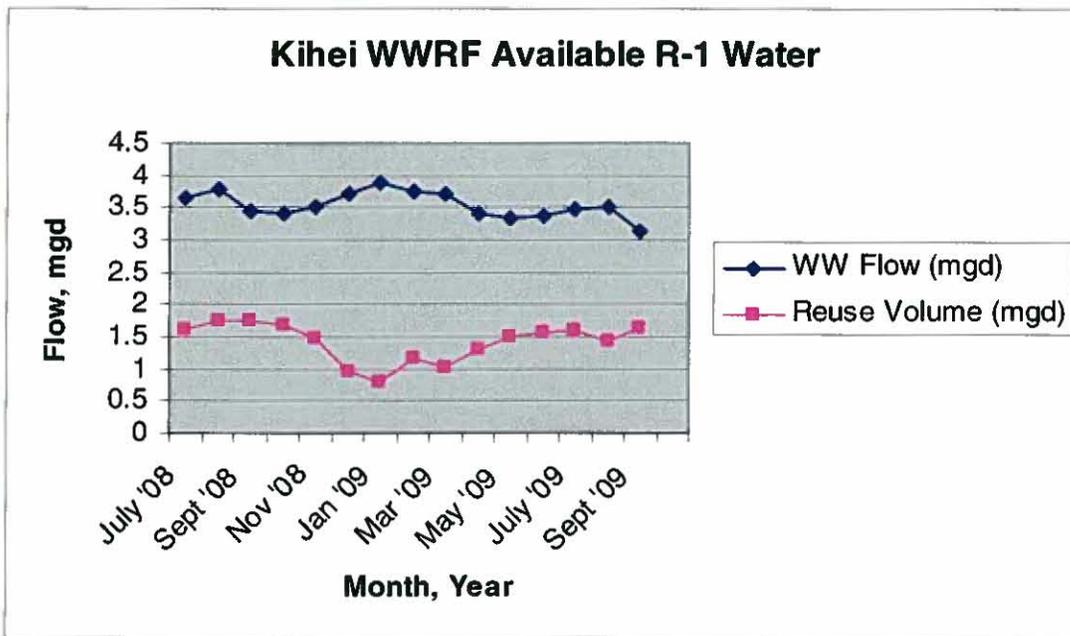


Figure 2- 1: Kihei WWRF Available R-1 Water Supply

The average daily wastewater flow to the facility in FY2009 was 3.58 mgd however due to lower tourism levels associated with the worldwide economic recession, the average daily flow to the facility in the first half of FY2010 dropped to 3.33 mgd. The lowest daily average wastewater flow of 3.14 mgd occurred in August, 2009.

The volume of R-1 water reused from the Kihei WWRF varies throughout the year and is subject to seasonal fluctuations. Generally, more water is used for irrigation in the dry summer and fall months than in the cooler, wetter winter and spring months. The months of July through October are the period of peak use of R-1 water in the Kihei area. The average daily R-1 water reuse volume for this four month period in FY2009 was 1.69 mgd. For FY2010, the four month daily average volume was 1.58 mgd. The highest daily average R-1 use of 1.75 mgd occurred in August, 2008. The use of recycled water in the Kihei area will increase in the near future even if the County does

not expand its R-1 water distribution system due to increased use at existing commercial properties (i.e. Hokolani Golf Villas) and the development of new commercial properties that are in close proximity to existing County R-1 water distribution lines (i.e. South Maui Community Park). Thus, the peak daily R-1 water reuse volume could very well be at or above 2.0 mgd within the next year or two.

An important rule for any utility purveyor is for demand not to exceed supply (R-1 water production capability). Based on the above, the excess R-1 water that is currently available during the peak demand months is approximately 1.39 mgd (3.14 mgd wastewater flow, August, 2009 minus 1.75 mgd R-1 volume, August, 2008). However, as explained in the preceding paragraph, the available reuse volume will most likely be less due to additional planned R-1 use at developing commercial properties that are located near the existing R-1 distribution system. Available R-1 water volume could be as little as 1.0 mgd during the July – October time periods in the near future. In order that R-1 demand not exceed R-1 supply, it is important that the County of Maui not over commit to R-1 water service to commercial properties.

During the winter months, wastewater flow rates to the treatment plant typically increase due to greater tourism levels in the South Maui area. At the same time, irrigation demands lessen significantly. As a result, excess R-1 water is available. For example, in January, 2009, the average daily wastewater flow to the Kihei WWRF was 3.87 mgd. The average daily R-1 reuse volume was only 0.78 mgd leaving an excess of 3.09 mgd of R-1 water. In order to utilize the excess R-1 water from the facility during the winter months, distribution systems would need to be constructed that provide commercial properties with large irrigated areas with a seasonal supply of R-1 water. Examples of such properties are HC&S and Monsanto in the North Kihei area and the resorts and golf courses in Wailea area. It is unlikely that the Kihei WWRF could provide enough R-1 water during the summer months to meet the total water demands of these commercial properties. Properties with large irrigated acreage would most likely need to switch back to their alternative source of water during the drier months when most of the R-1 water produced at the Kihei WWRF is used at commercial properties that are in closer proximity to the facility.

An economic disadvantage from the County WWRD's standpoint to this approach is that these larger commercial properties fall into the "Major Agricultural" or "Agricultural" recycled water rate classes meaning that the WWRD would receive the lowest revenue from these classes of recycled water users and thus more costs are placed on the County and the sewer users. Additionally, some of these larger users currently use non-potable water thus they might even pay lower rates to use R-1 water as they would qualify for avoided cost pricing.

CHAPTER 3 - R-1 WATER DISTRIBUTION SYSTEM EXPANSION OPTIONS IN THE SOUTH MAUI AREA

The WWRD has explored several options for expanding the use of Kihei WWRF's existing R-1 water distribution system. Each option identifies the commercial properties that could be served, the estimated peak volume of R-1 water that each property requires and the estimated cost for developing the required infrastructure to deliver the R-1 water to these properties. The estimated peak R-1 water demands were obtained either from each project's landscape architect or by using the standard irrigation requirement of 6,315 gallons per acre per day. Cost estimates were based on previous engineering cost estimates from planning studies that were conducted by consultant engineering firms. Components of the cost estimates included linear feet of pipe, service laterals, R-1 storage tanks, ultra-violet disinfection system upgrades, R-1 water pumping station upgrades and installation of pressure reducing systems. **Figure 3-1** shows the locations for the potential R-1 distribution systems and the projects that they would serve.

Utilization of Existing Distribution System

Several projects that will utilize recycled water for irrigation projects are already well into the design phase or even beginning construction. These projects include both planned new developments and established developments that will be expanding. Required improvements include 4,500 linear feet of transmission line, approximately seventeen service laterals and a booster pump station for the R & T Park. The majority of these projects with the exception of the Maui R & T Park would have used potable water for irrigation if the R-1 water was not available. **Table 3-1** lists these projects.

Table 3-1: Utilization of Existing Distribution System – Properties Served

Property	Estimated Peak R-1 Demand (GPD)	Estimated Cost (\$)
South Maui Community Park	196,500	--
Maui Highlands - Nu`u A`ina	12,000	--
Maui R & T Park	261,000	--
Kihei Multi-Purpose Center	10,000	--
Hokulani Golf Villas - Phases 2 & 3	100,000	--
Kihei Roundabout	6,000	--
Kihei Bikeway	14,000	--
Total Option 1	599,500	2,585,000

SOUTH MAUI POTENTIAL R-1 RECYCLED WATER EXPANSION OPTIONS



LEGEND

- Current Reuse Sites
- Current Distribution Line
- Planned Distribution Line
- Potential Distribution Line Alt.
- Potential Distribution Line
- Potential Reuse Tank
- Planned Dev. 1
- Planned Dev. 2
- Option 1
- Option 2
- Option 3
- Option 4
- Option 5a
- Option 5b
- Option 6a Potable Potential
- Option 6b Non-Potable Potential
- WWRF Locations

Pacific Ocean

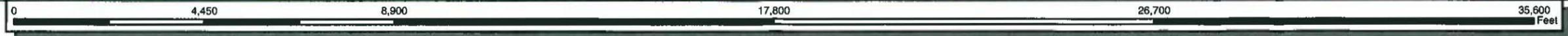


Figure 3-1



Planned Utilization of Private R-1 Line

Another planned project involves extending a private 12" R-1 pipe line currently owned by Monsanto to the site of the new South Maui police station. Monsanto is planning to dedicate their R-1 line to the County so that the entire pipe line (both existing and planned extension) are owned, operated and maintained by the County's WWRD. The cost for this expansion will be the responsibility of the County of Maui (Police Department). Improvements include 700 feet of transmission line and one service lateral. **Table 3-2** provides estimated R-1 usage and cost information.

Table 3-2: Planned Utilization of Private R-1 Line – Property Served

Property	Estimated Peak R-1 Demand (GPD)	Estimated Cost (\$)
South Maui Police Station	16,500	--
Total Option 2	16,500	275,000

Option 1: Extend Waipulani Street 12" Line to South Kihei Road

The Waipulani Street R-1 water pipe line was installed in 2003 with the intention of ultimately extending it to South Kihei Road so that R-1 water could displace both potable water and brackish water that is used to irrigate landscapes at condominiums and the Waipulani Park. The line was to be installed during a road widening project; however, the road widening was cancelled due to opposition from the community. All of the projects listed in **Table 3-3** currently use potable water for irrigation with the exception of the Maui Sunset and Kauhale Makai. Both of these sites utilize brackish water for irrigation. Required improvements include 2,700 linear feet of transmission line and nine service laterals

Table 3-3: Option 1 – Properties Served

Property	Estimated Peak R-1 Demand (GPD)	Estimated Cost (\$)
Maui Sunset*	30,000	--
Waipulani Condominium	6,000	--
Waipulani Park	50,000	--
Maui Schooner	30,000	--
Luanakai	35,000	--
Kauhale Makai*	17,000	--
Paradise Gardens	50,000	--
Koa Resort	21,000	--
Koa Lagoon	8,000	--
Total Option 1	247,000	1,215,000

*Currently utilizes brackish water.

Option 2: Extend Liloa Drive 12" Line Down Halekuai Street to South Kihei Road

The 12" R-1 water pipe line along Liloa Drive could be extended down Halekuai Street to South Kihei Road to provide R-1 water to irrigate landscape at the Maui Gardens Condominium and Saint Theresa's Church. Commercial properties along Halekuai Street could also utilize R-1 water however landscaping at these properties is minimal. All of the properties currently utilize potable water for landscape irrigation. Required improvements include 3,420 feet of transmission line and two service laterals. **Table 3-4** provides estimated R-1 water usage and cost information.

Table 3-4: Option 2 – Properties Served

Property	Estimated Peak R-1 Demand (GPD)	Estimated Cost (\$)
Maui Gardens Condominium	19,000	--
Saint Theresa's Church	19,000	--
Total Option 2	38,000	1,257,000

Option 3: Extend Liloa Drive 12" Line to Proposed Kihei High School

Option 3 involves extending the existing 12" line that currently terminates at the intersection of Liloa Drive and Waipulani Road to the proposed Kihei High School site. Due to the large acreage associated with a high school campus and athletic fields, this site will require a significant volume of water for irrigation. The R-1 water line would need to cross the Piilani Highway. A potential pathway is under a bridge that crosses the Waipulani Gulch. This pathway would enable the pipe line to be installed without disrupting the newly paved highway. The high school would need to boost pressure of the R-1 water so that the large areas receive a sufficient amount of irrigation water. Common areas at the Kamali'i Alayna subdivision could also be provided with R-1 water if this extension was completed. This extension would result in deferred potable water savings at the Kihei High School and displace potable water currently used at the Kamali'i Alayna subdivision. Required improvements include 2,530 linear feet of transmission line and two service laterals. **Table 3-5** provides estimated R-1 water usage and cost information.

Table 3-5: Option 3 – Properties Served

Property	Estimated Peak R-1 Demand (GPD)	Estimated Cost (\$)
Kihei High School	230,000	--
Kamali'i Alayna Subdivision	15,000	--
Total Option 3	245,000	1,135,350

Option 4: Extend East Welakahao Road 12” Line along Future North-South Collector Road

The North-South Collector Road is expected to be built within 5 – 10 years. At that time, the R-1 water distribution system could be extended along this corridor to the south by connecting to the existing East Welakahao Road distribution system. If a pipe line is constructed, it could provide R-1 water to condominiums that are located makai of the North-South Collector Road as well as to the Kamali'i School. A pressure reducing system would need to be installed at the East Welakahao Road connection point since the Department of Health requires recycled water main lines to be 10 p.s.i. less than potable water main lines that are in the immediate vicinity. All of these properties currently use potable water for irrigation although some use very little. Conversion of private irrigation systems is the responsibility of the individual land owners. As the current irrigation water usage is low, such an investment may be difficult for property owners. Required improvements include 5,575 linear feet of transmission line, seven service laterals and a pressure reducing system. **Table 3-6** provides R-1 water use and cost information.

Table 3-6: Option 4 – Properties Served

Property	Estimated Peak R-1 Demand (GPD)	Estimated Cost (\$)
Kalama Heights	24,000	--
Maui Vista	10,000	--
Maui Coast Hotel	6,315	--
World Mark	10,000	--
Pacific Shores	2,700	--
Ke Ali'i Ocean Villas	4,000	--
Kamali'i Elementary School	63,150	--
Total Option 4	120,165	2,411,450

Option 5a and 5b: Extend 12” and/or 18” Line to North Kihei

The Department of Water Supply and the Wastewater Reclamation Division co-funded a study completed in 2005 entitled the Kihei Effluent Reuse System Expansion Study that evaluated options for extending the existing R-1 distribution system to North Kihei where Monsanto currently utilizes up to 0.5 mgd of potable water for seed corn irrigation. These options are described below. The planning cost information was obtained from this study.

Option 5a: Extend 18” R-1 Line above Piilani Highway to North Kihei

The existing 18” R-1 line could be extended above the Piilani Highway to North Kihei to provide Monsanto with R-1 water for its seed corn operation where potable water is used for irrigation. Haleakala Ranch and Ka Ono Ulu Ranch could also possibly

utilize the R-1 water for pasture irrigation however at this time; it is uncertain whether these two large landowners would fully utilize the R-1 water. Pasture irrigation falls into the “Major Agriculture” category of the County’s recycled water fee schedule and would result in the lowest revenue from the sale of recycled water since the rate is currently set at only \$0.14 per 1,000 gallons. Required improvements include 25,300 linear feet of transmission line, an access road, three service laterals, an upgrade to the the R-1 water pump station at the Kihei WWRF and two R-1 water storage tanks. **Table 3-7a** provides R-1 water use and cost information.

Table 3-7a: Option 5a – Properties Served

Property	Estimated Peak R-1 Demand (GPD)	Estimated Cost (\$)
Monsanto	499,000	--
Haleakala Ranch*	1,280,000	--
Ka Ono Ulu Ranch*	1,120,000	--
Total Option 5a	2,899,000	9,800,000

*Currently no water used by these properties.

Option 5b: Extend 12” R-1 Line below Piilani Highway to North Kihei

Another option for providing R-1 water to North Kihei for use by Monsanto is to extend the existing 12” R-1 line that is below the Piilani Highway along the future northward route of the proposed North-South Collector Road. Monsanto would need to boost water pressure with this option since the R-1 water would be delivered to the lowest portion of the property. The Maui Lu Hotel and the Kenolio Park could also be provided with R-1 water for landscape irrigation through this option. Required improvements include 12,100 linear feet of transmission line and three service laterals. **Table 3-7b** provides R-1 water use and cost information.

Table 3-7b: Option 5b – Properties Served

Property	Estimated Peak R-1 Demand (GPD)	Estimated Cost (\$)
Monsanto	499,000	--
Maui Lu Hotel	48,000	--
Kenolio Park	6,000	--
Total Option 5b	553,000	3,800,000

Option 6: Extend 18” R-1 Line above Piilani Highway to Wailea Resorts

The existing 18” line could be extended to the Wailea area where R-1 water could be used to offset over 1.1 million gallons of potable water used for landscape irrigation at several resorts and other commercial properties during peak usage periods. This option could also provide at least a seasonal supply of irrigation water to the Wailea

Blue Golf Course where non-potable brackish water is used for irrigation. An adequate supply of R-1 water may only be available for the golf courses during the winter months when R-1 water use at existing and planned future properties decreases. This is the most expensive option due to the required improvements which include 26,235 feet of transmission line, nineteen service laterals, two R-1 water storage tanks, an ultra violet disinfection system channel upgrade, a pressure reducing system and the need to upgrade the R-1 water pump station at the Kihei WWRP. **Table 3-8** provides R-1 water use and cost information.

Table 3-8: Option 6 – Properties Served

Property	Estimated Peak R-1 Demand (GPD)	Estimated Cost (\$)
3400 Wailea Alanui	9,266	--
Ulua Beach Park	14,098	--
Four Seasons Resort	38,656	--
Grand Wailea	192,558	--
Kai Malu Wailea	153,869	--
Kea Lani Resort	156,098	--
Keauhou Homeowners Assoc.	11,246	--
Maluhia at Wailea	24,393	--
Mariott Hotel	69,016	--
One Palauea Bay Comm. Assoc.	30,885	--
The Shops at Wailea	44,754	--
Wailea Comm. Assoc	181,246	--
Wailea Ekolu Village	47,902	--
Wailea Elua Village	49,736	--
Wailea Fairways	54,230	--
Wailea Golf Estates	90,492	--
Wailea Hotel & Beach Resort	18,786	--
Wailea Town Center	9,639	--
Wailea Blue Golf Course*	1,000,000	--
Total Option 6	2,196,870	21,137,500

* Currently utilizes brackish water.

CHAPTER 4 - SUMMARY OF R-1 WATER EXPANSION OPPORTUNITIES

The objectives of the water reuse program are to displace current or projected future potable water use at commercial properties and reduce the use of injection wells for effluent disposal. Ideally, the use of recycled water at any given commercial property will meet both objectives. Using recycled water for agricultural or golf course irrigation could result in large volumes of recycled water being used. With agricultural irrigation of pasture land, seed corn, sugar cane or some other crop, the use of injection wells at the Kihei WWRF could be significantly reduced. However, no potable water would be saved and the County WWRD would earn the least revenue from this type of use.

The County WWRD must fulfill R-1 water obligations for projects that are either (a) already utilizing R-1 water and will see increased use as their projects expand, or for (b) projects that are in close proximity to existing R-1 distribution system infrastructure and will be utilizing R-1 water in the near future. The total R-1 demand for these commitments is 616,000 gallons per day. Some of the projects will not immediately utilize the water, however, capacity must be reserved since their respective developers were conditioned by the County to use the water and/or they paid for the expansion of the County's R-1 water distribution system. The cumulative Peak R-1 demand from these projects combined with the existing demand is 2.366 mgd.

As additional projects are considered for implementation, several issues need to be taken into account during evaluation of alternatives:

- 1) The planned developments will generate some additional wastewater; however, the volume is not expected to be significant enough to increase the R-1 water supply.
- 2) The constraint of peak summer/fall demand must be met at all times. We can not overextend the supply of R-1 water.
- 3) When the planned projects are in full operation, there will be approximately 0.774 mgd (774,000 gallons per day) of R-1 water remaining at the peak demand periods.
- 4) As explained in Chapter 2 of this report, there will always be a surplus of R-1 water in the winter and spring months due to reduced irrigation demands unless the R-1 water distribution system is extended to a large irrigation project that is able to accept a seasonal supply of R-1 water.
- 5) The use of potable water for irrigation can be offset by the use of R-1 water, brackish water irrigation can be replaced by using R-1 water or a combination approach can be used.

Table 4-1 summarizes the options discussed in this report. Included is the cost, gallons of potable water displaced, cost per gallon displaced and general comments about each option.

Table 4-1 Option Summary of Potable Water Displacement

Option	Description	Cost (\$)	Gallons of Potable Water Displaced/Day	Cost/ Gallon Displaced/ day	Comments
n/a	Projects in progress	\$ 2,585,000	599,500	\$ 4.31	<ul style="list-style-type: none"> • Seven (7) projects are involved. • All projects have begun construction or are in final design phases
n/a	Planned project	\$ 275,000	16,500	\$ 16.67	<ul style="list-style-type: none"> • Project (South Maui Police Station) is in preliminary design stage • Current private line requires dedication to the County
1	Waipulani Street/South Kihei Road	\$ 1,215,000	200,000	\$ 6.08	<ul style="list-style-type: none"> • Impacts nine (9) properties • 47,000 gpd of brackish waster would also be displaced
2	Liloa Drive / Halekuai St.	\$ 1,257,000	38,000	\$ 33.08	<ul style="list-style-type: none"> • Impacts two (2) properties
3	Liloa Drive / Kihei High School	\$ 1,135,350	245,000	\$ 4.63	<ul style="list-style-type: none"> • Impacts two (2) properties • Dependent on school construction timeline
4	East Welakahou / Future Collector Road	\$ 2,411,450	120,165	\$ 20.07	<ul style="list-style-type: none"> • Impacts seven (7) properties • Dependent on collector road construction
5a	North Kihei / Ranch Land	\$ 9,800,000	499,000	\$ 19.64	<ul style="list-style-type: none"> • Impacts three (3) projects, all agricultural • Easement dedication necessary • 2.4 mgd of use by ranches is also a possibility if water is available (no displacement) • Significant plant upgrades necessary
5b	North Kihei / North South Collector Road	\$ 3,800,000	553,000	\$ 6.87	<ul style="list-style-type: none"> • Impacts three (3) properties. • Dependent on collector road construction/right of way acquisition
6	Piilani Hwy. to Wailea Resort	\$ 21,137,500	1,196,870	\$ 17.66	<ul style="list-style-type: none"> • Impacts 19 properties • Significant infrastructure and plant upgrdes are required • 1 mgd of brackish waster could also be displaced at golf course

Notes:

- a. Costs are for CIP construction only, no operational/maintnence/finance costs are included
- b. Gallons of potable water displaced are peak values
- c. The current peak R-1 demand is 1.75 mgd
- d. The current R-1 supply is approximately 3.4 mgd