APPENDIX I

Water Resource Associates Results of 10-Day Pumping Tests for Wells 1, 2, and 3

RESULTS OF 10-DAY PUMPING TEST
WCT WELLS 1, 2, and 3
IN THE WAIKAPU AQUIFER, MAUI

Prepared for:

Waikapu Properties, LLC

P.O. Box 1870

Manteca, CA 953367

Prepared by:

Water Resource Associates

1296 Kapiolani Blvd, #1704

Honolulu, Hawaii 96814

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EXECUTIVE SUMMARY

The plan to perform a simultaneous constant-rate pumping test of Waikapu Country Town's (WCT) Wells 1, 2, and 3 for a 10-day period was to determine both their individual and aggregate sustainable capacities. Accordingly, the pumping rates of the three wells were set at 1.39 mgd, 1.03 mgd, and 1.07 mgd, respectively, for a total pumping rate of 3.49 mgd which compares with the sustainable yield of 3.0 mgd established for the Waikapu Aquifer System (in which the wells are located) by the State Commission on Water Resources Management. WCT has three more wells (4, 5, and 6) which have no pumps and which were used as observation wells to monitor water levels.

The area's contrasting geologic occurrence of interior permeable basalt lava flows which dip under a thick wedge of low-to-moderately permeable alluvial fan-type deposits that extend hundreds of feet below sea level plays an important role in the occurrence of high yield potable wells at the toe of interior basaltic slopes and lower yield potable wells on lower gentle slopes of alluvial deposits.

Non-vented data loggers were used to record water levels at two-minute intervals in six wells—three pumping and three non-pumping. Additional data was gathered and recorded for the pumping wells, including pumping rates, chlorides, and electrical conductivity of the pumped water. All data were compiled, analyzed, and presented graphically for easier understanding. Figures 6, 7, and 8 show that the pumping rates held steady in all three wells and that the chlorides in basalt Wells 1 and 2 were stable while the chlorides in alluvial Well 3 showed an increase from 25 to 109 mg/L. All three wells produced fresh potable water.

Figures 9, 10, and 11 graphically includes all Solinst recordings of drawdown and recovery of water levels in pumping Wells 1, 2, and 3. All graphs are typical of pumping tests in permeable aquifers in Hawaii.

Figures 12, 13, and 14 presents a semi-log plot and graphical analysis of the drawdown data for Wells 1, 2, and 3 to determine the transmissivity of the aquifer. The results indicate that basalt Wells 1 and 2 tap highly permeable aquifers and have sustainable capacities equal to or greater than their pumping rates and that alluvial Well 3 taps a moderately permeable aquifer.

Figures 15, 16, and 17, graphically presents the water level data recorded in the non-pumping Wells 4, 5, and 6. A cursory comparison of the water level graphs with the graph of atmospheric pressure in Figure 5, shows some possible relationship and the possibility that water levels in Well 4 were affected by the pumping test. However, no conclusions were possible with the cursory comparison.

Water samples were collected from the pumping wells and tested by Eurofins Analytical, an approved lab, for testing of water from new potable water sources as required by the Hawaii Department of Health. The overall results for the three wells showed no pesticides or other organic chemicals present, and all other contaminants tested were non-detectable or below maximum contaminant levels (MCL).

LOCATION OF WCT WELLS

A total of six deep wells have been drilled in the Waikapu Aquifer on a parcel of land situated immediately south of Waikapu Stream, which drains eastward out of the deeply eroded southern slopes of West Maui onto the isthmus of Central Maui (see Figure 1). Referred to as the Waikapu Country Town Development, this gently to moderately sloping parcel lies immediately south of old Waikapu Town. All six wells were drilled by Wailani Drilling Services of Maui and are numbered 1 through 6, in the order in which they were drilled.

Wells 1 and 2 lie at the toe of an outcrop of basaltic lava flows at 650 and 780 feet elevations, respectively; and they tap fresh basal water near sea level in permeable basaltic formations.

Well 3 lies directly down slope of Well 1 at an elevation of 520 feet on alluvial deposits called *slope wash* (deposits washed down by runoff water from deeply eroded interior slopes). Well 3 is cased to sea level and taps fresh basal water in slope wash deposits (based on moderate permeability). Only Wells 1, 2, and 3 have been outfitted with permanent pumps.

Wells 4 and 5 located northeast and further down slope of Well 3 at elevations of 460 and 480 feet, are also located on alluvial slope wash deposits and tap fresh basal water in slope wash deposits. Well 6, drilled at an elevation of 580 feet, lies northwest and slightly up slope of Wells 4 and 5 and near Waikapu Stream. Wells 4, 5, and 6 are yet to be completed with permanent casing.

A general summary of the hydrologic data for these six WCT wells are presented in Table 1.

GEOHYDROLOGIC SETTING

Oblique View. An oblique aerial photo (see Figure 2) of the Waikapu area clearly shows that there are two contrasting topographic environs, each of which reflect different types of geologic formations and groundwater occurrence. As can be seen in Figure 1, the toe of the deeply eroded basaltic slopes of West Maui Mountain delineate the approximate mauka boundary of the Waikapu Country Town Project. Abruptly down slope of the toe lie the gentle slopes of alluvial fan (slope wash) deposits transported by runoff from the mountainous interior. Based on Water Resource Associates' earlier investigations between Waikapu and

Waihee to the north, the slope wash deposits within the project area probably extend well below sea level and form "caprock" conditions that impede salt water intrusion and enhance the occurrence of the thick basaltic aquifers tapped by WCT Wells 1 and 2.

Geologic Cross Section. A thick, low-to-moderate permeability formation of slope wash deposits occurs within the project area, corroborated by hydro-geologic data from wells located north of Waikapu. In 1974, Well W2 (6-5130-02) situated approximately 2,500 feet north of Waikapu Stream (see Figure 1) was drilled in the hopes of tapping a basal aquifer in basaltic lava flows of the Wailuku volcanic series. Unexpectedly, however, no basalts were encountered—only alluvial (slope wash) deposits. Well W2 encountered fine to coarse sediments throughout its entire depth of 1,000 feet, a depth of 500 ft. below sea level (see geologic cross section in Figure 3). As expected, the slope wash formation has an overall low permeability and little salt water intrusion, based on the results of a constant-rate pumping test of the basal aquifer in Well 2 (500 gpm, 73 ft. drawdown, and 50 mg/L chlorides). Further to the north, another deep well, similarly positioned down slope of the contact between West Maui's basaltic slopes and associated slope wash deposits, also showed the occurrence of a thick alluvial formation that extends hundreds of feet below sea level. From other project investigations, it is postulated that slope wash deposits hundreds of feet thick below sea level occur down slope (east) of the West Maui basaltic toe from Malaaea to Waihee, acting as an impediment to salt water intrusion and enhancing the basal aquifer in basalts of the Wailuku volcanic series.

Aquifers and Sustainable Yield. Two types of aquifers occur within the project area based on the type of formations in which they occur: *basaltic aquifer* in permeable basaltic lava flows and *alluvial aquifer* in low-to-moderately permeable alluvial or slope wash deposits. Successful development of the basal aquifer in basaltic lava flows is confined to the *mauka* (interior) edge of the project area where the basalt formations can be encountered at or above sea level in order to tap the freshest part of the basal aquifer. Successful development of the basal aquifer in the alluvial slope wash deposits which occur throughout the project area is less predictable largely because of variations in permeability among the various sedimentary layers that comprise the slope wash formation which layers can range from clay to bouldery deposits.

The Commission on Water Resources Management (CWRM) regulates well drilling and groundwater resources in Hawaii and has established hydrologic units with sustainable yield values in million gallons per day (mgd) for the purpose of groundwater management throughout the state. The Waikapu Country Town Development lies within the Waikapu Aquifer System of the Wailuku Hydrologic Sector (see Figure 4). As shown in Figure 4, the *sustainable yield* (amount of groundwater that can be safely developed over the long term) of the Waikapu Aquifer System has been established as 3 mgd. When the CWRM officially *designates* a hydrologic sector or aquifer system for groundwater management, it has the responsibility to regulate the amount of groundwater use from wells within the designated area.

SOLINST DATA LOGGERS AND ATMOSPHERIC PRESSURE

The measurement of water levels in six wells (3 pumping and 3 non-pumping) for a total period of 18 days extending from April 25 to May 13, 2016 was accomplished with Solinst Model 3001 Levelogger Edge data loggers. These data loggers have an accuracy of 0.05% full scale and are based on non-vented pressure transducers which measure the absolute barometric pressure (atmospheric pressure and water pressure above the data logger). Therefore, a Model 3001 Barologger was also used to record the atmospheric pressure in Well 2 at a depth of 200 feet, which data was used to convert the absolute pressure readings into actual water levels above the data logger. A summary of the deployment data for the data loggers in each of the six wells are shown in Table 2.

It is well known that atmospheric pressure affects the water levels in wells in Hawaii to varying degrees, and the WCT wells are no exception as will be seen later in this report. A graph of the atmospheric pressure in the Waikapu area at the time of the pumping test, as recorded in Well 2 at a well depth of 200 feet, is shown Figure 5.

PUMPING TEST PROTOCOL

Purpose of Test. Aquifers are normally tested by two types of pumping tests—constant-rate and step-drawdown. The constant-rate test is used to obtain the specific capacity of a well and the transmissivity and storage values of the aquifer. Also, one or more observation wells are installed at appropriate distances from the pumping well because accurate drawdown data are normally difficult to obtain. However, the non-pumping wells (Wells 4, 5, and 6) are not useful as observation wells for the purpose of the 10-day constant-test, primarily because they are in different aquifers (alluvial slope wash deposits) rather than the basalt aquifers of pumping Wells 1 and 2. Furthermore, Well 3 is believed to tap an alluvial aquifer. The step-drawdown test is normally used to show the reduction in specific capacity of a well at increasing rates of pumping, or efficiency of the well at increasing rates. No step drawdown tests were performed in this project.

The plan to perform a simultaneous constant-rate pumping test of Waikapu Country Town's Wells 1, 2, and 3 for a 10-day period was to determine the specific or sustainable capacity of each well. Also, with simultaneous pumping and nominal pump capacities of 900 gpm, 700 gpm and 700 gpm, respectively, for Wells 1, 2, and 3 and a total pump capacity of 2,300 gpm, or 3.3 mgd, the 10-day pumping test was designed to test the aquifer's established sustainable yield value of 3.0 mgd.

Chlorides and Electrical Conductivity. Because basal aquifers are always subject to salt water intrusion, monitoring the chloride content of the pumped water is a key to the sustainable pumping capacity of a well. Chloride content is accurately measured in the laboratory using the Mohr method of titration with a silver nitrate solution. In the field, measurements of chloride content is conveniently accomplished with a commercially available test kit; and although less accurate than laboratory analysis, such measurements are used to guide the course of a pumping test. The monitoring of chlorides during a pumping test can also be accomplished by measuring the electrical conductivity (EC) of the pumped water. However, the electrical conductivity of a water sample is affected by all electrolytes and, therefore, serves primarily as an additional, quick way to monitor changes in chlorides during a pumping test. The protocol for these two parameters were based on water samples collected 6 times a day for the first 2-3 days and 4 times a day thereafter.

Water Levels. With the use of data loggers in all six wells, the protocol for measurement of water levels did not require any constraints based on any limits of manpower. All data loggers were programmed to record at 2-minute intervals beginning at 1:00 pm on April 25th (one day before the start of pumping at 9:00 am, April 26th) and ending at 1:00 pm on May 13, 2016.

Pumping. The constant-rate pumping test began with Well 1 at 9:00 am on April 26, 2016. The start times of Wells 2 and 3 were staggered 3 hours apart with

Well 2 starting at 12:00 pm, and Well 3 starting at 3:00 pm. The staggered start times was at the request of others and was intended to assist in assessing any effects of pumping among the three wells.

The end of the 10-day pumping test was at 9:00 am on May 6, 2016. The water levels in all six wells continued to be monitored for seven days after the end of pumping, in accordance with pre-programmed Solinst data loggers and barologger.

Non-Pumping Monitor Wells. Alluvial Wells 4, 5, and 6, which have no pumps, were outfitted with data loggers and used as monitor wells to determine any possible effect on water levels due to the pumping of Wells 1, 2, and 3.

RESULTS OF PUMPING RATE, CHLORIDES, AND ELECTRICAL CONDUCTIVITY

The 10-day pumping test began with the start of Well 1 at 9 am, April 26th, followed three hours later by Well 2 at 12 pm and three additional hours later by Well 3 at 3 pm. At the staggered start of Wells 2 and 3, the pumping rates of each well had to be adjusted during the initial hours after starting because the wells were pumping downgradient in an interconnected network of pipes and valves to a downgradient point of discharge below all three wells, rather than to a common storage tank. However, the pumping rates of the wells were otherwise maintained at a constant rate throughout the 10 days of pumping as expected with electric-powered pumps. Throughout the test, three parameters were carefully monitored besides the automatic recording of water levels by Solinst data loggers—pumping rate, chlorides, and electrical conductivity.

The pumping rate of each well was monitored with new flow meters installed at each well and at the total discharge point into an open reservoir. The chloride content (an indicator of salt water intrusion) of each well’s discharge water was monitored by collecting water samples and analyzing them with field test equipment. As an adjunct to chloride monitoring, the electrical conductivity of the pumped water was also monitored as a quick and easy indicator of any changes in chloride content. In addition to the field tests for purposes of field supervision of the pumping test, the grab water samples were later shipped to Honolulu for laboratory analyses and use in plotting the graphs shown in Figures 6, 7, and 8 discussed below.

Well 1. As shown in Figure 6, Well 1 was pumped at a constant rate of 972 gpm (1.39 mgd) for 10 days for a total pumpage of 13,600,000 gallons. During this period of time, Well 1's chloride content varied remarkably little—from an initial 41 mg/L to a final 47 mg/L (potable water limit is 250 mg/L). Correspondingly, the electrical conductivity of the pumped water increased little—from an initial 390 µS/cm (microSiemens per centimeter) to a final 400 µS/cm. Compared to other well tests in comparable basal aquifers, Well 1's chloride results are remarkable and suggest that Well 1 is capable of yielding 1.4 mgd, or more, of fresh water from a thick basal aquifer with a head (elevation of static water level above mean sea level) of 8.5 feet, in permeable basalts.

Well 2. As shown in Figure 7, Well 2 was pumped at a constant rate of 720 gpm (1.03 mgd) for 10 days, less three hours, for a total pumpage of 10,238,400 gallons. During this period of time, Well 2's chloride content decreased gradually from an initial 132 mg/L to 100 mg/L (potable water limit is 250 mg/L) and is corroborated by a similar decreasing trend in electrical conductivity from an initial 630 µS/cm to a final 540 µS/cm. This decreasing trend in chlorides is confirmed by a similar test performed in 2010 (10 days of pumping at an average rate 740 gpm). In this earlier test, Well 2 showed the same trend of decreasing chlorides over 10 days—from an initial 145 mg/L to 89 mg/L. While both unusual and difficult to explain without more data than is at hand, the occurrence of higher chloride water under static conditions than under pumping conditions in a well tapping a thick basal aquifer is plausibly not due to *upconing* of salt water from below, but rather from the uppermost layers of the aquifer. A salinity profile of the well might confirm this explanation.

Based on the chloride results, Well 2 is capable of yielding 1.0 mgd, or more, of fresh water from a thick basal aquifer with a head of 15.0 feet, in permeable basalts.

Well 3. As shown in Figure 8, Well 3 was pumped at a constant rate of 747 gpm (1.07 mgd) for 10 days, less 6 hours, for a total pumpage of 10,487,880 gallons. During this period of time, Well 3's chloride content increased from an initial 25 mg/L to a final 109 mg/L (potable water limit is 250 mg/L), while the well's electrical conductivity gradually increased from an initial 300 µS/cm to a final 600 µS/cm. Based on an observed linear rate of increase in chlorides of 8.4 mg/L chlorides per day, the projected salinity of Well 3 would rise to 250 mg/L chlorides after 17 additional days, or 27 total, of pumping at an average rate of 747 gpm.

The upward trend in chlorides is probably due to *upconing* of salt water from overall deeper alluvial deposits, but conceivably due to random layers of coarser, more permeable sediments containing less fresh water. Well 3's sensitivity to increasing chlorides under pumping conditions occurs despite the aquifer's high head of 8.5 feet and the well's modestly shallow depth of 80 feet below mean sea level. A contributing factor to Well 3's upward trend in chlorides is the well's high drawdown of 12.2 feet, to a level 3.7 feet below mean sea level. The sustainable capacity of Well 3 apparently is less than 700 gpm, based on the chloride trend observed during the 10-day test. Further testing at lower pumping rates and drawdowns will be required to assess Well 3's sustainable pumping capacity with regard to chlorides.

RESULTS OF DRAWDOWN AND RECOVERY

As mentioned earlier in this report, the drawdown and recovery of water levels in the pumping Wells 1, 2, and 3 were recorded at 2-minute intervals by Solinst data loggers installed in each well. The Solinst data show that water levels in the WCT wells fluctuated daily between about 0.01 and 0.25 ft. under static conditions and as much as 0.80 ft. under pumping conditions (probably due largely to turbulence in the well). Because a plot of the water level data at 2-minute intervals would result in a mass of black ink (data points), the *Drawdown and Recovery Curves* in Figures 9, 10, and 11 are based on plots using one-hour and two-hour interval data arbitrarily selected to show both the trend and daily fluctuations of drawdown and recovery.

Well 1. Figure 9 graphically shows the record of water levels (drawdown and recovery) in Well 1 during an overall period of 18 days spanning before, during, and after the 10-day pumping period. As expected for a well in highly permeable basalts, the initial drawdown in Well 1 was small—only 2.52 ft., from a static level of 8.52 ft., msl, down to a level of 6.00 ft., msl. Thereafter, drawdown continued to increase at a declining rate with time toward an apparently equilibrium value. Drawdown in Well 1 reached a final 4.15 feet at the end of the test. Also as expected, water level in this well recovered rapidly (within a few hours) after pumping ended, recovering to within 87% of the beginning static water level.

Well 2. Figure 10 graphically shows the record of water levels (drawdown and recovery) in Well 2 during an overall period of 18 days spanning before, during, and after the 10-day pumping period. As expected for a well in highly permeable basalts, the initial drawdown in Well 2 was small—only 2.72 ft., from a static level of 15.03 ft., msl, down to a level of 12.31 ft., msl. Thereafter, drawdown continued to increase at a declining rate with time toward an apparently equilibrium value. Drawdown in Well 2 reached a final 10.67 ft. at the end of the test. As expected, water level in this well recovered rapidly (within an hour) after pumping ended, recovering to within 88% of the beginning static water level.

Well 3. Figure 11 graphically shows the record of water levels (drawdown and recovery) in Well 3 during an overall period of 18 days spanning before, during, and after the 10-day pumping period. As expected for a well in low-to-moderately permeable formations (slope wash deposits), the initial drawdown in Well 3 was higher than in Wells1 and 2—a modest 6.73 ft., from a static level of 8.55 ft., msl, down to a level of -1.82 ft., msl. Thereafter, drawdown continued to increase at a declining rate with time toward an apparently equilibrium value. Drawdown in Well 3 reached a final -3.70 ft., msl, at the end of the test. Surprisingly, water level in the well recovered rapidly (within an hour) after pumping ended, recovering to within 84% of the beginning static water level.

TIME-DRAWDOWN ANALYSIS OF PUMPING WELLS

Semi-log plots of time-drawdown curves for a pumped well provide a graphical means of predicting future drawdown in the well. And when the slope of the time-drawdown curve changes during the period of continuous pumping, only graphical methods can be used to predict future drawdown in the pumped well.

Time-drawdown curves also provide a graphical means of determining, both, the coefficient of transmissivity (T) which indicates how much water will move through the aquifer and the coefficient of storage (S) which indicates how much water can be removed by pumping.

In using time-drawdown curves, $T=264Q/\Delta s$, where T is transmissivity in gpd/ft., Q is pumping rate in gpm, and Δs is drawdown in feet per log cycle.

Well 1. In Figure 12, Δs is graphically determined to be equal to 0.133, based on the first (in time) slope of the time-drawdown curve. Therefore, the coefficient of transmissivity for Well 1 = $264 \times 972/0.147$ = 1,929,000 gpd/ft, which is indicative of very permeable, high yield aquifer.

Assuming that the last interpreted slope of the time-drawdown curve does not change, drawdown in Well 1 is estimated to vary diurnally between 5.6 – 6.2 ft., after 1,000,000 minutes (694 days) of continuous pumping, non-stop, 24/7. Clearly, Well 1 has a sustainable capacity of 972 gpm (1.39 mgd), or more.

Well 2. In Figure 13, Δs is graphically determined to be equal to 0.133, based on the first (in time) slope of the time-drawdown curve. Therefore, the coefficient of transmissivity for Well 2 = $264 \times 720/0.145$ = 1,429,000 gpd/ft, which is indicative of a very permeable, high yield aquifer.

Assuming that the last interpreted slope of the time-drawdown curve does not change, drawdown in Well 2 is estimated to vary diurnally between 6.2 – 6.6 ft. after 1,000,000 minutes (694 days) of continuous pumping, non-stop, 24/7. Clearly Well 2 has a sustainable capacity of 720 gpm (1.03 mgd), or more.

Well 3. In Figure 14, Δs is graphically determined to be equal to 0.55, based on the first (in time) slope of the time-drawdown curve. Therefore, the coefficient of transmissivity for Well 3 = 264×747/0.522 = 358,600 gpd/ft, which is indicative of a low-to-moderate permeability, moderate yield aquifer.

Assuming that the last (third) interpreted slope of the time-drawdown curve does not change, drawdown in Well 3 is estimated to reach 15.9 ft. (7.4 ft below sea level) after 1,000,000 minutes (694 days) of continuous pumping, non-stop, 24/7. Well 2 has a sustainable capacity of less than 747 gpm (1.07 mgd).

RESULTS OF WATER LEVELS IN NON-PUMPING WELLS

Figures 15, 16, and 17 show graphs of the water levels in non-pumping Wells 4, 5, and 6 before, during, and after the 10-day test. Immediately noticeable are the diurnal fluctuations that seem to mirror to varying degrees the diurnal variations of the atmospheric pressure recorded in Well 2 (considered to be representative for the area). Only a cursory comparison could be made between the wells and atmospheric pressure, but only Well 4 showed a reasonable indication that its water levels might have declined as a result of the pumping test. No further study was made of the water levels in Wells 4, 5, and 6.

WATER QUALITY

The water quality parameter which is of most concern during a pumping test is chloride because it is an easily determined indicator of salt water intrusion. The potable water limit for chloride content is 250 mg/L, which indicates that Well 1 produces the freshest water at approximately 40 mg/L, followed close behind by basalt Well 2 at approximately 100 mg/L and alluvial Well 3 varying between 25 and 109 mg/L.

In addition to the frequent tests for chlorides, representative water samples were carefully collected from Wells 1, 2, and 3 for testing by Eurofins Analytical, an approved lab, in accordance with the requirements of the Hawaii Department of Health for new potable water sources. The results indicate that all three wells are capable of producing potable water of excellent quality. The chlorides are low and the tested inorganic constituents (see table below) are well within Federal maximum contaminant levels (MCL) of public water systems. Further, all volatile and non-volatile organic contaminants and pesticides analyzed were non-detectable.

INORGANIC WATER QUALITY OF WELLS 1, 2, & 3
(Summary of Positive Data Only)

Analyte	MCL	Units	Well 1	Well 2	Well 3
Alkalinity in CAC03 units		mg/L	95	77	81
Barium Total ICAP/MS	2000	ug/L	6.6	4.5	7.6
Calcium Total ICAP		mg/L	18	27	17
Chloride	250	mg/L	47	100	89
Chromium Total ICAP/MS	100	ug/L	6.4	3.2	6.5
Copper Total ICAP/MS	1300	ug/L	2.5		6.8
Fluoride	4	mg/L	0.14	0.12	
Gross Beta (Subbed)		pCi/L		3.7	1.l6
Nitrate as Nitrogen by IC	10	mg/L	1.5	0.96	1.7
PH (H3=past HT not compliant)		units	7.8	8.0	7.8
Sodium Total ICAP		mg/L	40	46	53
Specific Conductance, 25 C		umho/cm	380	540	510
Sulflate	250	mg/L	14	16	24
Turbidity	5	NTU			0.13

Figure 1. WCT WELLS LOCATION MAP

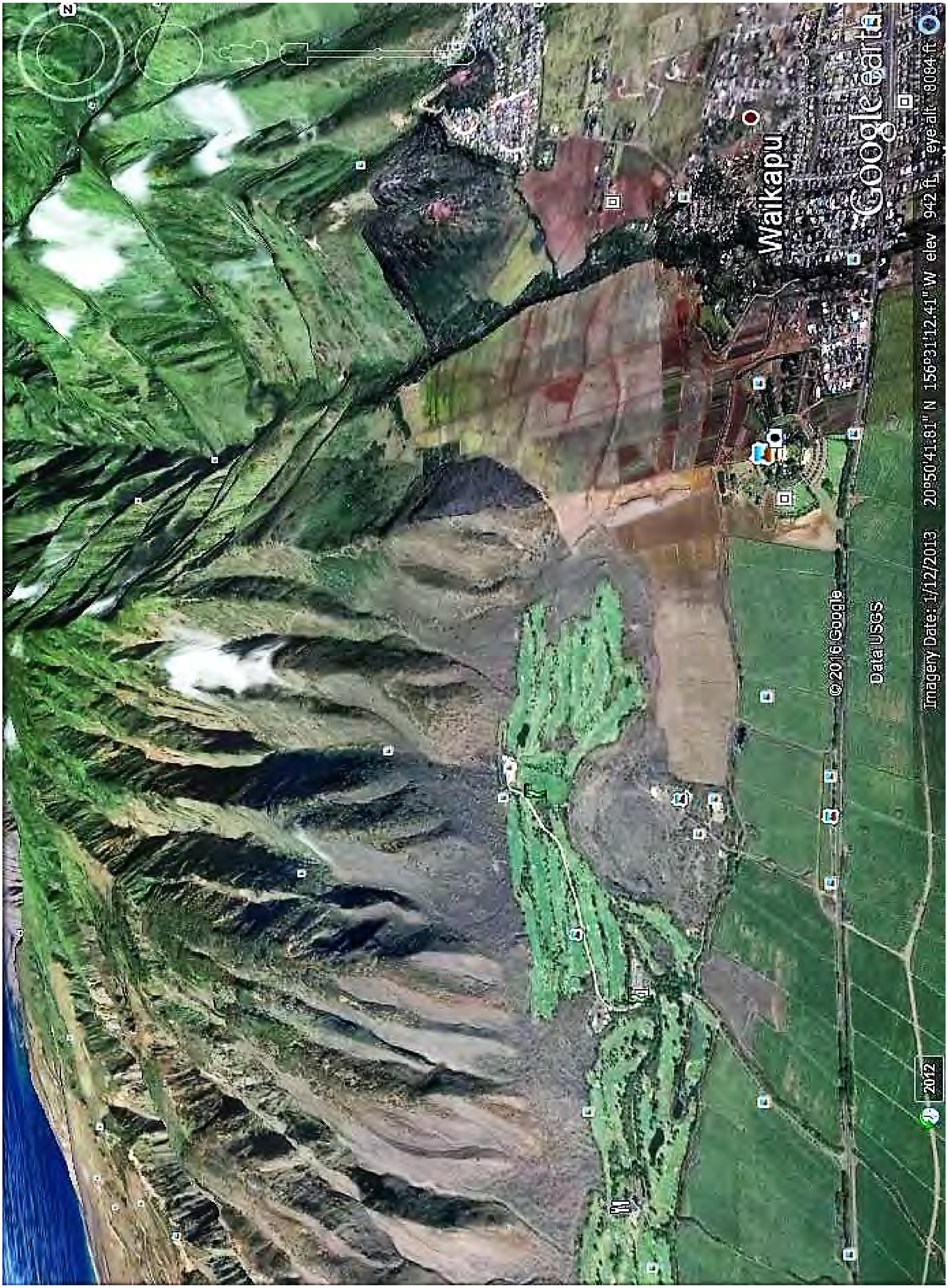


Figure 2. Oblique View of Project Area

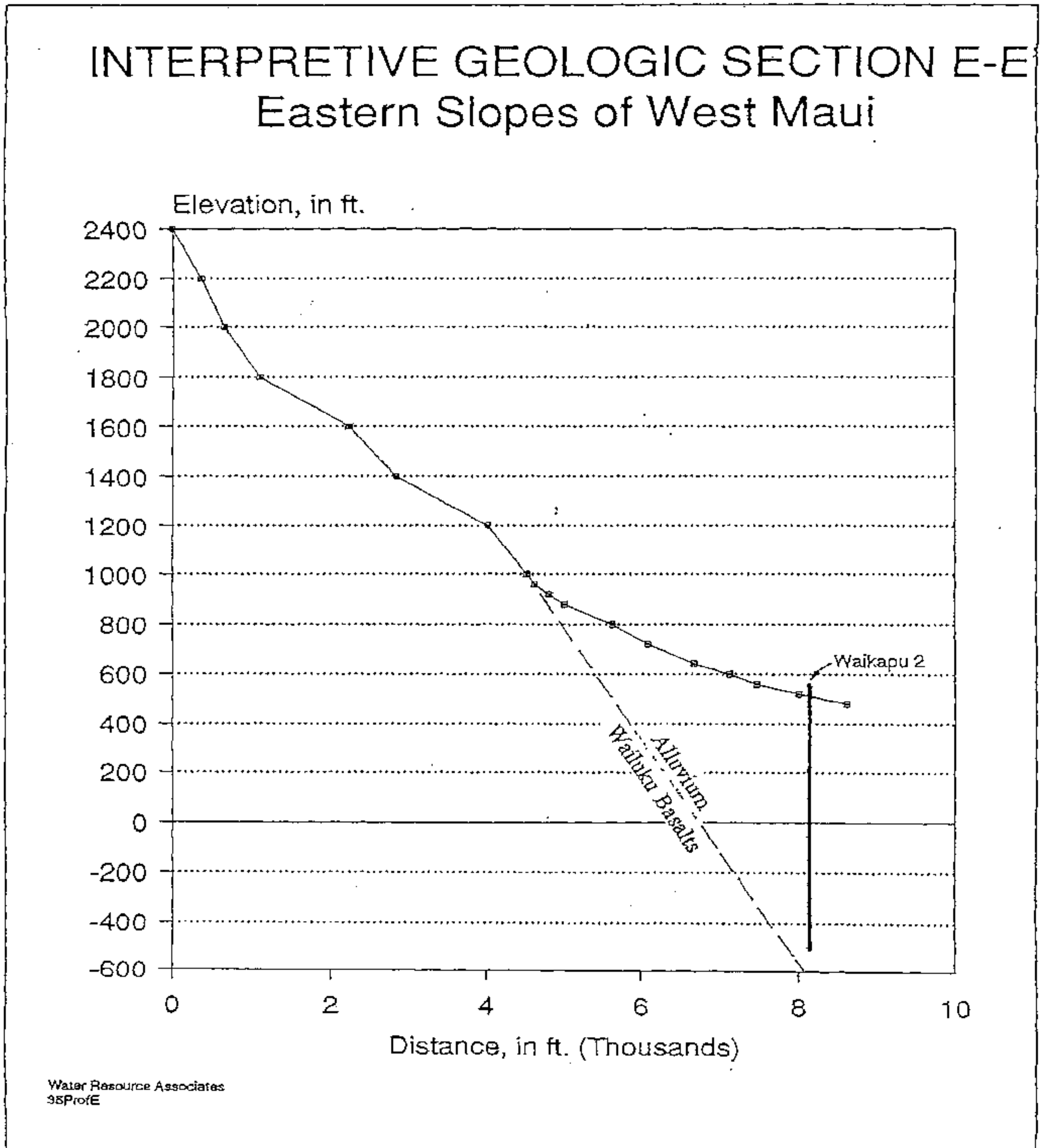


Figure 3. Interpretive Geologic Section E-E

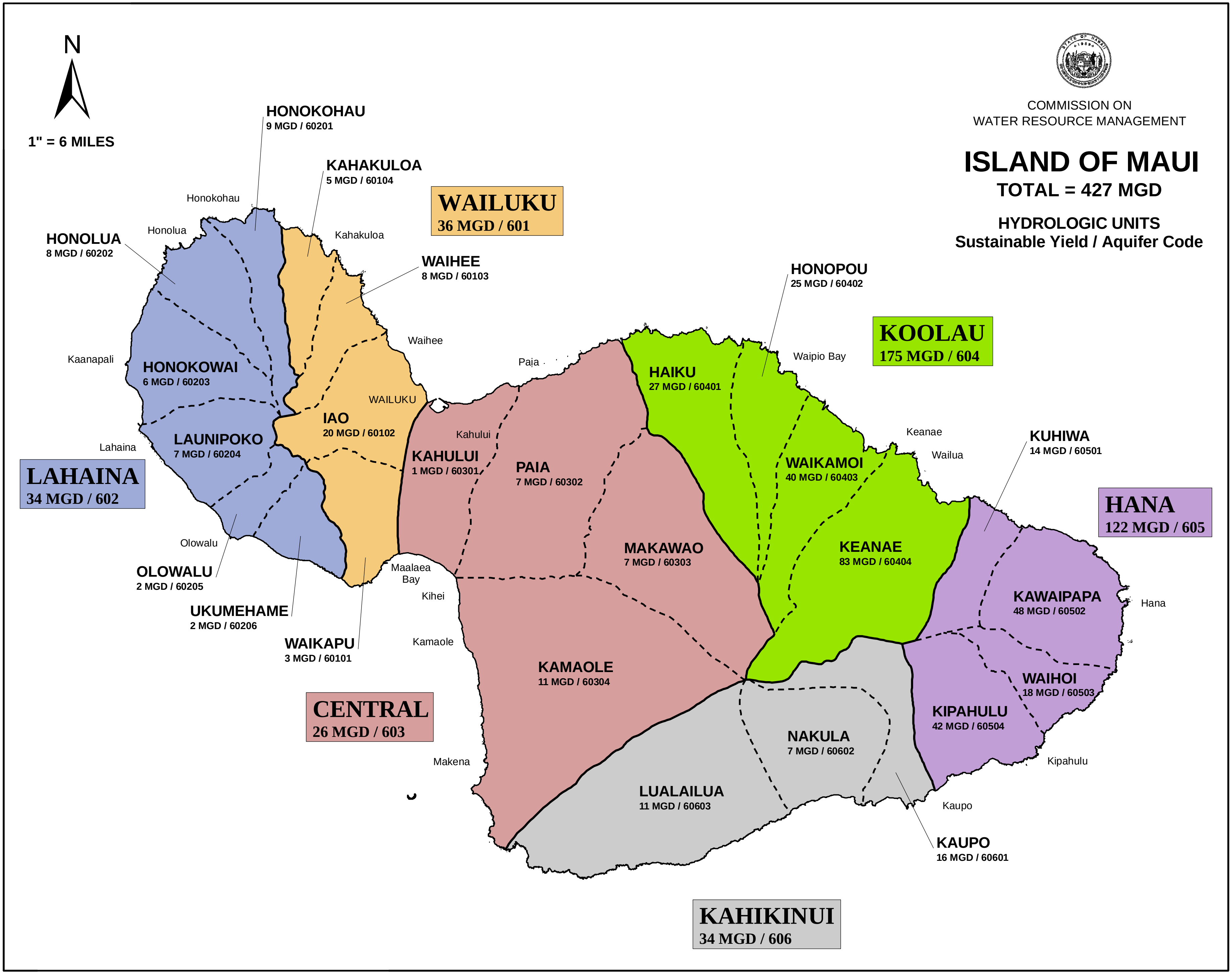


Fig. 4. SUSTAINABLE YIELD MAP OF MAUI

Map ID: 1019

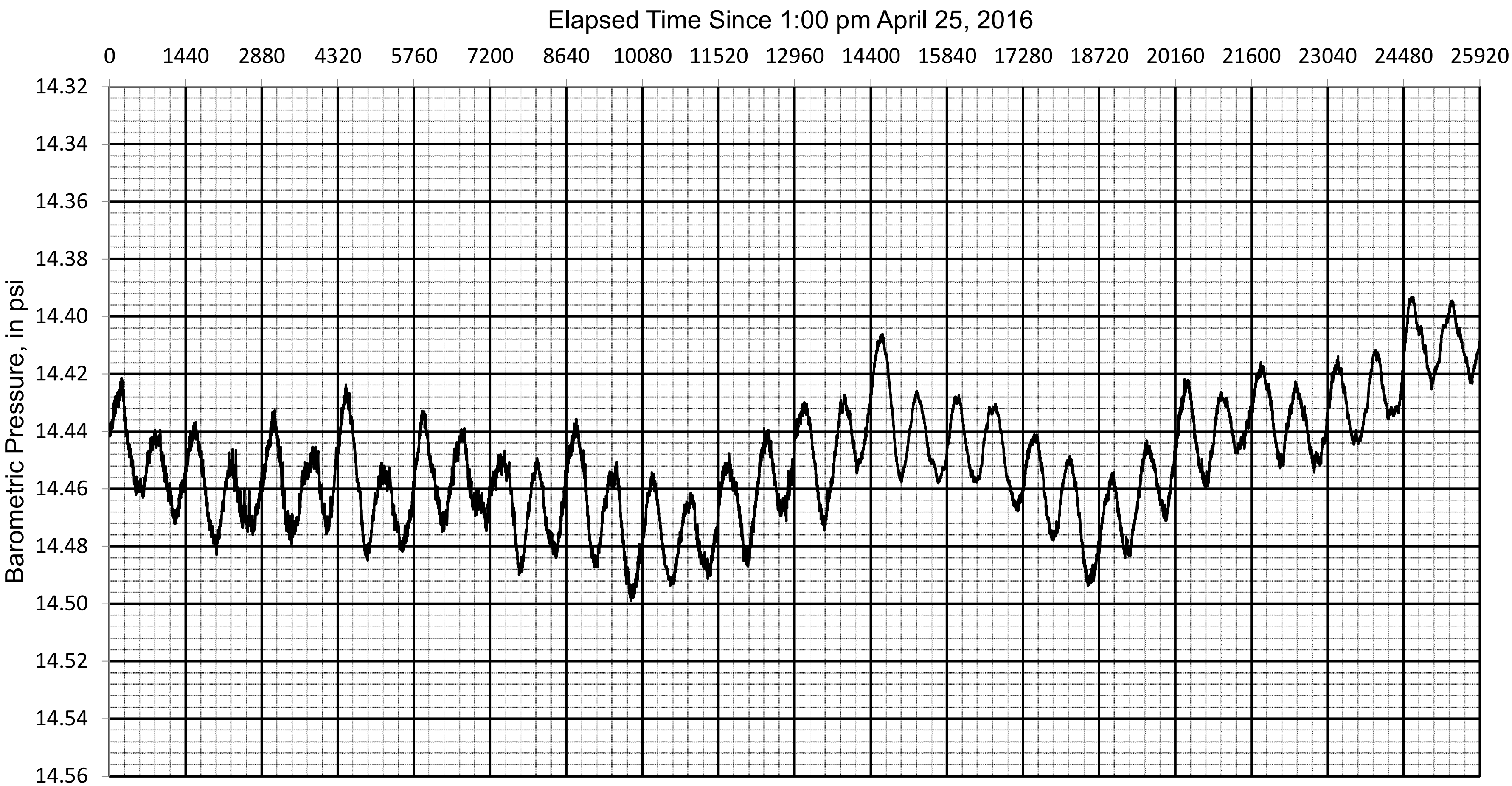
08/28/2008

Map Projection: Universal Transverse Mercator

Figure 5. GRAPH OF ATMOSPHERIC PRESSURE - WELL 2, 200 Ft. Depth

Solinst Barologger, 1pm April 25 - 3 pm May 13, 2016

Waikapu Country Town Development, Maui



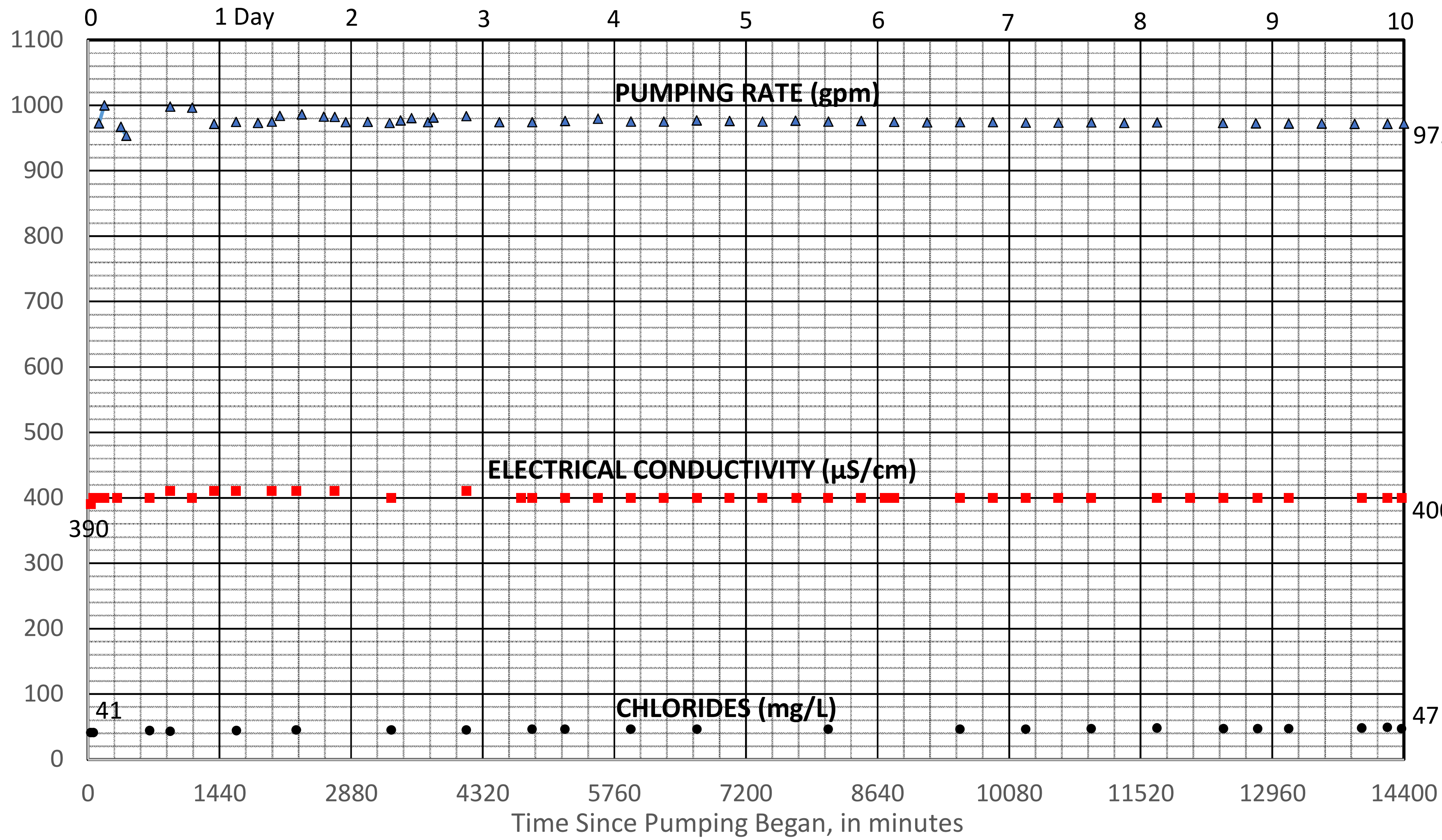
Daniel Lum
Geologist/Hydrologist
Water Resource Associates
Honolulu, Hawaii 96814

July 2016

Figure 6. PUMPING RATE AND CHLORIDES - WELL 1 (6-5030-01)

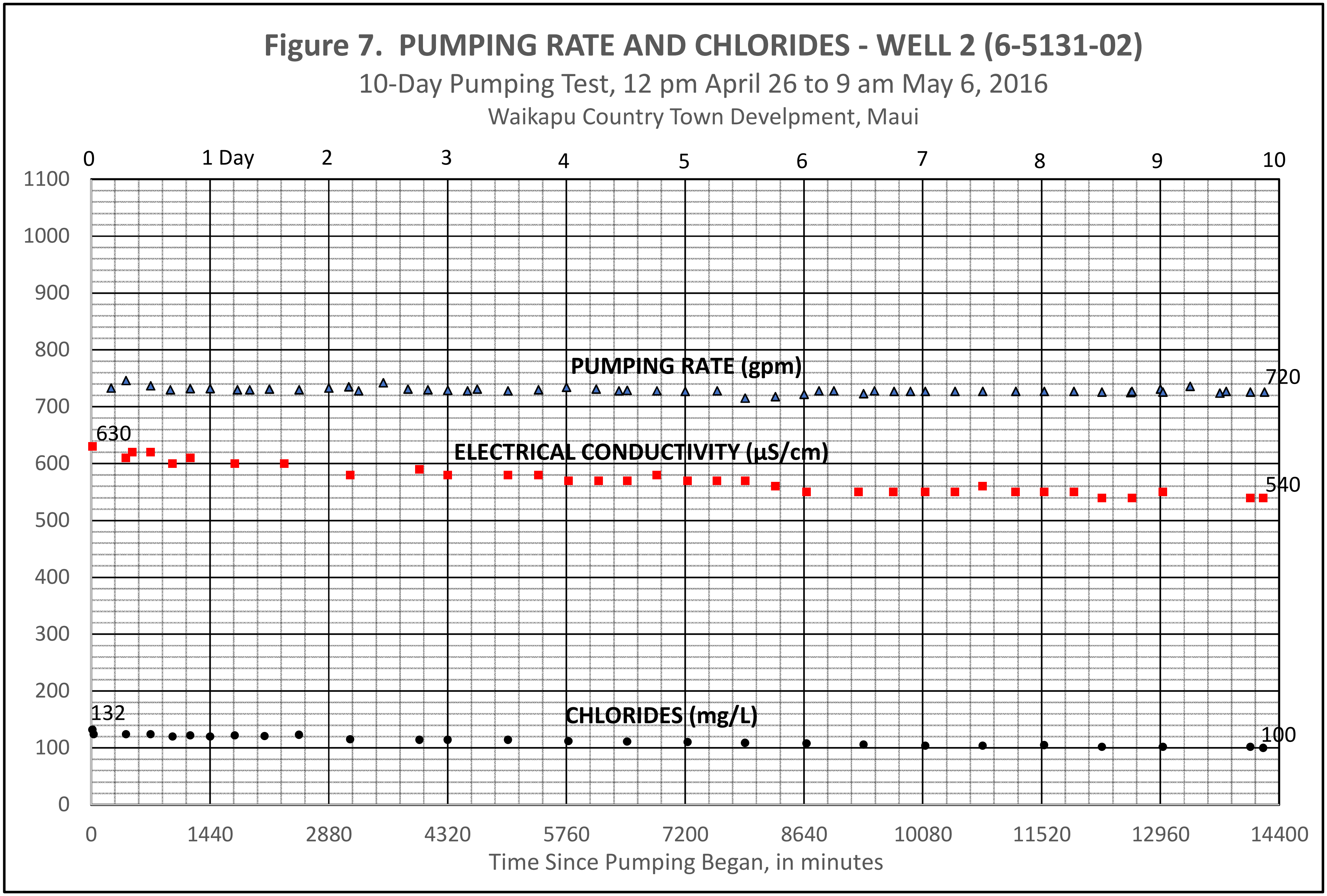
10-Day Pumping Test: 9 am April 26 to 9 am May 6, 2016

Waikapu Country Town Development, Maui



Daniel Lum, Geologist/Hydrologist
Water Resource Associates
Honolulu, Hawaii 96814

June 2016



Daniel Lum, Geologist/Hydrologist
Water Resource Associates
Honolulu, Hawaii 96814

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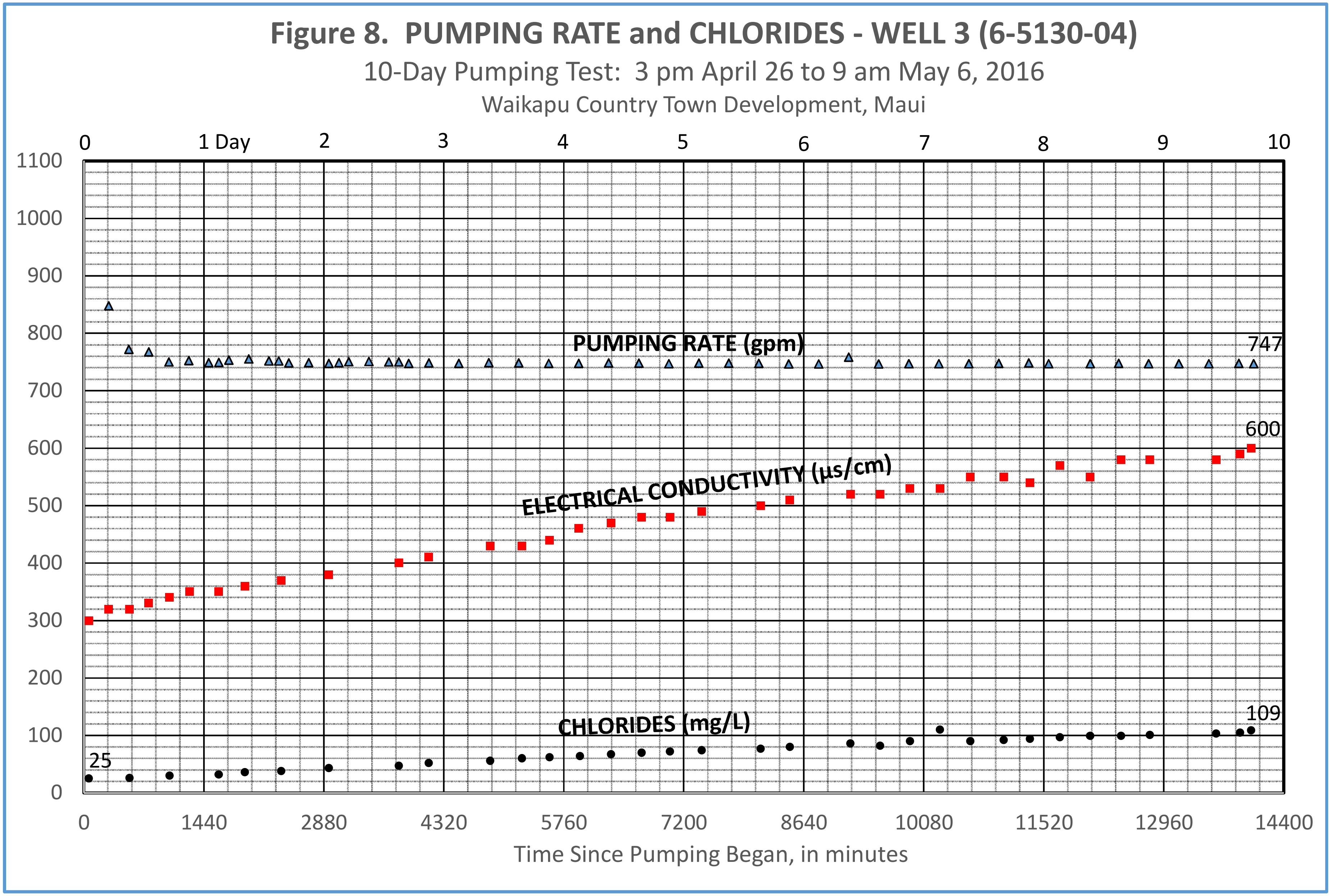

Daniel Lum, Geologist/Hydrologist
Water Resource Associates
Honolulu, Hawaii 96814

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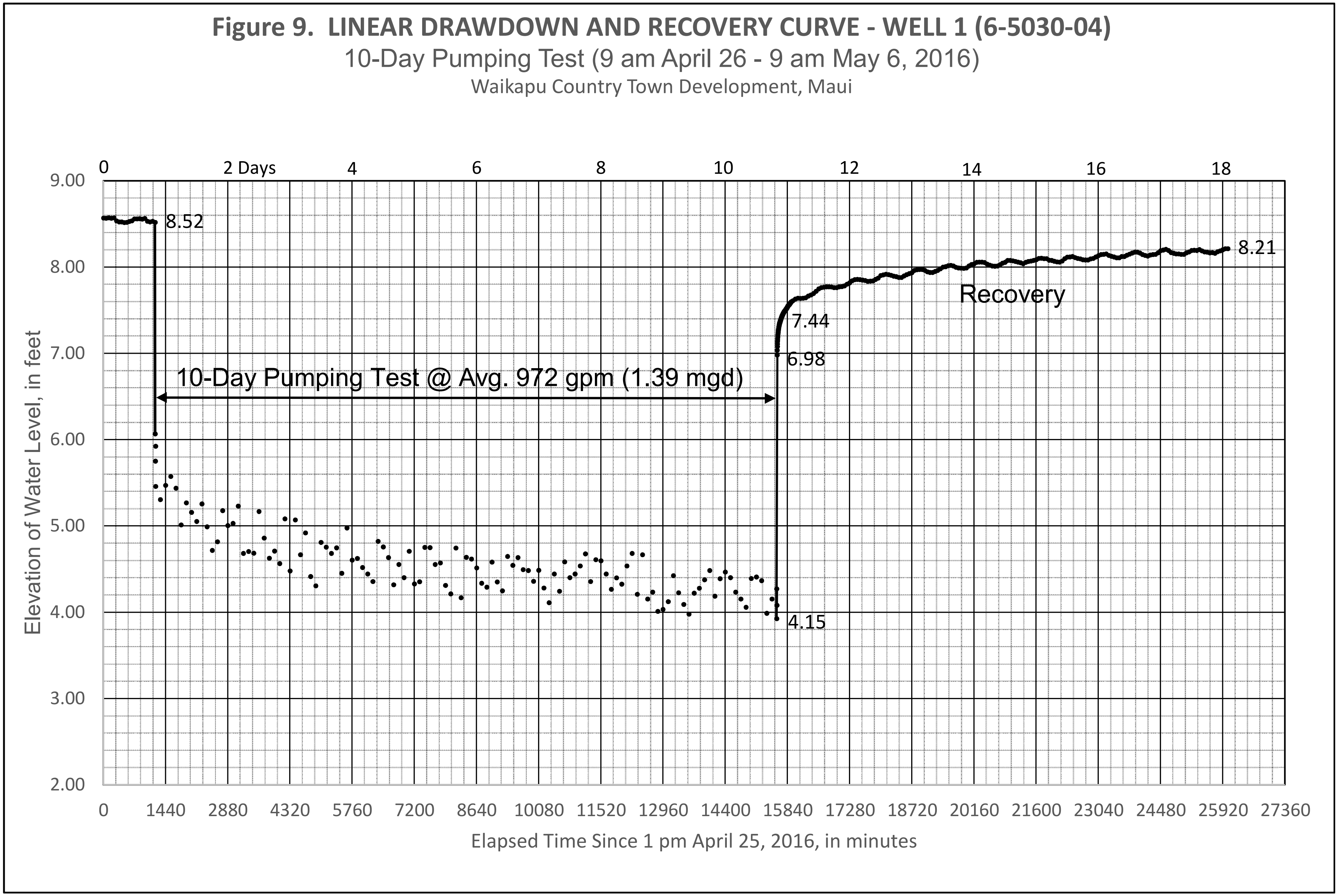

Daniel Lum, Geologist/Hydrologist
Water Resource Asssociates
Honolulu, Hawaii 96814

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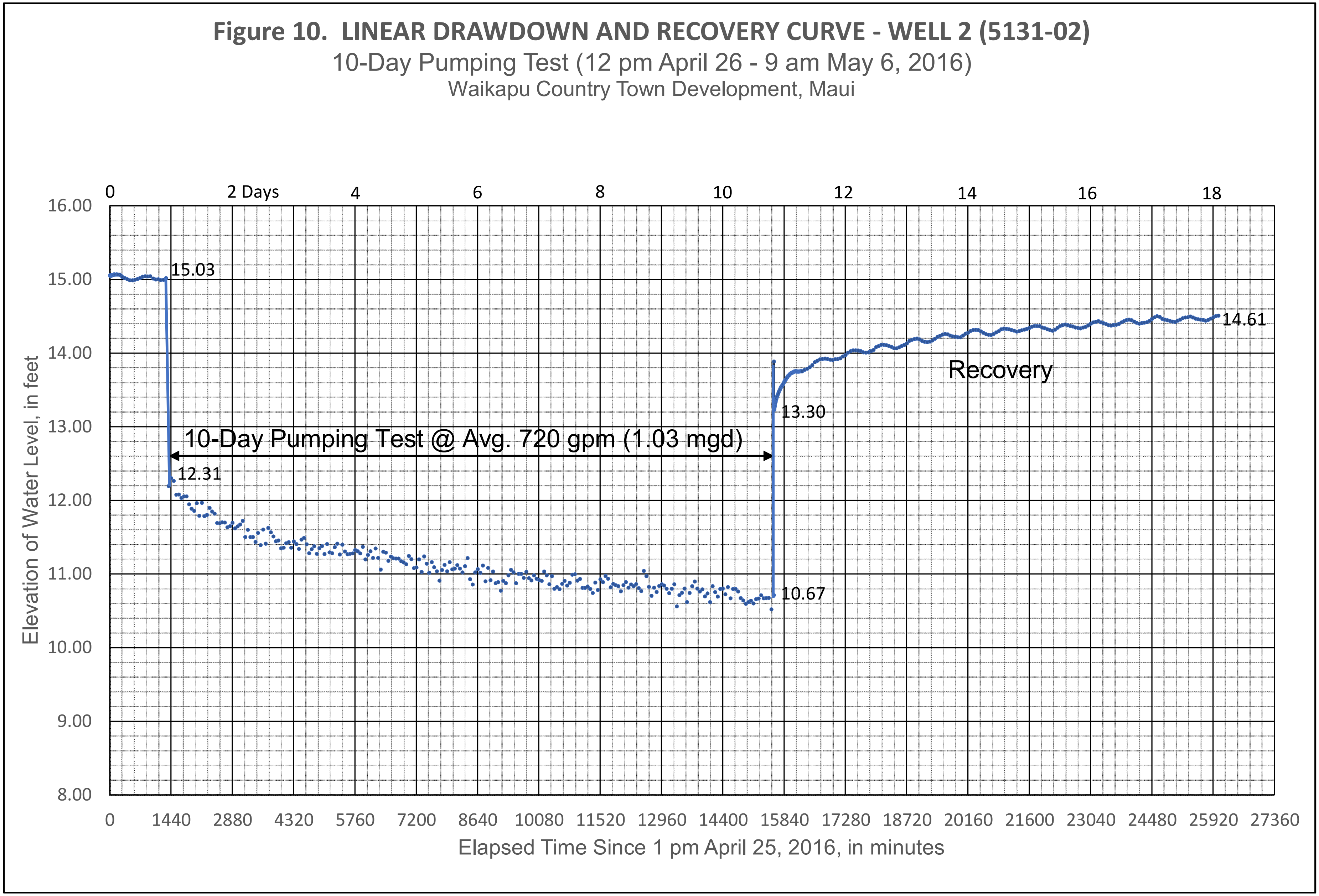

Daniel Lum, Geologist/Hydrologist
Water Resource Associates
Honolulu, Hawaii 96814

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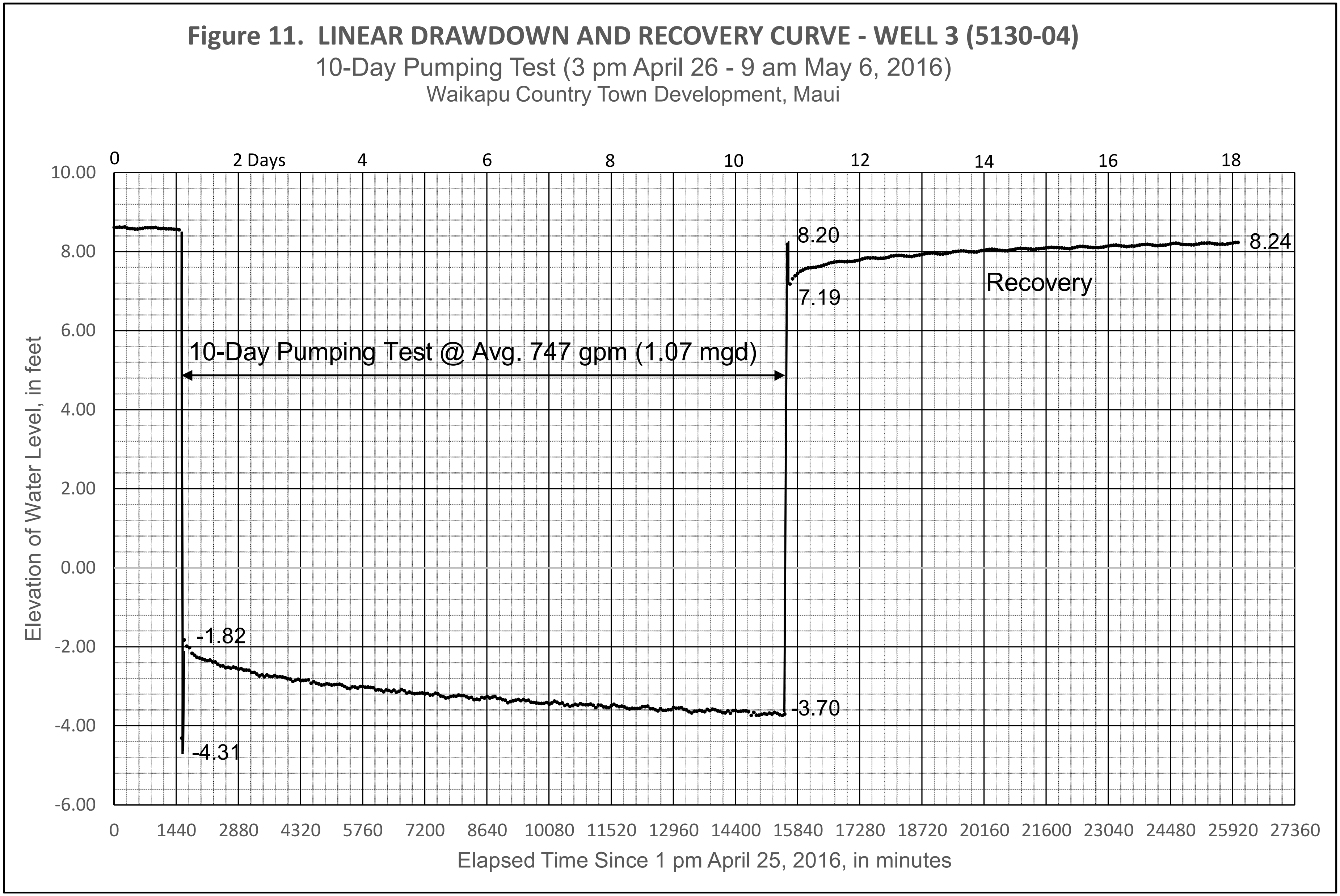

Daniel Lum, Geologist/Hydrologist
Water Resource Associates
Honolulu, Hawaii 96814

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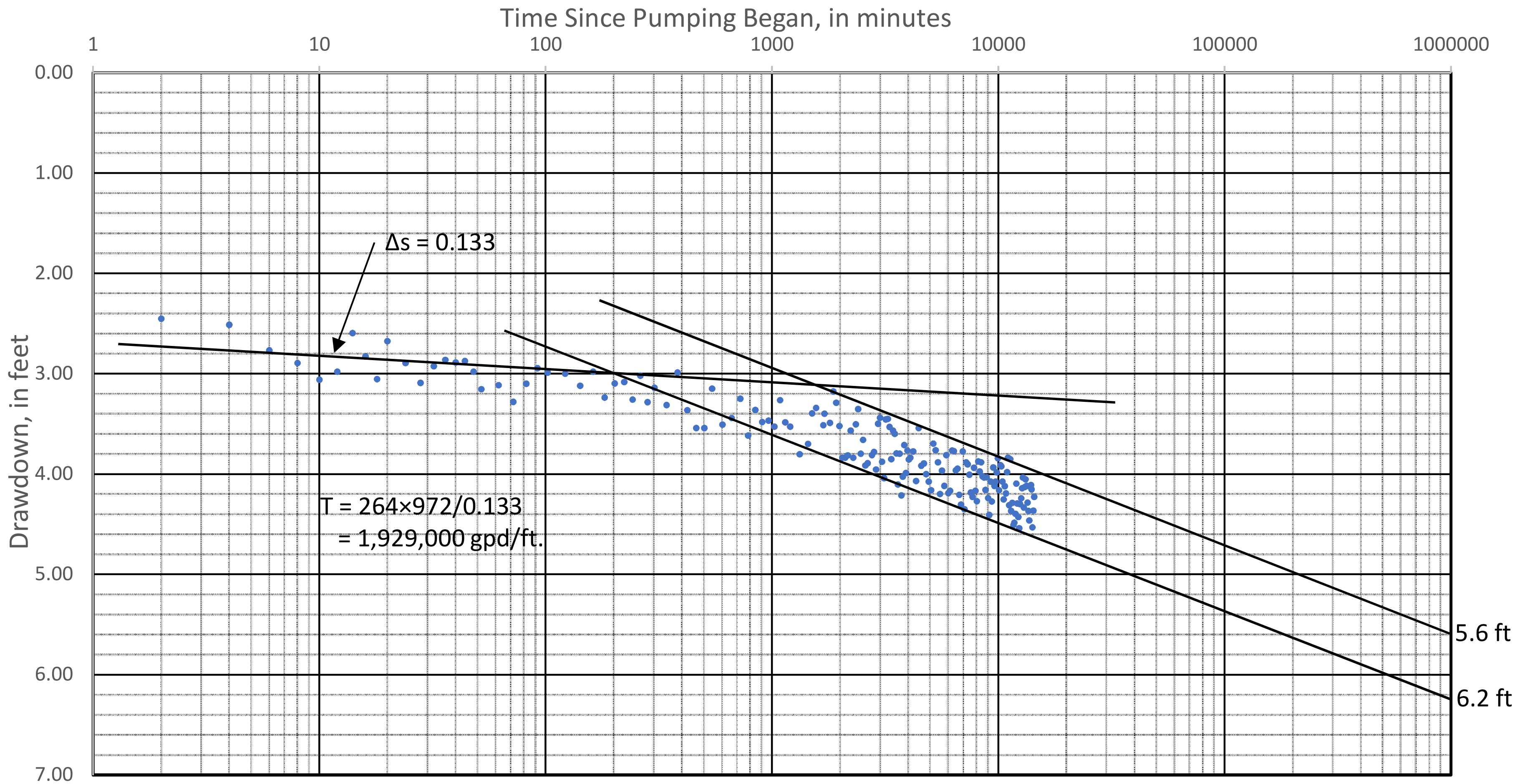
Figure 12. SEMI-LOG DRAWDOWN CURVE - WELL 1 (6-5030-04)

10-Day Pumping Test @ Avg. 972 gpm (9 am April 26 - 9 am May 6, 2016)

Waikapu Country Town Development, Maui



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Water Resource Associates

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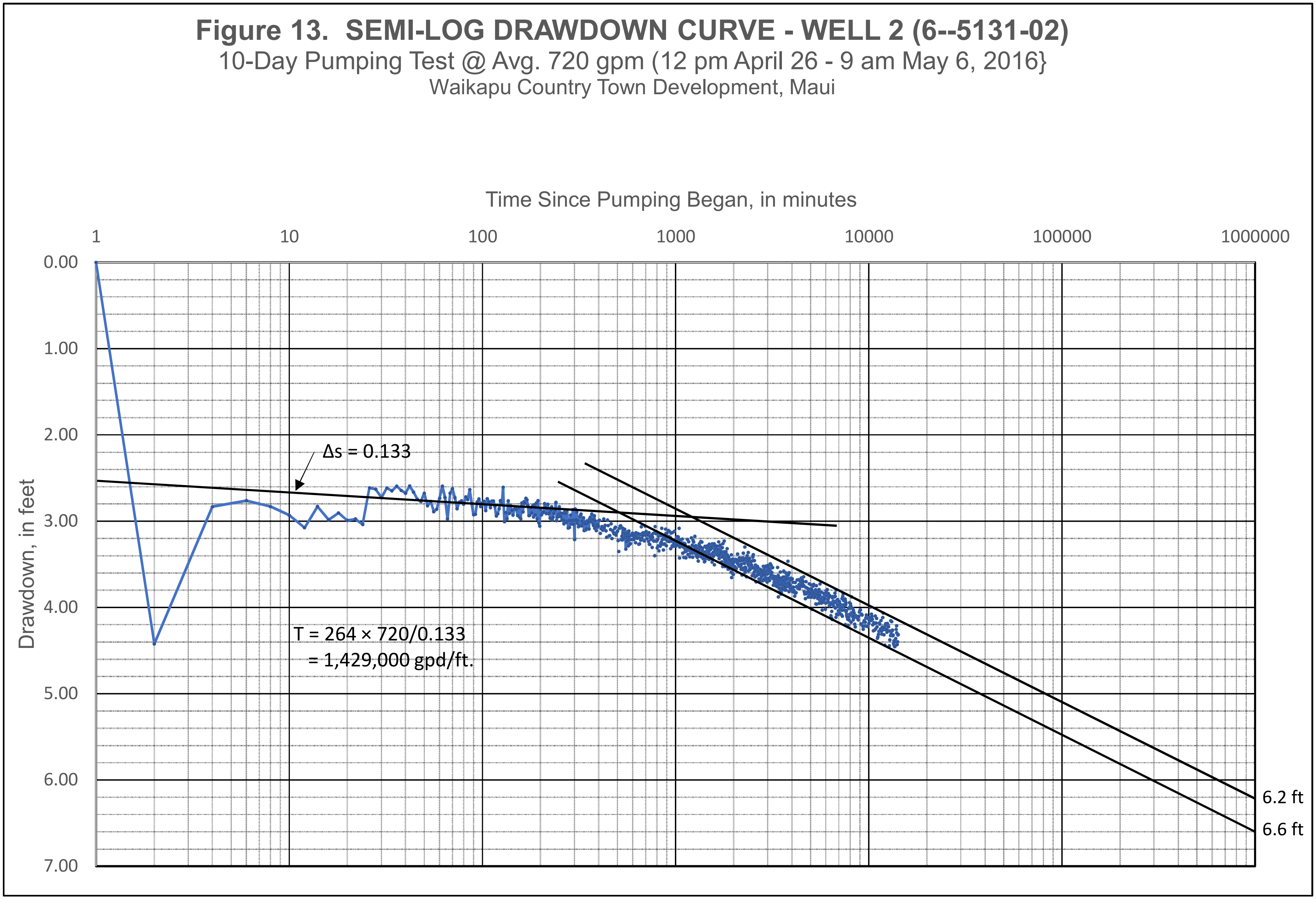
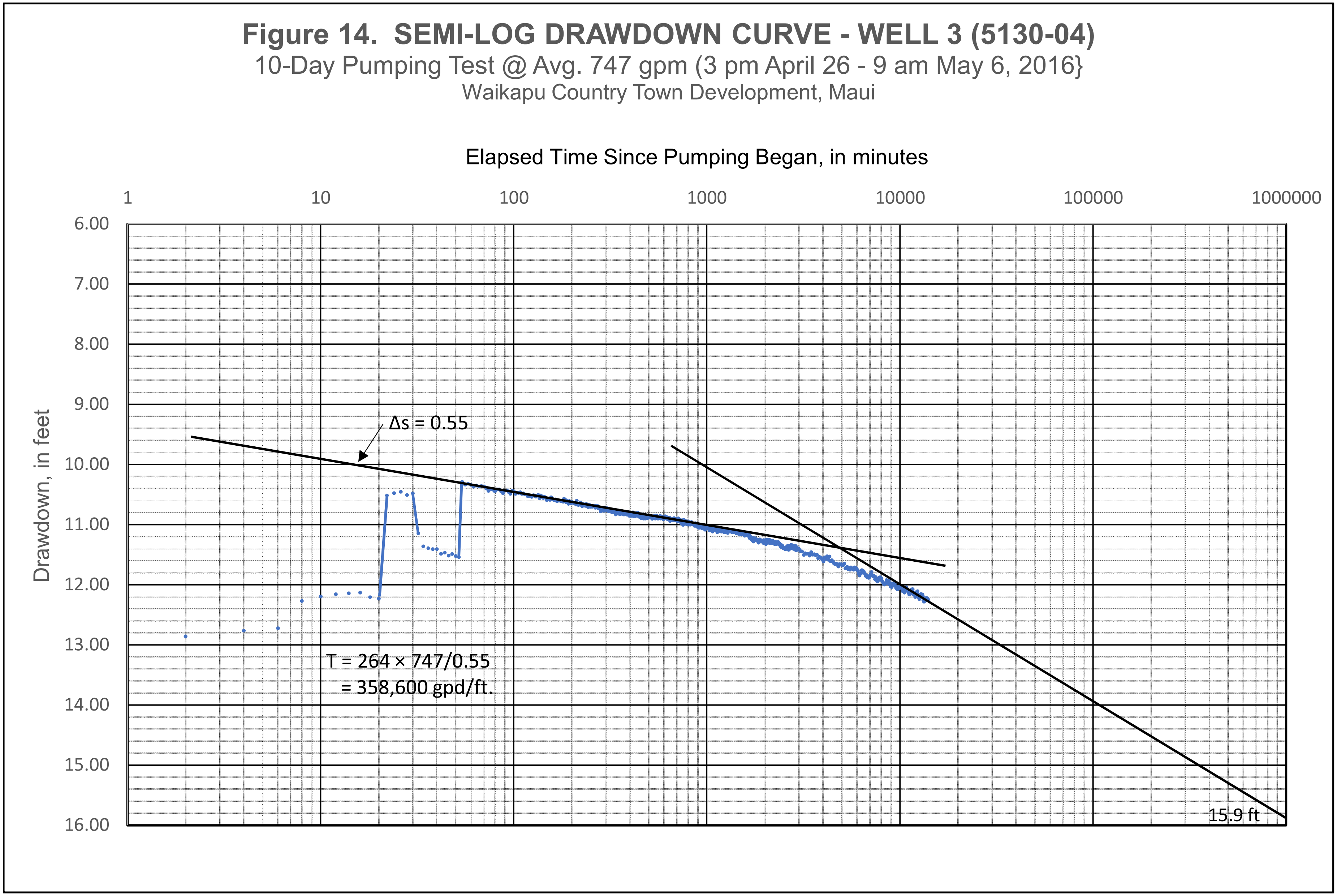


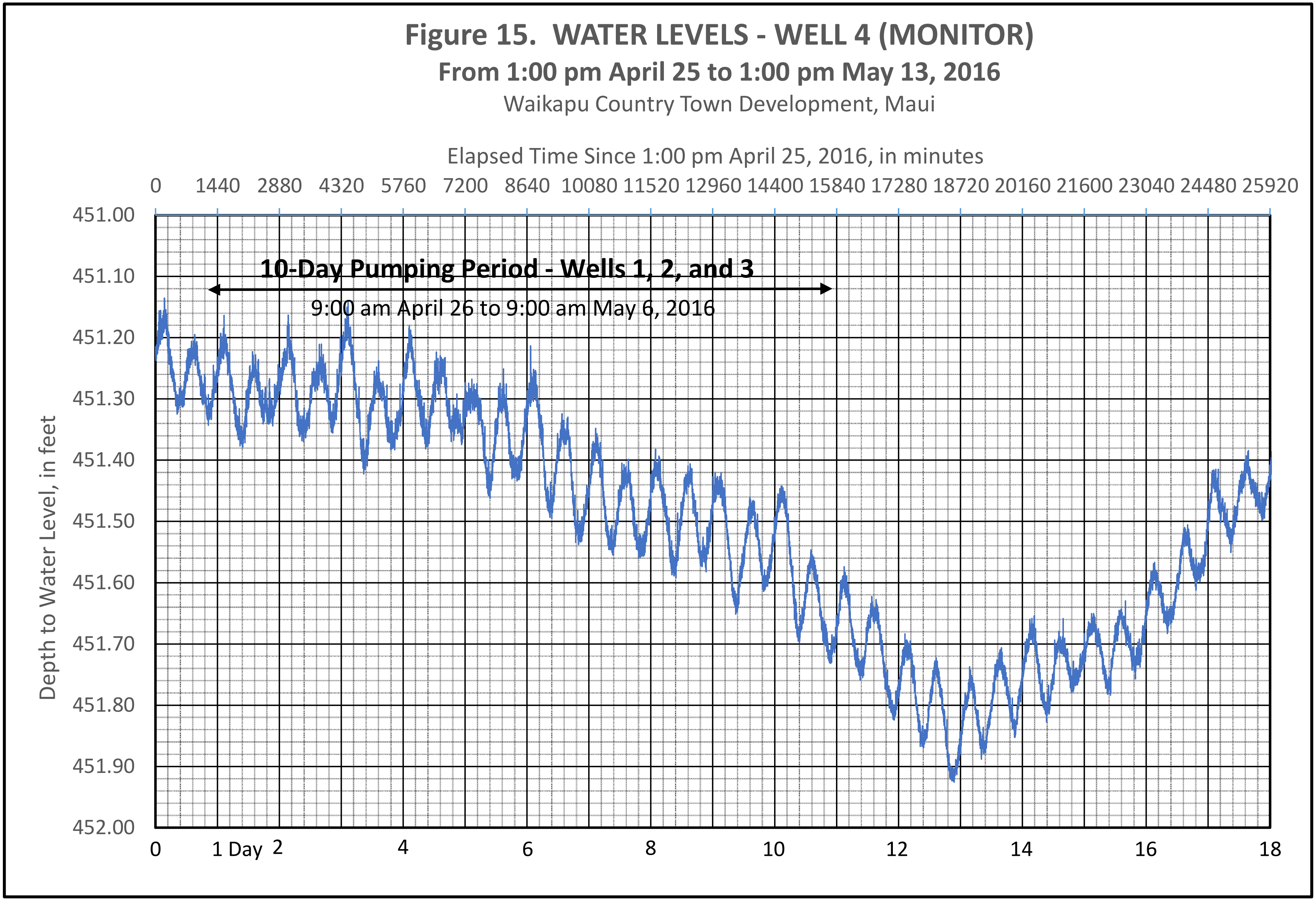
Daniel Lum, Geologist/Hydrologist
Water Resource Associates
Honolulu, Hawaii 96814

June 2016



Daniel Lum, Geologist/Hydrologist
Water Resource Associates
Honolulu, Hawaii 96814

June 2016



Daniel Lum, Geologist/Hydrologist
Water Resource Associates
Honolulu, Hawaii 96814

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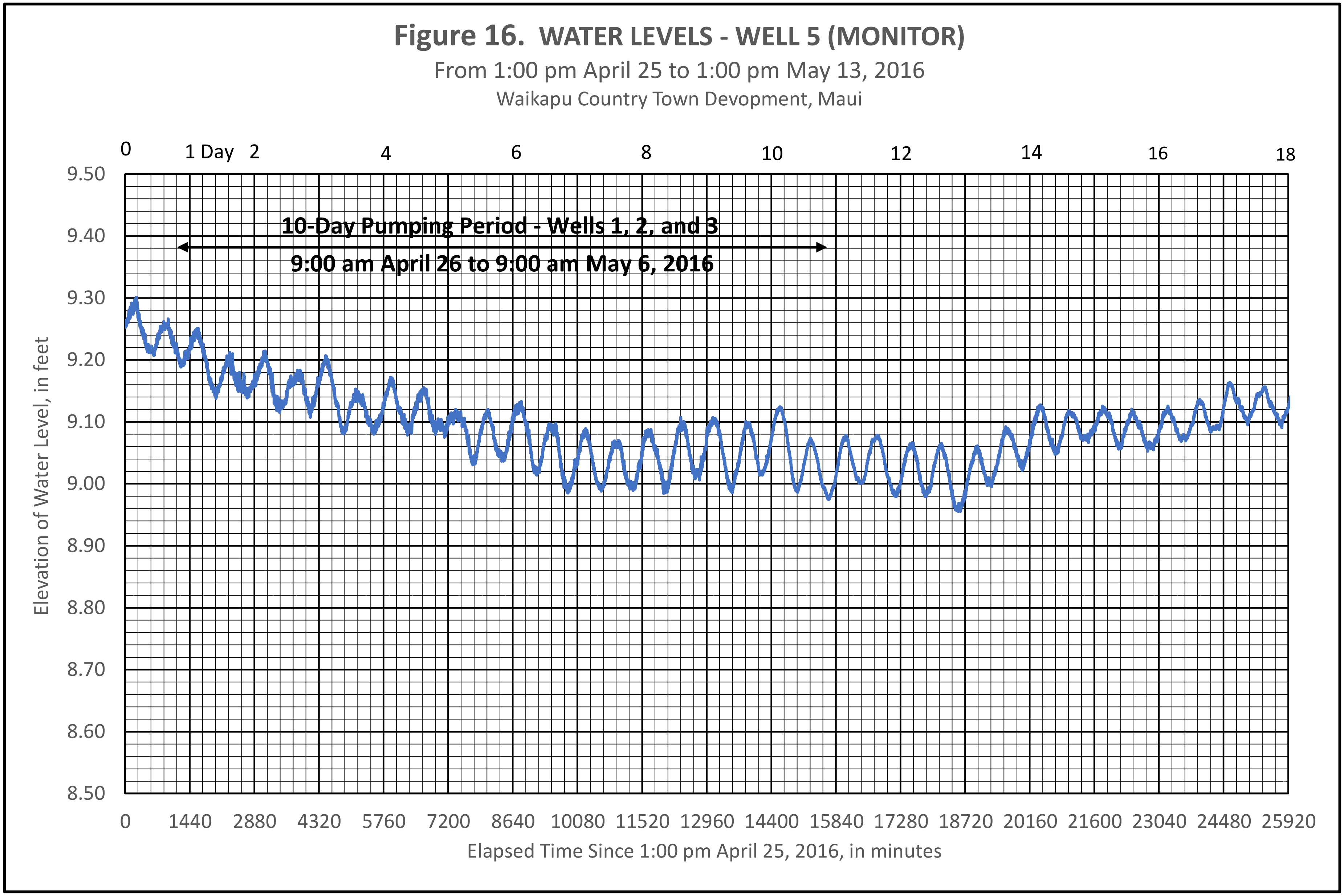

Daniel Lum, Geologist/Hydrologist
Water Resource Associates
Honolulu, Hawaii 96814

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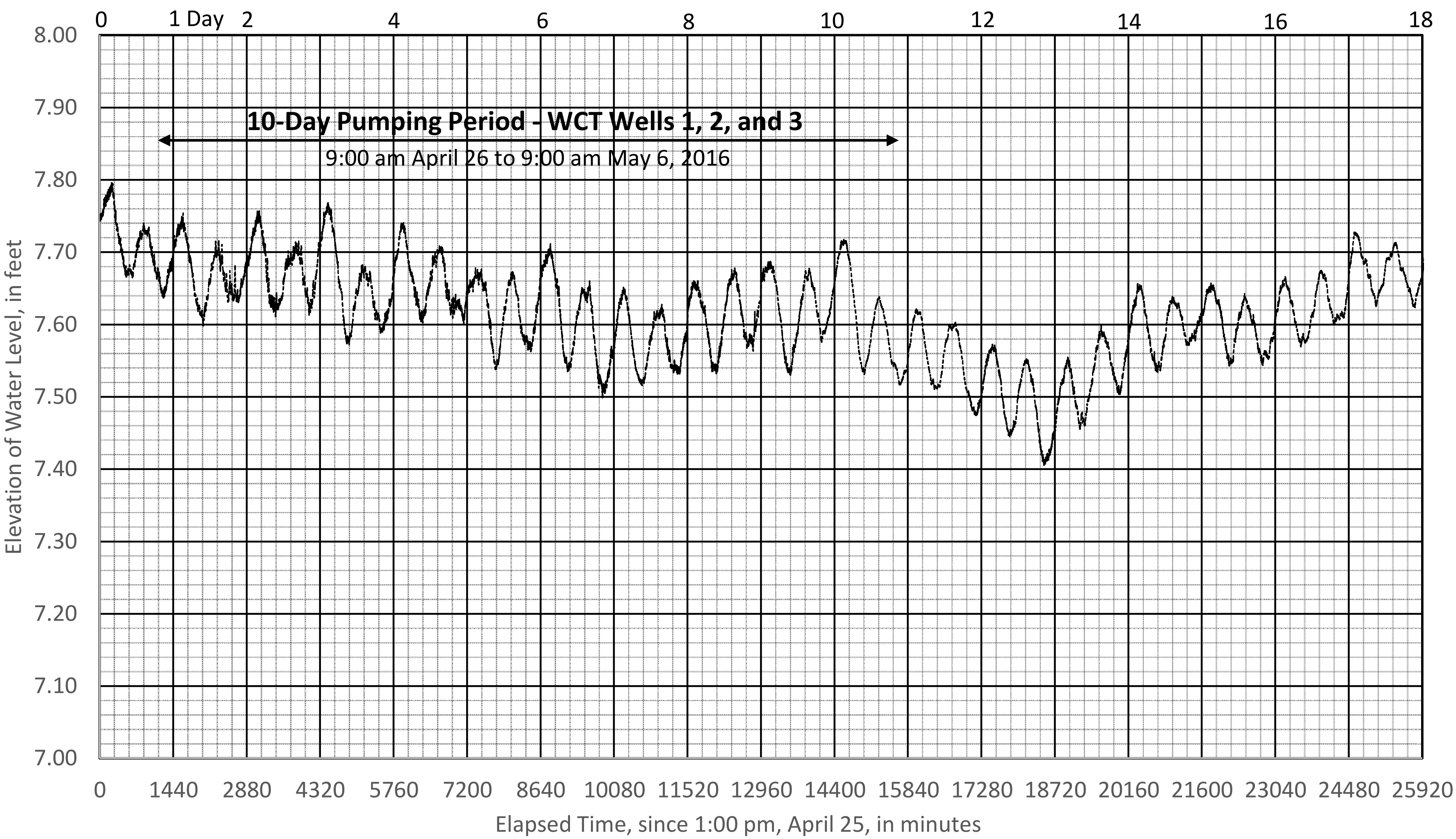
Figure 17. WATER LEVELS - WELL 6 (MONITOR)

From 1:00 pm April 25 to 1:00 pm May 6, 2016

Waikapu Country Town Development, Maui



Daniel Lum, Geologist/Hydrologist
Water Resource Associates
Honolulu, Hawaii 96814

June 2016

Table 1. SUMMARY OF WELL DATA

Waikapu Country Town Wells, Maui

WCT WELL NAME	STATE WELL NO.	GRD ELEV. (ft.)	SURVEY ELEV. (ft.)	M.P. ELEV. (ft.)	DTW (ft.)	SWL (ft.)	YIELD (gpm)	DRAW DOWN (ft.)	CHLOR (mg/L)	TEMP	AQFR	CSG DIA. (in.)	SOL CSG DEPTH (ft.)	PERF CSG DEPTH (ft.)	TD (ft.)	TD (ft. msl)
1-DOM	5030-01	653.98	654.96	655.00	*646.42*	8.58	500	2.5 +/-	30	?	Basalt	12				
2-DOM	5131-02	778.17	780.21	780.40	*767.70*	12.70	740	3.66 - 4.11	140-85	71.1	Basalt	18	778	54	900	-120
3-DOM	5130-04	522.53	522.93	523.00	*514.21*	8.79	1008	25.2 - 21.9	120-15	75.5	Alluvial	18	522	582	602	-80
4-AG	5030-02	459.318	464.17	465.50	*452.65*	12.85	500	< 25			Alluvial	14	155	None	596	-131
5-AG	5030-03	482.283	450.12	450.12	*441.37*	8.75	500	25 +/-	20		Alluvial					
6-MON	5030-04	580.709	533.36	534.18	*527.58*	6.49					Alluvial					

2-DOM Pumping Test: 10 days @ 740 gpm, increasing drawdown from 3.66 to 4.11 ft. (Mink and Yuen Report, May 2010)

3-DOM Pumping Test: 4 days @ 1008 gpm, decreasing drawdown from 23.7 to 25.5 to 21.9 ft. (WCR, 09/5/14; per. comm, 10/6/15, Wailani Drlg)

GRD - Ground
M.P. - Measuring Point
ELEV - Elevation
DTW - Depth to Water
SWL - Static Water Level

CHLOR - Chlorides
AQFR - Aquifer
SOL CSG - Solid Casing
Perf CSG - Perforated Casing
TD - Total Depth

msl - Mean Sea Level

Date: 11/12/15

Daniel Lum, Geologist/Hydrologist
WATER RESOURCE ASSOCIATES
1296 Kapiolani Blvd., #1704
Honolulu, Hawaii 96814
Ph.: 808-291-4800

Table 2. SOLINST DATA LOGGER DEPLOYMENT
Waikapu Country Town Wells, Maui

Data Logger	Installed In Well	Orig. M.P. (ft.)	Orig. DTW (ft.)	Orig. SWL (ft.)	Wailani M.P. (ft.)	Wailani DTW (ft.)	Wailani SWL (ft.)	Logger Rdg. (ft.)	Obs'd DD (ft.)	Logger Range (ft.)	Max Cable Length	Custom Cable Length	Logger DD Range
F30	***1 - DOM***	655.00	*646.42*	***8.58***	*657.48*	*648.75*	***8.73***	***56.30***	2.5+/-	30.00	676	***670***	24
F30	***2 - DOM***	780.40	*767.70*	***12.70***	*782.71*	*767.48*	***15.23***	***57.84***	4.11	30.00	798	***790***	22
F65	***3 - DOM***	523.00	*514.21*	***8.79***	*524.06*	*515.14*	***8.92***	***89.81***	25.20	65.00	579	***570***	56
F65	***4 - AG***	465.50	*452.65*	***12.85***		*451.22*		***80.79***	<25	65.00	518	***500***	47
F65	***5 - AG***	450.12	*441.37*	***8.75***	*451.54*	*442.16*	***9.38***	***92.29***	25+/-	65.00	506	***500***	59
F30	***6 - MON***	534.18	*527.58*	***6.60***					n/a	30.00	558	***550***	22

NOTES:
1. Original M.P. (Measuring Point) Elevations and DTWs (Depths to Water) are based on Nance's 5/6/15 Memorandum.
2. Wailani M.P. = Elevation of Direct Read Cable Suspension Point, measured on 12/23/15.
3. Wailani DTW Measureements: Wells 1 -5 on 12/23/15. Well 6 on 1//1/16.
4. The "Install Cable Length" rounded to nearest ten feet for straight forward field measurement and installation.
5. Well 4 reported inaccessible because chase tube offset from hole in steel base plate (corrected as of 11/12/15).
6. The recommended data loggers have measurement range of either 30 ft. or 65 ft of water.
7. The Observed DD (Drawdown) in Wells 1, 4, and 5 based on Mike Robertson info.

Date: 1/3/16

Daniel Lum, Geologist/Hydrologist
Water Resource Associates
1296 Kaiolani Blvd., #1704
Honolulu, Hawaii 96814
Mobile: 808-291-4800