

Appendix I

Hydrogeological Memorandum, Subject: Potential Impact of Additional Use of the Two
Keālia Water System Wells to Supply the Keālia Mauka Homesites Project,
Tom Nance Water Resource Engineering
Revised September 19, 2018



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be mailed to you.

September 20, 2018
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MEMORANDUM

To: Scott Ezer – HHF Planners

From: Tom Nance

Subject: Potential Impact of Additional Use of the Two Kealia Water System Wells to Supply the Kealia Mauka Homesites Project (Revised September 19, 2018)

Introduction

The Kealia Mauka Homesites Project would consist of 235 residential lots situated between Kuhio Highway and Kealia Road. Water service would be provided by the private Kealia Water Company system. The system is regulated by the State Department of Health as PWS No. 423. It is supplied by two side-by-side wells identified as State Nos. 0618-009 and 0618-010 and also known as Kealia 1A and Kealia 2A, respectively. Construction and pump testing of both wells was completed in 2001.

Use of the wells has averaged between 30,000 and 40,000 gallons per day (GPD) since they were put into service in 2008. They presently supply the residential subdivision along Kaa and Hopoe Roads and about 35 houses in the Kealia Makai subdivision. The additional pumpage of the wells to supply the 235-lot project, when it is ultimately fully occupied, could vary between a year-round average of about 120,000 GPD to a summertime maximum of up to 180,000 GPD. The question has been raised regarding the potential impact that this additional use of groundwater could have on upgradient uses of the resource. In particular, a concern was raised regarding the impact on the irrigation supply for the lo'i located about a mile inland of the wells (refer to Figure 1).

Groundwater Occurrence in the Vicinity of Kealia Wells 1A and 2A

Kealia Wells 1A and 2A are located within the area of a battery of seven wells developed and formerly used by Lihue Plantation. Table 1 provides summary information on the plantation's seven wells and Kealia Wells 1A and 2A. All nine of these wells were drilled through alluvial material comprised of various clays with some sand and coral to access the semi-confined basal groundwater which resides in the unweathered Koloa volcanics at depth below the alluvium. All nine wells are solid cased to depths between 80 to 130 feet below sea level. They draw water from the open boreholes below the solid casings. The open hole depths span from 80 to 235 feet below sea level. The piezometric head of the semi-confined groundwater tapped by these wells varies between eight (8) and 10 feet above sea level. When originally constructed, at least three of the seven plantation wells were free flowing under artesian pressure.

Potential Impact of Pumping Kealia Wells 1A and 2A on the Source of Irrigation Supply for the Lo'i Located About a Mile Inland of the Wells

A concern has been raised regarding the potential impact of the increased use of Kealia Well Nos. 0618-009 and 0618-010 on the source of irrigation supply for a lo'i located about one-mile upgradient from the wells. This source of irrigation supply has been described by others as a "spring". On September 19, 2018 and accompanied by Moana Palama and Leilani Alquiza, I walked the length of the small stream from its culvert crossing beneath the private dirt road up to its headwater at about 160- to 200-foot elevation. The approximate route of the stream is shown on Figure 2. Water running through the roadway culvert discharges into a ditch supplying the lo'i. Here is what I observed in traversing the approximately 2200-foot length of the stream on September 19th:

- The headwater consists of two locations where shallow groundwater emerges. At mid-morning on September 19th, virtually no water was emerging from either "spring" location.
- About 25 feet downstream, a flow of two to three gallons per minute (GPM) was observed (visual estimate)
- The flow in the stream progressively increased moving downstream. At about mid-length where there is a culvert crossing for a foot path, the flow had increased to about 40 to 50 GPM.
- At the makai side of the road culvert discharging into the lo'i, the flow rate was on the order of 75 to 100 GPM.

In other words, the source of irrigation for the lo'i is not a spring in the classical sense. Rather, it is a small but perennial stream, the flow rate of which progressively increases as it moves downstream. There are many such streams on Kauai which traverse the relatively poorly permeable, later-stage Koloa volcanics. In fact, there is another such stream located about 1500 feet to the west which is delineated on the USGS Kapaa Quadrangle map (its location is noted on Figure 2). Due to the stream's location, its elevation, and manner of its source of supply, there is no possibility that increased use of Kealia Well Nos. 0618-009 and 0618-010 will impact the flow in the stream.

Attachments

ec: Moana Palama and Leilani Alquiza – Kealia Properties, LLC
Greg Fukumitsu and Todd Yonamine – TNWRE Inc.

References

Kodani & Associates, LLC. 2017. Preliminary Engineering Report for Kealia Residential Subdivision. Consultant Report Prepared for HHF Planners (?)

MacDonald, G. A., D. A. Davis, and D. C. Cox. 1960. Geology and Ground-Water Resources of the Island of Kauai, Hawaii. Bulletin 13, Division of Hydrography, State of Hawaii.

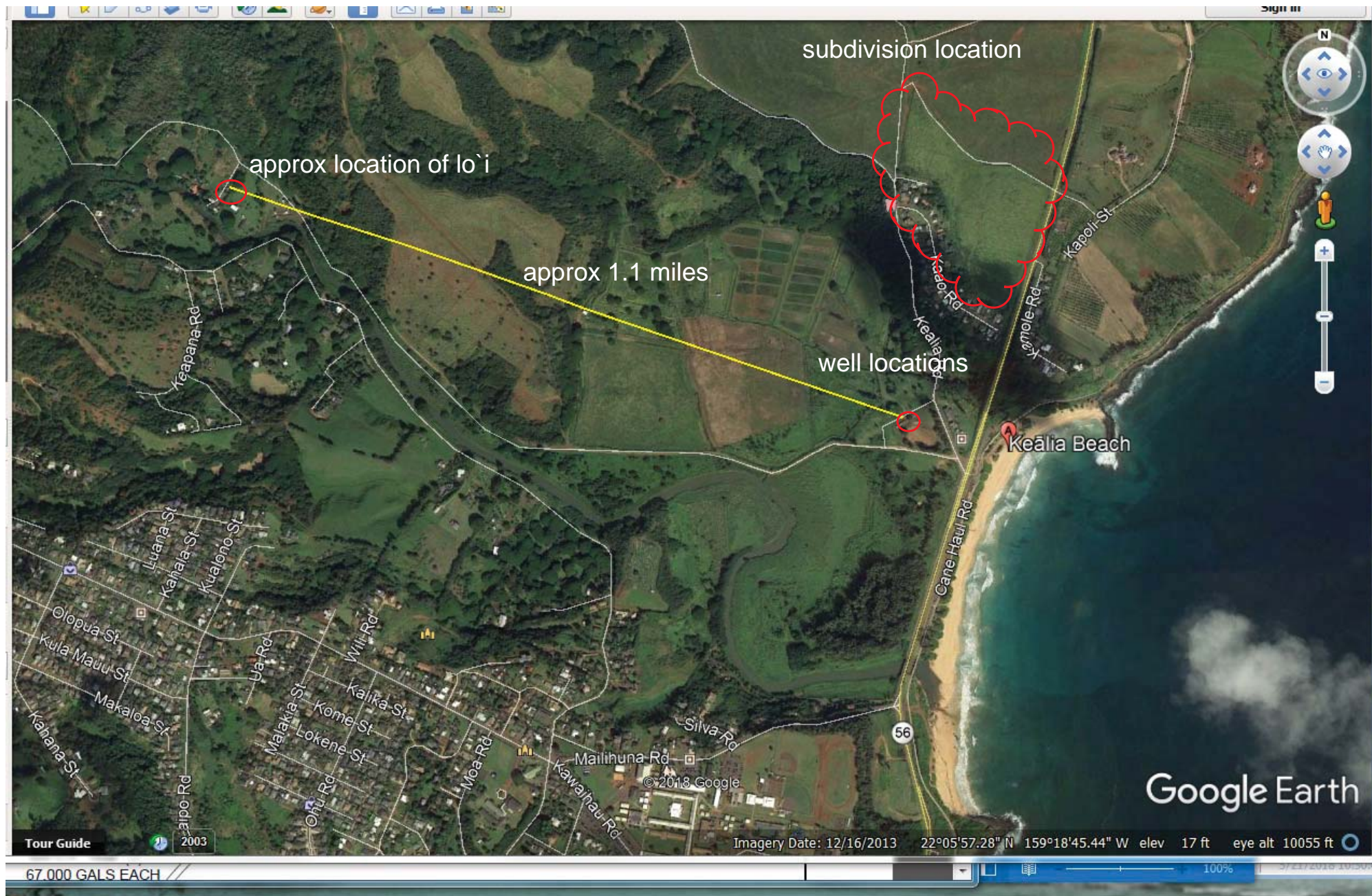
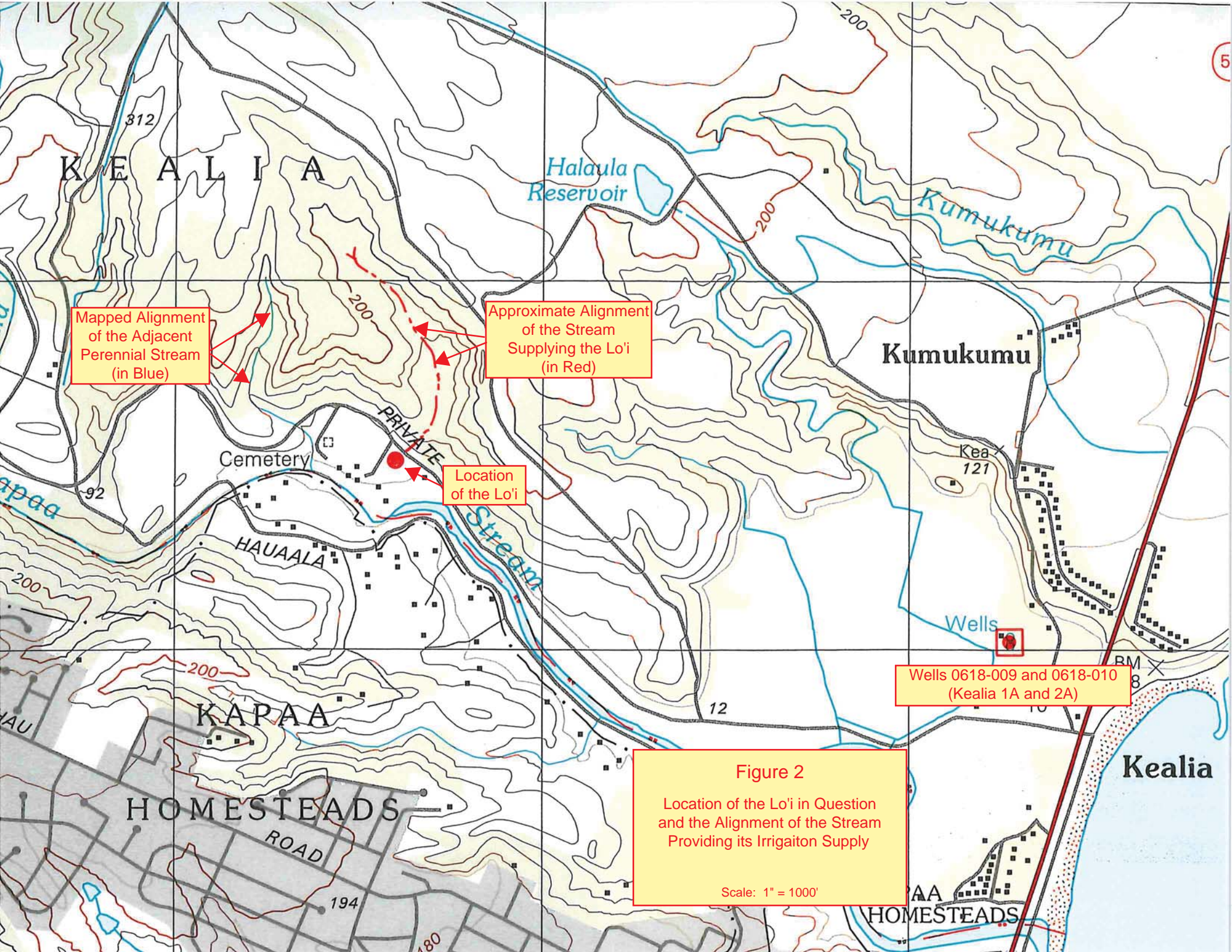


Figure 1

Table 1. Summary Information of the Plantation Kealia Well Battery,
Kealia Water System's Wells 1A and 2A, and Inland Wells 0619-001 and -003

Well		Year Drilled	Casing Diameter (Inches)	Ground Elevation (Ft. MSL)	Total Depth (Feet)	Elevation @ Bottom (Ft. MSL)	Solid Casing Length (Feet)	Open Hole Length (Feet)	Present Use	Installed Pump Capacity (GPM)
State No.	Name									
Lihue Plantation Well Battery										
0618-001	Kealia 2	1898	12	8	213	-205	95*	118	Sealed	- -
0618-002	Kealia 1	1898	10	8	213	-205	95*	118	Sealed	- -
0618-003	Kealia 4	1905	12	8	225	-217	85	140	Lost	- -
0618-004	Kealia 3	1905	12	8	210	-202	85	125	Lost	- -
0618-005	Kealia 7	1928	6	6	225	-219	140	85	Unused	None
0618-006	Kealia 6	1928	6	6	220	-214	123*	97	Unused	None
0618-007	Kealia 5	1928	12	15	250	-235	112	138	Lost	- -
Kealia Water Company Wells										
0618-009	Kealia 1A	2001	12	10	195	-185	95	100	Municipal	650
0618-010	Kealia 2A	2001	12	10	195	-185	95	100	Municipal	450
Inland Wells Along Hauaala Road										
0619-001	Mitchell	2009	6	200	260	-60	200	60	Domestic	Not Known
0619-003	Lamb	2017	4	300	210	+90	180	30	Domestic	Not Known

Note: Information from CWRM files and MacDonald, Davis, and Cox (1960).



Mapped Alignment
of the Adjacent
Perennial Stream
(in Blue)

Approximate Alignment
of the Stream
Supplying the Lo'i
(in Red)

Location
of the Lo'i

Wells 0618-009 and 0618-010
(Kealia 1A and 2A)

Figure 2
Location of the Lo'i in Question
and the Alignment of the Stream
Providing its Irrigation Supply

Scale: 1" = 1000'

KAPAA QUADRANGLE
HAWAII-KAUAI CO.
7.5-MINUTE SERIES (TOPOGRAPHIC)



Figure 2
Locations of Inland Wells
0619-001 and -003