WELL FIELD CAPACITY TEST REPORT, DOMESTIC WATER SUPPLY PERMIT NO. 02-03-06P1710015

Project No. 8410222

Prepared for:
Hidden Valley Lake Community Services District
19400 Hartman Road
Hidden Valley Lake, California, 95467

Prepared by:

Kent O'Brien, PG, CEG
Senior Hydrogeologist

PROFESSIONAL GEOLOGIST
ELIZABETH A. CARGAY
No.8228
STATE OF CALIFORNIA

Elizabeth Cargay PG No. 8228
Senior Project Manager

GHD Inc.
2235 Mercury Way, Suite 150
Santa Rosa, California 95407
(707) 523-1010

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PROFESSIONAL CERTIFICATION

This report was prepared by GHD Inc. (GHD) under the professional supervision of Elizabeth Cargay. The findings, recommendations, specifications, and / or professional opinions presented in this report were prepared in accordance with generally accepted professional geologic practice, and within the scope of the project.

Elizabeth A Cargay

Elizabeth Cargay, PG
PG No. 8228
Senior Project Manager
GHD Inc.

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This test was performed to comply with the requirements of the CDPH while at the same time continuing to supply water to Putah Creek. The Well Field pumping and distribution system is designed to operate efficiently for producing domestic water with the permit requirements to augment the flow on Putah Creek. The process of aquifer testing is typically performed under the extreme conditions of higher than normal pumping rates (drawdown testing) and no pumping at all (recovery testing). These extreme conditions are imposed on the aquifer so that pumping effects can be magnified to facilitate data measurement and evaluation. However operating a domestic water supply system under these extreme conditions can create difficulties in water supply reliability and permit compliance. The development of the testing protocol used in this test represents a balance of all these factors negotiated between the HVLCSD and CDPH.

HVLCSD, GHD and the California Department of Health Services (CDPH) developed testing protocol through a series of phone conversations and e-mail exchanges between GHD, HVLCSD and CDPH. These discussions were conducted to establish a well field testing program that would result in operating the Well Field under conditions that represented a reasonable maximum pumping rate. It was agreed that the test would be a multi-well test with progressively increasing production rates designed to provide the required information in general accordance with guidance provided by CDPH's *Pump Test Procedures for Wells in Alluvial Soils*. Some aspects of the CDPH's *Pump Test Procedures for Wells in Alluvial Soils* guidance were adjusted to allow for application to a multi-well pumping scenario. The Well Field test performed during this work was empirical in nature and provided a field test of the aquifer response under the minimum dry demand on the wells (augmenting Putah Creek) using 2 wells; to various normal demands of using 3 wells (approximately defined in this report as Normal Demand); to a maximum dry demand using 4 wells (Peak Demand). The collected data is presented in tabulated and graphical form and as interpretations of the cone of depression in the aquifer via several groundwater contour interval maps.

Specifically, after the potable water tanks were filled for domestic water use, a baseline drawdown was established by maintaining the required supplemental discharge to Putah Creek (pumping from Well 3 and the Ag Well) until conditions approximately stabilized. To this baseline withdrawal was added a Normal Demand withdrawal by pumping from Well 4. A Peak Demand scenario was tested by initiating pumping from Well 2 for the remainder of the 16 hour pumping test. The capacity of the aquifer to recover was tested by shutting down the pumping of Well 4 and Well 2 after the 16 hour period and monitoring the recovery back to baseline conditions (Well 3 and Ag Well continued to discharge to Putah Creek). At no time during the entire test were Wells 3 and the Ag well shut down.

2.1 Well Field Test Setup

2.1.1 Summary of Well Construction

Copies of the available well logs (Well 2, Well 3, Well 4 and Well MW-3 OB-1) are provided in Appendix B. Well logs for wells MW-2A, MW-2B and the Vineyard well are have not been located. For A summary of the construction of the wells used in this test is provided in the table below.

Table 2-1 – Well Construction Summary

Grange Road Well ID	Top of Casing Elevation (feet above mean sea level)	Diameter Well (inches)	Perforation Interval (feet) and Slot Opening (inches)	Sand Pack Gradation and Interval (feet)	Cement Seal Interval (feet)
Well 2	959.36	Steel	70-115	8x16	0 - 53
Installed 5/15/1985		12 3/4"	0.050"	53 - 120	
Well 3	956.69	Steel	80-170	None	0 - 50
Installed 10/22/1991		12 3/4"	0.070"	None	
Well 4	958.88	Steel	50-188	8x16	0 - 50
Installed 2/26/2003		12 3/4"	0.050"	50 - 206	
Ag Well	957.83	Steel	NA	NA	NA
unknown		6”	NA	NA	
Vineyard Well	956.97	Steel	NA	NA	NA
unknown		6”	NA	NA	
MW-3 OB-1	956.13	PVC	80-180	8x16	0-63
Installed 12/23/2005		2"	NA	64-180	
MW-2A (Deep)[1]	955.15	PVC	86-96	#3	0-20.6
Installed 9/9/1996		2"	0.020”	81-96	
MW-2B (Shallow)[1]	955.15	PVC	35-40	#3	0-20.6
Installed 9/9/1996		2"	0.020”	30-45	

Note – Well 1 was abandoned by permit in December 2008

1 – Top of casing is estimated by subtracting 0.5 feet from the top of the vault which covers the well head for both MW-2A (Deep) and MW-2B (Shallow).
NA=Not Available for test

2.1.2 Discharge Points for Pumping Wells

Three of the four wells that were used during the test had discharge points located outside of the area of the test. This prevented the extracted groundwater from re-entering the groundwater system and affecting the results of the test. Well 3 and the Ag Well were operated with a direct discharge location to Putah Creek (Figure 3). This flow does not run through the domestic supply distribution system but runs through a separate pipe directly to Putah Creek. This pumping and discharge to the Putah Creek is part of normal operations and the discharge location is located down gradient of the test area approximately 2 miles away. The discharge for Well 2 was run through temporary piping to a location approximately 100 feet west of the test area and discharged to ground. While this flow eventually re-infiltrated it is unlikely that the re-infiltration occurred rapidly enough to affect the test results. The Discharge for Well 4 was sent through the system distribution lines to the storage tank and used for domestic water supply.

2.1.3 Setup Wells for Groundwater Level Measurements

All four of the pumping wells and three of the four observation wells were fitted with transducers to record the pressure head of the water column during the test. The locations of the wells associated with this test are shown on Figure 4. The distances between wells are provided on Figure 5. All wells were also monitored during the test using electronic depth-to-water meters. In wells where there were transducers, the water level meter monitoring was conducted to acquire data for transducer calibration and to provide data as a backup if the transducer data was compromised for any reason. During the data analysis, the pressure head was converted to water elevation by calibrating the pressure head to hand depth-to-water measurements. The table below identifies the equipment used to monitor water levels in each well.

Table 2-2 – Water Level Measurement Equipment for Each Well

Well	Function of Well During Test	Make and Model of Transducer Used	Purpose for Hand Monitoring
Well 3	Pumping	Solinst non-vented F100	Transducer calibration and backup data set
Ag Well[1]	Pumping	Solinst non-vented F45	Transducer calibration and backup data set
Well 2	Pumping	Solinst non-vented F100	Transducer calibration and backup data set
Well 4[2]	Pumping	Solinst non-vented F100	Transducer calibration and backup data set
MW-2A	Observation	Solinst non-vented F15	Transducer calibration and backup data set
MW-2B	Observation	Solinst non-vented F15	Transducer calibration and backup data set
MW-3-OB-1	Observation	Solinst non-vented F15	Transducer calibration and backup data set
Vineyard Well	Observation	Transducer could not be installed due to obstructions in well	Primary data set
Barometer installed 10 feet into casing of well MW-3-OB-1	Barometric correction data to apply to wells with small water level response to test.	Solinst non-vented	No other record of barometric pressure

1 - Transducer hung up in well during installation and did not record water pressure. The hand collected depth-to-water data has for this data set.

2 – Transducer installed shortly before well started pumping. Early data does not appear valid and hand collected depth-to-water measurements were used as basis for first 20 minutes of the data set.

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2.1.3.1 Installation of Transducers

At each well the depth to water was recorded immediately before the installation of the transducer. The depth of transducer placement was selected based on an estimate of the magnitude of water level change that was expected to occur during the test. The sensitivity of the transducer was selected to optimize the response of the transducer to the expected water level change. The transducer support attachment varied at each well based on the well head construction. Each transducer was fixed to a point that would not be moved during the test. The barometer was installed inside the well casing of well MW-3-OB-1, approximately ten (10) feet from the top of the casing. Well MW-3-OB-1 was ported to the atmosphere during the test which allowed for a direct response of the barometric changes in atmospheric pressure. The well head at Well 4 required mechanical modification to allow access for the transducer and the depth-to-water meter during the test. Well 4 was the last well fitted with a transducer. Multiple depth-to-water measurements were made by hand before, during, and after the test. The transducers and water elevations were most stable at the end of the recovery phase of the test; therefore, the transducers were calibrated to the hand measured depth-to- water based on the pressure recorded in the last few minutes prior to transducer removal. This provided a more stable baseline rather than the initial depth to water measurements.

Table 2-3 – Transducer Installation Summary

Well	Date and Approximate time of Transducer Installation	Frequency of Data Record (minutes)	Date and Time Transducer Calibration[3]	Elevation of Measuring Reference Point (feet msl)	Depth of Installation Below Reference Point (feet)	Transducer Elevation (feet msl)[5]
Well 3	10/7/2012 3:15 PM	1	10/9/2012 12:30 PM	956.69	152.89	803.80
Ag Well[1]	10/7/2012 3:56 PM	1	-	-	unknown	
Well 2	10/7/2012 4:20 PM	1	10/8/2012 8:11 AM	959.63	127.62	832.01
Well 4[2]	10/8/2012 9:51 AM	1	10/9/2012 11:55 AM	958.88	122.75	836.13
MW-2A (Deep)	10/7/2012 4:05 PM	5	10/9/2012 8:41 AM	955.15[4]	50.93	904.22
MW-2B (Shallow)	10/7/2012 4:03 PM	5	10/9/2012 8:42 AM	955.15[4]	35.76	919.39
MW-3-OB-1	10/7/2012 3:22 PM	5	10/9/2012 12:25 PM	956.13	78.01	878.12
Barometer installed 10 feet into casing of MW-3-OB-1	10/7/2012 6:06 PM	10	Factory set	956.13	10	946.13
Vineyard Well	No Transducer Installed due to size of access point					

Notes:

1 - Transducer caught on wire or centralizer in well during installation. Did not record water pressure. Hand measurements were used for data set.

2 – Transducer installed shortly before well started pumping. Early transducer data appears to be unstable and so hand collected depth to water measurements were used as basis prior to the start of the test.

3 – Transducers are calibrated to hand collected depth to water measurements at the end of the test, immediately prior to transducer removal. The last depth to water measurement is correlated with the contemporaneous water pressure measurement.

4 – Elevation of well is calculated by subtracting 0.5 feet from the surveyed elevation of the well head protective vault.

5 – Elevation of the transducer was calculated by adding the hand measured depth-to-water to the corresponding transducer pressure head. Each transducer had a base pressure measurement of approximately 2.6 feet before insertion into the well. This base pressure was subtracted out as part of the barometric correction applied to the data set for wells MW-2A and MW-2B.

Msl = Mean Sea Level.

2.1.3.2 Hand Measurement Data Collection

During the test, the depth-to-water level was measured at each well using electronic meters. Measurements were made by gaining access to the inside of the well through an access hole in the well seal and lowering the probe of the depth-to-water meter until the meter indicated that water was encountered. The edge of the hole in the well seal was marked and used as the reference point for each well that had a seal. For wells MW-2A, MW-2B and MW-3 -OB-1, the rubber plug, which seals the well casing during non-use, was removed and the measurement was made to the top edge of the plastic casing. The surveyed top of well casing generally correspond to the elevation of the reference point except in the case of Well 4 where the survey point and the reference point are separated by approximately one foot. This separation may be due to well head construction, which occurred after the survey was conducted. The assumed elevation of the measuring reference point is provided in Table 2.2. For the groundwater contour maps, the calculated groundwater elevations have been rounded to the nearest foot because of these deviations between the reported survey and the reference point used during the test.

For all wells except the Vineyard well, the hand water level measurements were collected as backup water elevations. A transducer could not be installed into the Vineyard Well. Therefore, hand measurements were collected on a frequent basis and were used as the basis for this analysis. The primary data set used to calculate groundwater elevation for the remaining wells was gained from the pressure transducers. However, the transducer data collected from the Ag Well was not usable. The transducer was apparently hung up in the wires or centralizers in the well. For the Ag Well the only usable data is some of the hand collected data set. Some of these data appear unusable as it indicates that the water levels went up when wells were being pumped. The unusable points (most likely splashing or dripping water within the well casing onto the meter) were removed from the graph. They are included in "red" in the field data sheets and indicate that the water level in the Ag well changed very little over the 24 hour time period.

2.2 Well Field Capacity Test

The Well Field Capacity Test was conducted for approximately 24 hours to evaluate the effect of pumping the aquifer under dry season conditions. The approach consisted of establishing baseline groundwater elevations during which the required discharge to Putah Creek was satisfied by pumping Well 3 and the Ag Well constantly. Superimposed on this pumping to Putah Creek was the maximum pumping of Well 4 for a period of eight (8) hours to represent a pumping test when 3 wells are in use. Peak demand was then simulated by adding Well 2 to the production for an additional eight (8) hours with 4 wells running (Well 4 was pumped for sixteen (16) hours and Well 2 was pumped for eight (8) hours). Well 4 and Well 2 were then shut down to allow for aquifer recovery for a period of eight (8) hours. Well 3 and the Ag Well remained pumping during the entire time, including the recharge period to simulate recovery under conditions where discharge to Putah Creek is required. The order of pump activation and the approximate flow rate is presented on Figure 6.

A summary of the main sequence of events are listed below:

Pre-Test preparation -

1. Continuous pumping of Well 3 and the Ag Well to Putah Creek
2. Installing the transducers in the wells on Sunday, October 7, 2012
3. Filling the potable storage tank by Well 4 on Sunday October 7, 2012
4. Turning off Well 4 at 11:00 PM Sunday October 7, 2012

Pumping Test –

1. Continuous pumping of Well 3 and the Ag Well to Putah Creek
2. Turned on Well 4 at 10:16 AM on Monday October 8, 2012
3. Turned on Well 2 at 6:30 PM on Monday October 8, 2012
4. End of Pumping at Well 2 and Well 4 at 3:23 AM on Tuesday October 9, 2012

Recovery Test -

1. Turned off Well 2 and Well 4 at 3:24 AM on Tuesday October 9, 2012
2. End recovery period at 11:24 AM on Tuesday October 9, 2012

End of test –

1. Maintain continuous pumping of Well 3 and the Ag Well to Putah Creek
2. Removed transducers from all wells on Tuesday afternoon, October 9, 2012
3. Refill the storage tank using Well 4

2.2.1 Pumping of Well 3 and Ag Well (Baseline)

In the week prior to performing the Well Field Capacity Test, the system was operated normally with continuous pumping of Well 3 and the Ag Well to supplement water to Putah Creek and as-needed pumping of Well 4 and Well 2 to supply domestic water to the storage tank. Typical flow rates for Well 3 and the Ag Well are 385 gpm and 460 gpm respectively (for a combined flow of 845 gpm). The Ag well pumping varied between 425-460 gpm, while Well 3 pumping varied between 388-394 gpm. As required, between July and October each year, the continuous pumping of Well 3 and the Ag Well is completed to maintain the flow in Putah Creek. Given the operational constraints and for the purpose of this capacity test, the continuous pumping of Well 3 and the Ag Well is considered the “baseline” or “static” condition for the system operation under a maximum pumping rate scenario. Ideally, Well 4 which is the primary production well for domestic supply would have been turned off for twenty four (24) hours prior to the Well Field Capacity Test to allow the groundwater elevation to come into equilibrium with only Well 3 and the Ag Well pumping. Despite slightly less than twelve (12) hours of shut-off time in Well 4 prior to the test, the aquifer had already recovered well over 90% (inferred from final recovery water levels in Well 4). This was enough to begin the test at somewhat static conditions. However, customer demand for water was relatively high during the first week of October 2012 due to warm weather. Therefore, on Sunday, October 7, 2012 extended pumping of Well 4 was required to top-off the storage tank prior to shutdown of Well 4 at approximately 11:00 PM Sunday night (October 7, 2012).

2.2.2 Pumping of Well 3, Ag Well and Well 4 (Dry Season Normal Demand Simulation)

On the morning of October 8, 2012, at 10:16 AM, the typical flow rates for Well 3 and the Ag Well were 385 gpm and 460 gpm respectively (for a combined flow of 845 gpm). Well 4 was turned on and was running at 1300 gpm. As is typical during normal operation, the flow rate decreased as the water level in the well decreased. Most likely, this is due to the additional work the pump does to lift the water. After 16 hours, just prior to turning the pump off, the flow rate was measured at 1,260 gpm. Measuring and recording accurate depth-to-water measurements by hand during the first 10 minutes of Well 4 pumping was not possible due to rapid water level decline; however, these water elevations at pump startup are not relevant to the evaluation.

2.2.3 Pumping of Well 3, Ag Well, Well 4 and Well 2 (Dry Season Peak Demand Simulation)

At 6:30 pm on October 8, 2012, while all three pumping wells (Well 3, Well 4, and Ag Well) were still running, the pump in Well 2 was turned on and the pump rate of Well 2 was set to 775 gpm but decreased somewhat over time to 715 gpm.

2.2.4 Pump Shutdown and Recovery Monitoring (Dry Season Recovery Simulation)

At 3:24 AM on October 9, 2012, the two pumping wells, Well 2 and Well 4, were turned off. The Ag Well and Well 3 continued to be pumped.

2.2.5 End of Recovery Monitoring

At 11:53 am on October 9, 2012, the test was determined to be complete (90% or greater of the static levels were recovered in Well 2 and Well 4) and with the completion of the test:

- A final hand depth to water level measurement was recorded in each well;
- GHD and HVLCSD staff recovered the transducers
- All the well heads were secured to the original configurations; and,
- HVLCSD staff returned the water system to normal operating modes.

3. Well Field Capacity Test Results

Transducer data was converted to Excel format and is provided on a compact disk (Appendix C). In addition to water pressure (units of feet of water column), each device measured and recorded the temperature (units Celsius). On the first page of each Excel file is pertinent information related to the conversion of the water pressure data to water elevation. A copy of the first sheet from the Excel file for each well is provided in Appendix D.

Copies of the hand depth-to-water measurements are provided in Appendix E. The frequency of depth-to-water measurements (between 10 seconds and 10 minutes) was greater for Well 2, Well 4, MW-3 OB-1 and the Vineyard Well in order to record the rapid changes in water elevation that occur when a well started. Because of the relatively consistent pumping and expectation of stable water elevations, Well 3 and the Ag Well were measured less frequently by hand (every 1-2 hours to 6 hours). Well MW-2A and MW-2B were measured less frequently because they are located at a much greater distance from the pumping wells and were not expected to respond quickly to pumping changes. The transducer sample intervals were set to record once every minute.

Appendix F provides graphs for each well for the 24-hour test period between the October 8 and October 9, 2012. Below is a summary of observations for each of the graphs (Appendix G).

Pumping Wells -

1. Ag Well – The graph of water elevation for the Ag Well was prepared from some of the depth-to-water measurements collected by hand. Transducer data was not available for this well. The graph of groundwater elevation changes reflects the slow decrease in pumping rate during the test. The pumping rate was set at 464 at the start of the test. The rate slowly decreased to 425 gpm after approximately fourteen (14) hours of operation due to back pressure changes. Some of the hand collected water level measurements were not used because and indicate that the water levels went up several feet throughout the test, but then came right back down to near the same water elevation as it started and occurred several times. Water that is coming into and splashing in a pumping well can give falsely high depth-to-water readings because the electronic probes fitted to the end of water lever meters are sensitive to any droplets of water. This is most likely the case with the Ag Well data. If the increase in water levels during the test is eliminated in the Ag Well, the overall change in water levels is consistent and show little to no change in water levels (Appendix F). Note that all field data is included in this report, but the readings that were removed from the graphs are indicated by the red color in Appendix F.
2. Well 3 – The flow rate was steady at approximately 385 gpm for the duration of the test. Decreases in water elevation can be seen at the time intervals when Well 4 and Well 2 are activated. Because the flow rate from Well 3 was stable for the duration of the test, the change in water elevations can be attributed to the activation of Well 4 and 2.

3. Well 4 –The data used on the graph prior to pump activation is based on hand measurements taken with the depth-to-water meter. A rapid decline is present in Well 4 when the pump is activated, but then stabilizes quickly with a slight decrease in water levels over the 16 hour pumping test. The small decrease in water elevation which occurs at 6:30 PM on October 8, 2012 is likely related to the start of pumping of Well 2. The recovery of water elevation in Well 4 is rapid and nearly complete after eight (8) hours.
4. Well 2 – The water elevation in Well 2 is similar to Well 4 and reflects the pumping at Well 4 prior to Well 2 being turned on. A rapid groundwater elevation decrease occurs at 6:30 PM when the pump is activated. Well 2 has a rapid and nearly a complete recovery in groundwater elevation after eight (8) hours.

Observation Wells –

1. MW-3 OB-1 – The activation of Well 4 and Well 2 are reflected in the groundwater elevation in this observation well. The drawdown in this well is a slightly larger than Well 3 and indicates a smaller radius of influence on MW-3.
2. Vineyard Well – Drawdown from the activation of Well 4 and Well 2 seen on the graph. This indicates that the Vineyard Well is within the influence of these two production wells. However, no production difficulties have been reported by the well owner to HVLCSD. Under the Normal Demand scenario the drawdown was approximately 4 feet and under the Peak Demand scenario the drawdown was approximately 8 feet. This well also indicates a small radius of influence for Well 4.
3. MW-2A (Deep) – The deep well near Putah Creek decreased by 0.2 feet during the test. However, the activation of Well 4 and Well 2 can't be identified on the nearly straight line decrease on water elevation. The decrease is likely the result of the slow seasonal decline in water elevations.
4. MW-2B (Shallow) – The water elevation is nearly unchanged throughout the test indicating no response to pumping. There is approximately a four foot difference in water elevation form the Shallow well to the Deep well. This indicates that there is a restriction to vertical flow from the creek elevation to the underlying aquifer production zone.

The following table summarizes the groundwater elevation measured as the Well Field Capacity Test was performed. The elevation of groundwater presented in Table 3-1 was measured at the end of each simulation.

Table 3-1 – Summary of Groundwater Elevations at Beginning and End of Each Simulation

Well Name	Function of Well During Test	Water Elevation at Baseline Start of Pumping (feet) Start of Normal Dry Season Simulation	Water Elevation at Start of Additional Pumping (feet) Start of Peak Dry Season Simulation	Water Elevation at End of Pumping (feet) Start of Recovery	Water Elevation at End of Recovery (feet)
Well 4	Domestic Distribution pumping	914.69	864.50	861.32	913.98
Well 2	Domestic Distribution pumping	913.04	909.65	864.01	912.67
Well 3	Baseline pumping	877.85	876.27	874.84	877.74
Ag Well	Baseline pumping	896.32[1]	901.83[2]	896.22[3]	896.19
Vineyard Well	Observation	913.99	909.54	905.17	913.60
MW-2 A (Deep)	Observation	928.78	928.74	928.42	928.60
MW-2 B (Shallow)	Observation	932.01	932.00	931.98	931.97

Notes:

1 – Depth of groundwater measured at 7:12 AM on October 8, 2012, approximately four hours before the start of pumping in Well 4. Transducer data was not available.

2 – Depth of groundwater measured at 5:22 PM on October 8, 2012, approximately one hour before the start of pumping in Well 2. Transducer data was not available. Increase in water level may be due to temporary decrease in pumping rate in this well.

3 – Depth of groundwater measured at 1:35 AM on October 9, 2012, approximately two hours before the shut-down of Well 2 and Well 4. Transducer data was not available

The groundwater elevations have been plotted on a map and interpretive contour lines have been prepared for each simulation of the test (see Figures 7 through 10): Baseline, Dry Season Normal Demand, Dry Season Peak Demand and Dry Season Recovery. In general, a depression is observable on Figure 7 for the Baseline condition when both Well 3 and the Ag Well are pumping that is immediately near the wells and does not extend to Putah Creek. The groundwater elevation depression shown by the activation of Well 4 reflects this wells relatively close proximity to the Ag Well (Figure 8). Figure 9 reflects a complex interaction when all four wells are actively pumping. The recovery groundwater contour map reflects the high percentage and quick recovery that occurs in the vicinity of Well 4 and Well 2 once pumping is stopped.

The following table summarizes the additional drawdown measured when Well 4 and Well 2 were activated. Also summarized is the percent recovery of groundwater, measured eight (8) hours after Well 4 and Well 2 were shut down. In all cases, the recovery was equal to or exceeded 90% of static water levels prior to the test within eight (8) hours. This recovery is good, particularly when considering that the pumping duration was sixteen (16) hours.

Table 3-2 – Summary of Groundwater Elevation Differences Between Simulations

Well Name	Function of Well During Test	Change in Water Elevation Caused by Pumping Dry Season Normal Demand (feet)	Change in Water Elevation Caused by Pumping Dry Season Peak Demand (feet)	Percent of Recovery After 8 hours Dry Season Recovery (%)
		At ~8 hour	At ~16 hours	At ~24 hours
Well 4	Distribution pumping	50.19 (pumping)	53.37 (pumping)	99%
Well 2	Distribution pumping	3.39 (not pumping)	49.03 (pumping)	99%
Well 3	Baseline pumping	1.58[1]	3.01[1]	96%
Ag Well	Baseline pumping	No discernible change[1]		
MW-3 OB-1	Observation	2.66	4.34	90%
Vineyard Well	Observation	4.45[2]	8.82[2]	96%
MW-2 A (Deep)	Observation	Decrease of 0.2 foot during test (may be seasonal trend)		
MW-2 B (Shallow)	Observation	No discernible change[1]		

Notes:

1 –No discernible change when comparing the elevations at the start of the test to the end of the 16-hour peak dry season demand pumping.

2 – Hand measured depth-to-water.

Baseline pumping = Well 3 and Ag Well constantly pumping.

4. Conclusions

The conclusions which can be drawn from the Well Field Capacity Test are listed below:

- The recovery of the aquifer in the pumping wells was 90% or higher in all wells within the 8-hour recovery period. The groundwater level in the monitoring well closest to one of the pumping wells (<50 ft. for MW-3 OB-1) only decreased a maximum of 4.34 feet. This indicates that there appears to be sufficient water in the aquifer and interconnections to replenish the extracted groundwater in a short period of time.
- At the time of this study there was no surface water flow in Putah Creek between Highway 29 and the supplemental discharge point is located. Because of this, the shallow monitoring well MW-2B represents the potentiometric head at the creek. The negligible change in the groundwater water elevation measurements collected adjacent to Putah Creek indicates that pumping of the well field has no discernible effect on the Creek.
- Based on the results of the pumping test, the current production rates for the Well Field, it does not appear that the pumping would impose any major decrease in groundwater elevations. The wells were pumping at:
  - Well 2 was pumped at 715-775 gpm
  - Well 3 was pumped at 388-394 gpm
  - Well 4 was pumped at 1260-1300 gpm
  - Ag well was pumped at 425-460 gpm

  Total Pumping Rate: 2,788-2,929 gpm

GHD Inc.

2235 Mercury Way, Suite 150
Santa Rosa, CA 95407 USA
T: 1 707 523 1010 **E:** santarosa@ghd.com