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Water Availability Analysis and Water use Calculations

Containing the Following:

- Richard C. Slade & Associates (RCS), April 10, 2017, Aquifer Test and Tier 1 Water Availability Analysis (WAA), Anthem Winery.
- RCS, October 19, 2017, Addendum to the April 2017 WAA, Response to August 2017 WAA Peer Review comments.
- RCS, March 23, 2018, Response to January 2018 Peer Review Comments.
- RSA+, June 5, 2016, Tier 1 Water Use Calculations, Anthem Winery.

Anthem Winery P14-00320-MOD and Exception to Road and Street Standards,
Variance P14-00321-VAR and Viewshed, and
Agricultural Erosion Control Plan P14-00322-ECPA
Planning Commission Hearing Date (Wednesday, October 3, 2018)

MEMORANDUM

April 10, 2017

To: Ms. Julie Arbuckle
Anthem Winery
Sent via email (jarbucke@sbcglobal.net)

Job No. 560-NPA01

From: Chris Wick, Anthony Hicke, and Richard Slade
Richard C. Slade & Associates LLC

Re: Results of Aquifer Testing of Project Wells and
Napa County Tier 1 Water Availability Analysis
For Proposed Anthem Winery
3454 Redwood Road and 3123 Dry Creek Road
Mt. Veeder Area, Napa County, California

Introduction

Provided herein are the key findings, conclusions, and preliminary recommendations regarding the Water Availability Analysis (WAA) for the proposed Anthem Winery in Napa County, California, as prepared by RCS to be in conformance with Napa County Tier 1 requirements. The Anthem Winery property, known herein as the "subject property", is located at 3454 Redwood Road and 3123 Dry Creek Road in the Mt. Veeder area of Napa County. Figure 1, "Well Location Map," shows the boundary of the subject property superimposed on the USGS topographic map for the Napa quadrangle, along with the locations of eight existing onsite water wells. Property boundaries shown on Figure 1 were adapted from assessor's parcel data that are freely available from the Napa County GIS website. Figure 2, "Aerial Photograph Map," shows the locations of the onsite wells on an aerial photograph of the subject property; this aerial photograph was also obtained directly from the Napa County GIS website (the date of the imagery is August 2007).

Currently, the subject property is occupied by: 5.77 acres of vineyards; a winery permitted to produce 30,000 gallons of wine per year; and a few structures, including one primary residence, one secondary residence, and a wine cave. There are also roughly 2.29 acres of vines that have been approved as part of a previous permit (Permit No. P12-00401), but this new acreage has not yet been planted. We understand that the proposed project includes an increase in winery production to 50,000 gallons per year and 0.95 acres of additional vines. Water saving improvements to the existing vineyard and winery infrastructure are proposed to offset and reduce onsite water use to levels that are below those used by the current onsite infrastructure. Groundwater pumped from onsite wells is currently used to meet all of the existing water demands of the subject property. The owner proposes to use groundwater, reclaimed winery process water, and harvested rainwater to meet the water demands of the proposed project.

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Specifically, the owner proposes: (1) to increase the total water supply on the parcels by harvesting rainwater and reclaiming winery process water; and (2) to reduce the amount of permitted groundwater use in the future with the proposed winery expansion and proposed 0.95 acre of vineyard.

As part of the permit submittal for the proposed winery and vineyard expansion, a Water Availability Analysis is required by the County. Hence, this Memorandum was prepared by RCS to comply with Napa County's WAA guidelines, which were promulgated by the County in May 2015. Specifically, this Memorandum reflects a "Tier 1" WAA, because there are no known offsite wells located within 500 ft of any of the three onsite wells that are project wells; these onsite project wells are Wells 3, 6, and 8, and they are discussed in more detail later in this Memorandum. Because no offsite wells lie within 500 ft of one of these three project wells, a "Tier 2" WAA has been presumptively met.

Site Conditions

From the field reconnaissance visits to the subject property on July 8 and 20, 2015, the following key items were noted and/or observed (refer to Figure 1):

a. The subject property is comprised of two contiguous parcels, which have County Assessor Parcel Numbers (APN) of 035-460-038 (referred to herein as "Parcel 1") and 032-470-046 (referred to herein as "Parcel 2'), respectively; the total County-assessed acreage of the subject property is 44.8 acres.

b. The subject property is currently developed with: two residences (one main residence and one secondary residence); approximately 5.77 acres of vineyards; a winery permitted for an annual production of 30,000 gallons; an uncovered crush pad, tank area, and cave in which the existing winery is located. The remaining areas of the property were observed to be relatively undeveloped and covered by grasses, native brush, and trees.

c. Topographically, the western portion of the property has somewhat steep terrain and generally slopes to the southwest, whereas the eastern portion of the property is considerably less steep and generally slopes to the northeast.

d. Eight (8) water wells are known to exist on the subject property, as shown on Figures 1 and 2. Wells 2, 3, and 6 are located on Parcel 1 (APN 035-460-038), whereas the remaining wells (Wells 1, 5, 7, and 8) are located on Parcel 2 (APN 035-470-046); RCS observed each of these seven wells. Well 4 was not observed during our site visits, but is located at the northeastern end of the long, narrow portion of Parcel 1, as seen on Figure 1. Wells 3, 6, and 8 are considered herein to be the "project wells," and represent the only three onsite wells that are to be used to meet the groundwater demands of the proposed project in accordance with the County's WAA guidelines; note that project Wells 3, 6 and 8 are currently used to meet a small portion of the existing groundwater demand at the project site. Wells 1, 4, 5, and 7 are considered to be existing "non-project wells" and are used to meet the current groundwater demands at the subject property.

e. All onsite wells are equipped with permanent pumps and are considered to be active (operational) wells, with the exception of Well 2. Well 2 is currently not equipped

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with a pump and was irreparably damaged during the August 24, 2014 Napa earthquake, and is now unusable, according to the well driller.

f. The offsite areas surrounding the subject property consist primarily of existing vineyards, wineries, and residences to the east of the property, and primarily naturally vegetated and wooded hillsides to the west.

g. A seasonal drainage, labeled as “Redwood Creek”, is shown on the topographic base map for Figure 1 to flow in a northwest to southeast direction along the southwesterly side of the subject property, as illustrated by the dashed blue line on that figure. Redwood Creek flows offsite to the southeast of the property.

h. No nearby offsite wells owned by others were observed by the RCS Geologist during his site visits, and no wells owned by others were found to exist within 500 ft of Wells 3, 6, or 8 (i.e., the project wells). One nearby but offsite well is shown on Figure 2, and its location is based on information provided by the property owner.

i. No seeps/springs are known to exist in the immediate vicinity of the subject property. No seeps/springs were observed by the RCS geologists during the field visit, and the property owner also confirmed that none exist in the vicinity of the property.

j. As discussed above, a new winery building and 3.24 acres of vineyards (including 0.95 acres of new vines, and 2.29 acres of approved but unplanted vines) are to be developed on the subject property. The owner plans to use the existing onsite wells (with the exception of Well 2) in conjunction with recycled process water and harvested rainwater to meet the existing water demands and future water demands of the subject property.

Key Construction Data for Existing Onsite Wells

A California Department of Water Resources (DWR) Well Completion Report (also known as a driller’s log) is available for seven of the eight onsite water wells shown on Figure 1; no driller’s log or well construction information is available for Well 1. These available driller’s logs were provided to RCS Geologists by the property owner. RCS Geologists were not involved in assessing the hydrogeologic feasibility of developing groundwater from the property or from any of the onsite wells, or in the siting, design, or construction of any of these wells.

Table 1, “Summary of Well Construction Data,” provides a tabulation of key well construction and “testing” data, respectively, for those onsite wells for which the requisite data were available.

Key data for the existing onsite wells include:

a) Due to the lack of a driller’s log for Well 1, its casing depth, perforated interval, and sanitary seal depth are unknown. During our July 2015 site visits, the RCS Geologist did note that Well 1 has a 5-inch diameter PVC well casing. In discussions with staff for Dave Bess Pump and Well (Bess), of Napa, California, we understand that Bess constructed Well 1 in 1991.

b) Wells 2, 3, 4, 6, 7, and 8 were constructed by Bess between August 1995 and May 2015, using direct air and/or direct mud rotary drilling methods; Well 5 was drilled by Huckfeldt Well Drilling.

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c) Pilot hole depths (the borehole drilled before the well casing is placed downhole) were reported to have ranged from 310 ft below ground surface (bgs) in Well 3, to 880 ft bgs in Well 5.

d) The driller's logs state that the onsite wells were all cased with PVC well casing having nominal diameters of either 5 or 6 inches; total casing depths ranged from 310 ft bgs in Well 3, to 855 ft bgs in Well 5. Bess reported to RCS Geologists that Well 1, for which a driller's log is not available, may possibly be constructed to a total depth of about 215 ft bgs.

e) Casing perforations for all onsite wells are machine-cut slots and have slot opening widths of 0.032 inches (32-slot), with the exception of Well 2, which has a reported slot opening width of 0.020 inches (20-slot). The depth to the top of the uppermost perforations in the wells range from 40 ft bgs (in Well 2), to as deep as 280 ft bgs (in Well 6). The depth to the base of the bottommost perforations range from 310 ft bgs (in Well 3), to 835 ft bgs (in Well 5).

f) Gravel pack materials shown on the driller's logs for these wells were generally listed as "3/8 pea gravel" or "pea gravel". However, for Wells 6, 7, and 8, the gravel pack is only listed as "filter pack".

g) All onsite wells were stated to be constructed with sanitary seals consisting of cement (grout) and/or bentonite clay (a type of clay with low permeability). These sanitary seals were set to depths ranging from 20 ft (in Well 6) to 56 ft bgs (in Well 5). Wells 3, 6, and 8 have sanitary seal depths of 23 ft, 20 ft, and 50 ft, respectively.

<u>Summary of Key Well Test Data for Onsite Wells</u>

Table 1 also provides a brief summary of the original, post-construction "testing" data for the onsite wells, as listed on the driller's logs. These data include:

- Initial static water levels (SWLs) following completion of well construction ranged from 46 ft to 280 ft, depending on the well and its date of construction.
- Flow rates during initial post-construction airlifting were estimated by the driller to have ranged from 4 gpm (in Well 7) to 18 gpm (in Well 2). As a rule of thumb, RCS geologists typically estimate normal operational pumping rates for a new well equipped with a permanent pump are typically on the order of one-half the airlifting rate reported on the driller's log.
- Water level drawdown values during airlifting were not listed on the driller's logs, because water level drawdown cannot be measured during airlifting operations; thus original post-construction specific capacity (SC) values for the onsite wells cannot be calculated from the data on the driller's logs (only those wells where airlifting is noted). Specific capacity, in gallons per minute per foot of water level drawdown (gpm/ft ddn), represents the ratio of the pumping rate in a well (in gpm) divided by the amount of water level drawdown (in ft ddn) created in the well while pumping at that rate.

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- Post-construction pumping tests were performed in Wells 3 and 4, at the time of their respective well construction dates. Pumping rates in these two wells were reported to be 6 gpm and 2 gpm, respectively, at the date of construction.
- Specific capacities [determined only from those wells in which pumping rates (not airlifting rates) and resulting water level drawdowns were provided] ranged between 0.007 gallons per minute per foot of water level drawdown (gpm/ft ddn) in Well 4, to 0.7 gpm/ft ddn in Well 1. These values are considered to be low and are typical for wells constructed into the geologically old siltstone, sandstone, and shale known to be present beneath the subject property.

To our knowledge, additional pumping tests have previously been performed in Wells 2, 3, and 4; these pumping tests were performed in January 2010 by others. A short-term pumping test was also performed in Well 1 in 2006 by others. Basic results are also presented in Table 1 and are discussed below:

- In May 2006, a short-term pumping test on Well 1 was conducted by Bess; this test was approximately 6 hours in duration. This test revealed that Well 1 had a short-term specific capacity of 0.7 gpm/ft ddn while pumping at an average rate of 10 gpm. Water level drawdown during testing was reported to be approximately 14 ft, based on the pre-test SWL of 55 ft brp.
- In January 2010, Bess performed a 22-hour pumping test (likely a constant drawdown test) at Well 2. At the beginning of the pumping test, the pumping rate was reportedly 18 gpm. However, by the end of testing period, the pumping rate had been reduced to 2 gpm; the average pumping rate for this 22-hour constant drawdown test was reported to be 2 gpm. Based on a SWL of 92 ft brp, a final water level drawdown of 208 ft was created. This resulted in a low specific capacity value for Well 2 of 0.006 gpm/ft ddn.
- In January 2010, Bess performed an 18-hour constant drawdown test at Well 3. This test revealed that Well 3 had a specific capacity of 0.01 gpm/ft ddn while pumping at an average rate of 1.6 gpm. Initially, the pumping test was performed at a pumping rate of 12 gpm, but the pumper reduced the rate down to 1.6 gpm because the pump was breaking suction at the higher pumping rates. Reportedly, 131 ft of water level drawdown occurred in this well during this pumping test (based on a SWL depth of 149 ft bgs).
- Again, in January 2010, Bess performed a 17-hour constant drawdown test on Well 4. The test revealed that the specific capacity of Well 4 is low (a value of 0.007 gpm/ft ddn) while pumping at an average rate of 1.4 gpm. There were reportedly 205 ft of drawdown in Well 4 during this test, based on the pre-test SWL of 295 ft bgs. Pumping rates were as high as 7 gpm in Well 4 at the start of testing, but the pumper again reduced the rate (in this case, to 1.4 gpm) because the pump was breaking suction at those higher rates.

<u>Well Data from Site Visits</u>

The following information for the three project wells (Wells 3, 6, and 8) and the four non-project wells (Wells 1, 4, 5, and 7) was gleaned from our initial July 8 and 20, 2015 site visits, as well as

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from our additional site visits to the wells on September 1 and December 14, 2015 and on March 18, March 31, April 1, April 7, May 12, July 14, and July 28, 2016; these additional site visits were performed by RCS Geologists as part of an ongoing groundwater level monitoring program that was initiated in the onsite wells in July 2015:

- Well 1 – At the time of our initial site visit on July 8, 2015, Well 1 was equipped with a permanent pump. A SWL depth of 117.6 ft below the wellhead reference point (brp) was measured on that date; the reference point for the measurement was approximately 2.3 ft above ground surface (ags).

  Additional SWLs of 92.4 ft, and 91.6 ft brp were measured by the RCS Geologist during subsequent site visits to this well on March 18 and May 12, 2016. Pumping water levels (PWLs) of 179.1 ft, 200.3 ft, 162.4 ft, 115.8 ft, and 117.2 brp were measured by the RCS Geologist during our site visits on July 20, September 1, and December 14, 2015, March 31, May 12, and July 28, 2016.

- Well 2 – This well was not equipped with a pump on our July 8, 2015 site visit and was irreparably damaged during the 2014 Napa earthquake according to the well driller. A SWL depth of 143.9 ft brp was measured during the RCS site visit. This reference point was measured to be approximately 2.0 ft ags.

  During our site visits between September 1, 2015 and July 28, 2016, SWL depths ranging from 133.2 ft brp on July 28, 2016 to 143.9 ft brp on July 8, 2015 were measured by the RCS Geologist.

- Well 3 – This well is currently equipped with a permanent pump. RCS has never observed this well when it was being pumped, and thus no current instantaneous flow rates could be recorded during any of our visits. The reference point for the RCS SWL measurements was approximately 1.7 ft ags. SWL depths ranging between 105.9 ft brp (on March 18, 2016) and 150.3 ft brp (on December 14, 2015) have been measured by the RCS geologist between July 8, 2015 and July 28, 2016.

- Well 4 – RCS geologists have not performed a site visit to this well, because this well is located essentially on the floor of Napa Valley and relatively far from the project wells; it is a non-project well that supplies groundwater for existing onsite uses only.

- Well 5 – This well is currently equipped with a permanent pump. A SWL depth of 267.6 ft brp was measured during our July 20, 2015 site visit. During our subsequent site visits between September 2015 and May 2016, RCS geologists were not able to measure a water level in this well. However, during our recent July 14 and 28, 2016 site visits, SWLs of 151.1 ft and 192.5 ft brp were successfully measured by the RCS geologist. This reference point was measured to be approximately 1.8 ft ags.

- Well 6 – This well is currently equipped with a permanent pump. However, this well was never being actively pumped during any of our site visits. SWL depths ranging from 103.5 ft brp (on July 28, 2016) to 175.5 ft brp (on September 1, 2015) were measured in this well by the RCS Geologist during his site visits between July 2015 and July 2016. This reference point was measured to be approximately 2.0 ft ags.

- Well 7 – This well is currently equipped with a permanent pump. SWL depths of ranging between 154.4 ft brp (on July 12, 2016) and 418 ft brp (on December 12,

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2015) were measured by the RCS Geologist during our site visits between July 2015 and July 2016; the well was not pumping during any of those visits. This reference point was measured to be approximately 3.4 ft ags.

- Well 8 – This well was not equipped with a permanent pump during our July 8 or July 20, 2015 site visits and SWLs of 101.9 ft and 101.8 ft brp, respectively, were measured on those two dates. A permanent pump was installed in this well sometime between July 20, 2015 and our next site visit on September 1, 2015. SWL depths of ranging from 88.9 ft brp (on March 18, 2016) to 227.8 ft brp (on April 1, 2016) were measured in this well by the RCS Geologist during our site visits between July 2015 and July 2016; this well was not being pumped during any of those site visits. This reference point for our measurement was approximately 2.1 ft ags.

Local Geologic Conditions

Figure 3, “Geologic Map,” illustrates the types, lateral extents, and boundaries between the various earth materials mapped at ground surface in the region by others. Specifically, Figure 3 has been adapted from results of regional geologic field mapping of the Napa quadrangle, as published by the California Geologic Survey (CGS) in 2004 (Clahan, K.; Wagner, D.; et al). Key earth materials mapped at ground surface in the vicinity of the subject property, as shown on Figure 3 include, from geologically youngest to oldest, the following:

a. Alluvial-type deposits. These deposits consist of the following: stream channel stream terrace deposits (map symbols Qhc and Qht, on Figure 3) along Redwood Creek, and undivided alluvium materials (map symbols Qpa and Qoa) along the Napa Valley floor. These deposits are generally unconsolidated, and consist of layers and lenses of sand, silt, clay, and gravel. Very small amounts of stream channel (map symbol Qhc) and stream terrace deposits (map symbol Qht) are exposed at the western edge of the property along the proximal course of Redwood Creek.

b. Landslide deposits (map symbol Qls). Several landslides have been mapped in the region by others (see the bright-yellow colored areas on Figure 3). Arrows within these mapped landslide areas show the general direction of ground surface movement within each landslide mass. A landslide is shown to have been mapped by others at ground surface in the western portion of the subject property between Parcels 1 and 2.

   It was not a part of our Scope of Hydrogeologic Services for this project to study, investigate, analyze, determine, or opine on the potential activity of these landslides, and/or the potential impact of these landslides on the property or on the proposed winery and vineyard expansion.

c. Sonoma Volcanics (map symbol Tsvt). The Sonoma Volcanics are comprised by a highly variable sequence of chemically and lithologically diverse volcanic rocks. Among the rock types are volcanic agglomerate and tuff. As shown on Figure 3, the Sonoma Volcanics are exposed to the southeast of the subject property. In many parts of Napa and Sonoma counties, these volcanic rocks tend to be viable aquifer

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systems. However, no outcrops of Sonoma Volcanics rocks have been mapped by others on the subject property, and the RCS Geologist did not observe any outcrops of Sonoma Volcanics on the subject property during his site visits. Further, these rocks do not exist beneath any of the older sedimentary rocks that are discussed below.

d. Domengine Sandstone (map symbol Td). This sedimentary unit is shown on Figure 3 to be exposed at ground surface in the western portion of the subject property, west of a fault that transects the central portion of the property; the fault is shown as a thick, black-colored dashed line. The Domengine sandstone unit is of Eocene age and reportedly consists of brown quartzo-felspathic sandstone with minor thin claystone interbeds. Because of their geologic age and consolidated nature, these sedimentary rocks are considered to be capable of containing or yielding only limited amounts of groundwater to wells. However, because of the fault and/or faults that may intersect these geologic materials, it is possible that this geologic unit could contain slightly greater amounts of groundwater in open joints and fractures in the sandstone that may have been created in the rocks over time by faulting. The amount of groundwater available to a water well constructed into these rocks would be wholly dependent on factors such as well depth, and the size, number, and frequency, openness, lateral continuity and degree of interconnection of the joints and fractures encountered at each well site.

e. Great Valley Sequence (map symbols KJgv). These geologically old (early- and late-Cretaceous-aged) rocks are exposed at ground surface on the eastern half of the subject property and also east of the fault that transects the central portion of the property, as shown on Figure 3. These rocks consist mainly of well-consolidated to cemented, thinly bedded mudstone, siltstone, and shale, with minor amounts of thinly bedded sandstone. Due to their geologic age and the high degree of consolidation, these rocks are not typically considered to be a viable water-bearing formation and generally have low permeability and virtually no intergranular (primary) porosity.

   The quality and quantity of groundwater produced from this formation will depend on the fractured nature of these rocks and the amounts of average annual recharge (rainfall) experienced at the subject property. These rocks are also known to underlie all other geologically-younger rocks beneath the subject property (including the Domengine sandstone materials mentioned above), and are considered to be the bedrock of the area.

Geologic Structure

A single, oval-shaped fault, as mapped by others, is shown on Figure 3 (CGS 2004) to “enclose” the ground surface exposures of the Domengine sandstone. However, this fault, as shown, is “queried” (i.e., uncertain), and is more likely two separate faults that run sub-parallel to Redwood Road. Others have mapped this particular fault system as two sub-parallel faults that trend in a north-northwest and south-southeast direction; both of these may terminate at a third fault to the north that trends in a northwest-southeast direction (USGS 2007). One of these faults (the easternmost one shown on Figure 3) transects the central portion of the subject property. This fault separates the two main rock types known to be exposed on the subject property: the Domengine sandstone (map symbol Td) on the west side of the fault; and the

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Great Valley Sequence (map symbol KJgv) on the east side of the fault. The Domengine sandstone and the Great Valley Sequence have likely undergone considerable tectonic forces and stresses, like folding and faulting, over geologic time, due to movement along this fault. Consequently, these stresses may have helped to develop fractures and joints within the nearby rocks, which may have, in turn, increased the amount of groundwater that may be in storage in these geologic units. Additionally, faults can act as barriers to groundwater flow due to a layer of fine-grained clay (known as fault gouge) that is often created along the fault plane as a result of the grinding effect of the fault on rocks in the subsurface over time; such groundwater barriers tend to restrict groundwater flow. Others have noted that the Domengine sandstone may be in a vertical fault-bound relationship with the rocks assigned to the geologically older Great Valley Sequence, and this may have created a groundwater barrier between the groundwater in these two formations (LSCE 2014). Based on the available data, it is unclear if the fault that separates the Domengine sandstone from the Great Valley Sequence on the subject property is indeed a barrier to groundwater flow.

Please note that it is not the purpose of this project to assess the potential seismicity or activity of any faults that may occur in the region.

Water Demands of Existing Property and Proposed Project

Existing, approved (permitted), and proposed (future) water demands for the subject property were provided to RCS by RSA+ of Napa in their report titled "Tier 1 Water Use Calculations," dated April 7, 2017; a copy of this report has been attached as an Appendix to this Memorandum. The proposed (future) water demands for the entire property (included existing uses, the proposed increase in wine production, and irrigation of the permitted and newly-proposed vineyards are estimated by RSA+ to total 7.03 acre feet per year (AF/yr). The total proposed water demands for the project are itemized in the RSA+ report as follows:

a. Vineyard irrigation water demand = 3.61 AF/yr
    - These vineyard irrigation demands include 0.62 AF/yr for Parcel 1 and 2.99 AF/yr for Parcel 2.
b. Winery water demand = 1.92 AF/yr
    - These demands include: 0.77 AF/yr of water for winery production operations (i.e., process water); 0.82 AF/yr of water for the proposed landscaping irrigation; 0.10 AF/yr for water for winery employees; 0.12 AF/yr of water for future winery visitors; and 0.11 AF/yr for water for events.
c. Residential water demand = 1.50 AF/yr
    - This includes 0.75 AF/yr of water for residential use on Parcel 1, and 0.75 AF/yr of water for residential use on Parcel 2.
d. Water demand for proposed project = a + b + c = 7.03 AF/yr
    - Note that 1 AF = 325,851 gallons.

As mentioned previously, the proposed (future) water demands at the subject property will be met using a combination of groundwater, recycled winery process water, and harvested rainwater. Table 2, "Summary of Existing, Approved, and Proposed (Future) Water Demands,"

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summarizes the existing, approved (permitted), and proposed water demands of the Anthem Winery property by water source, as estimated and reported by RSA+, both for an average year rainfall and for a drought year rainfall; drought year rainfall is defined herein to be 48% of the average year rainfall[1]. As shown on Table 2, the existing water demands for the subject property are estimated by RSA+ to be 4.39 AF/yr and are currently met using groundwater. Note that infrequently in the past, the owner has used supplemental water (via trucking) in lieu of groundwater during two dry years as a preventative measure to allow for periods of water level recovery in onsite wells. However, the owner does not plan to truck water to the site in the future, and has not trucked in any water since August 2014.

Approved (permitted) water demands for the project were estimated by RSA+ to be 6.49 AF/yr, and this includes water that is permitted to be used for the irrigation of the previously-permitted but currently unplanted vineyards. The approved (permitted) water demands for the project are shown on Table 2 to be met using groundwater from the onsite wells.

To meet proposed (future) water demands at the subject property, existing site developments will still use groundwater pumped from the non-project wells, while the proposed new developments (i.e., the project) will use a combination of winery process water, harvested rainwater, and groundwater pumped from the project wells. The volumes of water used in the future from each of these sources for the project will depend on the amount of rain that falls onto the subject property. Table 2 shows the breakdown of water derived from each source for an average rainfall year, and an average drought year, as reported by RSA+.

Considering only the groundwater demand of the project, as shown on Table 2, groundwater demands are estimated to be 4.71 AF/yr during an average year rainfall, and 5.51 AF/yr during a drought year rainfall. This represents a groundwater demand increase of 0.32 AF/yr and 1.12 AF/yr compared to existing uses, for average and drought year rainfalls, respectively. In addition, Table 2 shows a groundwater demand decrease of 1.78 AF/yr and 0.98 AF/yr, for average and drought year rainfalls, respectively, when comparing the proposed (future) groundwater demands to the approved (permitted) groundwater demands.

Groundwater Well Pumping Rates

As discussed previously, Wells 3, 6, and 8 are currently used to meet a small portion of the existing water demand at the subject property[2] and are proposed to meet the future groundwater demands of the project. The total volume of groundwater to be pumped from the project wells (Wells 3, 6, and 8) to meet the future groundwater demands at the subject property are estimated by RSA+ to be 0.92 AF/yr during an average rainfall year, and 1.72 AF/yr during a drought year.

On pages 1 and 7 of their report, RSA+ estimates the proposed average combined pumping rates necessary from all project wells to meet the groundwater demands of the subject property described above. To determine these necessary combined pumping rates, it was assumed by

[1] The average annual rainfall is approximately 30 inches per year for the subject property per data from the PRISM Climate Group. A detailed discussion of the average rainfall and drought-year totals is provided later in this report under the heading "Rainfall".
[2] Groundwater use estimates for the project wells are listed on page 7 of the RSA+ April 7, 2017 report.

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RSA+ that the project wells would be pumped at a 50% operational basis, that is, 12 hours/day, 7 days/week, all year long (365 days). Based on those assumptions, it was determined that the three project wells (Wells 3, 6, and 8) would need to pump at an average combined pumping rate of 1.1 gpm to meet the average rainfall year groundwater demand of 0.93 AF/yr. During a drought year, the average combined pumping rate necessary from the three project wells was estimated by RSA+ to be 2.1 gpm. Further, RSA+ designed storage onsite such that the onsite project wells will not need to pump at a rate higher than the average pumping rate throughout the year.

Results of Recent Aquifer Testing

Based on the limited availability and/or reliability of available data from the prior onsite pumping tests, aquifer tests were recommended by RCS and performed by Bess in each of the three project wells (Wells 3, 6, and 8). These tests were performed in order to permit the collection of data necessary for RCS to help meet the requirements of the County's WAA guidelines. Pumping and field monitoring tasks for the subject aquifer tests were performed by Bess. Each aquifer test was to consist of: a period of baseline (background) water level monitoring; a period of pumping the well at a constant rate; and a final period of the monitoring of the recovery of water levels after turning off the pump.

Specifically, these pumping tests were being conducted to:

- Determine if the project wells can pump at sufficient rates and for sufficient durations to meet the proposed groundwater demands for new uses on the subject property.
- Determine whether or not the recommended pumping rates can be sustained during each respective pumping test, without the particular well having its pump break suction before the end of the period of continuous pumping.
- Observe the amount of self-induced drawdown created in each well by virtue of its own pumping.
- Observe the amount of water level decline, if any, induced in Wells 1, 2, 5, and 7 (non-project wells) by virtue of the subject pumping tests of Wells 3, 6, and 8; due to its distance (more than 2,000 ft away from the closest onsite well), Well 4 was not monitored during any part of the three subject pumping tests.
- Observe the amount and rate of water level recovery following the end of the pumping portion of each test.
- Help determine the aquifer parameters of transmissivity and possibly storativity for the aquifer system(s) encountered by the onsite wells. Storativity can be calculated only if a water level decline is induced in one of the other onsite water level observation wells being monitored during the various tests.

Test Protocol

The logistics and protocol for the subject aquifer (pumping) tests were developed by RCS Geologists. Key portions of that aquifer test protocol included: a period of water level monitoring (i.e., baseline water level monitoring) prior to the start of actual pumping; the main pumping portion of each respective aquifer test for Wells 3, 6, and 8; and a final period of monitoring of

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water level recovery following the constant rate pumping portion of each test. Based on field conditions and the project groundwater demands for the subject property at the time of the subject tests, the key protocol was followed for these aquifer tests. Provided below is a summary of the key aquifer testing protocol:

- Transducer Installation – Water level pressure transducers owned by Anthem Winery were initially installed by RCS Geologists as part of a proposed onsite groundwater monitoring program during previous site visits on July 8 and July 20, 2015 into the three project wells (Wells 3, 6, and 8) and in three of the non-project wells (Wells 1, 5, and 7). Well 2 was also monitored by a device owned by RCS Geologists. Well 4 was not monitored during the subject pumping tests, because it is not considered to be a project well and because of its distance to the aquifer test wells. A barometric pressure transducer was also installed at Well 7. All seven installed devices were operational and collected water level and/or barometric pressure readings between July 20, 2015 and March 31, 2016.

  In each aquifer test well, a 300 psi water level transducer was installed. The accuracy of the 300 psi transducer, as reported by the transducer manufacturer, In-Situ, Inc., is ±0.0658 ft. The barometric pressure transducer was installed at Well 7, and has a manufacturer-reported accuracy of ±0.0691 ft.

- Baseline Water Level Monitoring – The purpose of the baseline water level monitoring was to record groundwater level fluctuations that may have been occurring in the area prior to the pumping portion of the tests. Changes in such background (baseline) water levels could have occurred due to natural water level fluctuations in the aquifer and/or water level declines caused by possible water level drawdown interference from other pumping wells. Baseline monitoring in the onsite wells began on March 16, 2016 at 8:00 PM; this is when the last pump in the onsite pumping well (Well 7) was shut off. Baseline water level monitoring continued in the onsite wells until March 21, 2016 at 10:08 AM, when pumping for the Well 3 constant rate pumping test began. Hence, background monitoring in the onsite wells was conducted for a period of roughly 4½ days. During the background water level monitoring period, none of the onsite wells were pumped for any reason.

- Constant Rate Pumping Tests – The key portion of each aquifer test, the 24-hour constant rate pumping test, was performed at Wells 3, 6, and 8 on March 21, March 24, and March 28, 2016, respectively. Well 3 was continuously pumped at an average rate of 1.1 gpm throughout the pumping portion of its constant rate pumping test; Well 6 was continuously pumped at an average rate of 1.1 gpm; and Well 8 was continuously pumped at an average rate of 6.9 gpm during its test.

  Water levels were continually collected by all transducers during the pumping tests at a frequency of one measurement every minute; the barometric pressure transducer was collecting measurements once every 10 minutes. Occasional manual water level measurements were also collected in each of the seven wells by the pumper and/or the RCS Geologist to help corroborate transducer measurements. For each of the data sets collected from each of the wells, the collected manual measurements were determined by RCS geologists to corroborate the transducer-collected water level data.

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- Water Level Recovery Monitoring – Following the end of the pumping portion of each aquifer test, water level recovery data were then collected for an additional period of roughly 2 days at each of the monitored wells.
- Discharge of Pumped Groundwater – During each 24-hour pumping test period at Wells 3, 6, and 8, groundwater was discharged into one of two existing onsite water tanks and/or spread on the ground in an area approved by the Owner. None of the pumped groundwater reportedly flowed offsite or into any nearby creeks or swales.

As stated above, all pumping operations for these three subject pumping tests were performed by Bess personnel.

Test Results

Water level data collected as part of the aquifer tests for the three project wells are shown on Figures 4A to 4C, "Water Levels During Aquifer Test" for Wells 3, 6, and 8, respectively. Data collected from Wells 1, 2, 5, and 7 (i.e., the additional onsite water level observation wells), are also shown on Figure 4D, "Water Levels During Aquifer Test, Observation Wells."

It is important to note that, although not shown independently on a graph herein, barometric pressure data were also collected during each aquifer test. Before plotting each water level graph, the transducer data for each monitored well were corrected using the barometric data (that is, changes is barometric pressure were factored out of each data set, so that the graphed water level data now reflect only changes in water levels in the wells). It is also noteworthy that during the entire aquifer testing period, barometric pressure measurements in the area varied by a maximum of only 0.24 pounds per square inch (psi); this approximately equates to a water level change of only 0.55 ft.

Background Water Level Monitoring

As previously noted, background water levels were monitored for a period of approximately 4½ days in all onsite wells prior to the start of the initial constant rate pumping test at Well 3. Below is a summary of these pre-test (background) water level observations for each well (refer to Figures 4A through 4D):

- Well 3 (project well) – Water levels in Well 3 showed a slight and continual rise during the background monitoring period. Using the transducer data, water levels were detected to have risen by a total of 1.3 ft (from 106.6 ft to 105.3 ft brp) over the roughly 4½-day baseline monitoring period prior to testing at Well 3. Because this slight rise in water levels was continuous, and did not significantly fluctuate up and down, it is likely that water levels in this well were recovering from a recent period of domestic and/or irrigation pumping by this well.
- Well 6 (project well) – Similar to Well 3, water levels in Well 6 also showed a slight and continual rise during the baseline monitoring period. Transducer data show that water levels were detected to have risen from 105.0 ft to 103.6 ft brp, for a total rise of 1.4 ft. This slight rise in water levels is also likely due to water levels recovering from a recent period of domestic and/or irrigation pumping by this well.
- Well 8 (project well) – Static water levels recorded by the transducer in Well 8 during the background water level monitoring period appeared to be relatively stable and

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were at a depth of 88.9 ft brp prior to initiating testing at Well 3. Hence, it appears that this well had not been pumped prior to initiating its constant rate test.

- Wells 1, 2, 5, and 7 (water level observation wells, non-project wells) – Water levels in three of the four water level observation wells (Wells 1, 5, and 7) appeared to all be recovering from recent periods of domestic and/or irrigation pumping as shown on Figure 4D; water levels in Well 2 appeared to be relatively stable with only slight water level fluctuations (±0.1 to ±0.2 ft). The water level recovery that occurred in Wells 5 and 7 appears to be more pronounced than that that of Well 1, and this is likely due to the close proximity of Wells 5 and 7 (see Figure 1) and the fact that Well 7 was the last onsite pumping well to have been turned off prior to commencing the baseline monitoring period (beginning on March 16, 2016 at 8:00PM). Thus, it appears that pumping at Well 7 had a more significant effect on Well 5 than any other onsite well, based on the transducer data.

Constant Rate Pumping Tests of Wells 3, 6, and 8

Well 3 Constant Rate Pumping Test

Pumping for the constant rate pumping portion of the aquifer test for Well 3 began at 10:08 AM on March 21, 2016, and continued for 24 continuous hours (1,440 minutes) at an average pumping rate 1.1 gpm, as determined from totalizer dial reading recorded by the Bess pumper throughout the pumping period.

Figure 4A graphically illustrates the water levels as recorded by the pressure transducer and as recorded via occasional manual water level measurements obtained by the pumper. Below is a summary of the water level data collected from Well 3 (the pumping well), and from the water level observation sites (Wells 1, 2, 5, 6, 7 and 8) that were monitored during the pumping and water level recovery portions of the Well 3 constant rate pumping test:

- Well 3 (Pumping Well) – A pre-test static water level of 105.3 ft brp was measured in this well just before the pump was turned on to begin the subject pumping test. After 24 hours (1,440 minutes) of continuous pumping, the maximum pumping water level in Well 3 was measured at a depth of 144.3 ft brp, as shown on Figure 4A. This represents a maximum water level drawdown during the 24-hour constant rate pumping test of 39.0 ft and calculates to a specific capacity of 0.03 gpm/ft ddn. As shown on Figure 4A, water levels did not stabilize or reach equilibrium by the end of the pumping test. Specifically, in the last 4 hours of the pumping period, the pumping water level in this well was still decreasing at a rate of approximately 1.2 ft per hour.

  Following pump shut-off, water level recovery data were then collected for an additional period of about 48 hours (2,880 minutes) prior to the start of the pumping test at Well 6 on March 24, 2016; the duration of this water level recovery period is consistent with the protocol. At the end of this 48-hour recovery period, a final water level depth of 116.1 ft brp was recorded. This calculates to a water level recovery of 28.2 ft (below pre-test SWLs) and represents 72% of the total drawdown recorded during the pumping portion of the test (see Figure 4A). Thus, water levels in this well recover slowly following periods of pumping.

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- Water Level Observation Wells
    - Well 1 – Water levels recorded by the transducer in Well 1 (Figure 4D) showed no definitive water level drawdown impact during the 24-hour constant rate pumping test at Well 3. That is, water levels in Well 1 were observed to actually have slightly increased by roughly 0.3 ft during the 24-hour testing period at Well 3. In the 48-hour water level recovery period, water levels in Well 3 continued to increase by another 0.6 ft, prior to the commencement of the test at Well 6.
    - Well 2 – Water levels in Well 2 (Figure 4D) remained relatively stable during the constant rate pumping test of Well 3, and only fluctuated both up and down by a couple tenths of a foot during the entire testing period. No water level drawdown impacts are apparent in Well 2 as a result of the pumping test of Well 3.
    - Well 5 – Transducer data for Well 5 (Figure 4D) show that water levels increased approximately 3.4 ft over the entire 24-hour testing period of Well 3. Therefore, no definitive water level drawdown impact was observed in Well 5 during the 24-hour constant rate pumping test at Well 3. Well 5 water levels may have still been recovering slowly following the pumping of this well on March 16, 2016.
    - Well 6 – Water levels in Well 6 (Figure 4B) are shown to have decreased steadily over the 24-hour testing period at Well 3. Specifically, transducer data show that water levels in Well 6 decreased approximately 8.5 ft over the 24-hour pumping period for Well 3. In the 48-hour water level recovery period, water levels continued to decrease in Well 6, to a total depth of 114.0 ft in the first 24 hours of this 48-hour recovery period; water levels then increased to a depth of 112.9 ft brp over the remaining 24 hours of the recovery period. Thus, water levels in Well 6 appeared to have been impacted by the pumping of Well 3. Because Well 6 lies relatively close to Well 3 (they are separated by approximately 175 ft, and the next closest well, Well 8, is 415 ft away), pumping at Well 3 would be expected to create some drawdown interference in Well 6.
    - Well 7 – Transducer data for Well 7 (Figure 4D) show that water levels increased approximately 1.9 ft over the entire 24-hour test period at Well 3. Thus, water levels in Well 7 are also considered to have not been definitively impacted by the pumping of Well 3 during its aquifer test. Similar to Well 5, water levels in Well 7 may have still been recovering from pumping of this well on March 16, 2016.
    - Well 8 – Water levels in Well 8 (Figure 4C) remained relatively stable during the constant rate pumping test of Well 3, and fluctuated both up and down by only a couple tenths of a foot during the entire 24-hour testing period. Thus, no definitive water level drawdown interference was induced in Well 8 during the 24-hour pumping period at Well 3.

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Well 6 Constant Rate Pumping Test

Pumping at Well 6 for its constant rate pumping test began at 10:18 AM on March 24, 2016, and continued for 24 continuous hours (1,440 minutes) at an average pumping rate 1.1 gpm. The average pumping rate was calculated from totalizer dial readings recorded by the Bess pumper during the test.

Figure 4B graphically illustrates the water levels as recorded by the pressure transducer and by occasional manual water level measurements recorded by the pumper. Below is a summary of the water level data collected from Well 6 (the pumping well) and each of the six additional water level observation wells (Wells 1, 2, 3, 5, 7, and 8) during the pumping and water level recovery portions of the Well 6 aquifer test:

- Well 6 (pumping well) – A pre-test static water level of 112.9 ft brp was measured in this well just before the pump was turned on to begin its pumping test. This SWL may be artificially low, as it appears that water levels were still recovering from the drawdown interference which occurred in this well during the pumping test of Well 3, as shown on Figure 4B. Prior to the pumping test at Well 3, a SWL of 103.6 ft brp was measured in Well 6. After 24 hours (1,440 minutes) of continuous pumping, the maximum pumping water level in Well 6 was measured at a depth of 149.0 ft brp, as shown on Figure 4B. This represents a total water level drawdown during the 24-hour constant rate pumping test of 45.4 ft and calculated to a specific capacity of the well of 0.02 gpm/ft; this water level drawdown calculation is based on the SWL collected in Well 6 (at 103.6 ft brp) just prior to the start of the pumping test in Well 3. As shown on Figure 4B, water levels in Well 6 had not stabilized or reached equilibrium at the end of this pumping test. Specifically, in the last 4 hours of the pumping test, the pumping water level in this well was still declining at a rate of approximately 0.7 ft per hour.

  Following pump shut-off, water level recovery data were then collected in Well 6 for an additional period of about 3 days (72 hours) prior to the commencement of the pumping test at Well 8; this time period is consistent with the protocol (a minimum of 48 hours of water level recovery had been recommended). At the end of this 72-hour recovery period, a final water level depth of 118.3 ft brp was recorded in Well 6. This calculates to a water level recovery of 30.7 ft and represents 85% of the total drawdown recorded during the pumping portion of the test (see Figure 4B). Similar to Well 3, water level recovery time in Well 6 is slow.

- Water Level Observation Wells
  - Well 1 – Similar to the water level measurements obtained in Well 1 during the aquifer testing of Well 3, water levels in Well 1 (see Figure 4D) increased very slightly during the constant rate pumping test of Well 6; the increase was approximately 0.4 ft during the entire testing period. During the 72-hour water level recovery period, water levels continued to increase by a total of 0.1 ft during the entire 72-hour recovery period. Therefore, no definitive water level drawdown impact is considered to have occurred in Well 1 while pumping Well 6 for its 24-hour constant rate pumping test.
  - Well 2 – Water levels in Well 2 (Figure 4D) remained relatively stable, and water levels fluctuated both up and down by only a couple tenths of a foot during the

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entire testing period of Well 6. Thus, no definitive water level drawdown interference was induced in Well 2 by virtue of the 24-hr pumping test of Well 6.

- o Well 3 – Water levels recorded by the transducer in Well 3 (see Figure 4A) decreased approximately 3.9 ft during the 24-hour pumping period of Well 6. During the 72-hour recovery portion of Well 6, water levels in Well 3 continued to decrease by an additional 0.9 ft in the first 10 hours of the recovery period, and then increased a total of 3.8 ft throughout the remainder of the recovery period, prior to the commencement of testing at Well 8. Similar to the effects that pumping Well 3 had on Well 6, water levels in Well 3 appear to have been impacted during the 24-hour pumping test of Well 6. Again, these wells are approximately 175 ft away from each other, and they probably intersect at least some of the same water-bearing fracture systems in each well; this is likely the cause of this apparent water level interference during pumping.
- o Well 5 – Water levels in Well 5 (Figure 4D) appeared to be increasing continuously during the 24-hour constant rate pumping test of Well 6. Transducer data for Well 5 show that water levels increased approximately 1-foot over the entire 24-hour testing period at Well 6. Well 5 water levels appeared to have still been recovering slightly from a short pumping period in this well on March 16, 2016. Thus, no definitive water level drawdown impact was detected in the transducer for Well 5 while performing the 24-constant rate test at Well 6. As is commonly the case in fractured rock systems, the fact that no drawdown interference was recorded suggests that Well 5 is too distant from Well 6 and does not lie in the sphere of pumping influence created by Well 6, or that these wells do not extract groundwater from the same water-bearing fractures.
- o Well 7 – Water levels in Well 7 (Figure 4D) were recorded to have increased 1.2 ft during the 24-hour testing period at Well 6. Thus, because water levels in Well 7 increased during the pumping test of Well 6, Well 7 is also considered to not have been impacted by the pumping of Well 6 during the its recent pumping test.
- o Well 8 – Water levels in Well 8 (Figure 4C) remained relatively stable, and water levels fluctuated both up and down by a couple tenths of a foot during the entire testing period of Well 6. Thus, no definitive water level drawdown interference was induced in Well 2 by virtue of the 24-hr pumping test of Well 6.

<u>Well 8 Constant Rate Pumping Test</u>

Pumping at Well 8 for its constant rate pumping test began at 9:56 AM on March 28, 2016, and continued for 24 continuous hours (1,440 minutes) at an average pumping rate 6.9 gpm, as determined from totalizer dial reading recorded by the Bess pumper throughout the pumping test.

Figure 4C graphically illustrates the water levels as recorded by the pressure transducer and as recorded via occasional manual water level measurements obtained by the pumper. Below is a summary of the water level data collected from Well 8 (the pumping well) and each of the six additional water level observation wells (Wells 1, 2, 3, 5, 6, and 7) during the pumping and water level recovery portions of the Well 8 aquifer test:

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- Well 8 (Pumping Well) – A pre-test static water level of 88.8 ft brp was measured in this well just before the pump was turned on to begin its pumping test. After 24 hours (1,440 minutes) of continuous pumping at an average rate (determined by Bess) of 6.9 gpm, the maximum pumping water level in Well 8 was measured at a depth of 392.0 ft brp, as shown on Figure 4C. This represents a total water level drawdown during the 24-hour constant rate pumping test of 303.2 ft, and calculates to a specific capacity of this well of 0.02 gpm/ft ddn. As shown on Figure 4C, water levels had not stabilized or reached equilibrium at the end of the pumping test. Notably, in the last 4 hours of the pumping test, the pumping water level in this well was still decreasing at a rate of approximately 3.7 ft per hour. However, it was reported to RCS that the Bess pumper adjusted (increased) the flow rate upon returning to the well site roughly 90 minutes prior to the end of the scheduled pumping period, and as a direct result, the water levels in this well declined from a depth of 382.0 ft to 392.0 ft brp in the last 90 minutes of testing. Prior to the adjustment, the pumping water level was still decreasing at a rate of 1.8 ft per hour (between 6:00 AM and 8:30 AM on March 29, 2016). Hence, the pumping water levels had not stabilized or reached equilibrium.

  Following pump shut-off, water level recovery data were then collected in each of the seven transducer-monitored observation wells for an additional period of about 53 hours (3,180 minutes). At the end of this 53-hour recovery period, a final water level depth of 270.8 ft brp was recorded at Well 8. This calculates to a water level recovery of 28.2 ft and represents 40% of the total drawdown recorded during the pumping portion of the test (see Figure 4C). Following this water level recovery period, Wells 1, 3, 5, 6, and 7 were turned back on by Bess for normal operational onsite uses. Water levels in Well 8 continued to recover as shown on Figure 4C, as this well was not turned on during the remainder of the monitoring period to our final site visit on April 8, 2016. Transducer data and manual water level measurements collected by RCS Geologists in Well 8 following the end of the pumping test show that water levels have continued to recover. On April 7, 2016, a manual water level measurement of 146.0 ft brp was recorded by the RCS Geologist. This calculates to a water level recovery of 246 ft and represents 81% of the total drawdown recorded during the pumping portion of the test (see Figure 4C). However, this site visit on April 7 was 9 days following termination of the 24-hr pumping period of Well 8. This represents slow water level recovery in this well following periods of pumping.

  - <u>Water Level Observation Wells</u>
    - Well 1 – Water levels recorded by the transducer in Well 1 (see Figure 4D) showed no definitive water level drawdown impact while performing the 24-hour constant rate pumping test at Well 8. That is, water levels in Well 1 were observed to have slightly increased by roughly 0.1 ft during the 24-hour testing period. Thus, no definitive water level drawdown impact is apparent in the water level data collected in Well 1 while performing the 24-hour constant rate test at Well 8.
    - Well 2 – Water levels in Well 2 (Figure 4D) increased approximately 0.1 ft during the entire testing period of Well 8. Thus, no definitive water level

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drawdown impact was detected in the transducer for Well 2 while performing the 24-hour constant rate test at Well 8.

- o Well 3 – Transducer data for Well 3 (Figure 4A) show that water levels increased approximately 1.5 ft over the entire 24-hour pumping period in Well 8. Therefore, no definitive water level drawdown impact was observed in Well 3 during the 24-hour constant rate pumping test at Well 8. Well 3 water levels may have still been recovering from its pumping test between March 21 and 22, 2016, and/or from the water level drawdown impacts induced by the pumping test at Well 6 between March 24 and 25, 2016.
- o Well 5 – Water levels in Well 5 (Figure 4D) appeared to have slightly increased during the 24-hour constant rate pumping test of Well 8. Transducer data for Well 5 show that water levels actually rose by approximately 0.4 ft over the entire 24-hour testing period at Well 8. Thus, no definitive water level drawdown impact was detected by the transducer data for Well 5 while performing the 24-constant rate test at Well 8.
- o Well 6 – Water levels in Well 6 (Figure 4B) are shown to have increased steadily over the 24-hour testing period at Well 6. Transducer data show that water levels increased approximately 1.8 ft over this 24-hour testing period. In the 53-hour water level recovery period, water levels continued to rise to a depth of 113.8 ft brp (an increase of 2.8 ft over the entire water level recovery period). Well 6 water levels may have still been recovering from its pumping test between March 24 and 25, 2016, and/or from the water level drawdown impacts induced by the pumping test at Well 3 between March 21 and 22, 2016. Thus, water levels in Well 6 appeared to have not been impacted by the pumping of Well 8.
- o Well 7 – Transducer data for Well 7 (Figure 4D) show that water levels increased approximately 2.6 ft over the entire 24-hour test period at Well 8. Well 7 is also considered to have not been impacted by the pumping of Well 8 during its aquifer test.

Specific Capacity Data

A useful indicator of well performance or efficiency (in terms of changes in water level drawdown over time with respect to pumping rate) is the specific capacity of a well, which can be calculated from the results of the aquifer test or from data generated during regular periods of pumping and water level monitoring. In general, when groundwater is pumped from an active water well, a hydraulic gradient is established toward the well, and a cone of water level depression forms within the aquifer system, with the pumping well being located at the locus of this cone. In general, the greater the pumping rate (and/or the longer the duration of pumping), the greater is the water level drawdown in the well (drawdown represents the vertical distance between the non-pumping, or static, water level and the resulting pumping water level in the well). As an indication of the relative efficiency or productivity of a well, the term "specific capacity" is commonly used to define the amount of water (in gallons per minute) that the well will yield for each foot of water level drawdown created while the well is pumping at a particular rate. The specific capacity of a well is calculated using the pumping rate of the well (in gpm) divided by the total water level drawdown (in ft) created in that well while pumping at that rate, and is expressed in units of gallons per minute per foot of water level drawdown (gpm/ft ddn).

The specific capacity of a well depends on several factors, including the hydrogeologic characteristics and thickness of the local aquifer system, the method of well construction, the type and degree of well development performed, the age and current condition of the casing perforations and gravel park, and the pumping rate and pumping duration of the pumping event being monitored. Hence, it is difficult to compare specific capacity values from one well to another even if the two wells are in the same aquifer system.

During the 24-hour long constant rate pumping tests performed in Wells 3, 6, and 8 in March 2016, the specific capacity values of these wells were calculated to be 0.028, 0.024, and 0.023 gpm/ft ddn, respectively. Such values, as mentioned previously, are considered to be low, but typical for the geological materials into which the wells are constructed

In comparison, and as shown on Table 1, a specific capacity value of 0.01 gpm/ft ddn was calculated following an 18-hour pumping test in Well 3 in January 2010; thus, it appears that the specific capacity of this well has increased since January 2010. No previous pumping tests were performed on either Well 6 or Well 8, thus we cannot compare the current specific capacity data generated during that prior testing of these two wells. In general, the higher the specific capacity value for a well, the more productive (or efficient) a well is with respect to pumping rates and resulting drawdowns. However, as stated above, the specific capacity values calculated from each of the recent aquifer test are all considered to be low and typical for the geologic materials into which the wells were constructed. Specific capacity is useful to help evaluate changes in well performance over time, and helping to determine when a well is in need of rehabilitation.

Calculation of Aquifer Parameters

Important aquifer parameters such as transmissivity (T) and storativity (S) can often be determined using data collected during a pumping test of a well. Transmissivity is a measure of the rate at which groundwater can move through an aquifer system, and therefore is essentially a measure of the ability of an aquifer to transmit water to a pumping well. Transmissivity is expressed in units of gallons per day per foot of aquifer width (gpd/ft). Storativity (S) is a measure of the volume of groundwater taken into or released from storage in an aquifer for a given volume of aquifer materials; storativity is dimensionless and has no units. Storativity calculations can only be made using water level drawdown data, if any, monitored in an observation well during a pumping test of another well; storativity cannot be calculated using water level drawdown data acquired solely from a pumping well.

Based on the results of the constant rate pumping tests of Wells 3, 6, and 8, it appeared that definitive water level drawdown interference occurred in water level observation Wells 3 and 6, by virtue of pumping in Wells 6 and 3, respectively. Thus, water level drawdown and recovery data in these two water level observation wells collected during the constant rate pumping tests of Wells 3 and 6 were input into the software program AQTESOLV (version 4.5 Professional). Numerous analytical solutions were then applied in attempt to determine transmissivity values using an automatic curve fitting procedure. The solutions utilized consisted only of confined or semi-confined aquifer solutions; no unconfined solutions were used. Note that RCS did analyze a few “unconfined solutions” during the analyses but the curve fitting portion of the unconfined

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solutions analysis was determined to be unreliable and these solutions were not deemed valid; thus they are not presented herein.

Also, certain assumptions must be made about the aquifer when using these solutions. In general, for the solutions listed below, key assumptions are that the aquifer has an infinite areal (lateral) extent, that the pumping well fully penetrates the aquifer system(s), and that water is instantaneously released from storage with the decline of hydraulic head. Also, for the purposes of this analysis, the assumption is made that the aquifer is 295 ft thick. This was determined by taking the vertical distance between the static water level in Well 6 prior to the start of testing and the bottom of the casing perforations in Well 6. Due to their close proximity, Well 3 and Well 6 appear to be constructed at least in part into the same water-bearing fracture systems and since Well 6 is slightly deeper, pumping from Well 3 would still pull from the aquifer system(s) into which Well 6 was likely constructed. In the case of Well 6, the static water level was roughly at 105 ft bgs, and the bottom of its perforations are at a depth of 400 ft bgs; thus, a thickness of 295 ft was used for the analyses. Note that this is a conservative approach, because the saturated thickness of the sedimentary rock aquifers in the area could be greater than 295 ft, as evidenced by other wells on the subject property constructed to greater depths than Well 6.

Using the water level data collected by the pressure transducer installed into Wells 3 and 6 during their respective constant rate and recovery portions of the tests, RCS geologists used the AQTESOLV software package to perform the automatic curve fitting procedures. Below is a list of the different curve-fitting solutions used, the transmissivity value calculated, the figure number on which the water level data and fitted-curve are presented in this report, and additional assumptions about the aquifer inherent in the solution. Note, that several solutions were analyzed using confined, semi-confined, and even fractured aquifer types. RCS reviewed several of these analytical solutions, but the curve fitting portion of these analyses were determined to be unreliable for many of these solutions and thus were deemed to not be valid; thus these curves are not presented below.

- Theis – Figure 5A, “Constant Rate Pumping Test Analysis, Theis Solution Confined Aquifer, Well 3 (Pumping Well).” – As shown on the figure, the curve for the confined aquifer solution has been matched to much of the water level drawdown and recovery data acquired during the pumping test of Well 3. A transmissivity value of only approximately 6 gpd/ft is calculated for these data. Storativity could not be calculated in this solution because the analysis uses data from the pumping well, and not an observation well. The Theis (1960) solution assumes numerous conditions, including the aquifer is isotropic (the same in all directions).
- Moench – Figure 5B, “Constant Rate Pumping Test Analysis, Moench (Case 2), Leaky Aquifer Solution, Observation Well 6.” – As shown on the figure, the curve for the leaky aquifer solution using the Moench (1985) Case 2 solution for a has been matched to the later time portion of the water level data acquired during the test and during the water level recovery period in water level observation Well 6 because water level drawdown interference did occur in the nearby water level observation well. A transmissivity value of only approximately 3 gpd/ft is calculated for these data. Also, a storativity value of 4.7×10^{-7} was calculated. The Moench solution assumes numerous conditions, including that the aquifer is isotropic (the same in all directions) and includes a correction for

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delayed observation well response, which was observed in Well 6 during the pumping test of Well 3.

- Moench – Figure 5C, "Constant Rate Pumping Test Analysis, Moench, Leaky Aquifer Solution, Observation Well 3." – As shown on the figure, the curve for the leaky aquifer solution has been matched to the later time portion of the water level data acquired during the test and during the water level recovery period in water level observation Well 6. A transmissivity value of only approximately 17 gpd/ft is calculated for these data. A storativity value of 9.5×10^{-5} was calculated. The Moench solution assumes numerous conditions, including that the aquifer is isotropic (the same in all directions) and includes a correction for delayed observation well response, which was observed in Well 3 during the pumping test of Well 6.

Based on the analytical solutions performed above, transmissivity and storativity values were determined to be low. This reveals the fractured-rock aquifer systems into which Wells 3, 6, and 8 are constructed are: of limited vertical extent; or of limited areal (horizontal) extent; or lacks abundant interconnected fractures beneath the property when compared to other wells constructed into similar geological materials.

An independent evaluation of transmissivity (T), using data from the subject pumping test, was also made via the empirical relationship T≈1,750 (Q/s), where (Q/s) is the specific capacity of the pumping well and 1,750 is an empirical constant for a semi-confined aquifer system in the fractured rocks of the Domengine sandstone and/or Great Valley Sequence. Applying this relationship to the specific capacity value calculated for the subject pumping tests of Wells 3 and 6 yields a transmissivity value on the order of 35 to 52 gpd/ft.

Additional Pumping Test of Well 8

The original results of the constant rate pumping test performed in Well 8 by Bess in late-March 2016 showed that Well 8 likely could not sustain an operational pumping rate of 6.9 gpm. As a result, and following discussions with the property owner, future anticipated groundwater demands for the project were reduced by the owner through the inclusion of process waste water recycling, increased rainwater harvesting, and the planned installation of a higher efficiency irrigation system in the vineyards to be planted. Based on these project changes, RCS recommended performing another pumping test in Well 8 but at lower rates than those used during its prior test in March 2016. Pumping at these lower rates could help determine a more feasible pumping rate for Well 8. RCS recommended performing a constant drawdown-type test (in lieu of a constant rate test) at pumping rates on the order of 3 gpm for Well 8. RCS also recommended performing this pumping test over a 5-day period with alternating 12-hour periods of pumping and non-pumping (i.e., 12 hours pumping followed by 12 hours of water level recovery). These alternating periods of pumping and water level recovery were performed to help "mimic" the proposed future operational pumping of this project well, based on the project water demand data provided by RSA+.

This constant drawdown test was conducted in Well 8 between July 18 and 22, 2016 by Bess. Bess personnel were onsite on a part-time basis to operate the permanent pump and to collect periodic manual measurements during the pumping test, as recommended by RCS geologists. Water level data collected via a water level pressure transducer during the testing period for Well 8 are shown on Figure 6, "Water Levels During 5-Day Pumping Test." Below is a summary

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of those data collected during the background water level monitoring period, the pumping period, and the water level recovery portions of this constant drawdown pumping test:

- Static water levels recorded by the transducer in Well 8 during the background water level monitoring period appeared to be stable and were at a depth of 148.8 ft brp prior to initiating testing at Well 8. For comparison, static water levels prior to the March 2016 were on the order 89 ft brp; thus, water levels were roughly 60 ft deeper prior to testing at Well 8 in July 2016.
- A nominal pumping rate of 3 gpm was recommended by RCS geologist for Day 1 of the pumping test. The pumping test was initially started by Bess at a pumping rate of 3 gpm, but after a pumping period of 12 hours, the average pumping rate (based on totalizer data collected by Bess and provided to RCS) was calculated to be 2.7 gpm. The slight decline in pumping rate during testing period was due to declining PWLs during the testing period and the resulting additional pumping lift necessary. At the end of the 12-hour pumping period at a rate of 2.7 gpm, a final PWL of 242.6 ft was recorded by the transducer. It is noteworthy that this final PWL was significantly shallower than those PWLs recorded after 12 hours of pumping at the higher rate of 6.9 gpm during testing in March 2016; those prior pumping levels were on the order of 340 ft (see Figure 4C).
- Following a period of water level recover of 12 hours, a SWL of 197.2 ft brp was recorded by the transducer just before the pump was turned on to begin Day 2 of the pumping test; this SWL is approximately 48 ft deeper than the SWL recorded prior to the start of pumping on Day 1. Thus, it appears that water levels were still recovering following the Day 1 pumping period. After 12 hours of continuous pumping on Day 2, the maximum PWL in Well 8 was measured at a depth of 303.4 ft, as shown on Figure 6. Due to the declining pumping water level (and resultant decline in pumping rates) in the well during the Day 1 testing, the pumping rate was increased slightly for the Day 2 pumping. At the end of the 12-hour pumping period, the average pumping rate for Day 2 was calculated to be 3.3 gpm. At this slightly higher average pumping rate of 3.3 gpm during the Day 2 pumping period, it appears that PWLs were roughly 61 ft deeper than the Day 1 PWLs while pumping the well at an average pumping rate of 2.7 gpm.
- SWLs recovered to a depth of 251 ft brp during the 12-hour recovery period prior to the start of the Day 3 pumping period. Thus, water levels did not recover to pre-Day 2 testing levels. Therefore, based on the results of Day 2 pumping and the relatively slow water level recovery rates, RCS recommended a nominal pumping rate of 2 gpm for the Day 3 portion of this test. At the end of the 12-hour Day 3 pumping period, an average pumping rate of 2.4 gpm was calculated. A maximum PWL of 311.5 was recorded by the transducer at the end of this Day 3 pumping period. This PWL is only 8 ft deeper than the maximum Day 2 PWL. Also, the change in maximum PWLs between Day 2 and 3 (8 ft) while pumping at average rates of 3.3 gpm and 2.4 gpm, respectively, is significantly less than the change in maximum PWL between Day 1 and Day 2 (61 ft) when pumping rates were 3 gpm and 3.3 gpm, respectively.

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- Prior to the Day 4 portion of the pumping test, following a period of recovery (non-pumping) of 12 hours, SWLs in Well 8 recovered to a depth of 273.3 ft brp. This SWL is 22 ft deeper than the pre-test SWL (251.0 ft brp) on the previous day. Thus, it appears that the reduced pumping rate on Day 3 (2.4 gpm) of Well 8 decreased the maximum water level drawdown during testing and allowed water levels to more fully recover during the subsequent 12-hour recovery period.
- A nominal pumping rate of 2 gpm was recommended by RCS for the Day 4 pumping period. At the end of this 12-hour pumping period, an average pumping rate was calculated to be 1.2 gpm. The maximum PWL recorded by the transducer during this period was 293.7 ft brp. Thus, the maximum PWL during this Day 4 pumping period at 1.2 gpm was roughly 18 ft shallower than the maximum PWL recorded during the Day 3 pumping period at 2.4 gpm. Therefore, pumping at this lower rate allowed water levels to recover somewhat better in this well.
- During the subsequent 12-hour water level recovery period following the Day 4 pumping period, SWLs recovered to a depth of 265.6 ft brp. This SWL is roughly 8 ft shallower than the Day 4 pre-test SWLs, and therefore water level recovery continued in this well even after pumping at a rate of 1.2 gpm.
- A nominal pumping rate of 1 gpm was recommended by RCS for the final Day 5 pumping period. An average pumping rate of 1.2 gpm was calculated for the 12-hour pumping period. The maximum PWL in Well 8 was measured at a depth of 290.5 ft brp, as shown on Figure 6. Following pump shut-off and after a period of roughly 12 additional hours, water levels are shown on Figure 6 to have recovered to a depth of approximately 265 ft brp. This water level is essentially the same as the pre-test SWL recorded prior to testing on Day 5. Again, water levels had fully recovered after a period of 12 hour following a 12-hour testing period on Day 5, and continued to recover despite pumping for 12 hours at 1.22 gpm.
- Water level recovery data were then collected in Well 8 for a period of about 6 days. As shown on Figure 6, at the end of this 6-day recovery period, a water level depth of 195.7 ft brp was recorded in Well 8. This SWL is still roughly 47 ft deeper than the SWL recorded prior to the pumping period on Day 1.

Based on the data presented above, it appears that Well 8 is capable of pumping at operational rates on the order of 1 to 2 gpm on a 12-hour operational basis during the irrigation season of most years. Although water levels did not recover completely to pre-testing levels after the 5-day constant drawdown pumping test (with alternating 12-hour water level recovery periods), it does appear that water level recovery improved significantly when pumping this well at rates ≤2 gpm. It is noteworthy that water levels were able to fully recover from the Day 4 and Day 5 pumping periods.

Ongoing Water Level Data Collection

Beginning in July 2015, RCS Geologists initiated a water level monitoring program in onsite Wells 1, 2 (the inactive onsite well), 3, 6, 7 and 8 by installing a water level pressure transducer in each of these wells; a water level pressure transducer was previously installed in Well 5 by

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others. Figures 7A through 7G, "Water Level Data," shows the water level data collected by these automatically-recording transducers in the seven wells that were monitored between July 8, 2015 and January 31, 2017. The blue-colored lines on each graph were created using the water level data collected from each of the transducers installed in these 7 wells in the roughly ±20-month monitoring period (the transducer was removed from Well 2 by RCS geologists in March 2016). Also shown on Figures 7A through 7G are: occasional manual water level measurements collected by RCS Geologists during each site visit; the transducer installation depth (as marked by a dashed green line); and accumulated rainfall totals (in inches and shown as a gold-colored line) by water year (WY) since WY 2014-15, as available from the Napa One Rain website for the "Redwood Creek at Mt. Veeder" rain gage. This rain gage is located roughly ¾ of a mile west of the subject property, and is discussed more in detail in the following "Rainfall" section of this Memorandum (see page 26).

As shown on Figures 7A through 7G, water levels were generally deepest during the 2015 summer and fall irrigation periods, as well as the 2016 summer irrigation period in some of these wells. These periods of decreased water levels in the wells generally coincide with increased pumping durations and/or frequency, as well as the limited rainfall recharge in the recent drought period. During the non-irrigation months of late-2015/early-2016 and late-2016/early-2017, when pumping from the onsite wells at the subject property was limited to domestic and landscaping uses, and when rainfall may have been occurring, water levels are shown to recover. It also appears that SWLs in the onsite wells recorded by the transducers in summer of 2016 are higher than SWLs recorded in the summer of 2015, with the exception of Well 8 (the decrease in SWLs in Well 8 is likely due the increase in pumping in that well). Thus, the data presented on these figures illustrate the fact that rainfall recharge does occur on the property.

It should also be noted in Figures 7A through 7G is that water levels recovered slowly in the three project wells (Wells 3, 6, and 8) following the pumping portion of their respective March 2016 pumping tests. In Well 3 (see Figure 7C), a SWL of 106.8 ft brp was recorded by the RCS Geologist on July 28, 2016, which is 1.5 ft below the pre-test SWL of 105.3 ft brp on March 21, 2016. Water levels in Well 3 increase up to a depth of 104.6 ft brp on November 22, 2016 before the well was used again. Note that pumping tests have not been performed in Well 3 or Well 6 since testing occurred in March 2016, although these wells have continued to be used to meet existing onsite domestic and landscaping water demands. As shown on Figure 7E, a SWL of 103.7 ft brp was recorded in Well 6 by the RCS Geologist on July 28, 2016. This July 2016 SWL at Well 6 is nearly the same as the pre-test SWL of 103.6 ft brp recorded on March 21, 2016. Based on the water level data collected by the transducer in those two wells, it appears that water levels have fully recovered from the pumping tests that were previously performed in these wells in March 2016. SWLs in Well 8 have yet to recover to the water levels recorded prior to testing in March 2016, as shown on Figure 7G. However, this well has been pumped several times since the March and July 2016 pumping tests.

Also noted from Figures 7A through 7G is that pumping water levels in several of the wells have consistently descended below the depth of the installed transducer (see Wells 1, 3, 6, and 7 on Figures 7A, 7C, 7E, and 7F, respectively) throughout the recent ±20-month monitoring period. Each of the transducers were installed to a depth relatively close (within ±10 ft) to the Bess-reported depth setting for the permanent pump; the pumps in several of the onsite wells may

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have also broken suction while pumping (i.e., water levels descended below the depth of the pump intake), which is likely due to an improperly-sized pump being utilized in those wells.

Rainfall

Long-term rainfall data for the subject property are essential for estimating the average annual groundwater recharge that may occur at the subject property. Average annual rainfall totals specifically at the subject property are not directly known, because no onsite rain gage exists. However, the nearest rain gage with over 100 years of available data exists roughly 6 miles southeast of the subject property. Data for this gage are available from the California Data Exchange Center (CDEC) website (http://cdec.water.ca.gov/), maintained by the California Department of Water Resources (DWR), and the gage is named "NSH – Napa Fire Department." Data from this CDEC gage are available beginning in 1904, but water year (WY) 1980-81 (October 1980 – September 1981) and WY 1981-82 appear to have missing data. As part of this analysis, RCS removed those water years with missing data from the data set before calculating an average annual rainfall for this gage. Note that RCS only removed these missing water years; no rainfall was "added" to the data set. With these assumed missing water years removed from the data set, an average rainfall of 24.4 inches (2.03 ft) is calculated for this CDEC NSH rain gage for WY 1904-05 through WY 2015-16. This rain gage is located at a lower elevation (±60 ft above sea level, asl) than that of the subject property (between ±180 ft and ±420 ft asl), and therefore the average annual rainfall at the subject property is likely to be higher than that experienced at this known gage location. Also, because this rain gage is located 6 miles southeast of the subject property, it is less likely that these data are representative of the long-term average annual rainfall at the subject property.

Another rain gage with a significantly long data record is the one located at the Napa State Hospital. The data for this gage are available from the Western Regional Climate Center (WRCC) website (http://www.wrcc.dri.edu). This gage is reported to have a very similar location and elevation as the CDEC rain gage discussed above and is likely the same gage, but this could not be confirmed. For this rain gage, the period of record is listed as January 1893 through December 2016. Note that there are several missing months and/or years of rainfall data missing between 1897 and 1902, and between 1915 and 1916. For the available period of record, the average annual rainfall (mean rainfall) at this Napa State Hospital gage is reported to be 24.7 inches (2.06 inches), as calculated by the WRCC.

A rain gage labeled as "Redwood Creek and Mt. Veeder Rd" is reported to exist roughly ¾ miles west of the subject property, near the intersection of Mt. Veeder Road and Redwood Road. Data for this gage are available from the Napa One Rain website (http://napa.onerain.com/) maintained by Napa County. Data from the Napa One Rain website for this gage are available for WY 2000-01 through WY 2015-16. The average annual rainfall for WY 2000-01 through 2015-16 at this gage site is calculated to be 34.6 inches (2.88 ft). This rain gage is located at a similar elevation (±360 ft asl) as that of the subject property, and therefore, the average annual rainfall at the subject property is likely to be similar to that experienced at this known gage location. However, because the period of available rainfall data is relatively short (16 years in duration), RCS does not assume these data are representative of the long-term annual average rainfall in the area surrounding the subject property.

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To help confirm the average annual rainfall data derived from the CDEC, WRCC, and/or Napa One Rain gages, RCS reviewed the precipitation data published by the PRISM Climate Group at Oregon State University. This data set, which is freely available from the PRISM website (http://prism.oregonstate.edu/) contains "spatially gridded average annual precipitation at 800m grid cell resolution." The date range for this dataset includes the climatological period between 1981 and 2010. These gridded data can be used to provide an average annual rainfall distributed across the subject property, based on the boundaries of the subject property. Using this data set, RCS determined that the average rainfall for the subject property for the stated data range is approximately 30 inches (2.50 ft).

An isohyetal map (a map showing contours of average annual rainfall) is available that covers all of Napa County, and is freely available for download from the online Napa County GIS database (*gis.napa.ca.gov)*. The download page for the file named "isohyetal_cnty" can be accessed via:

> http://gis.napa.ca.gov/giscatalog/catalog_xml.asp?srch_opt=all&db_name=x&theme=x&sort_order=layer&meta_style=fgdc&submit=Submit

As described in the metadata for the file (also available via the download page at the web link shown above), the isohyets are based on a 60-year data period beginning in 1900 and ending in 1960. As stated in the metadata for the file, the contour interval for the map is reported to be "variable due to the degree of variation of annual precipitation with horizontal distance", and therefore the resolution of the data for individual parcels is difficult to discern. The subject property is located within the boundaries of the 35-inch rainfall contour on the map. Based on our interpretation of the actual isohyetal contour map (not provided herein), the long-term average annual rainfall at the subject property is likely on the order of 32 inches (2.67 ft).

Table 3, "Comparison of Rainfall Data Sources," shows a comparison of the data collected from the different rainfall sources discussed above. Based on the various rainfall data sources described in Table 3, RCS will assume that the long-term average annual rainfall at the subject property is 30 inches (2.50 ft), as derived from the PRISM data set. The 30-inch per year estimate is based on the data source with a relatively long period of record (29 years) and is site-specific, when compared to the nearby rainfall data sources listed above that exist at different elevations and/or at large distances from the subject property.

Estimate of Groundwater Recharge

Groundwater recharge on a long-term average annual basis at the subject property can be estimated as a percentage of average rainfall that falls on the subject property and becomes available to deep percolate into the local aquifers over the long-term. The actual percentage of rain that deep percolates can be variable based on numerous conditions, such as the slope of the land, the soil type that exists at the property, the evapotranspiration that occurs on the property, the intensity of the rainfall, etc. Therefore, we must look to various analyses of deep percolation into the local bedrock and/or Great Valley Sequence rocks conducted and relied upon by other consultants and government agencies.

Estimates of groundwater recharge as a percentage of rainfall are presented for a number of watersheds in Napa County in the report titled "Updated Napa County Hydrogeologic Conceptual Model" (LSCE&MBK, 2013) prepared for Napa County. Watershed boundaries

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within Napa County are shown on Figures 8-3 and 8-4 in that report. At the request of RCS, those watershed boundaries were provided to RCS by MBK Engineers (MBK) via email. Figure 8, "Watershed Boundaries," was prepared for this project using those watershed boundaries. As shown on Figure 5, the subject Anthem Winery property is partially located within the watershed referred to by MBK as "Redwood Creek". As shown on Table 8-9 on page 97 of the referenced report (LSCE&MBK, 2013), 10% of the average annual rainfall that occurs within this watershed was estimated to be able to deep percolate as groundwater recharge.

As stated above, the ground surface area of the subject property is 44.8 acres. Assuming a conservative value of 30 inches (2.5 ft) of rain falls on the property on a long-term average annual basis, then the total volume of rainfall available for deep percolation over the long term is approximately 112.0 (44.8 acres x 2.5 ft). Assuming 10% of the average annual rainfall could deep percolate to the groundwater beneath the subject property, then the average annual groundwater recharge at the subject property would be approximately 11.2 AF/yr.

Effect of Ground Slope Angle on Recharge Potential

Any estimate of the percentage of rainfall that becomes available for deep percolation that relies on estimates of rainfall, evapotranspiration, and surface water outflow for an entire watershed, such as those estimates provided by LSCE&MBK 2013, inherently includes the effects of slope angle in the estimate. However, to provide a more complete consideration of the potential effects of ground slope angle on groundwater recharge specifically at the subject property, analysis of those effects is provided below.

Many basic geologic references assume that recharge potential is reduced on steeper slopes, as steeper slopes can increase surface water runoff rates, and therefore less time is available for rainfall to deep percolate. On page 56 of LSCE&MBK 2013, it is asserted that deep percolation recharge from rainfall is "significantly reduced" for land areas with slopes angles greater than 30 degrees. Because the various factors that affect groundwater recharge are likely interrelated (Yeh 2009), assigning a value to define the amount that recharge is diminished is extremely difficult. No references were reviewed by RCS that quantify the possible reduction of deep percolation that might occur as a function of slope angle/percentage.

Estimates of the deep percolation of rainfall for the entire "Redwood Creek" watershed were based on water balance calculations by others that included rainfall throughout the entire watershed. As discussed above, those watershed-scale calculations inherently include all slopes within the watershed, including slopes greater than 30 degrees. Therefore, to evaluate the site-specific recharge potential of the property and to also include assumptions about the varying recharge potential based on slope, then the deep percolation percentage used for slopes less than 30 degrees within the entire watershed would have to be increased to offset the decrease in the percentage for slopes greater than 30 degrees.

Table 4, "Estimated Recharge Based on Slope Deep-Percolation Assumption", shows a range of values for different assumptions for the amount of deep percolation that might occur on slopes greater than 30 degrees in the rocks beneath the subject property. To create Table 4, deep percolation values were first calculated for the entire Redwood Creek Watershed. That is, the deep percolation percentage for the slopes within the watershed that are less than 30 degrees were increased to offset the diminished deep percolation percentage for the slopes greater than 30 degrees. A range of values was calculated assuming a range of recharge

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percentage "diminishment factors" of 25%, 50%, 75%, and 100%. Once the deep percolation percentages for slopes less than and greater than 30 degrees were calculated for the entire watershed, then those same resultant percentages shown on Table 4 were applied to the subject property; recall that the entire property is underlain by rocks of the Domengine sandstone and/or Great Valley Sequence.

As shown above, a recharge estimate of 11.2 AF/Yr was calculated for the subject property assuming a conservative value of 10% for the deep percolation of rainfall would occur on all 44.8 acres of the subject property (underlain by rocks of the Domengine sandstone and Great Valley Sequence). Approximately 4.0 acres of the subject property consist of slopes greater than 30 degrees. Hence, if the assumption is made that the deep percolation that occurs on the 40.8 acres of the subject property with slopes greater than 30 degrees is diminished by a factor of 100%, then the average annual recharge that is estimated to occur at the subject property would be 11.02 AFY; see Table 3 herein. This calculated recharge volume is still greater than the estimated future groundwater demand of 4.71 AF/yr and 5.51 AF/yr for the subject property during average and drought year rainfalls, respectively (see Table 2).

Estimate of Groundwater in Storage

To help evaluate possible impacts to the local aquifer system that may occur as a result of pumping for the proposed project, the volume of groundwater extracted for the project can be compared to an estimate of the volume of groundwater in storage beneath the subject property. To estimate the amount of groundwater currently in storage beneath the Anthem Winery property, the following parameters are needed:

a. Approximate surface area of property = 44.8 acres

b. Depth of Well 3 = 310 ft bgs; Well 3 is the shallowest well on the subject property, and thus provides the most conservative estimate of the minimum thickness of saturated rocks within the Domengine Sandstone and/or Great Valley Sequence that might exist beneath the subject property and other wells on the property are much deeper and could have greater thicknesses of saturated rocks.

c. Well 3 has a total length of perforated casing of 250 ft, with perforations emplaced continuously between the depths of 60 ft and 310 ft bgs. However, to present a conservative calculation of groundwater in storage, we will assume that the saturated thickness of the aquifer beneath the subject property is only 130 vertical feet. This value is calculated for Well 3 by subtracting the SWL of 180 ft brp (measured in September 2015 by RCS Geologists; see Figure 7C) from the depth to the bottom of the perforations at 310 ft bgs in this well. Based on the static water level data shown on Figure 7C, this is the lowest SWL measured by RCS Geologists during the ±12-month monitoring period, and is being used to provide a conservative calculation of the volume of groundwater storage beneath the subject property (as of September 2015). Further, the saturated rock (comprised of sandstones, mudstone, siltstones, and/or shales) aquifers beneath the subject property, especially in areas to the southeast, could be much deeper; this could tend to create greater potential groundwater storage volumes in that area.

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d. Approximate average specific yield of the Domengine sandstone and/or Great Valley Sequence = 2%. Specific yield of these rocks can vary greatly depending on the degree and interconnection of the pore spaces and/or fracturing within the rocks. A conservative estimate by Kunkel and Upson for the specific yield of the local sedimentary-type rocks ranges from 3% to 5% (UGSS 1960). Values for the specific yield of the different rock types are discussed on pages 65 and 78 of that Kunkel and Upson report (USGS 1960). Although no specific yield values are stated directly for the Domengine sandstone and/or Great Valley sequence rocks, comparisons can be made to the rock types listed as “cemented conglomerate; cemented sand, gravel, and clay”; “cemented sand and boulders”; “sandrock”; and/or “sandstone” in that USGS (1960) report. For other nearby properties for which RCS has performed similar analyses, a more conservative estimate for specific yield of 2% was used (typically used by RCS for volcanic rock settings). Hence, to present a conservative analysis, we will assume a specific yield value of only 1% for these consolidated and/or possibly cemented rocks that underlie the subject property, although the value may, in reality, be somewhat higher.

e. Thus, a conservative estimate of the groundwater currently estimated to be in storage (S), beneath the subject property (as of September 2015) is calculated as:

   S = property area (a, above) times saturated thickness (c, above) times average specific yield (d, above) = (44.8 ac)(130 ft)(1%) = 58.1 AF.

In contrast, future groundwater use for the subject property during an average drought year is estimated to be 5.51 AF. Hence, the future groundwater demand during a drought year represents about 9% of the groundwater conservatively estimated to be in storage in the rocks beneath the subject property.

Possible Effects of “Prolonged Drought”

California is currently experiencing a period of prolonged drought. Here, drought is defined as a meteorological drought, that is, a period in which the total annual precipitation is less than the long-term average annual precipitation (DWR 2015). For similar projects in the County, Napa County Planning, Building and Environmental Services Department (PBES) has asked RCS to consider what the effects on groundwater availability at a particular property might be if a period of “prolonged drought” were to occur in the region, assuming the project were to operate in the future as described herein. Recharge volumes estimated in this Memorandum are based on the long-term average rainfall value determined for the subject property using available data. Recall that a calculation of average annual rainfall for any long-term period always includes periods of below-average rainfall and above-average rainfall that occurred during the period over which the average was calculated. Therefore, it is our opinion that the preceding calculations do inherently include consideration of drought year conditions.

However, to help understand what potential conditions might exist in the local sedimentary rocks beneath the property during a “prolonged drought period”, a “prolonged drought” must be defined. As discussed by DWR, “there is no universal definition of when a drought begins or ends, nor is there a state statutory process for defining or declaring drought.” (DWR 2015).

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California's most significant historical statewide droughts were defined by DWR as occurring during the following periods (DWR 2015):

- WY 1928-29 through WY1933-34 - six years
- WY 1975-76 through WY 1976-77 – two years
- WY 1986-87 through WY 1991-92 – six years
- WY 2006-07 through WY 2008-09 – three years
- Current drought – WY 2011-12 through WY 2015-16 – five years to date

Table 5, "Drought Period Rainfall as Percentage of Average," shows the average amount of rainfall that occurred during each drought period for which rainfall data exist at the three rain gages discussed above and shown on Table 3; that drought period rainfall amount is also expressed on Table 5 as a percentage of the total rainfall that fell. As shown on Table 5, determining the amount of rain that might fall during a "prolonged drought" is variable, and depends on the period of record for the specific rain gage. Clearly, the WY 1975-76 to WY 1976-77 drought period recorded by the Napa State Hospital rain gage and reported by the WRCC had the lowest total rainfall at 48%, compared to the long-term average, and it lasted for two years. The WY 1928-29 to WY 1933-34 drought period lasted for six years, but rainfall during this drought was 70% of the average annual rainfall at the Napa State Hospital gage. It is important to note that the drought year percentage listed on Table 4 is completely dependent on the period of record for each individual gage. An example of this is the Napa One Rain gage data; because the period of record for this gage is short, and includes many drought years, then the last two available drought year period rainfall percentages are shown to be 85% and 82% of the long-term average.

Hence, for the purposes of this analysis, RCS will conservatively consider a "prolonged" drought period rainfall to be 48% of the average annual rainfall that occurs (using the PRISM data set). Further, to again be conservative, RCS will estimate a "prolonged drought period" to last 6 years, which is the longest drought period on record according to DWR (DWR 2015); see Table 5. This six-year period is a conservative estimate, because the 48%-average figure corresponds with a two-year drought period, not a six-year drought period.

To meet six years of the estimated future groundwater demand for the proposed subject property during prolonged drought period (i.e., drought year rainfall), a total onsite groundwater extraction of 33.1 AF is estimated to be required (a demand of 5.51AF/yr per drought year rainfall multiplied by 6 years = 33.1 AF). Assuming groundwater recharge is reduced to 48% of the average annual recharge during such a theoretical "prolonged drought period", then a total of approximately 31.7 AF of groundwater recharge might occur during the entire six-year drought period, as calculated below:

- From page 29 herein, the average annual groundwater recharge at the subject property is estimated to be 11.02 AF/yr. Taking 48% of this annual volume yields a drought period recharge volume of 5.29 AF/yr.
- Assuming a drought period duration of 6 years, then 31.7 AF of groundwater (a recharge volume of 5.29 AF/yr times 6 years) would be able to recharge the earth materials

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beneath the property by virtue of deep percolation of the direct rainfall recharge within the boundaries of the subject property.

Therefore, assuming a theoretical six-year drought period during which only 48% of the average annual rainfall might occur, there may be a total "recharge deficit" of only 1.4 AF (calculated by subtracting the 31.7 AF of groundwater recharge over the entire six years from the 33.1 AF of total onsite groundwater extractions over the entire 6-year period). Water to meet this deficit would be available during drought periods from the 58.1 AF of groundwater currently estimated to be in storage beneath the subject property.

As conservatively estimated on page 30 herein, 58.1 AF of groundwater are in storage beneath the property (as of September 2015). Hence, the six-year long drought period groundwater "recharge deficit" of 1.4 AF would represent only about 2% of that volume of groundwater in storage. Temporarily removing an average of approximately 0.23 AF of groundwater from storage every year (or 1.4 AF of "deficit" over the entire 6-year period) may cause water levels to decrease, but removal of such a relatively small percentage of groundwater from storage over a 6-year period of time is not expected to significantly affect groundwater levels beneath the property. Also, as discussed above and shown in the longer-term water level data for the onsite wells, water levels have been shown to recover (albeit, slowly) during non-irrigation periods which last for weeks or months. However, following the 24-hour pumping periods for the three subject pumping tests, water level recovery was slow in Wells 3, 6, and 8. This reveals that 24-hour pumping by these wells in the irrigation season may continue to create increasingly deeper pumping levels, particularly during future periods of extended drought. This possibility can be mitigated by pumping the project wells on a 50% operational basis (12 hours a day) throughout the year.

Possible Effect of Fault

As shown on Figure 3 (discussed above), a single fault is shown to transect the central portion of the subject property. As mapped by others (CGS 2004 and USGS 2007), this fault separates the Domengine sandstone on the west side of the property from the Great Valley Sequence rocks on the east side of the property. Based on the local geologic descriptions by others (LSCE 2014), this fault could potentially also act as a barrier to groundwater flow in the aquifer systems beneath the property. The three project wells (Wells 3, 6, and 8), which are the wells proposed by the property owner to be used to supply groundwater for the new uses on the property, lie on the west side of this fault. Due to the potential groundwater flow barrier of the fault, rainfall that is able to deep percolate into the local aquifers as groundwater recharge on the east side of the fault may not necessarily be available for the project wells on the west side of the fault. In order to determine the amount of rainfall available for groundwater recharge, as well as to be conservative, an additional recharge analysis was performed for only the portion of the subject property west of the fault, as shown below:

a. Approximate onsite ground surface area west of fault = 30.0 acres

b. Long-term average annual rainfall = 30.0 inches (2.5 ft) per year

c. Average annual groundwater recharge west of fault (assuming 10% of the average annual rainfall could deep percolate) = (30 ac)(2.5 ft)(10%) = 7.5 AF/yr

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Similar to our discussion on pages 28 through 29 herein, RCS assumes that rainfall recharge potential is reduced on steeper slopes. Approximately 4.0 acres of the subject property located west of the fault consist of slopes greater than 30 degrees. Hence, if the assumption is made that deep percolation that occurs on these 4.0 acres with slopes greater than 30 degrees is diminished by 100%, then the average annual recharge that is estimated to occur at the subject property on the west side of the fault would be 7.0 AF/yr. This calculated recharge volume is still greater than the estimated future groundwater demand of 0.92 and is also greater than the 1.72 AF/yr needed from the project wells (Wells 3, 6, and 8) during average and drought rainfall years, respectively.

A conservative estimate of the groundwater estimated to be in storage (as of September 2015) beneath the subject property on the west side of the fault was also calculated. Similar to our calculation presented on page 29 herein, Well 3 is the shallowest well on the west side of the fault, and its well construction parameters will be used to present a conservative estimate for the groundwater in storage on that side of the property. Using the same parameters discussed on pages 29 and 30 herein, however, and because of the smaller ground surface area of the property on the west side of the fault, the groundwater in storage beneath this western portion of the property is calculated as:

- S = (property area)*(saturated thickness)*(average specific yield)
  = (30.0 ac)*(130 ft)*(1%)
  = 39 AF

Hence, the annual volume of groundwater needed from the project wells (Wells 3, 6, and 8) during drought year rainfall periods represents only about 4% of the groundwater conservatively estimated to be in storage in the rocks beneath the subject property that lies west of this fault.

Key Conclusions and Recommendations

1. The existing property is currently developed with vineyards, residences, a winery with a permitted annual production of 30,000 gallons per year, an outdoor crush pad and tank area, a cave in which the winery exists, and associated landscaping. Existing water demands have been estimated by RSA+ to be 4.39 AF/yr, whereas approved (permitted) water demands for all onsite uses (including uses for the previously approved but unplanted 2.29 acres of vineyards), are estimated to be 6.49 AF/yr. Existing water demands are met by pumping groundwater from the non-project wells (Wells 1, 4, 5, and 7).
2. The project includes an increase in winery production to 50,000 gallons per year and 0.95 additional acres of new vines; an additional 2.29 acres of vines have already been permitted but are currently unplanted. Project components include sustainability and water use reduction measures intended to require less water in the future than is currently used by the existing winery and vineyard infrastructure. Specifically, the owner proposes: (1) to increase the total water supply on the parcels by harvesting rainwater and reclaiming winery process water; and (2) to reduce the amount of permitted groundwater use in the future with the proposed winery expansion and new proposed 0.95 acre of vineyard.

MEMORANDUM

3. The proposed (future) annual groundwater demands for the entire property, as reported by RSA+, are estimated to be 4.71 AF/yr during an average rainfall year, or 5.51 AF/yr during a drought year. This represents: (a) a groundwater demand decrease of 1.78 AF/yr and 0.98 AF/yr, for average and drought year rainfalls, respectively, when comparing the proposed (future) groundwater demands to the approved (permitted) groundwater demands; and (b) a groundwater demand increase of 0.32 AF/yr and 1.12 AF/yr when comparing the proposed uses to existing uses, for average and drought year rainfalls, respectively.

   The total combined future groundwater demand from the project wells (Wells 3, 6, and 8) is estimated to be 0.92 AF/yr in an average rainfall year, and 1.72 AF/yr in a drought year.

   In order to meet the future pumping needs of the subject property, the project wells need to pump at a total combined pumping rate of 1.1 gpm in an average rainfall year, and 2.1 gpm in a drought rainfall year. These pumping rates assume the project wells would be pumped on a 50% operational basis (pumping 12 hours per day) for 365 days/yr.

4. Based on the results of the March 2016 constant rate pumping tests performed by Bess Wells 3, 6, and 8, and the July 2016 constant drawdown test performed by Bess in Well 8, the project wells appear to be capable of pumping at rates needed to meet the average annual groundwater demand for the proposed new uses of the subject property. Well 3 and 6 were both pumped at an average rate of 1.1 gpm during their respective constant rate pumping tests, and Well 8 was pumped at an average rate of approximately 2 gpm.

5. Using the pumping data generated from the pumping tests performed in March and July 2016, the combined current capacity of the three project wells is likely on the order of 2.5 gpm. Thus, based on combined pumping rates alone, it appears Wells 3, 6, and 8 are capable of providing the necessary pumping rates for the proposed new uses on the subject property during years of average rainfall, and also during dry years as defined above. Assuming a theoretical six-year drought period during which only 48% of the average annual rainfall might occur, there may be a total “recharge deficit” of only 1.4 AF (calculated by subtracting the 31.7 AF of groundwater recharge over the entire six years from the 33.1 AF of total onsite groundwater extractions over the entire 6-year period). Water to meet this deficit would be available during drought periods from the 58.1 AF of groundwater currently estimated to be in storage beneath the subject property.

6. There are no known neighboring wells or springs within 500 feet of the project wells (Wells 3, 6, and 8). Although the owner's non-project wells are located in closer proximity to the project wells, pumping tests performed in the three project wells showed no water level drawdown impacts on any of the non-project wells.

7. The fracture systems are likely not well-connected beneath the property, because during the pumping portion of the three subject aquifer tests, water level drawdown impacts were not induced in some water level observation wells that were located relatively close to one of the pumping test wells. Only Wells 3 and 6 showed measurable water level drawdown interference on each other during their respective pumping tests. These two wells are separated by just 175 ft and are likely constructed into the same

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"compartmentalized" fractured rocks. Results of the various pumping tests at the subject property also showed that water levels did not reach equilibrium or become stable at the end of the pumping portion of each of the tests. After several additional days of non-pumping, water levels had still not entirely recovered to their pre-pumping test levels. These facts indicate that the local fractured rock aquifer systems are likely not continuous and do not extend over wide lateral distances in the subsurface. In essence, the groundwater in these rocks tends to be "compartmentalized" (i.e., it occurs in "pockets" in the subsurface). That is, the water levels may tend to become increasingly deep, resulting in increased pumping heads, decreased pump efficiency, reduction in pumping rates, and increased pumping costs.

8. Often, water levels in aquifer systems similar to those found beneath the subject property decline during the drier spring and summer months, when irrigation demand is higher, rainfall recharge is low, and when wells constructed into these fractured rock aquifers are pumping. Water levels in the local aquifer systems tend to recover once the rainy season is underway, because that rainfall becomes available for deep percolation and recharge into these sedimentary rocks. Based on the water level data collected from the onsite wells during the ongoing water level monitoring program conducted at the subject property between July 2015 and January 2017, periods of increased rainfall coupled with limited onsite pumping have helped to increase water levels in the onsite wells. Thus rainfall recharge is occurring and important for the recovery of the onsite wells during the wetter, non-irrigation periods.

9. Groundwater recharge at the subject property on a long-term average annual basis is estimated to be 11.02 AF/yr; this value is based on conservative estimates of average annual rainfall at the property and conservative estimates of the percentage of rainfall that could be available to deep percolate into the fractures and jointed rocks of the Domengine sandstone and/or Great Valley Sequence that underlie the subject property. Also included in our conservative estimates of recharge is the assumption that deep percolation of rainfall does not occur on slopes greater than 30 degrees (approximately 4.0 acres of the subject property is diminished by a factor of 100%). This average annual recharge volume is higher than the estimated long-term groundwater demand for the subject property of 5.51 AF/yr during a drought year and 4.71 AF/yr during an average year.

   Conservative estimates of recharge that occur during a "prolonged drought" (as defined above) show that, over a six-year drought period in which only 48% of the average annual rainfall might occur, a total of 31.7 AF of rainfall recharge would occur within the boundaries if the subject property. This "prolonged drought" recharge estimate of 31.7 AF is less than the total estimated groundwater demand of 33.1 AF for that same six-year period. However, only about 2% of groundwater currently estimated to be in storage beneath the subject property would be utilized over the entire 6-year drought period. It is feasible that rainfall recharge during years of above-average rainfall would then replenish groundwater in storage that was used to meet the groundwater demand during the drought.

10. RCS assumes that Napa County will require water level monitoring and volume extraction monitoring for the project wells as a standard condition of approval for this

MEMORANDUM

project; RCS supports continued monitoring. Observing the trends in groundwater levels and future well production rates over time by qualified individuals, the property owner can address potential declines in water levels and well production in the area, if needed.

MEMORANDUM

References

- **(CGS 2004)** Clahan, K.; Wagner, D.; et al., 2004. Geologic Map of the Napa 7.5' Quadrangle, Napa County, California: A Digital Database. California Geological Survey.
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- **(USGS 2007)** Graymer, Brabb, et al, 2007. Geologic Map and Map Database of Eastern Sonoma and Western Napa Counties, California, USGS.
- **(WAA 2015)** Napa County Board of Supervisors, Adopted May 12, 2015. Water Availability Analysis (WAA) – Guidance Document.
- **(YEH 2009)** Yeh HF, Lee CH, Hsu KC, Chang PH, 2009. GIS for the assessment of the groundwater recharge potential zone. Environ Geol 58: 185-195
- Napa One Rain, 2015. https://napa.onerain.com
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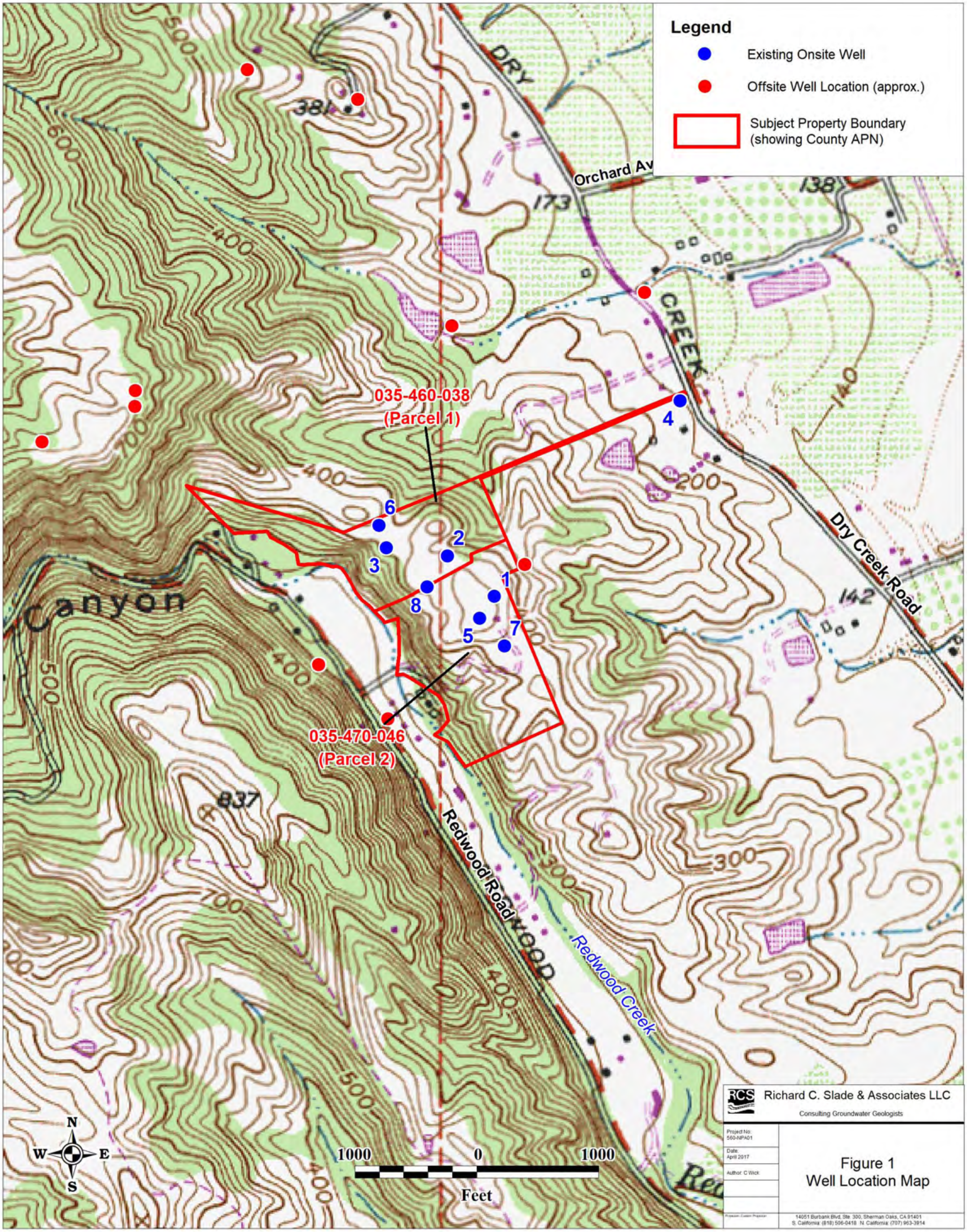


Figure 1
Well Location Map

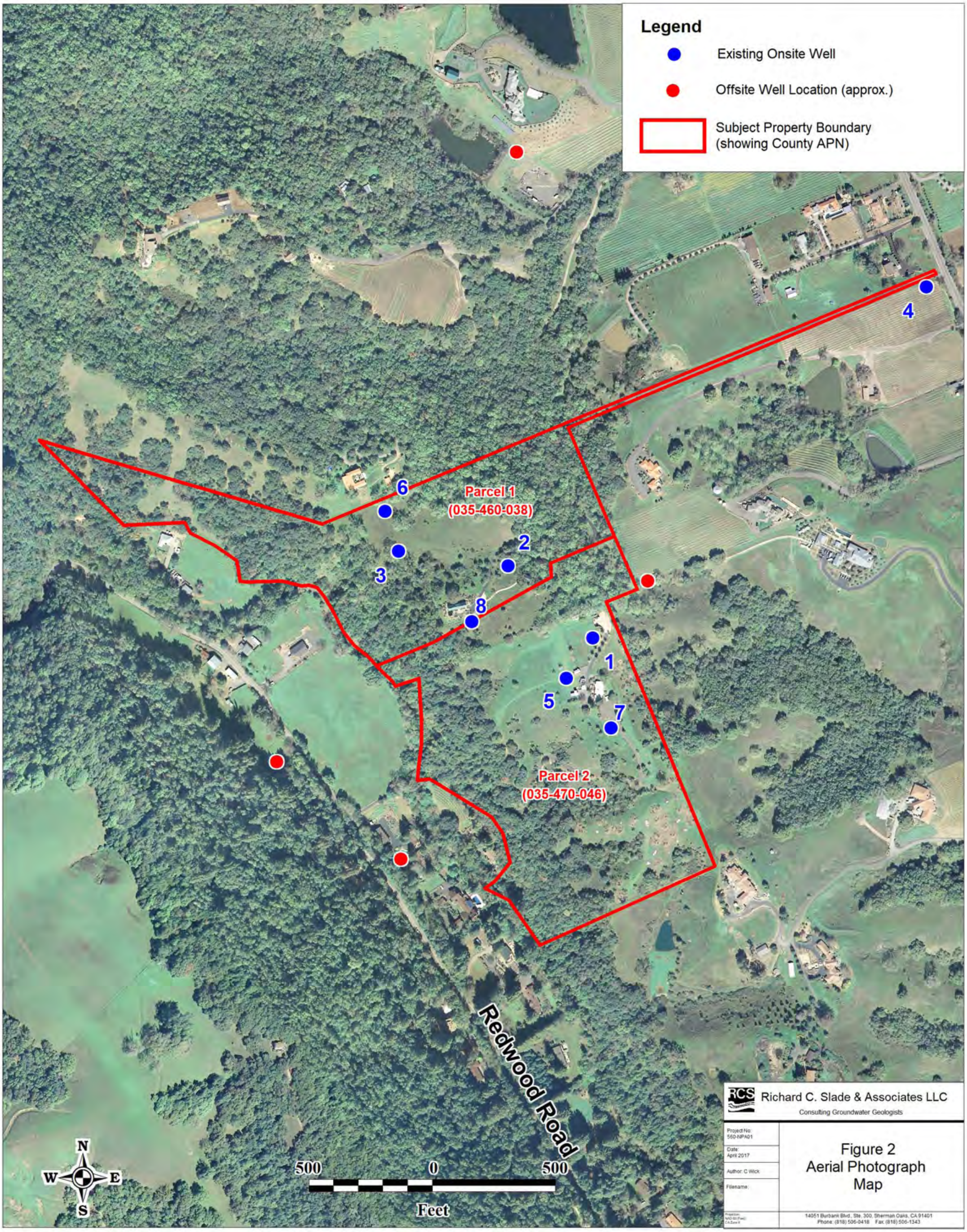
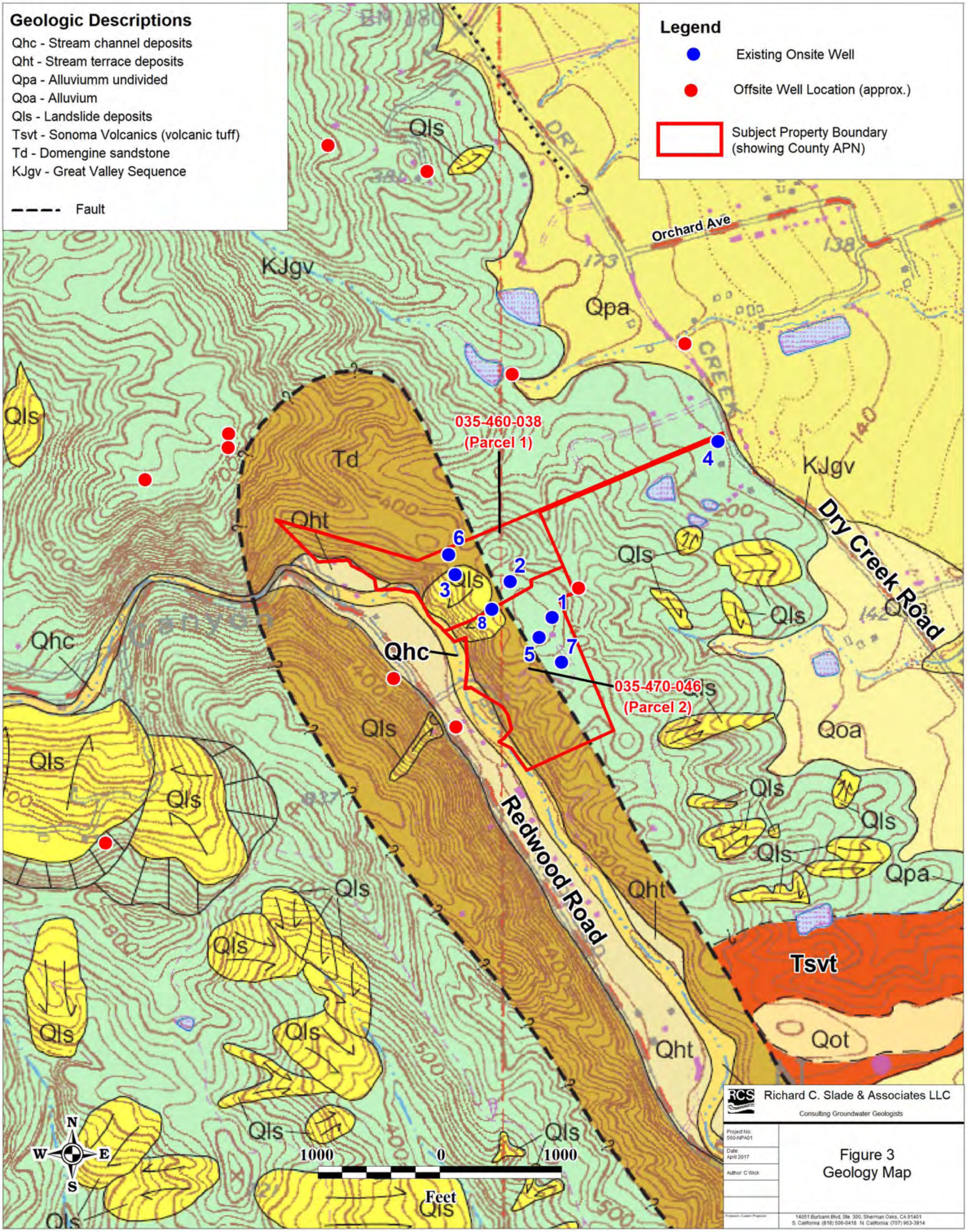
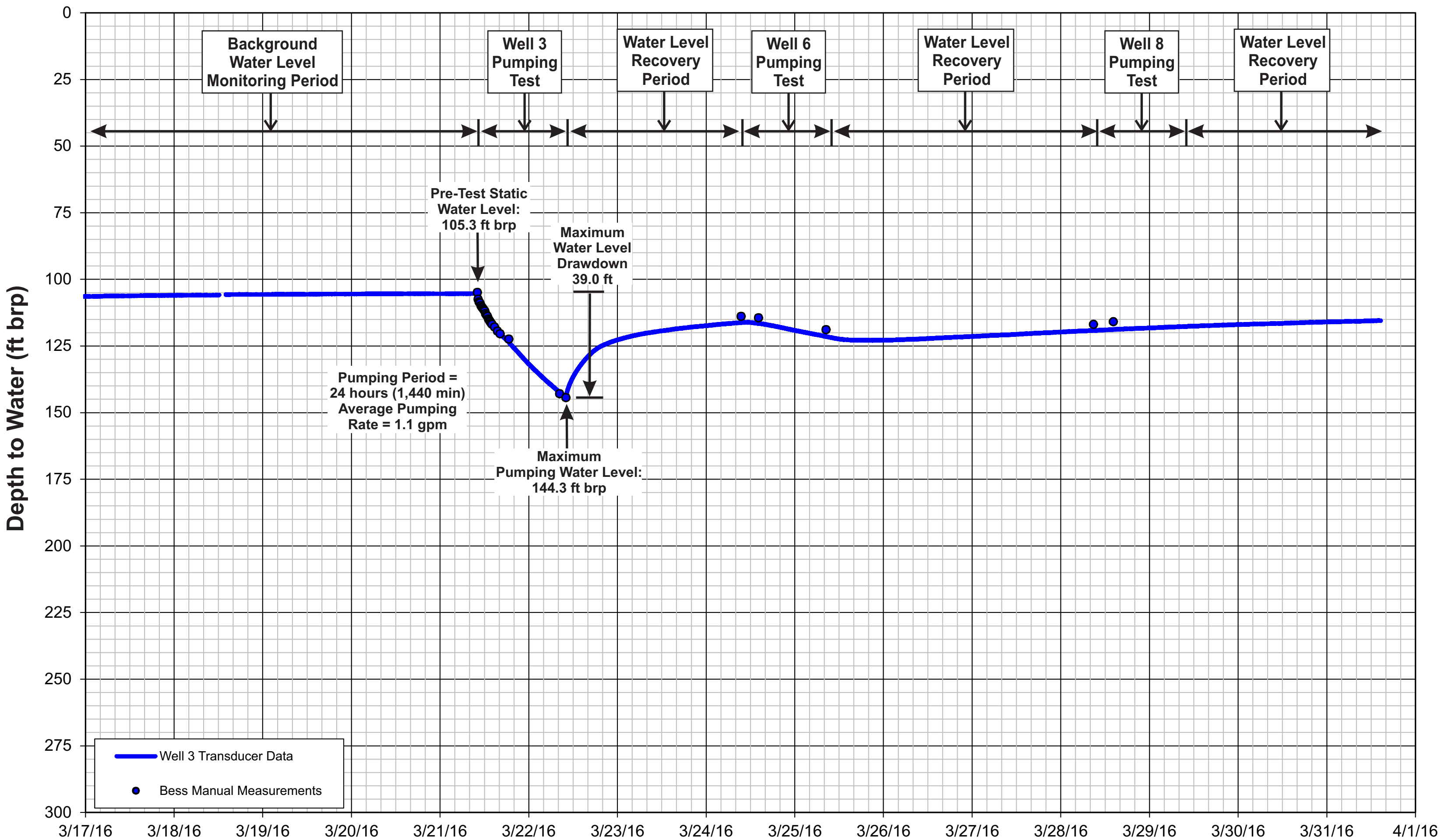


Figure 2
Aerial Photograph Map



Geologic Descriptions
Qhc - Stream channel deposits
Qht - Stream terrace deposits
Qpa - Alluviumm undivided
Qoa - Alluvium
Qls - Landslide deposits
Tsvt - Sonoma Volcanics (volcanic tuff)
Td - Domengine sandstone
KJgv - Great Valley Sequence
Fault
Legend
Existing Onsite Well
Offsite Well Location (approx.)
Subject Property Boundary (showing County APN)
035-460-038 (Parcel 1)
035-470-046 (Parcel 2)
1
2
3
4
5
6
7
8
Orchard Ave
Dry Creek Road
Redwood Road
DRY CREEK
Canyon
KJgv
Qpa
Qoa
Td
Qht
Qhc
Qls
Tsvt
Qot
1000
0
1000
Feet
N
S
E
W
Richard C. Slade & Associates LLC
Consulting Groundwater Geologists
Figure 3
Geology Map



Note: Major divisions on the X-axis represent 1 day; minor divisions represent 4 hours.

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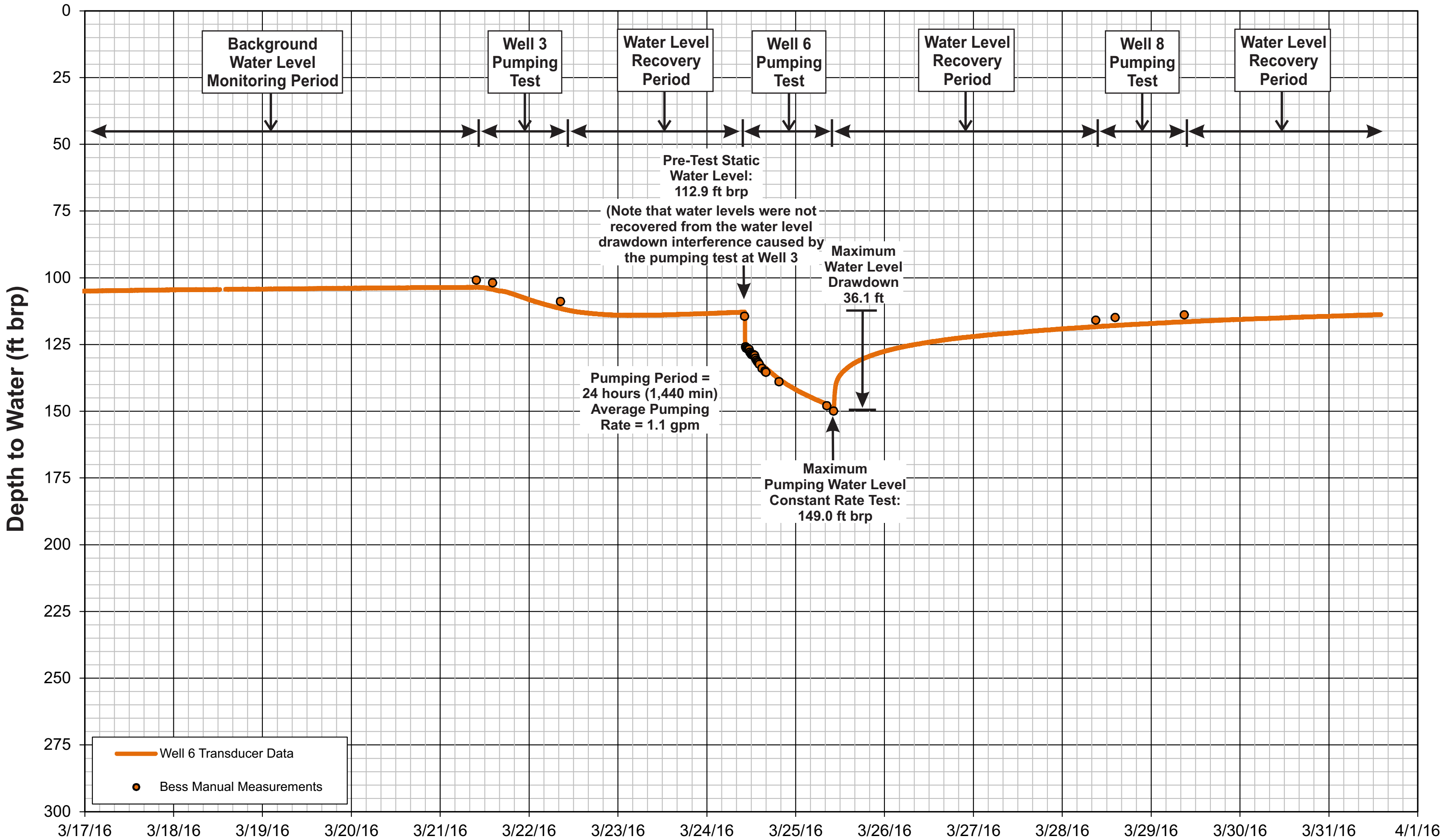
FIGURE 4A
WATER LEVELS DURING AQUIFER TEST
WELL 3
PROPOSED ANTHEM WINERY

Job No. 560-NPA01

April 2017



Note: Major divisions on the X-axis represent 1 day; minor divisions represent 4 hours.

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FIGURE 4B
WATER LEVELS DURING AQUIFER TEST
WELL 6
PROPOSED ANTHEM WINERY

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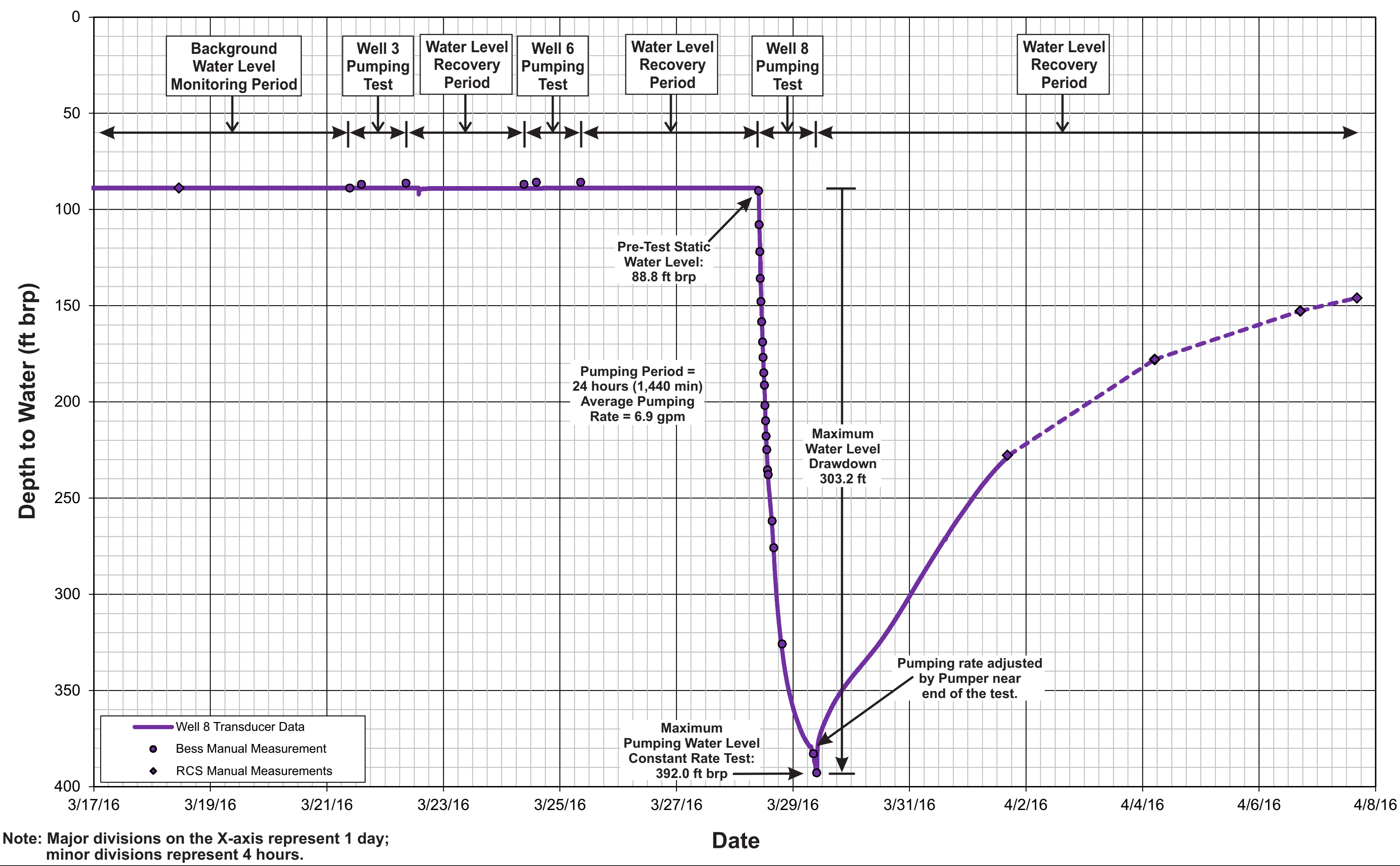

Note: Major divisions on the X-axis represent 1 day; minor divisions represent 4 hours.

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FIGURE 4C
WATER LEVELS DURING AQUIFER TEST
WELL 8
PROPOSED ANTHEM WINERY

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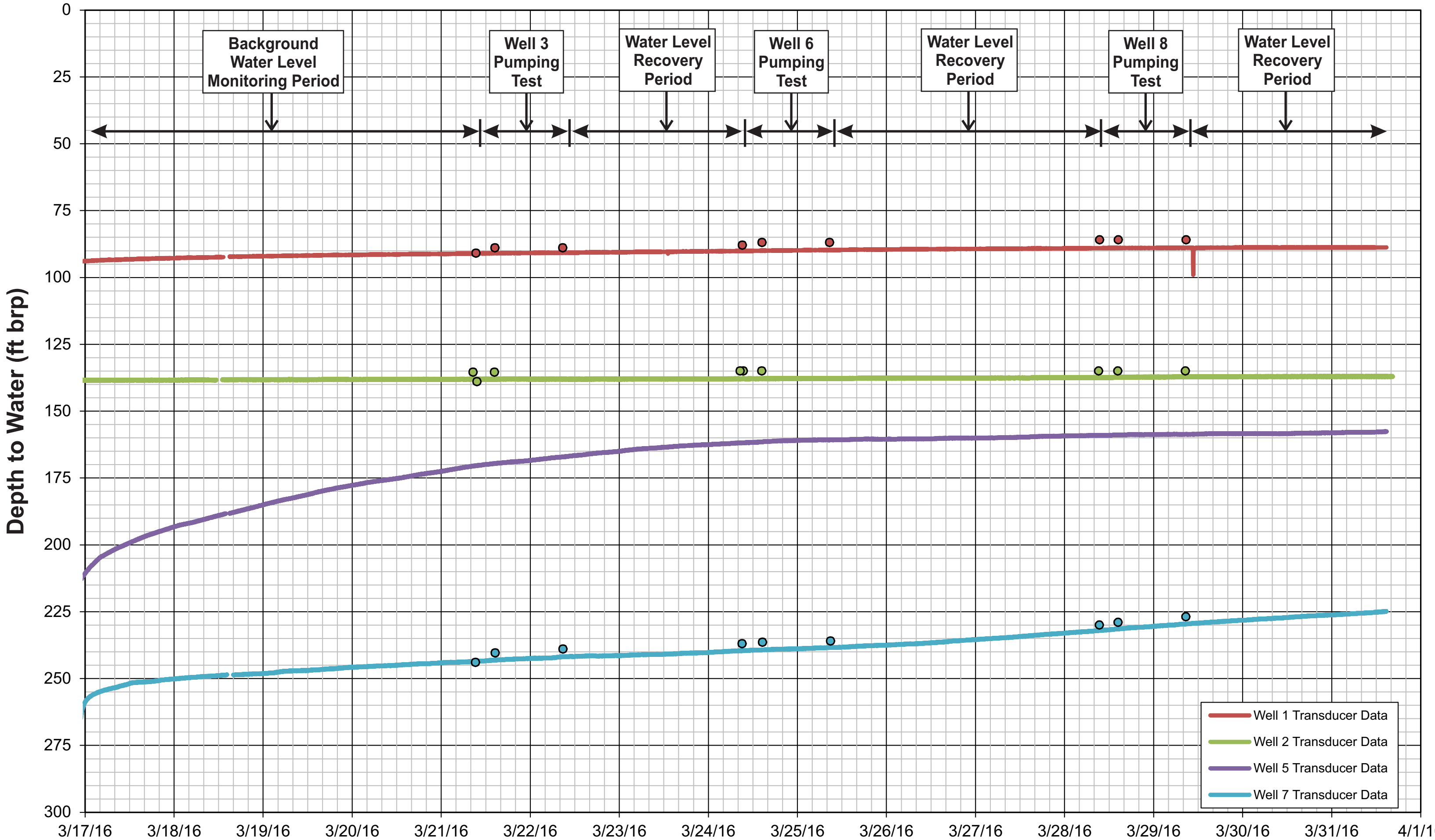

Note: Major divisions on the X-axis represent 1 day; minor divisions represent 4 hours.

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FIGURE 4D
WATER LEVELS DURING AQUIFER TEST
OBSERVATION WELLS
PROPOSED ANTHEM WINERY

Job No. 560-NPA01

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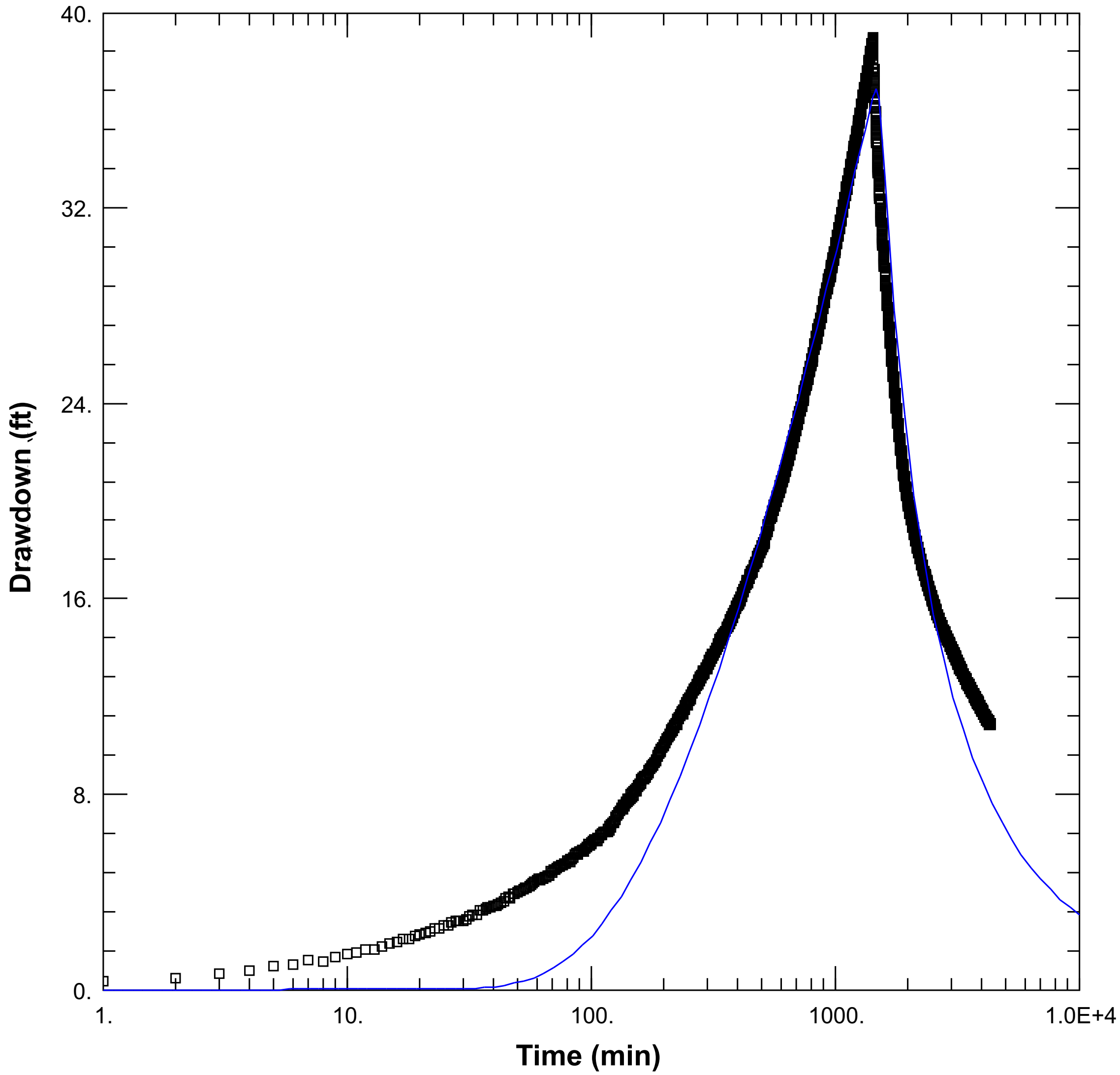

Obs. Wells

□ Well 3 (pumping well)

Aquifer Model

Confined

Solution

Theis

Parameters

T = 6 gal/day/ft

*No storativity (S) value because Well 3 is the pumping well.

Test Date = March 21, 2016
(24-hour test)
Pre-Test
Static Water Level = 105.3 ft brp

Average pumping rate = 1.1 gpm

Graphical Solution by:
AQTESOLV Vers. 4.50 Pro
by Hydrosolve, Inc.

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FIGURE 5A
CONSTANT RATE PUMPING TEST ANALYSIS
THEIS CONFINED AQUIFER SOLUTION
WELL 3 (PUMPING WELL)

Job No. 560-NPA01

April 2017

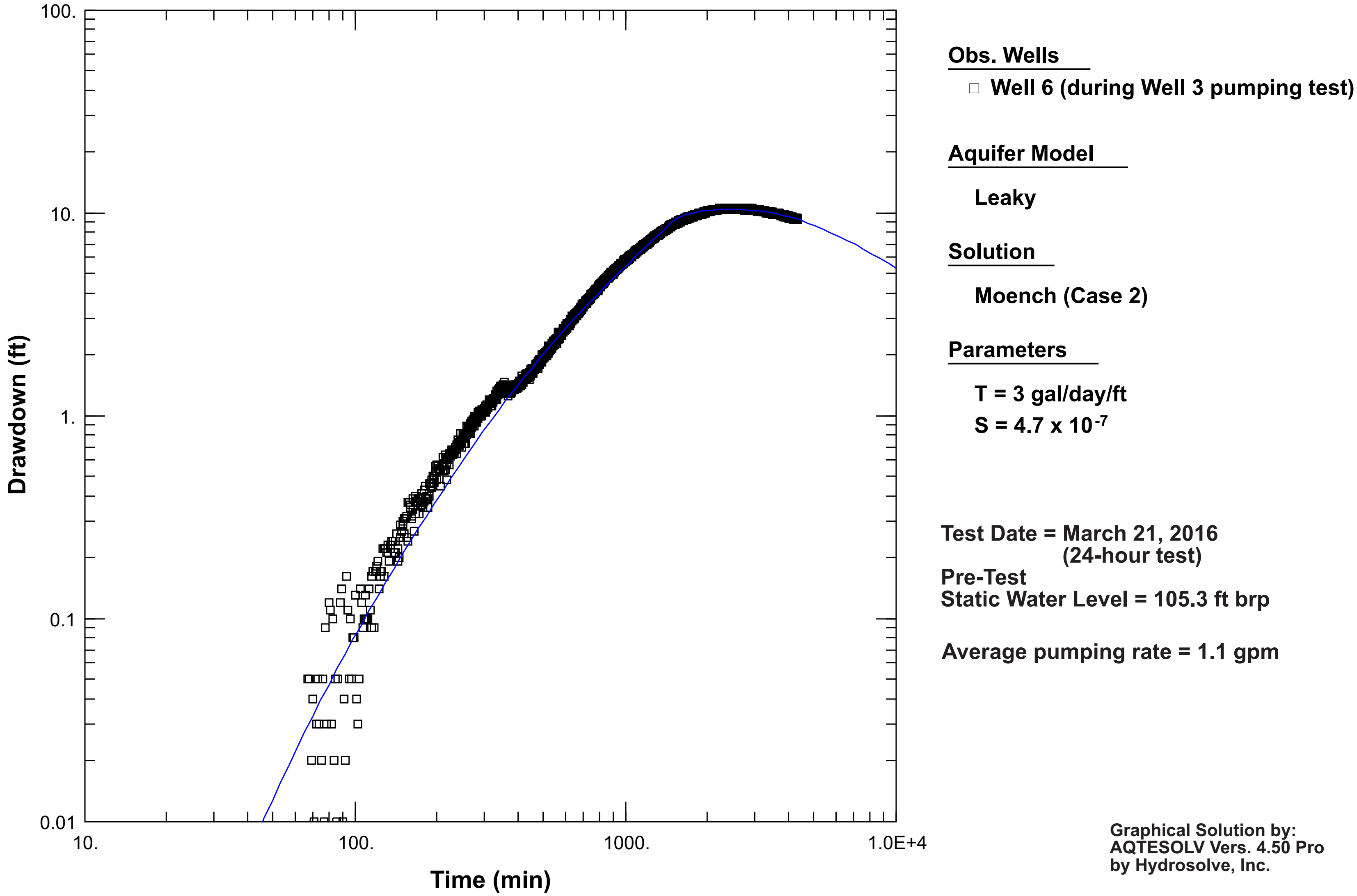

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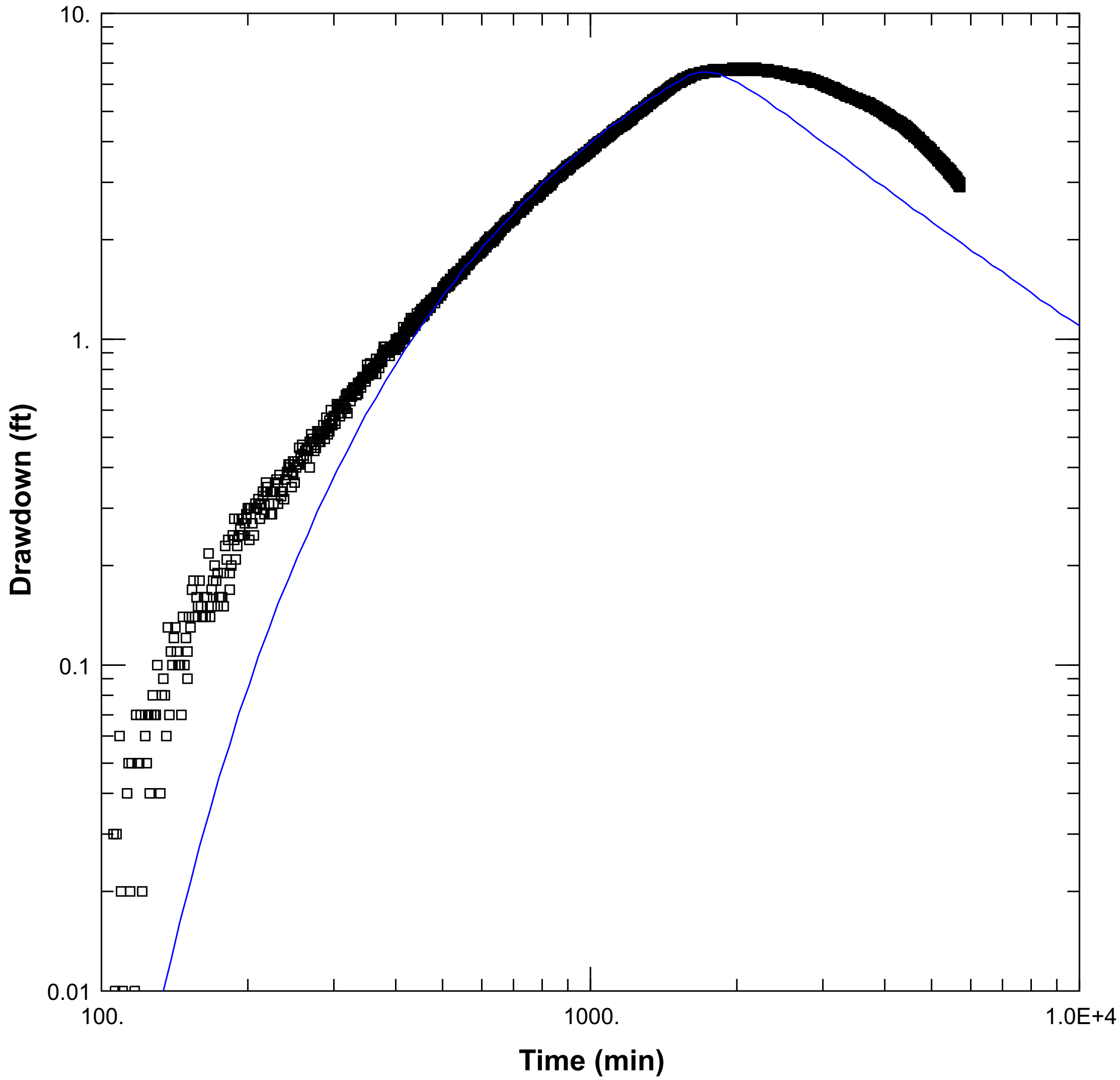
FIGURE 5B
CONSTANT RATE PUMPING TEST ANALYSIS
MOENCH LEAKY AQUIFER SOLUTION
OBSERVATION WELL 6

Job No. 560-NPA01 April 2017



Obs. Wells

□ Well 3 (during Well 6 pumping test)

Aquifer Model

Leaky

Solution

Moench (Case 2)

Parameters

T = 17 gal/day/ft

S = 9.5 x 10^{-5}

Test Date = March 24, 2016
(24-hour test)
Pre-Test
Static Water Level = 103.6 ft brp

Average pumping rate = 1.1 gpm

Graphical Solution by:
AQTESOLV Vers. 4.50 Pro
by Hydrosolve, Inc.

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FIGURE 5C
CONSTANT RATE PUMPING TEST ANALYSIS
MOENCH LEAKY AQUIFER SOLUTION
WELL 3 (OBSERVATION WELL)

Job No. 560-NPA01

April 2017

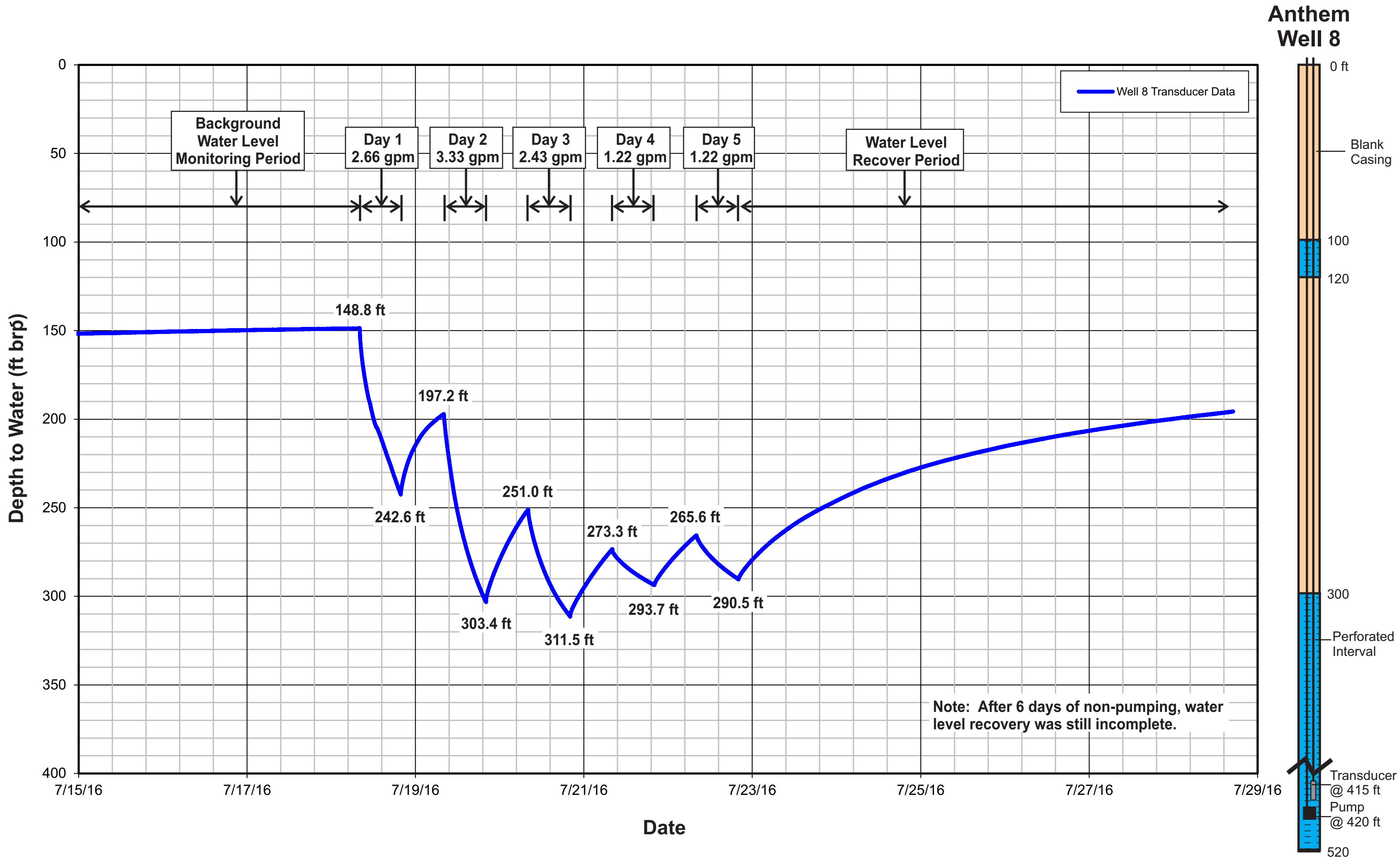

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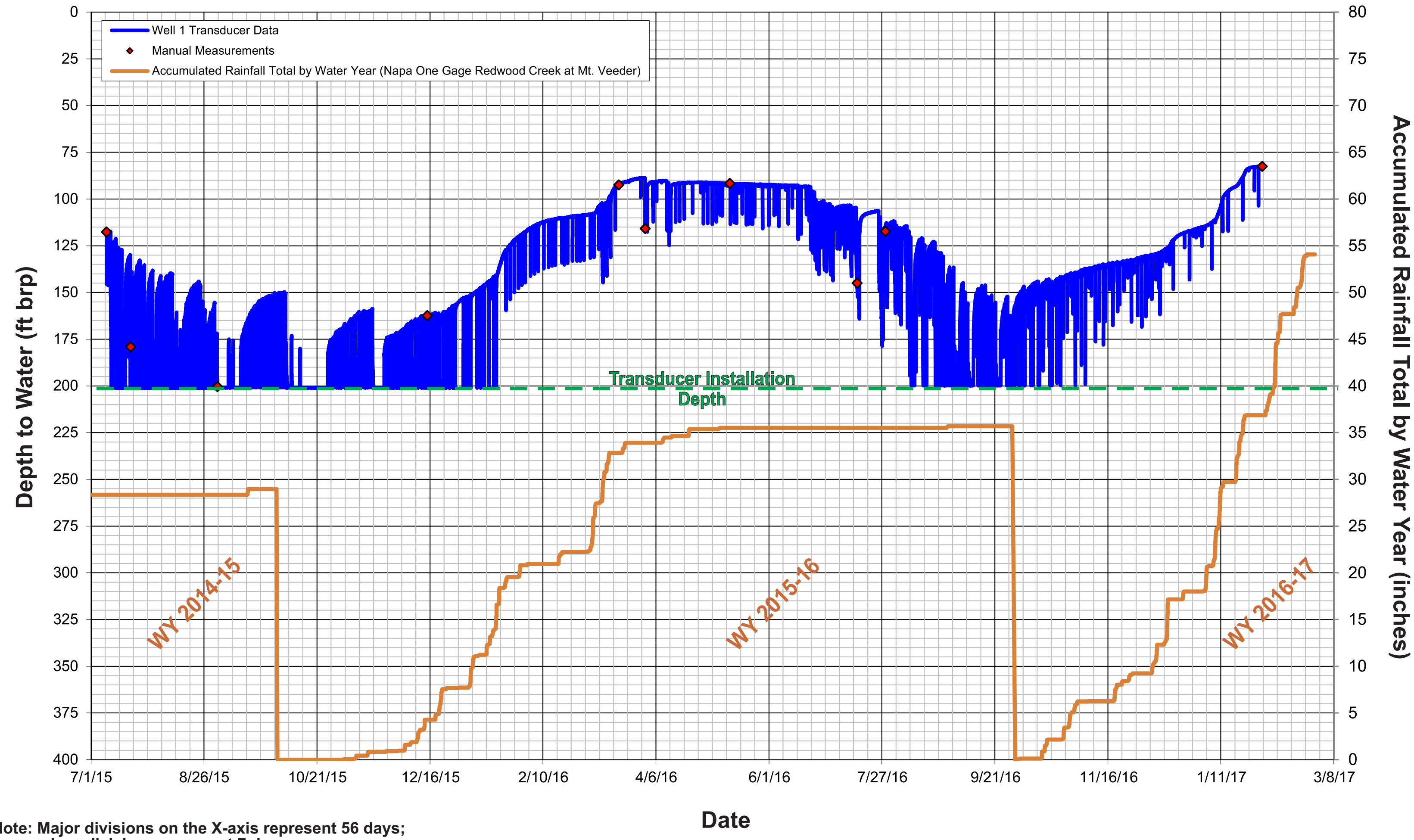
FIGURE 6
WATER LEVELS DURING 5-DAY PUMPING TEST
WELL 8
PROPOSED ANTHEM WINERY

Job No. 560-NPA01 **April 2017**



**Note: Major divisions on the X-axis represent 56 days;
minor divisions represent 7 days.**

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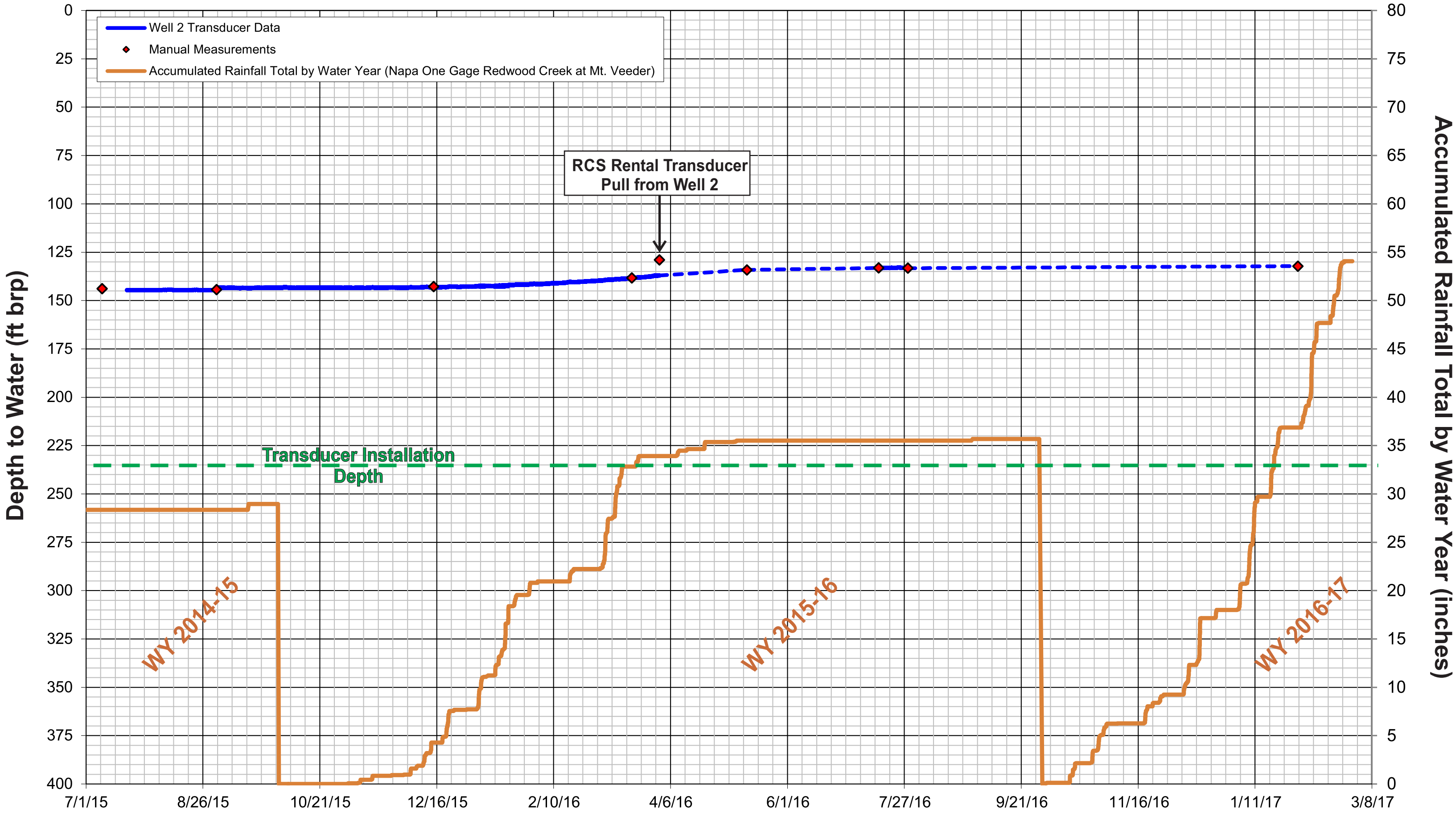
Figure 7A
Water Level Data - Well 1
Anthem Winery

Job No. 560-NPA01

April 2017



Note: Major divisions on the X-axis represent 56 days; minor divisions represent 7 days.

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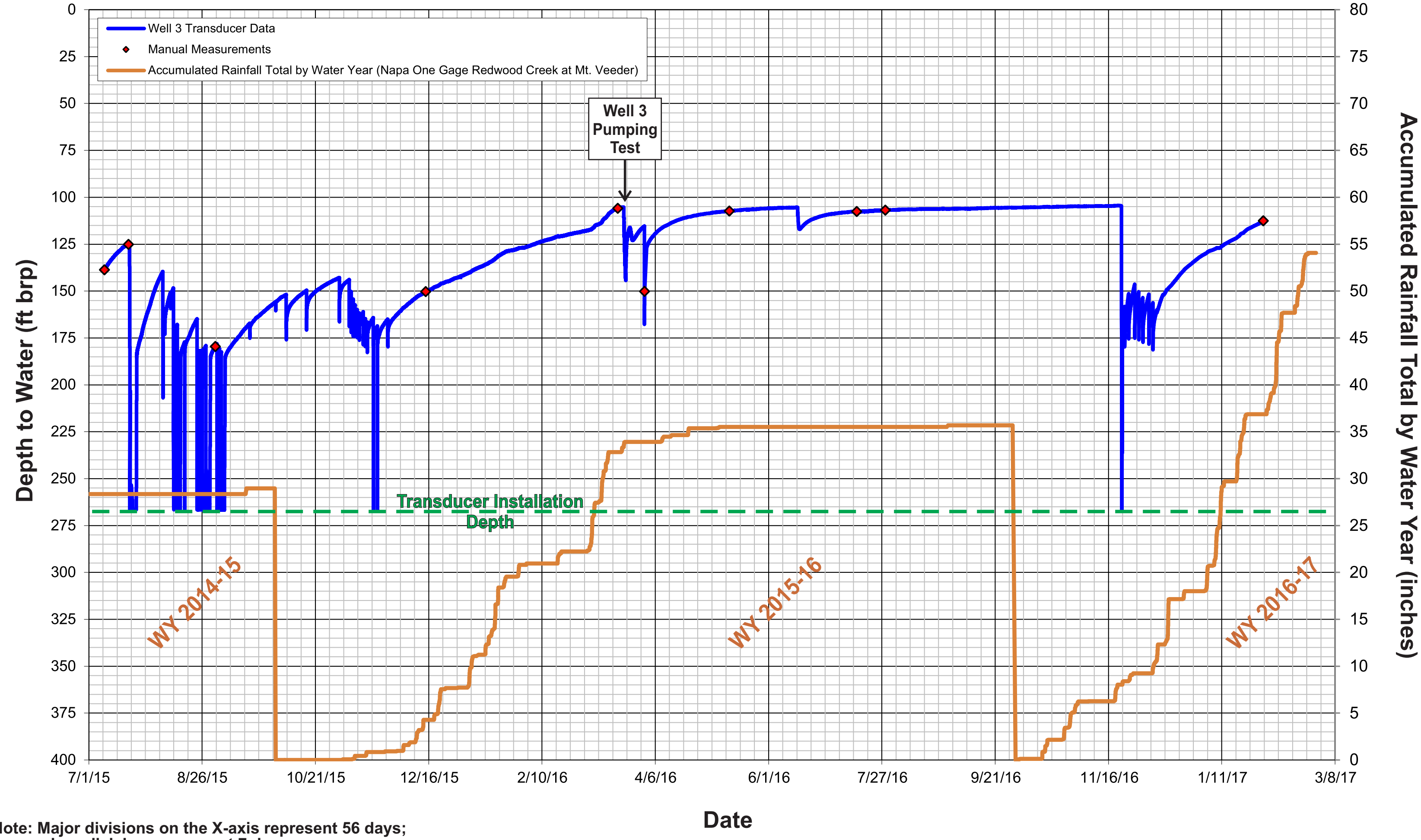
Figure 7B
Water Level Data - Well 2
Anthem Winery

Job No. 560-NPA01

April 2017



Note: Major divisions on the X-axis represent 56 days; minor divisions represent 7 days.

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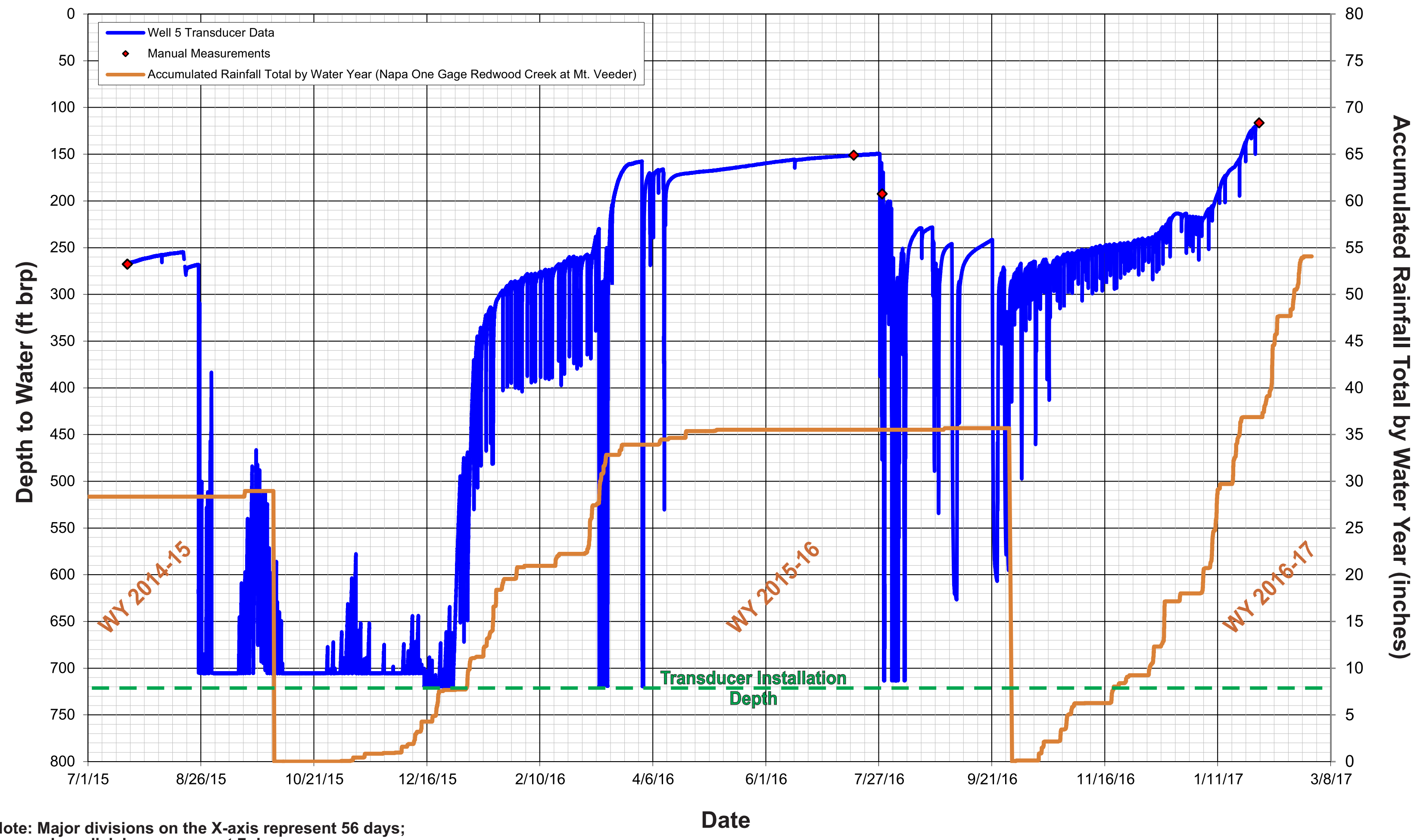
Figure 7C
Water Level Data - Well 3
Anthem Winery

Job No. 560-NPA01 **April 2017**



Note: Major divisions on the X-axis represent 56 days; minor divisions represent 7 days.

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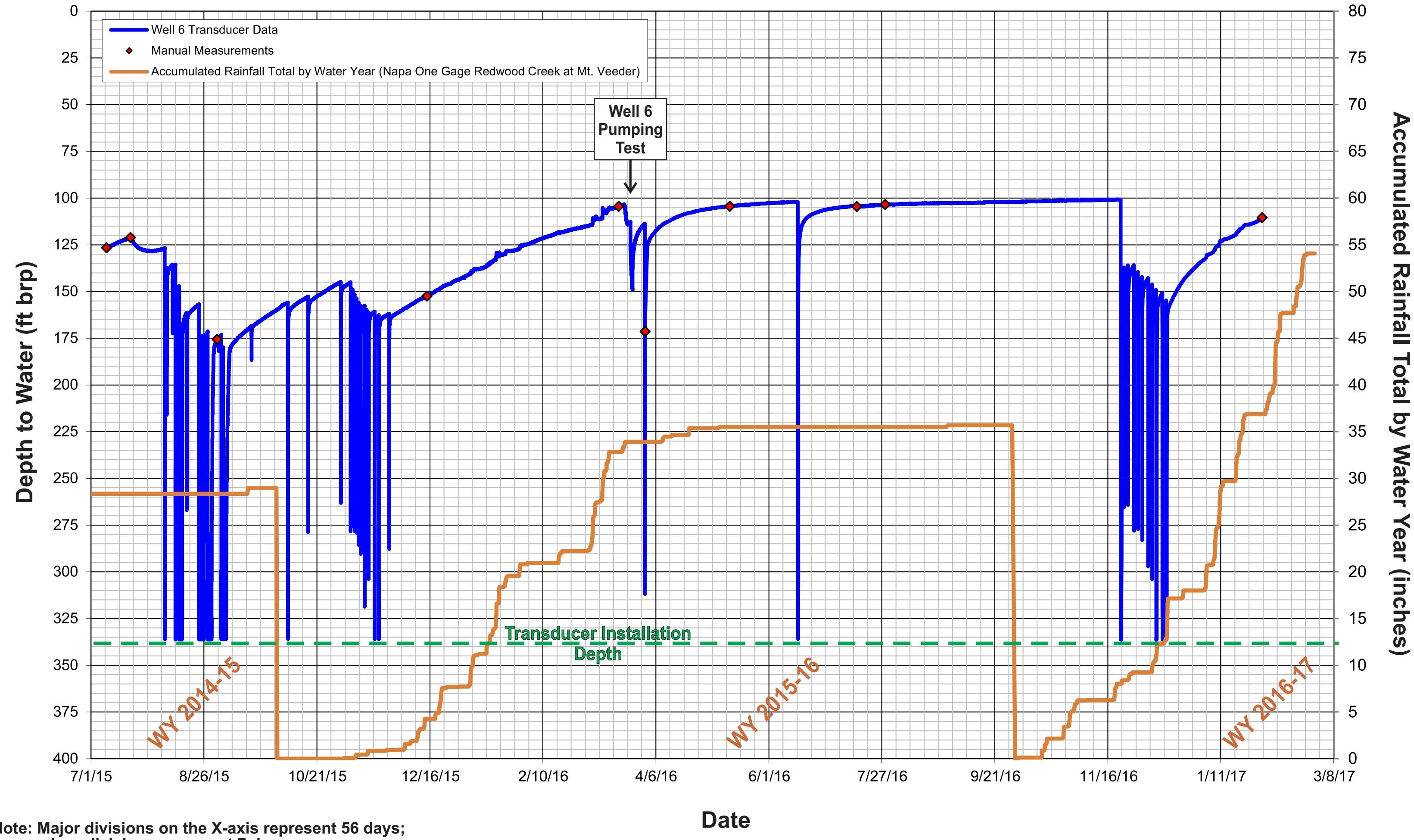
Figure 7D
Water Level Data - Well 5
Anthem Winery

Job No. 560-NPA01

April 2017



Note: Major divisions on the X-axis represent 56 days; minor divisions represent 7 days.

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Figure 7E
Water Level Data - Well 6
Anthem Winery

Job No. 560-NPA01

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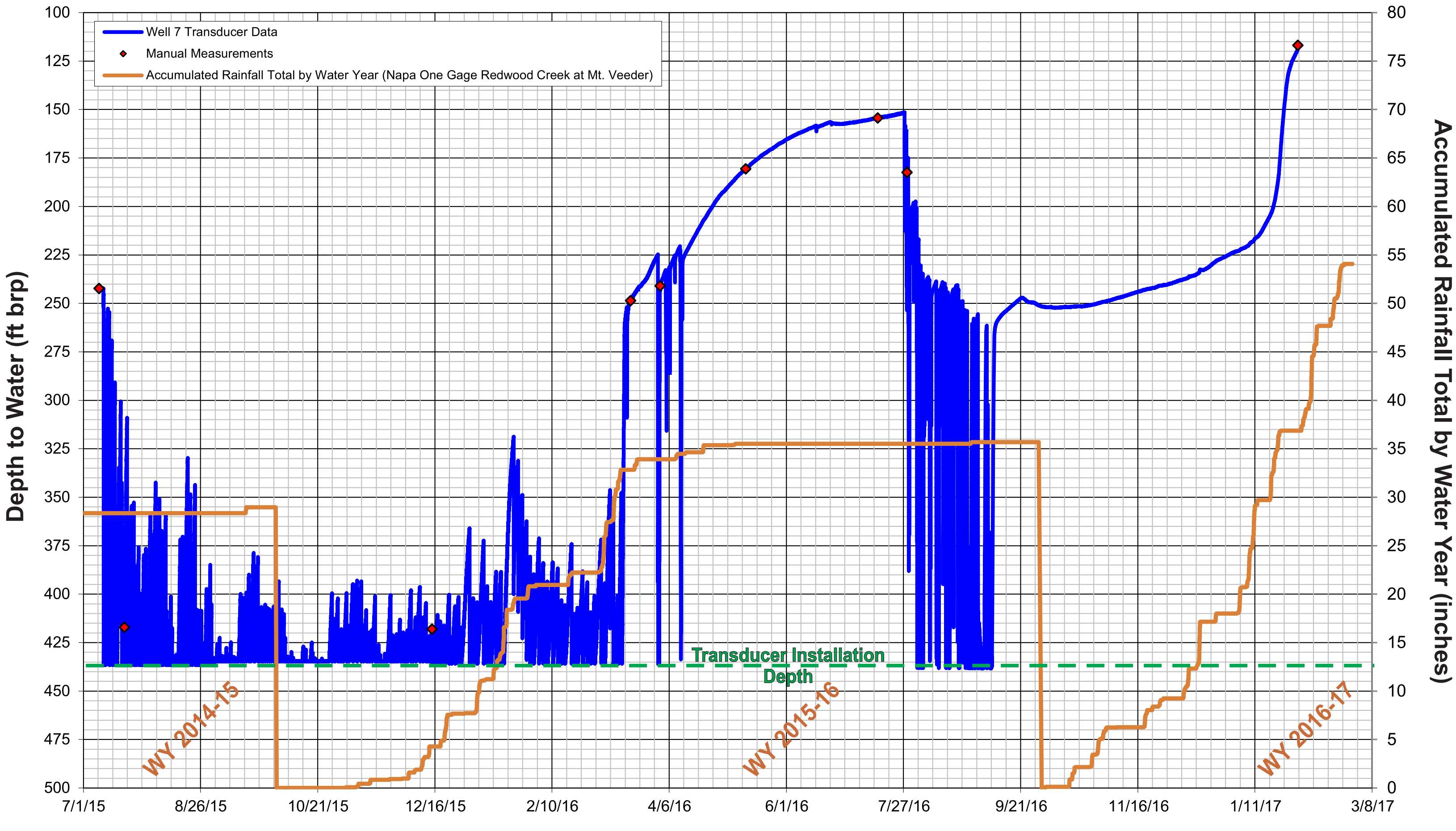

Note: Major divisions on the X-axis represent 56 days; minor divisions represent 7 days.

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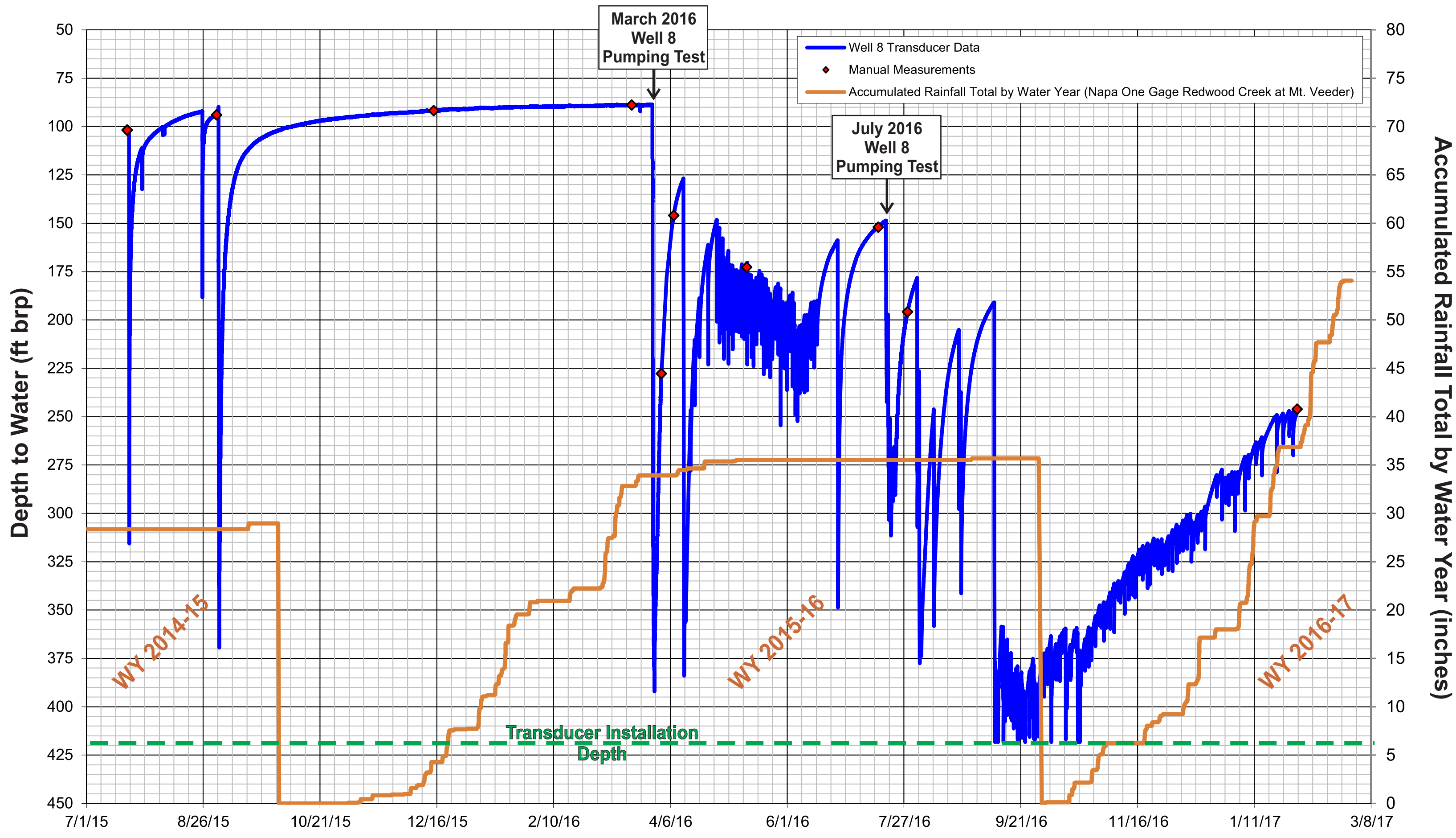
Figure 7F
Water Level Data - Well 7
Anthem Winery

Job No. 560-NPA01 **April 2017**



Note: Major divisions on the X-axis represent 56 days; minor divisions represent 7 days.

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Figure 7G
Water Level Data - Well 8
Anthem Winery

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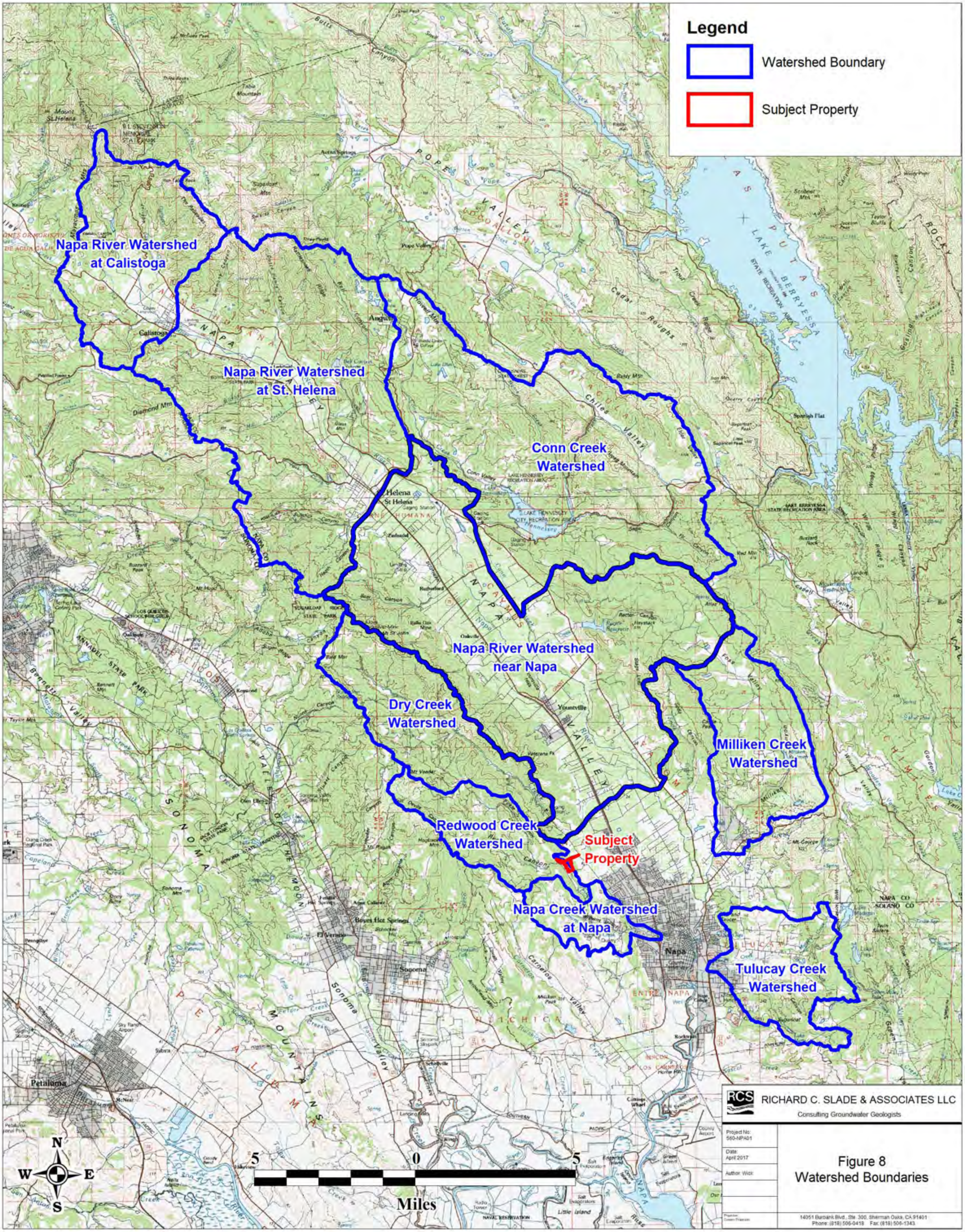

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Figure 8
Watershed Boundaries

Project No: 560-NPA01
Date: April 2017

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TABLE 1
SUMMARY OF WELL CONSTRUCTION DATA
ANTHEM WINERY

Well No.	State Well Completion Report No.	Date Drilled	Method of Drilling	Pilot Hole Depth (ft)	Casing Type & Depth (ft)	Casing Diameter (in)	Borehole Diameter (in)	Sanitary Seal Depth (ft)	Perforation Intervals (ft)	Type and Slot Size of Perforations (in)	Type of Gravel Pack	Data Reported by Driller at Date of Construction or Later Testing						
												Date & Type of "Test"	Duration of "Test" (hrs)	Estimated Flow Rate (gpm)	Static Water Level (ft)	Pumping Water Level (Ft)	Estimated Specific Capacity (gpm/ft ddn)	Reported Depth of Pump Intake (ft)
1[A]	No log	1991 (?)	ND	ND	PVC 213(?)	5	ND	ND	ND	ND	ND	5/06 pump	6	10	55	69	0.7	ND
2	557077	1995	air rotary	405	PVC 345	5	8 1/2	23 Cement	40-345	factory-cut slots 0.020	3/8 "pea"	9/95 airlift	4	18	46	ND	ND	300
												1/10 pump	22	2	92	208	0.006	
3	737013	2001	air rotary	310	PVC 310	5	8 3/4	23 Cement	60-310	factory-cut slots 0.032	3/8 "pea"	6/01 pump	6	0.75	85	205	0.006	280
												1/10 pump	18	1.6	149	280	0.01	
4	0940500	2008	direct mud rotary	620	PVC 580	5	8 3/4	50 Bentonite	150-580	factory-cut slots 0.032	gravel	5/08 pump	2	6	264	ND	ND	500
												1/10 pump	17	1.4	295	500	0.007	
5	e0106846	2010	direct mud rotary	880	PVC 855	6	12	56 Cement	95-135, 175-215 275-335, 395-455 675-755, 795-835	factory-cut slots 0.032	"pea"	5/10 airlift	2	17	48	ND	ND	ND
6	e0234715	2014	air rotary	400	PVC 400	5	8 3/4	20 Bentonite	280-320 360-400	factory-cut slots 0.032	"filter pack"	1/14 airlift	2	5	280	ND	ND	No Pump
7	e0254818	2015	air rotary	800	PVC 500	6	10	50 Bentonite	260-300 420-500	factory-cut slots 0.032	"filter pack"	2/15 airlift	2	4	210	ND	ND	440
8	e0283411	2015	air rotary	530	PVC 520	5	8 3/4	50 Bentonite	100-120 300-520	factory-cut slots 0.032	"filter pack"	6/15 airlift	2	15	94	ND	ND	420

Note: A. Data listed for Well No. 1 reported by Dave Bess Pump & Well, "Water Well Test" sheet, dated 5/24/06; 3/4 Hp pump installed 1991.
ND = No Data

Table 2
Summary of Existing, Approved (Permitted), and Proposed (Future) Water Use for the Proposed Anthem Winery

Water Source	Average Year Rainfall Water Demand (AF/yr)			Drought Year Rainfall[1] Water Demand (AF/yr)		
	Existing	Approved[2] *(permitted)*	Proposed *(future)*	Existing	Approved[2] *(permitted)*	Proposed *(future)*
Groundwater	4.39	6.49	4.71	4.39	6.49	5.51
Harvested Rainwater	0.00	0.00	1.55	0.00	0.00	0.77
Winery Process Water	0.00	0.00	0.77	0.00	0.00	0.75
Total Water Demand (AF/yr)	**4.39**	**6.49**	**7.03**	**4.39**	**6.49**	**7.03**

Groundwater Demand Change Compared to Proposed (Future)	***0.32***	***(1.78)***	***--***	***1.12***	***(0.98)***	***--***

Notes:

1. Drought year rainfall is defined by RSA+ to be 48% of the average year rainfall based on the PRISM data set for the subject property. The average annual rainfall at the subject property, per the PRISM data set, is approximatley 30 inches annually.
2. "Approved" water demands include all onsite permitted uses, including currently planted and unplanted vineyards.

AF/yr = acre feet per year

(1.78) = denotes negative value (i.e., decrease)

Table 3
Comparison of Rainfall Data Sources
Proposed Anthem Winery Property

Rain Gage and/or Data Source	Years of Available Rainfall Record	Average Annual Rainfall in Inches (ft)	Elevation of Rain Gage[(1)] (ft asl)	Distance of Rain Gage from Subject Property (mi)	Elevation Relative to Subject Property
CDEC NSH-Napa Fire Dept	WY 1905-06 through WY 2015-16[(2)]	24.4 (2.03)	60	6.0	Lower
WRCC Napa State Hospital	1893 through December 2016[(3)]	24.7 (2.06)	60	6.0	Lower
Napa One Rain Redwood Creek at Mt. Veeder	WY 2000-01 through WY2015-16	34.6 (2.88)	360	0.8	Similar
PRISM Climate Group	1981 to 2010	30.0 (2.50)	---	---	---
Napa County Isohyetal Map	1900 to 1960	32.0 (2.67)	---	---	---

Notes:

1. The subject property is located at an elevation between ±180 and ±420 ft asl
2. Missing data in WY 1980-81 and WY 1981-82.
3. Several months and/or missing years of rainfall between 1897 and 1902, and between 1915 and 1916.

Table 4
Estimated Recharge Based on Slope Deep Percolation Assumption

Region	Area	Average Rainfall [1]	Rainfall Volume	Reduced Recharge Assumption based on Slope Angle									
				Deep Percolation/Not Slope Dependent		Deep Percolation on >30° Slope Diminished by 25%		Deep Percolation on >30° Slope Diminished by 50%		Deep Percolation on >30° Slope Diminished by 75%		Deep Percolation on >30° Slope Diminished by 100%	
				Deep Percolation Percentage	Deep Percolation Volume	Deep Percolation Percentage	Deep Percolation Volume	Deep Percolation Percentage	Deep Percolation Volume	Deep Percolation Percentage	Deep Percolation Volume	Deep Percolation Percentage	Deep Percolation Volume
	(acres)	(in)	(AF)	(%)	(AF)	(%)	(AF)	(%)	(AF)	(%)	(AF)	(%)	(AF)
Entire Redwood Creek Watershed													
<30° Slope	5,951	38.2	18,944	10.00%	1,894.40	10.20%	1,932.52	10.40%	1,970.64	10.60%	2,008.76	10.80%	2,046.88
>30° Slope	479	38.2	1,525	10.00%	152.48	7.50%	114.36	5.00%	76.24	2.50%	38.12	0.00%	-
TOTAL =	6,430			TOTAL =	2,046.88	TOTAL =	2,046.88	TOTAL =	2,046.88	TOTAL =	2,046.88	TOTAL =	2,046.88
Anthem Winery Property													
<30° Slope	40.8	30.0	102	10.00%	10.20	10.20%	10.41	10.40%	10.61	10.60%	10.82	10.80%	11.02
>30° Slope	4.0	30.0	10	10.00%	1.00	7.50%	0.75	5.00%	0.50	2.50%	0.25	0.00%	-
TOTAL =	44.8			TOTAL =	11.20	TOTAL =	11.16	TOTAL =	11.11	TOTAL =	11.07	TOTAL =	11.02

Note: The "Entire Redwood Creek Watershed" values are used to calculate the change in deep percolation percentage of <30 ° slopes based on the deep percolation volume of 3,192 AF calculated using the assumptions shown. Deep percolation percentage values determined for the entire watershed are then used for site specific calculations.

[1] Average Rainfall for "Redwood Creek Watershed" and "Anthem Winery Property" per PRISM Dataset (1980-2010)

Table 5
Drought Period Rainfall as Percentage of Average

Statewide Drought Period as Defined by DWR (DWR 2005)	Drought Duration (years)	Average Rainfall by Raingage								
		Napa Hospital Raingage, WRCC Period of Record - 1893 through Sept 2015			NSH-Napa Fire Deparment, CDEC Period of Record - 1893 through Sept 2015			Redwood Creek and Mt. Veeder Road, Napa One Rain Period of Record - 2000 through Sept 2015		
		[A] Total Gage Average (in)	[B] Drought Period Average (in)	[B÷A] Drought Period Rainfall as % of Average	[C] Total Gage Average (in)	[D] Drought Period Average (in)	[D÷C] Drought Period Rainfall as % of Average	[E] Total Gage Average (in)	[F] Drought Period Ave. (in)	[F÷E] Drought Period Rainfall as % of Average
WY 1928-29 to WY 1933-34	6	24.7	17.3	70%	24.4	17.3	71%	ND	ND	ND
WY 1975-76 to WY 1976-77	2	24.7	11.8	48%	24.4	11.8	48%	ND	ND	ND
WY 1986-87 to WY 1991-92	6	24.7	18.5	75%	24.4	18.5	76%	ND	ND	ND
WY 2006-07 to WY 2008-09	3	24.7	18.1	73%	24.4	19.0	78%	34.6	29.4	85%
WY 2011-12 to WY 2015-16	5*	24.7	21.0	85%	24.4	21.1	86%	34.6	28.2	82%

* Drought could potentially continue into WY 2016-17; the duration of the current drought is unknown.

ND = No rainfall data available for the corresponding drought period.

APPENDIX
"TIER 1 WATER USE CALCULATIONS"
BY
RSA+

TIER 1
WATER USE CALCULATIONS

ANTHEM WINERY
3454 REDWOOD RD
NAPA, CALIFORNIA

APN 035-470-046

PROPERTY OWNER:

Julie Arbuckle
3454 Redwood Rd
Napa, CA 94558

Project# 4111010.0
March 17, 2015
Revised: April 7, 2017

I. Executive Summary

These calculations demonstrate that the proposed total ground water use on both parcels is less than the estimated groundwater recharge rate for normal, "Average Rainfall", and dry, "Drought" years. The currently approved groundwater use on both parcels is greater than the estimated groundwater recharge rate.

The methods used in this analysis are based on the Final Adopted Napa County Water Availability Analysis guidance document, dated May 12, 2015.

The existing and proposed water use for the Anthem Winery parcels are as follows:

Usage Type	Existing [af/yr]	*Approved [af/yr]*	Proposed [af/yr]
Parcel 1 – Vineyard (APN: 035-460-038)			
Residential	0.75	*0.75*	0.75
Vineyard	0.00	*0.96*	0.62
Parcel 1 Water Use	**0.75**	***1.71***	**1.37**
Parcel 2 – Winery (APN: 035-470-046)			
Residential	0.75	*0.75*	0.75
Vineyard	2.89	*3.39*	2.99
Winery			
Process Water	0.00	*0.46*	0.77
Landscaping	0.00	*0.15*	0.82
Employees	0.00	*0.02*	0.10
Visitors	0.00	*0.01*	0.12
Events	0.00	*0.00*	0.11
Parcel 2 Water Use	**3.64**	***4.78***	**5.66**
Additional Water Supply (Average Rainfall Year)			
Reclaimed Process Wastewater	0.00	*0.00*	-0.77
Harvested Rainwater	0.00	*0.00*	-1.55
Total Groundwater Use (Average Rainfall Year)	**4.39**	***6.49***	**4.71**
Additional Water Supply (Drought Year)			
Reclaimed Process Wastewater	0.00	*0.00*	-0.77
Harvested Rainwater	0.00	*0.00*	-0.75
Total Groundwater Use (Drought Year)	**4.39**	***6.49***	**5.51**

The proposed average pump rate for project wells (3, 6, and 8 combined) during Average Rainfall years is 1.1 gpm, on a 12 hour/day duty cycle. Similarly, the average proposed pump rate for project wells during Drought years is 2.1 gpm. Sufficient water storage will be provided on site to normalize pump rates throughout the year.

II. Parcel 1 – Vineyard (APN: 035-460-038)

Residential Water Use

Existing primary residence + guest house to remain (3 bedrooms total):

$$W_{Residential} = \mathbf{0.75\ af/yr}$$

Non-Residential Water Use

Approved Agricultural (P12-00401)

Previously Approved, Unplanted Vineyards – Irrigation Only:

$$W_{A\_Vineyards} = \left(\frac{0.5\ af/yr}{ac}\right)(1.91ac) = \mathbf{0.96\ af/yr}$$

Proposed Agricultural

40% reduction in vineyard demand due to proposed switch to water-efficient underground irrigation:

$$Q_{DRI} = 0.6\left(\frac{0.5\ af/yr}{ac}\right) = 0.3\ af/yr$$

Previously Approved Vineyards to be planted – Underground Irrigation Only:

$$W_{A\_Vineyards} = \left(\frac{0.3\ af/yr}{ac}\right)(1.55ac + 0.11ac) = 0.498\ af/yr$$

New Proposed Vineyards – Underground Irrigation Only:

$$W_{P\_Vineyards} = \left(\frac{0.3\ af/yr}{ac}\right)(0.90ac) = 0.27\ af/yr$$

50% reduction for planting 1 acre of low-water varietal (e.g. Sauvignon Blanc):

$$W_{DRI\_Low-Water} = -0.5\left(\frac{0.3af/yr}{ac}\right)(1.0ac) = -0.15\ af/yr$$

Total Post-Project Vineyards – Irrigation Only:

$$W_{Vineyards} = 0.498\ af/yr + 0.27\ af/yr - 0.15\,af/yr = \mathbf{0.62\ af/yr}$$

Total Parcel 1 Water Use

$$W1_{Existing} = \mathbf{0.75\ af/yr}$$

$$W1_{Approved} = 0.75\ af/yr + 0.96\ af/yr = \mathbf{1.71\ af/yr}$$

$$W1_{Proposed} = 0.75\ af/yr + 0.62\ af/yr = \mathbf{1.37\ af/yr}$$

III. Parcel 2 – Winery (APN: 035-470-046)

Residential Water Use

Primary Residence to remain

$$W_{Primary} = \mathbf{0.75\ af/yr}$$

Non-Residential Water Use

Existing Agricultural

Existing Vineyards – Irrigation Only:

$$W_{E\_Vineyards} = \left(\frac{0.5\ af/yr}{ac}\right)(5.77ac) = 2.885\ af/yr$$

Approved Agricultural (P08-00345, P12-00401)

Previously Approved, Unplanted Vineyards – Irrigation Only:

$$W_{A\_Vineyards} = \left(\frac{0.5\ af/yr}{ac}\right)(0.16ac + 0.85ac) = 0.505\ af/yr$$

Total Existing and Approved Vineyards – Irrigation Only:

$$W_{Vineyards} = 2.885\ af/yr + 0.505\ af/yr = \mathbf{3.39\ af/yr}$$

Proposed Agricultural

Existing Vineyards to remain – Irrigation Only:

$$W_{E\_Vineyards} = \left(\frac{0.5\ af/yr}{ac}\right)(5.77ac - .20ac) = 2.785\ af/yr$$

Previously Approved Vineyards to be planted (0.38 ac to remain unplanted) – Underground Irrigation Only:

$$W_{A\_Vineyards} = \left(\frac{0.3\ af/yr}{ac}\right)(0.08ac + 0.55ac) = 0.189\ af/yr$$

New Proposed Vineyards – Underground Irrigation Only:

$$W_{P\_Vineyards} = \left(\frac{0.3\ af/yr}{ac}\right)(0.05ac) = 0.015\ af/yr$$

Total Post-Project Vineyards – Irrigation Only:

$$W_{Vineyards} = 2.785\ af/yr + 0.189\ af/yr + 0.015\ af/yr = \mathbf{2.99\ af/yr}$$

Existing Winery

Previously Approved Winery Process Water:

$$W_{Process} = \left(\frac{5\ \ gal.process\ water/gal.wine}{325{,}851\ \ gal/af}\right)(30{,}000\ gal.wine) = \mathbf{0.46\ \ af/yr}$$

Previously Approved Landscaping (Tier 1 WAA method):

$$W_{Landscaping} = \left(\frac{0.5\ \ af/yr}{100{,}000\ gal.of\ wine}\right)(30{,}000\ gal.of\ wine) = \mathbf{0.15\ \ af/yr}$$

Previously Approved Employees:

$$Shifts_{Full-time} = \left[(2)\left(\frac{1\ shift}{8\ hours}\right)\left(\frac{40\ hours}{week}\right)\right]\left[\frac{52\ weeks}{yr}\right] = 520\ \ shifts/yr$$

$$W_{Employees} = \left[\left(\frac{15\ gal./yr}{shift}\right)(520\ shifts)\right]\left[\frac{1\ af}{325{,}851\ gal.}\right] = \mathbf{0.02\ af/yr}$$

Previously Approved Visitors:

$$Visitors = \left(\frac{5\ visitors}{week}\right)\left(\frac{52\ weeks}{yr}\right) = 260\ visitors/yr$$

$$W_{Visitors} = \left[\left(\frac{3\ gal./yr}{visitor}\right)(260\ visitors)\right]\left[\frac{1\ af}{325{,}851\ gal.}\right] = \mathbf{0.01\ af/yr}$$

Proposed Winery Expansion

Proposed Winery Process Water:

$$W_{Process} = \left(\frac{5\ \ gal.process\ water/gal.wine}{325{,}851\ \ gal/af}\right)(50{,}000\ gal.wine) = \mathbf{0.77\ \ af/yr}$$

Proposed Landscaping (WELO Analysis, Estimated Total Water Use):

$$W_{Landscaping} = (266{,}824\ gal/yr)\left[\frac{1af}{325{,}851\ gal}\right] = \mathbf{0.82\ af/yr}$$

Proposed Employees:

$$Shifts_{Full-time} = \left[(7)\left(\frac{1\ shift}{8\ hours}\right)\left(\frac{40\ hours}{week}\right)\right]\left[\frac{52\ weeks}{yr}\right] = 1{,}820\ \ shifts/yr$$

$$Shifts_{Part-time} = \left[(5)\left(\frac{1\ shift}{8\ hours}\right)\left(\frac{40\ hours}{week}\right)\right]\left[\frac{12\ weeks}{yr}\right] = 300\ \ shifts/yr$$

$$W_{Employees} = \left[\left(\frac{15\ gal./yr}{shift}\right)(1{,}820\ shifts + 300\ shifts)\right]\left[\frac{1\ af}{325{,}851\ gal.}\right] = \mathbf{0.10\ af/yr}$$

Proposed Visitors:

$$Visitors = \left(\frac{256\ visitors}{week}\right)\left(\frac{52\ weeks}{yr}\right) = 13{,}312\ visitors/yr$$

$$W_{Visitors} = \left[\left(\frac{3\ gal./yr}{visitor}\right)(13{,}312\ visitors)\right]\left[\frac{1\ af}{325{,}851\ gal.}\right] = \mathbf{0.12\ af/yr}$$

Proposed Events:

$$\begin{aligned} Visitors = &\left[\left(\frac{2\ events}{month}\right)\left(\frac{30\ visitors}{event}\right)\left[\frac{12\ months}{yr}\right] + \left(\frac{10\ events}{yr}\right)\left(\frac{100\ visitors}{event}\right)\right] \\ &+ \left(\frac{1\ event}{yr}\right)\left(\frac{200\ visitors}{event}\right) + \left(\frac{1\ event}{yr}\right)\left(\frac{300\ visitors}{event}\right) \\ &= 2{,}220\ event\ visitors/yr \end{aligned}$$

$$\begin{aligned} Event\ Staff = &\left(\frac{10\ event_{100}}{yr}\right)\left(\frac{5\ staff}{event_{100}}\right) + \left(\frac{1\ event_{200}}{yr}\right)\left(\frac{10\ staff}{event_{200}}\right) \\ &+ \left(\frac{1\ event_{300}}{yr}\right)\left(\frac{15\ staff}{event_{300}}\right) = 75\ event\ staff/yr \end{aligned}$$

$$W_{Events} = \left[\left(\frac{15\ gal./yr}{person}\right)(2{,}220\ visitors + 75\ staff)\right]\left[\frac{1\ af}{325{,}851\ gal.}\right] = \mathbf{0.11\ af/yr}$$

Total Parcel 2 Water Use

$$W2_{Existing} = 0.75\ af/yr + 2.89\ af/yr = \mathbf{3.64\ af/yr}$$

$$\begin{aligned} W2_{Approved} = &\ 0.75\ af/yr + 3.39\ af/yr + 0.46\ af/yr + 0.15\ af/yr + 0.02\ af/yr \\ &+ 0.01\ af/yr = \mathbf{4.78\ af/yr} \end{aligned}$$

$$\begin{aligned} W3_{Proposed} = &\ 0.75\ af/yr + 2.99\ af/yr + 0.77\ af/yr + 0.82\ af/yr + 0.10\ af/yr \\ &+ 0.12\ af/yr + 0.11\ af/yr = \mathbf{5.66\ af/yr} \end{aligned}$$

Beneficial Use of Reclaimed Process Wastewater

Proposed Reclaimed Process Wastewater:

$$PW = 0.77\ af/yr$$

Beneficial Use of Harvested Rainwater

Average Annual Rainfall (PRISM), per RCS = 30.0 in/yr

Drought year, per RCS = 48% of average:

$$Drought\ year = 0.48(30.0\ in/yr) = 14.4\ in/yr$$

Proposed Rainwater Harvesting

Building	Roof Area	
Fermentation Room 1:	4,478	sf
Fermentation Room 2:	5,207	sf
Hospitality[1]:	0	sf
Office*:	0	sf
Outdoor Event Area:	1,204	sf
Parcel 1 Residence & Guest House:	1,760	sf
Parking Lot & Roof Terrace**:	14,397	sf
Total roof area	27,046	sf

* Rainwater harvesting systems to be constructed at a later date - not included in water balance.
** Collected separately for irrigation only.

Average Rainfall Year Harvested Rainwater:

$$RW_{Average\ Year} = (\ 30\ in/yr)(27{,}046\ sf)\left(\frac{1\ ac}{43{,}560\ sf}\right)\left(\frac{1\ ft}{12\ in}\right) = \mathbf{1.55\ af/yr}$$

Drought Year Harvested Rainwater:

$$RW_{Drought\ Year} = (\ 14.4\ in/yr)(27{,}046\ sf)\left(\frac{1\ ac}{43{,}560\ sf}\right)\left(\frac{1\ ft}{12\ in}\right) = \mathbf{0.75\ af/yr}$$

Total Groundwater Use

Average Rainfall Year Groundwater Use

$$GW_{Existing-Average} = 0.75\ af/yr + 3.64\ af/yr = \mathbf{4.39\ af/yr}$$

$$GW_{Approved-Average} = 1.71\ af/yr + 4.78\ af/yr = \mathbf{6.49\ af/yr}$$

$$GW_{Proposed-Average} = 1.37\ af/yr + 5.66\ af/yr - 0.77\ af/yr - 1.55\ af/yr = \mathbf{4.71\ af/yr}$$

Drought Year Groundwater Use

$$GW_{Existing-Drought} = 0.75\ af/yr + 3.64\ af/yr = \mathbf{4.39\ af/yr}$$

$$GW_{Approved-Drought} = 1.71\ af/yr + 4.78\ af/yr = \mathbf{6.49\ af/yr}$$

$$GW_{Proposed-Drought} = 1.52\ af/yr + 5.66\ af/yr - 0.77\ af/yr - 0.75\ af/yr = \mathbf{5.51\ af/yr}$$

Groundwater Sources

Well 4 (non-project well)

Existing supply to remain – 20% of Parcel 1 Residence:

$$W_{Well\ 4\ Existing} = (0.20)(0.75\ af/yr) = \mathbf{0.15\ af/yr}$$

Wells 1, 5, 7 (non-project wells)

Existing supply to remain – Parcel 2 Residence and Vineyards:

$$W_{Well\ 1,5,7\ Existing} = 0.75\ af/yr + 2.89\ af/yr = \mathbf{3.64\ af/yr}$$

Well 2 (non-project well)

Destroyed in 2014 earthquake. To be abandoned per Napa County Well Destruction Guidelines.

Wells 3, 6, 8 (project wells)

Average Rainfall Year Supply:

$$W_{3,6,8\ Existing-Average} = 4.39\ af/yr - 0.15\ af/yr - 3.64\ af/yr = \mathbf{0.60\ af/yr}$$

$$W_{3,6,8\ Approved-Average} = 6.49\ af/yr - 0.15\ af/yr - 3.64\ af/yr = \mathbf{2.70\ af/yr}$$

$$W_{3,6,8\ Proposed-Average} = 4.71\ af/yr - 0.15\ af/yr - 3.64\ af/yr = \mathbf{0.92\ af/yr}$$

Drought Year Supply:

$$W_{3,6,8\ Existing-Drought} = 4.39\ af/yr - 0.15\ af/yr - 3.64\ af/yr = \mathbf{0.60\ af/yr}$$

$$W_{3,6,8\ Approved-Drought} = 6.49\ af/yr - 0.15\ af/yr - 3.64\ af/yr = \mathbf{2.70\ af/yr}$$

$$W_{3,6,8\ Proposed-Drought} = 5.51\ af/yr - 0.15\ af/yr - 3.64\ af/yr = \mathbf{1.72\ af/yr}$$

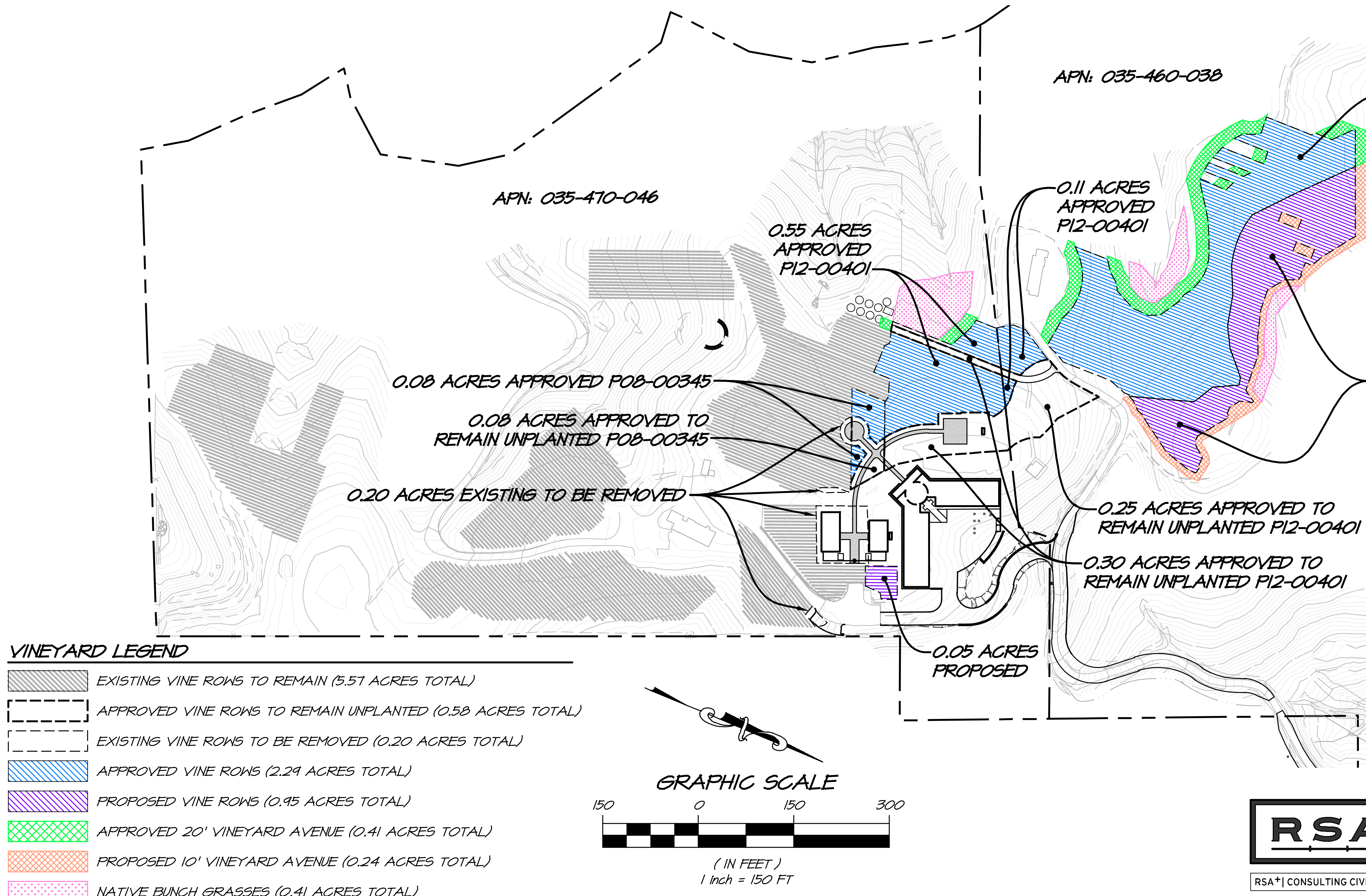
Proposed Average Rainfall Year Pump Rate, 12 hr/day duty cycle:

$$Q_{3,6,8\ Proposed-Average} = (0.92\ af/yr)\left(\frac{325{,}851\ gal}{1\ af}\right)\left(\frac{1\ yr}{365\ days}\right)\left(\frac{1\ day}{12\ hrs}\right)\left(\frac{1\ hr}{60\ min}\right) = \mathbf{1.1\ gpm}$$

Proposed Drought Year Pump Rate, 12 hr/day (720 min/day) duty cycle:

$$Q_{3,6,8\ Proposed-Drought} = (1.72\ af/yr)\left(\frac{325{,}851\ gal}{1\ af}\right)\left(\frac{1\ yr}{365\ days}\right)\left(\frac{1\ day}{12\ hrs}\right)\left(\frac{1\ hr}{60\ min}\right) = \mathbf{2.1\ gpm}$$

ANTHEM WINERY
VINEYARD EXHIBIT



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Appendix A

Maximum Applied Water Allowance - Napa
Anthem Winery, based on planting plan dated 10/27/15

The following calculations will help you determine your site specific water budget and establish a planting mix that will allow you to meet your water budget. Your Estimated Total Water Use must be less than your Maximum Applied Water Allowance.

Section B2. Maximum Applied Water Allowance (MAWA)

MAWA = (ETo) (0.62)[(0.7x LA) + (0.4 x SLA)]

Where:
ETo = Annual Net Reference Evapotranspiration (inches)
0.7 = ET Adjustment Factor
LA = Landscaped Area (square feet)
0.62 = Conversion factor (to gallons per square foot)
SLA = Portion of the landscape area identified as Special Landscape Area (square feet)
0.4 = the additional ET adjustment factor for Special Landscape Area (1.0 - 0.6 = 0.4)

A.) Net Evapotranspiration Calculation

44.30 *(Annual ETo)*

27.50 *(Annual Rainfall)* x .25 = 6.88 *(Effective Rainfall)*

Net ETo Calculation = Annual ETo - Effective Rainfall = 37.43

B.) Adjusted Landscape Area Calculation

31248 *(Landscaped Area)* x 0.7 *Adjustment Factor* = 21873.6

0 *(Special Landscaped Area)* x 0.4 *Adjustment Factor* = 0

Sum of Adjusted Landscape Area = 21873.6

MAWA = 37.43 x 0.62 x 21873.6 = 507,544 gallons/year

Section B3. Estimated Total Water Use (ETWU)

A.) Net Evapotranspiration Calculation

Net ET Calculation = Annual ETo - Effective Rainfall = 37.43

B.) Adjusted Landscape Area Calculation

8800 *(Very Low water use plant sqft)* x 0.1 = 880

15248 *(Low water use plant sqft)* x 0.3 = 4574.4

7200 *(Moderate water use plant sqft)* x 0.6 = 4320

0 *(High water use plant sqft)* x 1.0 = 0

Sum of Adjusted Landscape Area = 9,774

ETWU = 37.43 x 0.62 x 9,774 / 0.85 = 266,824 gallons/year

Irrigation Efficiency Factor

Percent of total landscape Irrigated with Drip	
0-25%	0.71
26-50%	0.75
51-75%	0.80
76-100%	0.85

Section B1. Hydrozone Information Table

Zone	Plant Name	Water Use	Qty	Area/plant at maturity	Total Area of plants at maturity	Size	Method of irrigation	GPM	% of total landscaped area
1	Morus alba 'Fruitless'	Moderate	16	400	6400	36" box	Drip	1.6	20.48%
2	Fruit Tree TBD	Moderate	2	400	800	B&B	Drip	0.2	2.56%
3	Olea europaea 'Sevillano'	Very Low	10	400	4000	Field Dug	Drip	3.33	12.80%
4	Quercus agrifolia	Very Low	12	400	4800	72" box	Drip	4	15.36%
5	Arbutus 'Marina'	Low	8	400	3200	48" box	Drip	1.33	10.24%
6	Arctostaphylos 'Louis Edmunds'	Low	42	100	4200	5 gal	Drip	1.4	13.44%
6	Arctostaphylos 'Dr. Hurd'	Low	26	100	2600	24" box	Drip	1.73	8.32%
6	Ceanothus 'Yankee Point'	Low	13	100	1300	5 gal	Drip	0.43	4.16%
7	Perovskia atriplicifolia 'Blue Spires'	Low	128	9	1152	5 gal	Drip	4.27	3.69%
7	Salvia leucantha 'Midnight'	Low	321	4	1284	5 gal	Drip	10.7	4.11%
7	Agastache 'Blue Fortune'	Low	93	4	372	1 gal	Drip	1.55	1.19%
7	Agastache rupestris 'Licorice Mint'	Low	71	4	284	1 gal	Drip	1.18	0.91%
7	Erigeron karvinskianus	Low	184	4	736	1 gal	Drip	3.07	2.36%
8	Nepeta faassenii 'Blue Wonder'	Low	30	4	120	1 gal	Drip	0.5	0.38%
	Total area of all plants at maturity:				31,248				100.00%

Summary Hydrozone Table

Hydrozone		Area (sf)	% of Total Landscape Area
High Water Use		0	0.00%
Moderate Water Use		7,200	23.04%
Low Water Use		15,248	48.80%
Very Low Water Use		8,800	28.16%
	Total:	31,248	100%

Appendix B: Estimated Water Use for Specified Land Use

Each project applicant is responsible for determining estimated water usage for their proposed project. While some guidelines are provided below, other industry standards exist, PBES may be able to provide data based on previous applications, and each project has its own unique characteristics. The most appropriate data should be used by the applicant to estimate water use for their specific project.

Guidelines for Estimating Residential Water Use:

The typical water use associated with residential buildings is as follows:

Primary Residence	0.5 to 0.75 acre-feet per year (includes minor to moderate landscaping)
Secondary Residence or Farm Labor Dwelling	0.20 to 0.50 acre-feet per year

Additional Usage to Be Added

1. Add an additional 0.1 acre-feet of water for each additional 1000 square feet of drought tolerant lawn or 2000 square feet of non-xeriscape landscaping above the first 1000 square feet.
2. Add an additional 0.05 acre-feet of water for a pool with a pool cover.
3. Add an additional 0.1 acre-feet of water for a pool without a cover.

Residential water use can be estimated using the typical water uses above. All typical uses are dependent on the type of fixtures and appliances, the amount and type of landscaping, and the number of people living onsite. If a residence uses low-flow fixtures and has appliances installed, is using xeriscape landscaping, and is occupied by two people, the water use estimates will be on the low side of the ranges listed above.

Examples of Residential Water Usage:

Residential water use can vary dramatically from house to house depending on the number of occupants, the number and type of appliances and water fixtures, the amount and types of lawn and landscaping. Two homes sitting side by side on the same block can consume dramatically different quantities of water.

Example 1:

Home #1 is 2500 square feet. Outside the house there is an extensive bluegrass lawn, a lot of water loving landscaping, and a swimming pool with no pool cover. Inside the house all the appliances and fixtures, including toilets and shower-heads, are old and have not been upgraded or replaced by water saving types. The owners wash their cars weekly but they don't have nozzles or sprayers on the hose. They do not shut off the water while they are soaping up the vehicles, allowing the water to run across the ground instead. Water is commonly used as a broom to wash off the driveways, walkways, patio, and other areas. The estimated water usage for Home #1 is 1.2 acre-feet of water per year

Example 2:

Home #2 is also 2500 square feet. Outside of the house there is a small lawn of drought tolerant turf, extensive usage of xeriscape landscaping, and no swimming pool. Inside the house all of the appliances and fixtures, including toilets and showerheads, are of the low flow water saving types. The owners wash their cars weekly, but have nozzles or sprayers on the hose to shut off the water while they are soaping up the vehicles. Driveways, walkways, patios, and other areas are swept with brooms instead of washed down with water. Estimated water usage for Home #2 is 0.5 acre-feet of water per year.

The above are only examples of unique situations. The estimated water use for each project will vary depending on existing parcel conditions.

Guidelines For Estimating Non-Residential Water Usage:

Agricultural:	
Vineyards	
Irrigation Only	0.2 to 0.5 acre-feet per acre per year
Heat Protection	0.25 acre-feet per acre per year
Frost Protection	0.25 acre-feet per acre per year
Irrigated Pastures	4.0 acre-feet per acre per year
Orchards	4.0 acre-feet per acre per year
Livestock (sheep or cows)	0.01 acre-feet per acre per year
Winery:	
Process Water	2.15 acre-feet per 100,000 gal. of wine
Domestic and Landscaping	0.50 acre-feet per 100,000 gal. of wine
Employees	15 gallons per shift
Tasting Room Visitation	3 gallons per visitor
Events and Marketing, with on-site catering	15 gallons per visitor
Industrial:	
Food Processing	31.0 acre-feet per employee per year
Printing/Publishing	0.60 acre-feet per employee per year
Commercial:	
Office Space	0.01 acre-feet per employee per year
Warehouse	0.05 acre-feet per employee per year

Winery: Anthem Winery is proposing to build an 11,350 square foot state of the art wine making facility, along with a 1000 square foot mechanical building. The winery, which has been designed by renowned Napa Valley architects Howard Backen and John Taft, will be divided into two buildings with a round bottle room in the center connecting the two buildings. The crush pad will be located in front of the winery buildings. This application requests to increase the winery's permitted production limit from 30,000 gallons to 50,000 gallons of wine per year – a 66% increase. All of the grapes grown on the property will be crushed at the winery.

Hospitality / Marketing Plan: Anthem Winery's tasting room and guest relations building is separate from the winery building. This 1800 square foot structure will offer guests the opportunity to taste Anthem Winery's wines in a beautiful, natural, and relaxed setting.

On premise consumption of wine will be allowed pursuant to the Evans Bill (AB2004). Hours of operation will be from 8:00 a.m. to 8:00 p.m. (10:00 a.m. to 5:00 p.m. tasting, and 8:00 a.m. to 8:00 p.m. non-harvest production) 7 days a week.

Anthem Winery plans to entertain 60 people per day on weekends, and 40 people per day on weekdays, for a maximum of 320 guests per week. The marketing events will occur both inside and outside the winery and hospitality buildings and may include food pairings. In addition, the winery plans to host 4 food and wine events per month with a maximum of 30 people, and 2 events per month with a maximum of 100 people. Additionally, the winery plans to host 2 larger events with 300 people per year, and to participate in the wine auction. The marketing events may include amplified music or entertainment. Evening marketing events are proposed to cease by 10:00 p.m. on weekdays and by midnight on weekends. All marketing events will be by appointment or invitation. Parking for events will be in front of the winery, on site next to the vineyard blocks, and off site utilizing shuttle service.

Administration/Office Building: The administrative offices for the winery will be adjacent to the tasting room. This 1600 square foot office structure will house the offices for the winery's staff and owners, and will include a commercial kitchen where food for events can be prepared.

Caves: Anthem Winery plans to store the wine produced at the winery in barrels located in underground caves that connect to the back of the winery's bottle room. The caves will total 22,000 square feet, which includes two 635 square foot private tasting rooms for guests.

Parking: Employees and guests will park in front of the winery. There will be 18 new regular parking spaces, plus 2 new ADA parking spaces, and 1 new parking space for electric vehicles only with an electric vehicle charging station.

Employees: Anthem Winery will employee 7 full time and 5 part time employees.

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ADDENDUM
TO WATER AVAILABILITY ANALYSIS

October 19, 2017

To: Ms. Julie Arbuckle
Anthem Winery
Sent via email (jarbucke@sbcglobal.net)

Job No. 560-NPA01

From: Chris Wick, Anthony Hicke, and Richard Slade
Richard C. Slade & Associates LLC

Re: Response to Peer Review Letter Regarding
Napa County Tier 1 Water Availability Analysis by RCS
For Proposed Anthem Winery
3454 Redwood Road and 3123 Dry Creek Road
Mt. Veeder Area, Napa County, California

Ref: Peer Review of Draft RCS Memorandum "Results of Aquifer Testing of
Project Wells and Napa County Tier 1 Water Availability
Analysis for Proposed Anthem Winery" (RCS Draft dated April 10, 2017)
Prepared by Luhdorff & Scalmanini Consulting Engineers (LSCE)
Dated August 10, 2017

We have reviewed the above-referenced Peer Review Letter from LSCE, and are providing the following additional information and/or analyses as requested therein. The specific data requests or recommendations for further analysis by LSCE are repeated in italicized text below. The RCS response to select recommended elements follows each of the reprinted original comments. Herein, the April 10, 2017 RCS-prepared Draft Memorandum titled "Results of Aquifer Testing of Project Wells and Napa County Tier 1 Water Availability Analysis for Proposed Anthem Winery" will be referred to as the "RCS WAA".

<u>LSCE Recommendation 1</u>: *Provide an analysis of the effect of mutual well interference between Wells 3 and 6, sufficient to address the effect on each well's capacity at pumping rates and schedules sufficient to meet the total project demand. If the analysis results in a recommendation for increased rates of groundwater pumping at Well 8 or supplying groundwater for the proposed project from non-project wells, those changes should also be analyzed to demonstrate feasibility.*

As summarized in Item 4, on page 34 of the RCS WAA, Wells 3 and 6 were both pumped at an average rate of 1.1 gpm during their respective constant rate pumping tests, and Well 8 was pumped at an average rate of approximately 2 gpm. Then in Item 5 (also on page 35) the statement is made that "…the combined current capacity of the three project wells [Wells 3, 6,

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and 8] is likely on the order of 2.5 gpm." RCS agrees there is a possibility that simultaneous pumping by Wells 3 and 6 could result in the reduction of the individual pumping rates from each of these wells. This is the reason why RCS did not present the total combined pumping rates of the wells as 4.2 gpm (derived at by summing the values of the pumping tests of 1.1 gpm for Well 3, 1.2 gpm for Well 6, and 2 gpm for Well 8). The analysis presented below illustrates that it is not necessary to pump Wells 3 and 6 simultaneously to meet the groundwater demands required for the project.

As stated on page 9 of the RCS WAA, water use estimates were provided by RSA+ of Napa in their report titled "Tier 1 Water Use Calculations," dated April 7, 2017. In response to the subject LSCE Recommendation 1, RSA+ re-issued an updated version of their memo (dated August 30, 2017), which included a "Water Balance" that detailed monthly water production, monthly water use, and a storage schedule for both an average rainfall year and drought year[1]. That updated August 30, 2017 RSA+ report is attached as an Appendix to this Addendum.

As shown on the RSA+ spreadsheets titled "Water Balance - Average Year", based on the size of the storage tanks and the estimated water use during each month, the pumping rates necessary to meet project demands are 1.1 gpm to 1.2 gpm each month, 12 hours per day, every day of the year. Further, aquifer testing of Well 8 showed that it is capable of pumping at rates of approximately 2 gpm (see page 24 of the RCS WAA). Hence, Well 8 alone is likely capable of pumping the groundwater necessary for the project during an average year, without contribution from Wells 3 and 6.

Some examples of possible pumping schedules during an average rainfall year to meet a daily demand of 864 gallons (1.2 gpm for 12 hours) could include:

- Average Year Scenarios in which Wells 3 and 6 are not needed:
  - Well 8 pumping daily for 12 hours per day at 1.2 gpm
  - Well 8 pumping daily for approximately 10 hours at 1.5 gpm
  - Well 8 pumping daily for just over 8 hours at 1.75 gpm
  - Well 8 pumping daily for about 7 hours at 2 gpm
- Average Year Scenarios including Wells 3 and 6:
  - Well 8 pumping daily at 1.5 gpm for 8 hours per day. This would require Well 3 (or Well 6) to pump at 0.5 gpm for just under 5 hours per day. Hence, Wells 3 and 6 could be used on alternating days.
  - Well 8 pumping daily at 1.2 gpm for 8 hours per day

During a drought year[1], more groundwater would be necessary from the project wells (i.e., Wells 3, 6, and 8). As illustrated on the RSA+ table "Water Balance -Drought Year", combined pumping rates of 2.0 to 2.2 gpm will be required from the project wells. Therefore, assuming a daily demand of 1584 gallons of groundwater (calculated as 2.2 gpm for 12 hours per day), possible pumping scenarios could include:

- Drought Year Scenarios in which only one of Well 3 or 6 is pumped daily:

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[1] Drought year rainfall is defined for the purposes of these analyses in the RCS WAA and the RSA+ "Tier 1 Water Use Calculations" to be 48% of the average year rainfall.

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  - Well 8 pumping daily for 12 hours per day at 1.75 gpm. This would require Well 3 (or Well 6) to pump at 0.5 gpm for about 11 hours per day. Hence, Wells 3 and 6 could be used on alternating days, etc.
  - Well 8 pumping daily at 2 gpm for 12 hours per day. Well 3 (or Well 6) would need to be pumped for just under 5 hours per day at a rate of 0.5 gpm. Hence, Wells 3 and 6 could be pumped on alternating days, etc.
- Drought Year Scenarios including both Wells 3 and 6 pumping on a daily basis:
  - Well 8 pumping daily at 1.5 gpm for 12 hours per day. This would require Well 3 and Well 6 to each pump at rates of 0.5 gpm for just over 8 hours per day. Hence, Wells 3 and 6 could be pumped at different times of the day for 8 hours each, with a period of no pumping from either well in between those separate (individual) pumping events.
  - Well 8 pumping daily at 1.75 gpm for 12 hours per day. Well 3 and Well 6 would each need to be pumped for just under 5 hours per day and at rates of 0.5 gpm. These two 5-hour pumping periods could be staggered throughout the 24-hour day.

Note that in the scenarios presented above, Wells 3 and 6 are estimated to be pumping at 0.5 gpm, less than half of their individual pumping test rates of 1.1 gpm. Based on the data provided above, it is feasible to operate the onsite wells to minimize the effects of mutual water level drawdown interference between wells 3 and 6.

<u>*LSCE Recommendation 2*</u> *- Provide documentation or details identifying the location of wells on properties to the north and west of Parcel 1 which may be close enough to experience an impact from proposed project Wells 3 and 6, and to confirm that there are no wells on these properties that are within 500 feet of said wells. Well Completion Reports requested from the Department of Water Resources can assist identification of neighboring wells at distances less than 500 feet from proposed Project wells.*

Figures 1 and 2 in the RCS WAA show the locations of known offsite wells (not included herein). Figure A, "Location Map," attached hereto is adapted from Figure 2 of the RCS WAA, and shows the APNs and the boundaries of the parcels that surround the subject property. RCS understands LSCE's concerns regarding a possible well in the vicinity of the offsite development which is visible on a Google Earth image just north of Well 6 (on neighboring Parcel 035-460-034). However, during numerous site visits, RCS did not observe an offsite well in that area. Further, the property owner has confirmed that there is no well in that area, and due to the elongated east-west shape of that neighboring parcel (with access to Dry Creek Rd), water is likely provided to this specific neighboring property from a well located along Dry Creek Rd. to the east. Note that Well 4 at the subject property is similarly located along Dry Creek Rd, and supplies water to the subject property via a long pipeline.

To corroborate the lack of a well within 500 ft of the project wells (Wells 3, 6, and 8), the property owner, with the help of Napa County staff, performed a search of Napa County permit records and well log records. There are only three parcels that have property boundary lines within 500 feet of the project wells (APN 035-010-055, APN 035-010-056, and APN 035-460-034). These three parcels are reportedly served by wells located further than 500 feet from the

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project wells. The data, well permits, and maps received from the County are included as an Appendix to this document.

RCS then used the California Department of Water resources in-progress new online Well Completion Report download site to download driller's logs for wells in the vicinity of the subject property. A few other offsite wells were located, but none within 500 feet of the project wells. In addition, RCS was able to correlate a DWR log with each of the drilling permits received. Those driller's logs are included in the Appendix with the well permits.

Using the information presented above, Figure A shows the locations of known offsite wells in the vicinity of the subject property, including those locations discovered via the well permits received from Napa County and the driller's logs recently downloaded from the DWR site. None of the offsite well locations shown on Figure A are within 500 feet of any of the project wells (Well 3, 6, and 8).

<u>LSCE Recommendation 3</u> - Provide details in the WAA regarding the proposed groundwater production schedule, winery process water schedule, and the existing or proposed means for treating and storing sufficient groundwater, reclaimed winery process water, and captured rainwater to provide the water supply needed for the proposed project.

As stated above, RSA+ re-issued an updated version of their "Tier 1 Water Use Calculations" (dated August 30, 2017), which included "Water Balance" tables for both an average year and a drought year. Those tables include the requested details regarding the timing of water production, use, and storage.

<u>LSCE Recommendation 4</u> - Provide slope mapping to show the acreage over 30 degrees that occurs within the holding so that the effect of ground slope on the recharge potential can be confirmed.

Figure B, "30-Degree Slope Map", illustrates the areas of the property in which the ground slope exceeds 30 degrees (as determined using GIS methods).

<u>LSCE Recommendation 5</u> - If not already done, install groundwater flow meters with totalizers on all wells on all project and non-project wells to determine the volumes of groundwater extracted at regular intervals.

Onsite wells at the Anthem property have been previously outfitted with totalizing flowmeters, with the exception of: Well 2 (the damaged well that is slated for permanent destruction) and Well 4 (non-project well). Readings of each of the existing totalizers are recorded each time data are downloaded by RCS from the onsite transducers. The property owner will provide Well 4 with a totalizing flowmeter in the future.

<u>LSCE Recommendation 6</u> - Record quarterly static groundwater levels in all project and non-project wells for three years.

As stated on page 12 of the RCS WAA, water level pressure transducers (water level data loggers) owned by Anthem Winery were installed during site visits on July 8 and July 20, 2015 by RCS Geologists into the three project wells (Wells 3, 6, and 8) and in three of the non-project wells (Wells 1, 5, and 7), as part of a groundwater monitoring program for the Anthem property.

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Figures 7A through 7G of the RCS WAA (not included herein) show water level data collected in the monitored onsite wells since publication of that document.

Those pressure transducers described above are still installed today and continue to collect water levels at a frequency of 1 measurement per hour. The property owner will make accommodations in the future to measure water levels in Well 4 on a quarterly basis (the only unmonitored onsite well) for three years, as recommended.

LSCE Recommendation 7 - Detail the amounts of water trucked to supply water uses at the project parcels during the two years referenced in the draft WAA to quantify the shortfall.

As reported by the property owner, the following dates represent the only short periods of time in which water was trucked to the subject property:

1) 143,000 gallons of water between Aug. 1 and Sept. 19, 2013.
2) 152,750 gallons of water between July 16 and August 22, 2014.

During those two events, the property owner imported only a fraction of the water necessary during its peak irrigation season in the 2013 and 2014 drought years for the following reasons:

- Due to older infrastructure and irrigation plans for the property (that will be upgraded as part of the project), several vineyard blocks were irrigated simultaneously (in the future, irrigation of various blocks will be staggered over time).
- The onsite vineyards did not yet have an underground irrigation system installed (underground irrigation systems reduce water use and allow for alternate irrigation cycles).
- Trucking in water was a preventative operational decision by the property owner to avoid the possibility of over pumping its few, then-existing wells.

The property owner reports that they have had no reason to use and has not used outside (trucked-in) water since August 2014.

LSCE Recommendation 8. - Provide details as to how existing water uses were supplied in 2015 and 2016 (e.g., whether Wells 6 and 8 or other water sources were used to meet demands on Parcel 2).

As reported by the property owner, in years 2015 and 2016, water demands for Parcel 2 (which includes a residence, winery, landscaping, and vineyards) has been supplied only by Wells 1, 5, and 7. In those same years, water demands for the existing rental home and landscaping on Parcel 1 were supplied by Wells 3, 4, and 6. Well 8 was drilled and constructed to help support the proposed project, and is not needed to meet the existing water demands on Parcel 1 or Parcel 2. Since it was drilled in 2015, Well 8 has been pumped in order to establish, test, and maintain it as a viable project well and source of onsite domestic water. RCS recommends that no well remain unpumped for an extended period of time. Wells that sit idle for extended periods of time can experience problems such as: bacterial growth that plugs perforations and reduces well production rates and efficiency; and establishment of bacterial colonies such as coliform that make future sanitation difficult.

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Therefore, in early November 2016, Well 8 was connected to the water tank that serves Parcel 2 and was pumped occasionally in order to prevent its groundwater from becoming stagnant and contaminated. Water generated as a result of this pumping was directed to the Parcel 2 tank in an effort to conserve water that would otherwise be wasted.

<u>LSCE Finding 9</u>. - *The draft WAA does not consider the potential for streamflow depletion by the three project wells. Although all three of the project wells have capacities below 10 GPM and would therefore have the Tier 3 criteria presumptively met if they are greater than 500 ft from the creek, Well 3 does have a surface seal of less than 50 ft and casing perforations above 100 ft, which could result in a potentially significant influence on streamflow.*

It is noteworthy to mention that, as discussed in the RCS WAA on page 10, groundwater use at the property after full buildout of the project increases by only 0.32 AF/yr and 1.12 AF/yr, respectively, compared to existing uses, for average and drought year rainfall. This equates to only about 0.03 AF/month to 0.09 AF/month. With the theoretical assumption that the local groundwater might somehow influence creek flow, then it must be noted that the 0.09 AF/month of groundwater production in a drought year would amount to an equivalent but non-measurable flow rate of only 0.66 gpm in Redwood Creek (1 AF = 325,851 gallons, the month of May has 31 days, 1,440 minutes per day).

Distances of the project wells from the nearest point along Redwood Creek are as follows: Well 3 is 340 ft northeast of Redwood Creek, Well 6 is 390 ft, and Well 8 is 420 ft east of the Creek, and are therefore less than 500 ft from Redwood Creek. No data reviewed by RCS geologists suggest that a direct hydrogeologic connection exists between Redwood Creek and the onsite well. Further, site specific data discussed below reveal that use of the project wells at the very low pumping rates proposed for the project and the hydrogeologic character of the site do not present a potentially significant influence on streamflow in Redwood Creek.

Two geologic cross sections, have been prepared to help illustrate the relationship between the onsite project wells and Redwood creek. The alignment of these cross sections are shown on Figure C, Geology Map, and the sections are presented as Figure D, “Geologic Cross Section A-A’”, and Figure E, “Geologic Cross Section B-B’”. As shown on the sections, geologically, Redwood Creek lies on top of a thin section of alluvium, that overlies the older sedimentary deposits of the Domengine sandstone. The eastern side of Redwood Creek at its nearest point to the subject property created a “cut-bank”, in which the Creek maybe be in direct contact with the Domengine sandstone.

As illustrated on the geologic cross sections, the onsite project water wells are not perforated within the alluvial deposits of Redwood Creek, or within the landslide deposits mapped in the area. No springs or seeps have been observed by RCS or have been reported by the property owner that are known to flow directly into Redwood Creek from the subject property. Therefore, no direct or indirect hydraulic connection to the creek is known to exist.

It is from the fractures within the consolidated sedimentary Domengine sandstone that the Project water wells produce groundwater. As described in the RCS WAA, the nature and interconnection of these fractures is unpredictable. Pumping test have shown that hydraulic communication is limited at the subject property, and the interconnection of fracture systems

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changes rapidly over short distances. Hence, a continuous, smooth water surface within the Domengine sandstone that directly connects the project wells to Redwood Creek likely does not exist.

The seasonal nature of Redwood Creek is further evidence that a continuous groundwater surface between the creek and the project wells does not exist. Redwood Creek is an ephemeral Creek, meaning that the creek does not flow year-round, and is dry for a significant portion of each year. Many data sources support the fact that the creek is ephemeral. Firstly, the USGS topographic map of the area shows Redwood Creek as a dashed blueline; the dashes signify the ephemeral nature of the stream. Data available from a variety of those sources also support the ephemeral nature of Redwood Creek. Those key data sources include stream gages, the locations for which are shown on Figure F, “Stream Gage Locations,” and data for the individual references that are shown in Figure G1 through Figure G3, “Stream Gage Data.” A review of the various stream flow data sources is provided below:

- USGS 11458200 – This stream gage was active from August 1, 1958 through October 1, 1973 (USGS 2017). A graph of streamflow over time for the gage is available on Figure G1. As shown thereon, flow in the creek ceased annually in roughly May each year, and resumed in roughly October of each year (these dates are estimates and simplified for the purposes of this discussion, as the time of year flow ceased each year is variable).
- In the Southern Napa River Watershed Plan by the Napa County Resource Conservation District (NCRCD) dated April 2009, the statement is made that “…much of reaches 1, 2, and a short section of reach 3 [of Redwood Creek] went completely dry in summer.” Note that, based on a map shown in NCRCD 2009 document, the project site is located adjacent to “reach 2” of Redwood Creek as shown on Figure F.
- Streamflow measurements collected in Redwood Creek at points located upstream and downstream of the project site are available for the time period ranging from 2007 to 2010. These data represented in the NCRCD report titled “Water for Fish and Farms Project: Task 4 Report, Real-Time Telemetric Streamgaging Stations.”; those graphs are reproduced on Figure G2. As shown thereon, flow in Redwood Creek generally ceases flow in May of each year, and resumes in October of each year.
- More recent data are available from the Napa County One Rain site (One Rain 2017), as illustrated on Figure G3. Although there are what appear to be errors in the data available from the site, recent data from the stream gage gleaned from the site include:
    - In 2017, flow ceased on about May 29, 2017.
    - In 2016, flow ceased on about May 18, 2016, and resumed on Oct 25, 2016.
    - Data previous to 2015 appear to have calibration issues.

Because Redwood Creek is strictly ephemeral, it is probable that this creek is not connected to the groundwater table in the area. That means that groundwater moves from the bottom of the creek toward the groundwater table through an unsaturated zone, and that the water level in the creek is not connected to the groundwater table. The USGS describes a scenario in which a stream (or creek) is not connected to the local groundwater table (USGS 2013) as a “disconnected stream”. The same document (USGS 2013) also includes a reference to a journal article (Brunner 2011) that provides “a summary of several of the issues related to disconnected systems and the factors that influence the dynamics of disconnection.” In that document, the definition of “disconnection” is discussed, and whereas the document describes a

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few specific scenarios that groundwater pumpage might have on disconnected systems, it is stated on page 11 that “Ephemeral streams therefore are frequently disconnected even in the absence of a clogging layer” (Brunner 2011).

In order for there to be any connection between the project wells and Redwood creek, the fractures from which the wells produce groundwater must intersect the creek channel. The perforation intervals for each of the three project wells are shown on the cross sections, (Figures D and E). As shown on Figure D, Wells 3 and 6 have very different perforation intervals, but very similar water level data. Further, Wells 3 and 6 perform similarly under pumping conditions. The wells are only 175 feet from one another, and aquifer testing data show that the wells are hydraulically connected. Based on these factors, it is the opinion of RCS that the significant water producing zone in Well 3 is likely near the bottom of the well, at depths similar to the depths of the perforations in Well 6, and at elevations deeper than the channel of Redwood Creek. Water level data shown on Figure D supports this assertion; static water levels are much lower than the top of the perforations in Well 3. This assertion that the significant water producing zones in the Domengine sandstone being deep is supported by Well 8, also. The vast majority of the perforations in Well 8 lie at an elevation that is deeper than the channel of Redwood Creek, and recent water levels are well below the small zone of perforations in the upper part of the well. Based on these data, it is likely that the significant fracture systems from which the onsite wells derive water are deeper than the elevation of Redwood creek.

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References

- (Brunner 2011) Brunner, Philip, Cook, P.G., and Simmons, C.T., 2011, Disconnected Surface Water and Groundwater—From Theory to Practice: Ground Water, v. 49, no. 4, p. 460–467
- (CGS 2004) Clahan, K.; Wagner, D.; et al., 2004. Geologic Map of the Napa 7.5' Quadrangle, Napa County, California: A Digital Database. California Geological Survey.
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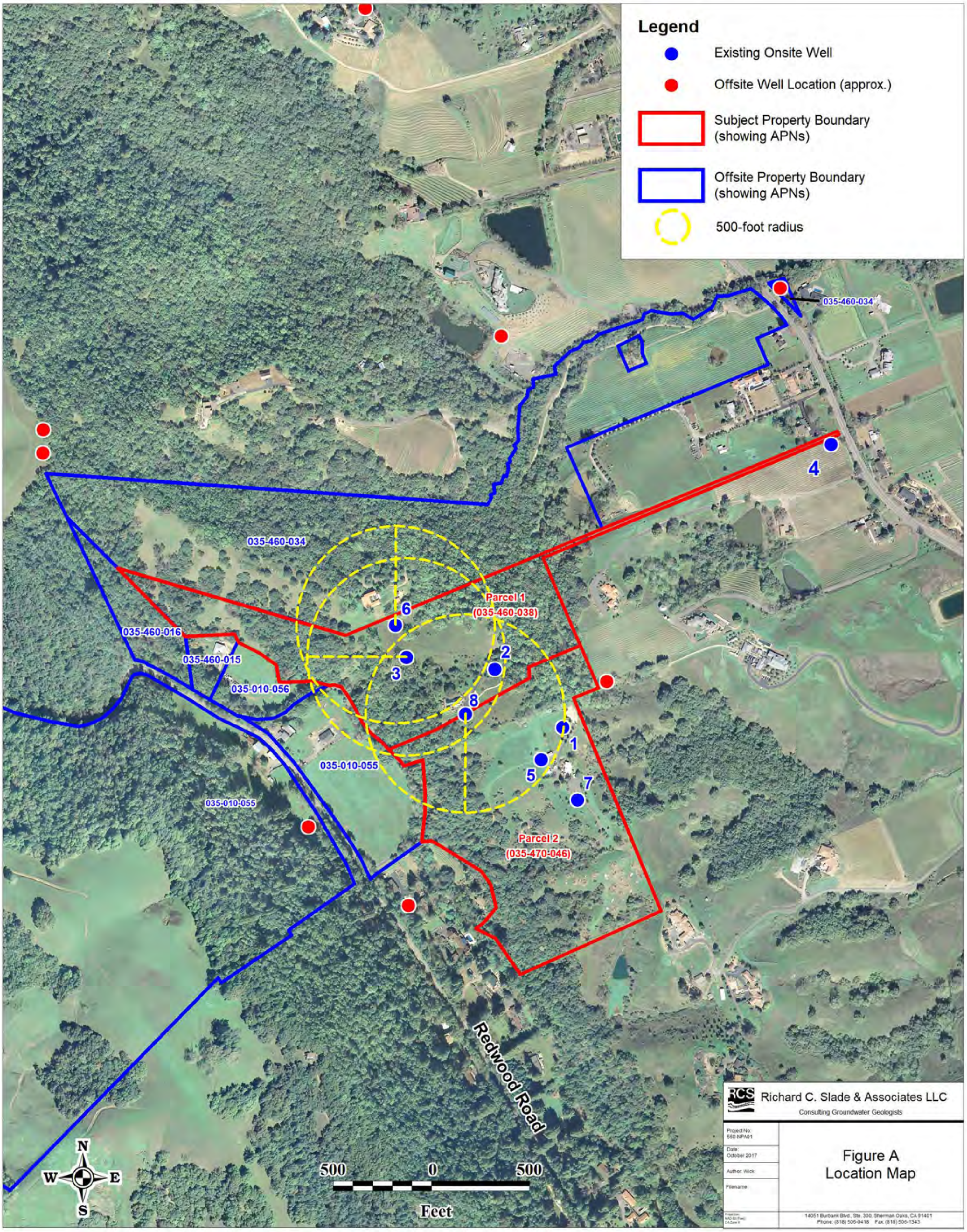
- (NRCD 2009) Napa County Resource Conservation District, April 30, 2009. Southern Napa River Watershed Project, Prepared for the U.S. Department of Fish and Game
- (NCRCD 2010) Napa County Resource Conservation District, April 2010. Water for Fish and Farms Project: Task 4 Report, Real-Time Telemetric Streamgaging Stations. Prepared for the CALFED Bay Delta Authority Watershed Program, State of California Department of Water Resources.
- (USGS 2013) Paul M. Barlow and Stanley A. Leake, 2013 Streamflow Depletion by Wells—Understanding and Managing the Effects of Groundwater Pumping on Streamflow (USGS Circular 1376)
- (USGS 2017) –USGS Water Data for USA. Website, 2017. https://waterdata.usgs.gov/nwis?


Legend
Existing Onsite Well
Offsite Well Location (approx.)
Subject Property Boundary (showing APNs)
Offsite Property Boundary (showing APNs)
500-foot radius
035-460-034
035-460-034
035-460-016
035-460-015
035-010-056
035-010-055
035-010-055
Parcel 1 (035-460-038)
Parcel 2 (035-470-046)
1
2
3
4
5
6
7
8
Redwood Road
N
S
E
W
500
0
500
Feet
RCS
Richard C. Slade & Associates LLC
Consulting Groundwater Geologists
Project No: 560-NPA01
Date: October 2017
Author: Wick
Filename:
Figure A
Location Map
14051 Burbank Blvd., Ste. 300, Sherman Oaks, CA 91401
Phone: (818) 506-0418 Fax: (818) 506-1343

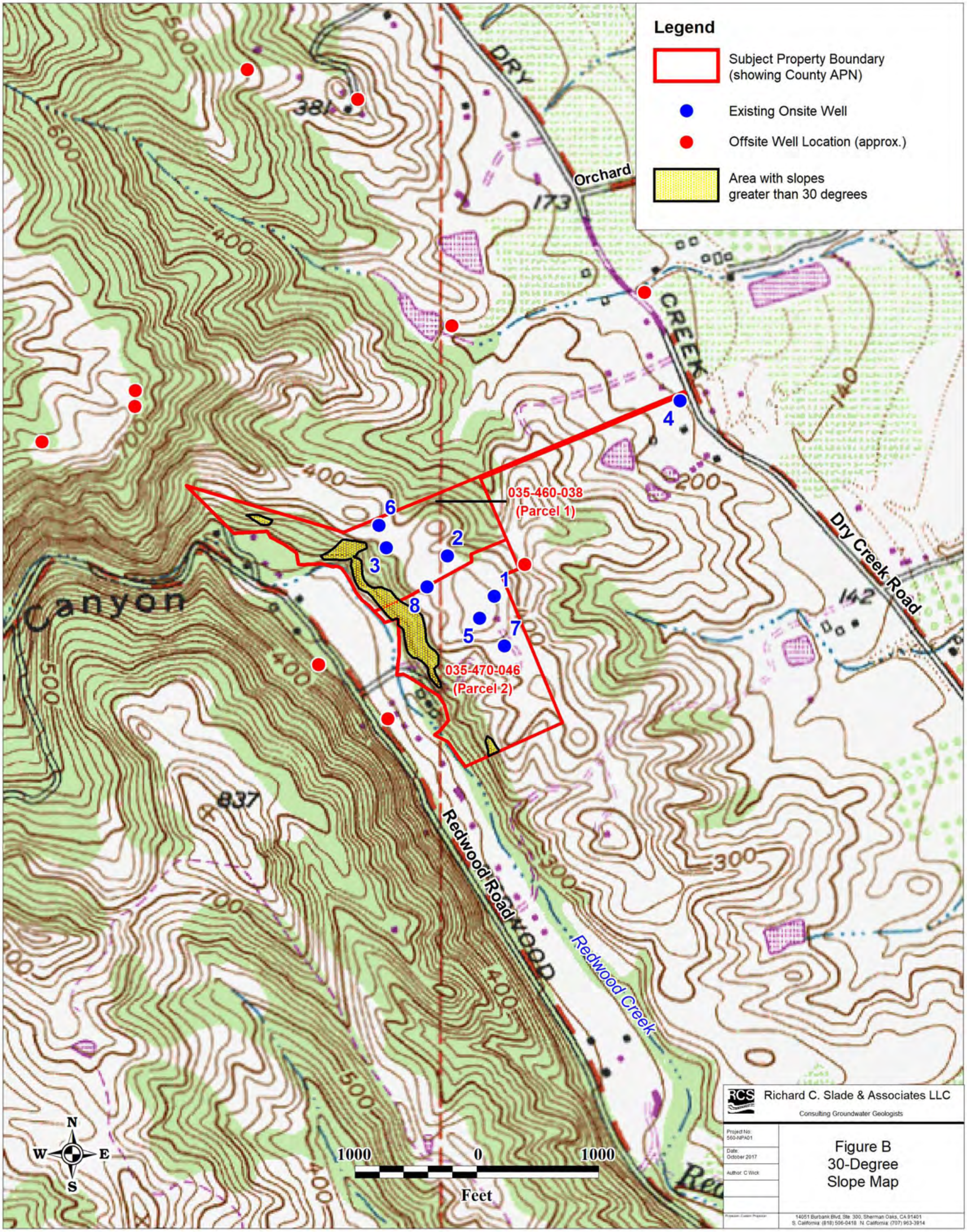


Figure B
30-Degree Slope Map

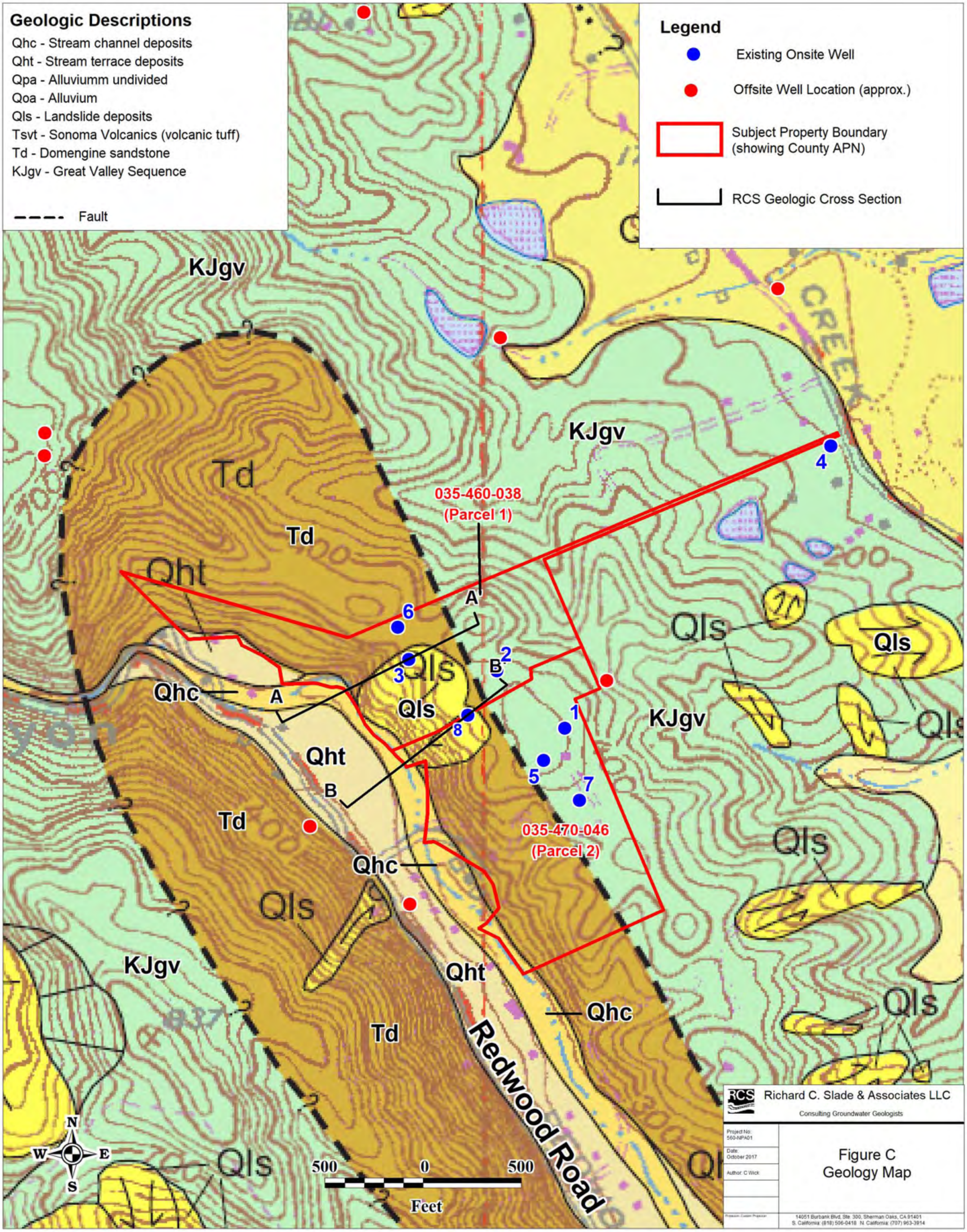
Geologic Descriptions

Qhc - Stream channel deposits
Qht - Stream terrace deposits
Qpa - Alluviumm undivided
Qoa - Alluvium
Qls - Landslide deposits
Tsvt - Sonoma Volcanics (volcanic tuff)
Td - Domengine sandstone
KJgv - Great Valley Sequence

Fault

Legend

Existing Onsite Well
Offsite Well Location (approx.)
Subject Property Boundary (showing County APN)
RCS Geologic Cross Section

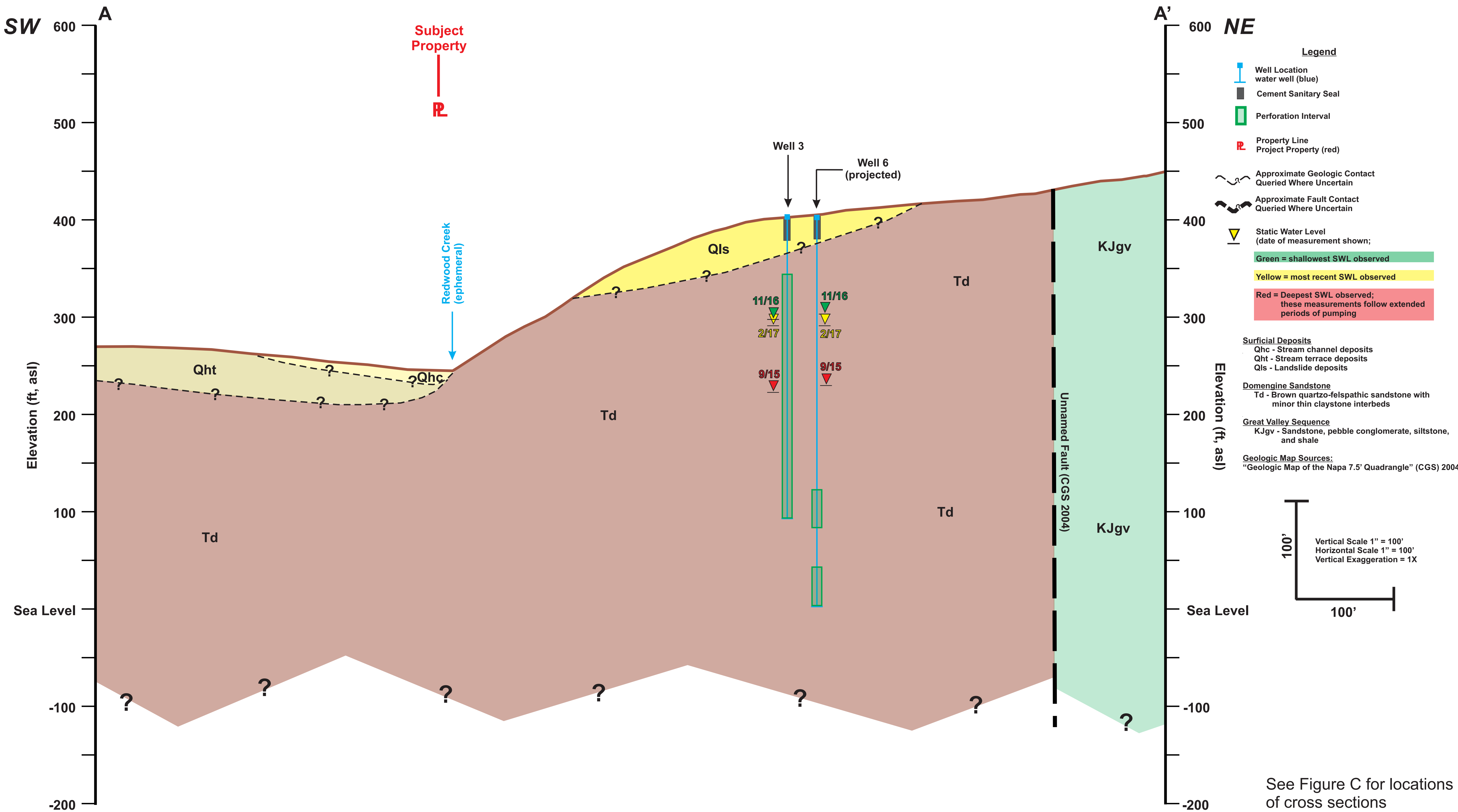


Richard C. Slade & Associates LLC
Consulting Groundwater Geologists

Project No: 560-NPA01
Date: October 2017
Author: C Wick

Figure C
Geology Map

14051 Burbank Blvd, Ste. 300, Sherman Oaks, CA 91401
S. California: (818) 506-0418 N. California: (707) 963-3914



See Figure C for locations of cross sections

RCS
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CONSULTING GROUNDWATER GEOLOGISTS
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Sherman Oaks, CA 91401
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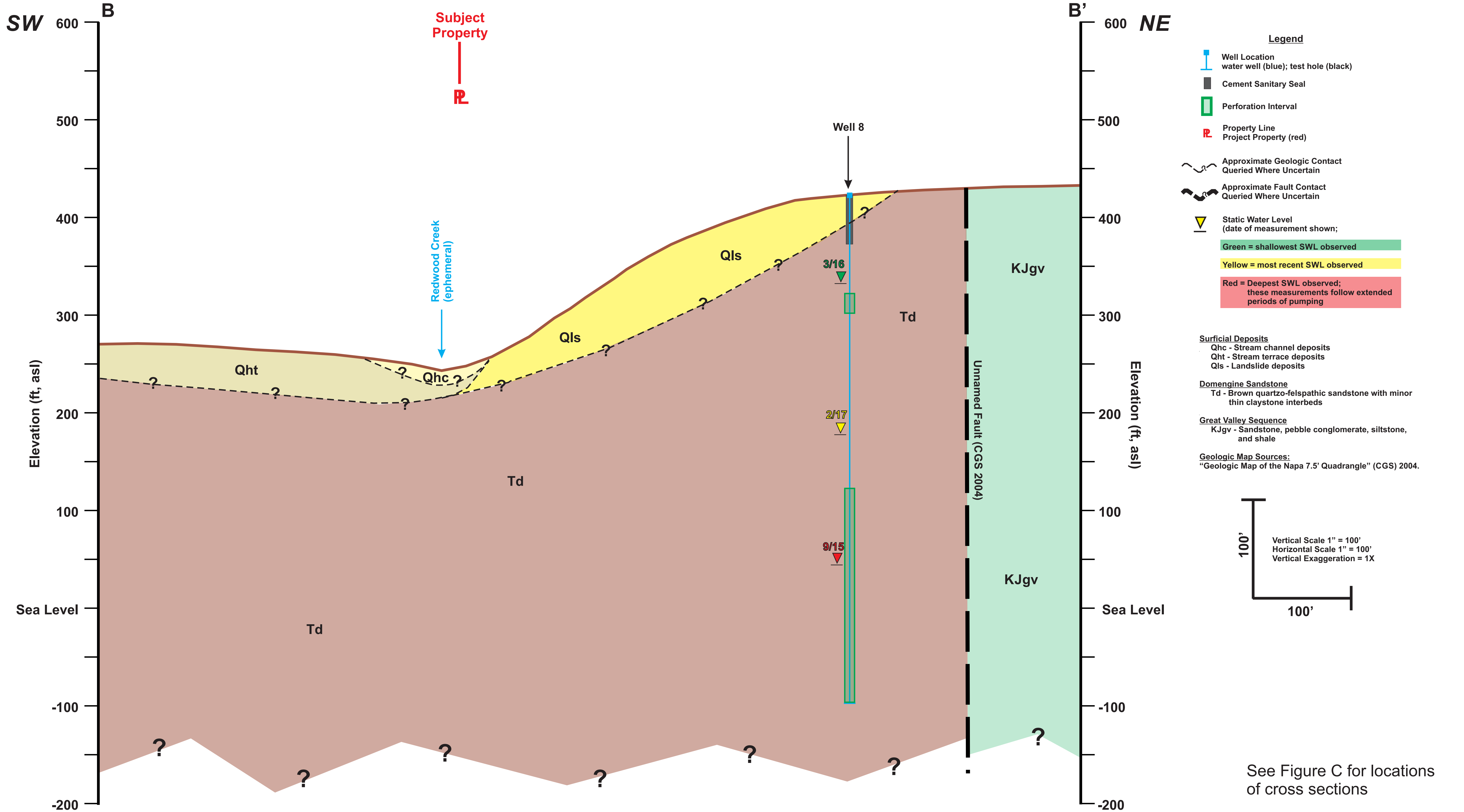
Northern California (707) 963-3914

Figure D
Geologic Cross Section A-A'

Job No. 560-NPA01

October 2017



See Figure C for locations of cross sections

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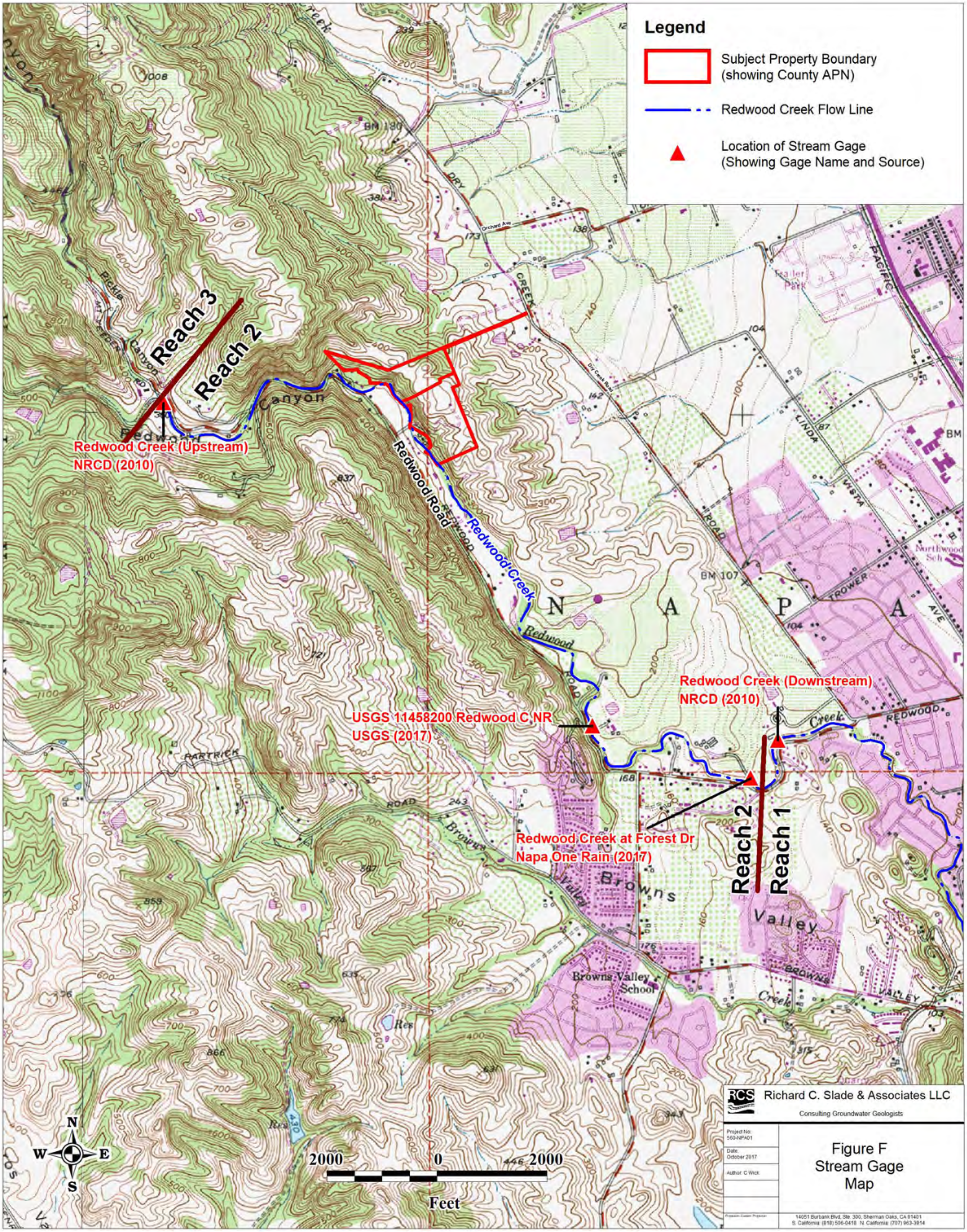
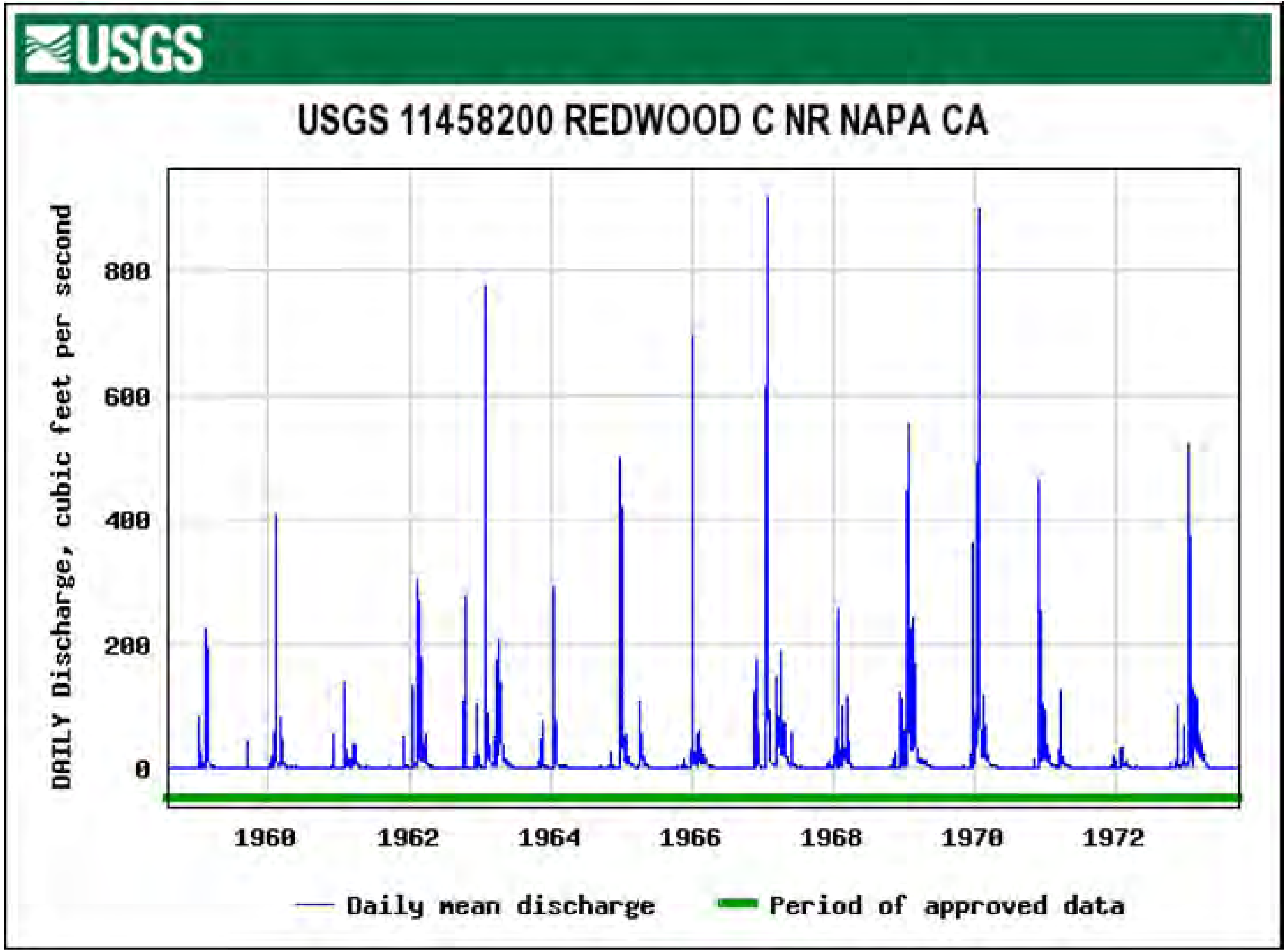
Figure E
Geologic Cross Section B-B'

Job No. 560-NPA01

October 2017


Legend
Subject Property Boundary (showing County APN)
Redwood Creek Flow Line
Location of Stream Gage (Showing Gage Name and Source)
Reach 3
Reach 2
Redwood Creek (Upstream) NRCD (2010)
Redwood Road
Redwood Creek
USGS 11458200 Redwood C NR USGS (2017)
Redwood Creek (Downstream) NRCD (2010)
Redwood Creek at Forest Dr Napa One Rain (2017)
Reach 2
Reach 1
N A P A
Browns Valley School
2000 0 2000
Feet
Richard C. Slade & Associates LLC
Consulting Groundwater Geologists
Project No: 560-NPA01
Date: October 2017
Author: C Wick
Figure F
Stream Gage Map
14051 Burbank Blvd, Ste. 300, Sherman Oaks, CA 91401
S. California: (818) 506-0418 N. California: (707) 963-3914



SOURCE: USGS Water Data for USA Website, 2017. https://waterdata.usgs.gov/nwis?

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Figure G1
Stream Gage Data
USGS Water Data for USA

Job No. 560-NPA01

October 2017

Figure 4. Streamgaging data for Station RED (lower Redwood Creek).

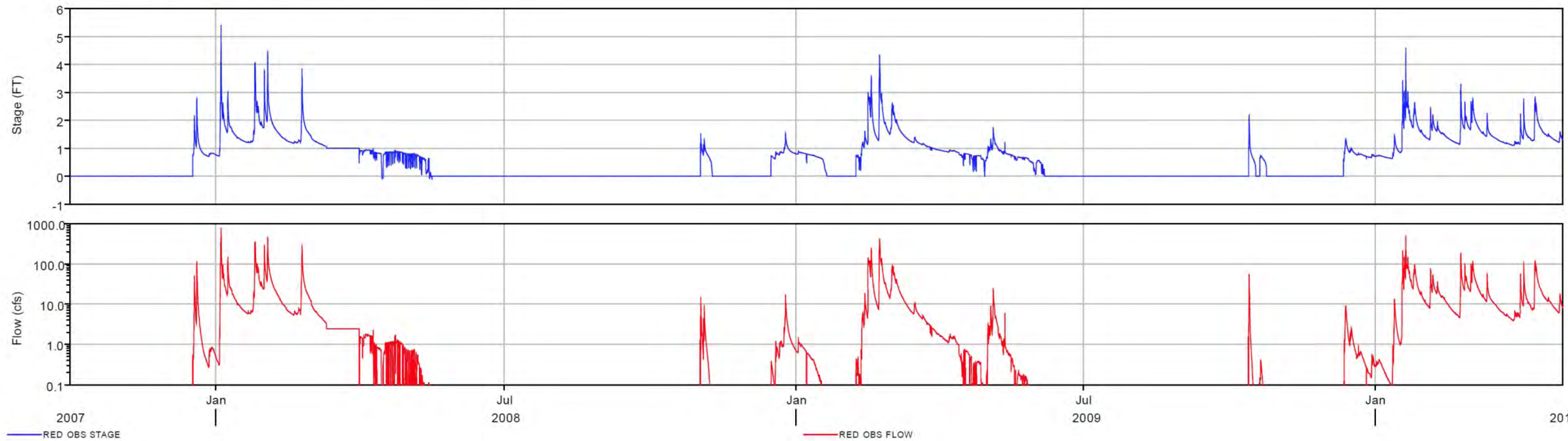
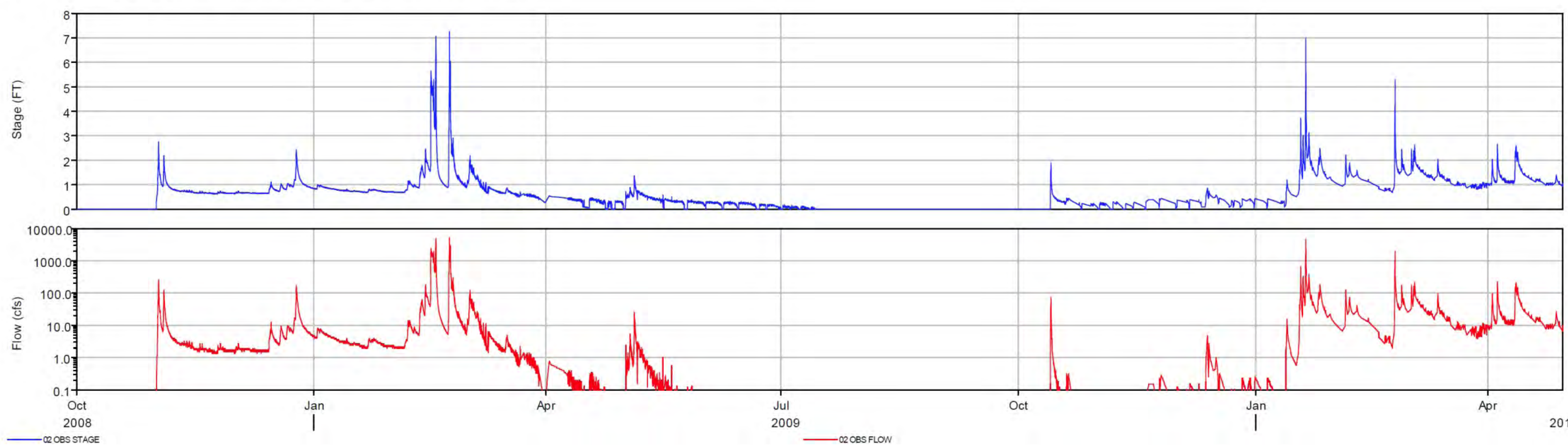


Figure 5. Streamgaging data for RMS Station 02 (upper Redwood Creek).



SOURCE: Napa County Resource Conservation District, April 2010. Water for Fish and Farms Project: Task 4 Report, Real Time Telemetric Streamgaging Stations. Prepared for the CALFED Bay Delta Authority Watershed Program, State of California Department of Water Resources.

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Northern California (707) 963-3914

Figure G2
Stream Gage Data
Napa Country Resource Conservation District

Job No. 560-NPA01 **September 2017**

SOURCE: Napa One Rain Website , 2017. https://napa.onerain.com. Gage: Redwood Creek at Forest Dr

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Sherman Oaks, CA 91401
Southern California (818) 506-0418
Northern California (707) 963-3914

Figure G3
Stream Gage Data
Napa One Rain Website

Job No. 560-NPA01 **September 2017**

APPENDIX
“TIER 1 WATER USE CALCULATIONS”
BY
RSA+

TIER 1
WATER USE CALCULATIONS

ANTHEM WINERY
3454 REDWOOD RD
NAPA, CALIFORNIA

APN 035-470-046

PROPERTY OWNER:

Julie Arbuckle
3454 Redwood Rd
Napa, CA 94558

REGISTERED PROFESSIONAL ENGINEER
BRUCE FENTON
77859
Exp. 06/30/2019
CIVIL
STATE OF CALIFORNIA

Project# 4111010.0
March 17, 2015
Revised: August 30, 2017

I. Executive Summary

These calculations demonstrate that the proposed total ground water use on both parcels is less than the estimated groundwater recharge rate for normal, "Average Rainfall", and dry, "Drought" years. The currently approved groundwater use on both parcels is greater than the estimated groundwater recharge rate.

The methods used in this analysis are based on the Final Adopted Napa County Water Availability Analysis guidance document, dated May 12, 2015.

The existing and proposed water use for the Anthem Winery parcels are as follows:

Usage Type	Existing [af/yr]	*Approved [af/yr]*	Proposed [af/yr]
Parcel 1 – Vineyard (APN: 035-460-038)			
Residential	0.75	*0.75*	0.75
Vineyard	0.00	*0.96*	0.62
Parcel 1 Water Use	**0.75**	***1.71***	**1.37**
Parcel 2 – Winery (APN: 035-470-046)			
Residential	0.75	*0.75*	0.75
Vineyard	2.89	*3.39*	2.99
Winery			
Process Water	0.00	*0.46*	0.77
Landscaping	0.00	*0.15*	0.82
Employees	0.00	*0.02*	0.10
Visitors	0.00	*0.01*	0.12
Events	0.00	*0.00*	0.11
Parcel 2 Water Use	**3.64**	***4.78***	**5.66**
Additional Water Supply (Average Rainfall Year)			
Reclaimed Process Wastewater	0.00	*0.00*	-0.77
Harvested Rainwater	0.00	*0.00*	-1.55
Total Groundwater Use (Average Rainfall Year)	**4.39**	***6.49***	**4.71**
Additional Water Supply (Drought Year)			
Reclaimed Process Wastewater	0.00	*0.00*	-0.77
Harvested Rainwater	0.00	*0.00*	-0.75
Total Groundwater Use (Drought Year)	**4.39**	***6.49***	**5.51**

The proposed average pump rate for project wells (3, 6, and 8 combined) during Average Rainfall years is 1.1 gpm, on a 12 hour/day duty cycle. Similarly, the average proposed pump rate for project wells during Drought years is 2.1 gpm. Sufficient water storage will be provided on site to normalize pump rates throughout the year. Refer to attached Water Balance for monthly water production, use, and storage schedule.

II. Parcel 1 – Vineyard (APN: 035-460-038)

Residential Water Use

Existing primary residence + guest house to remain (3 bedrooms total):

$$W_{Residential} = \mathbf{0.75\ af/yr}$$

Non-Residential Water Use

Approved Agricultural (P12-00401)

Previously Approved, Unplanted Vineyards – Irrigation Only:

$$W_{A\_Vineyards} = \left(\frac{0.5\ af/yr}{ac}\right)(1.91ac) = \mathbf{0.96\ af/yr}$$

Proposed Agricultural

40% reduction in vineyard demand due to proposed switch to water-efficient underground irrigation:

$$Q_{DRI} = 0.6\left(\frac{0.5\ af/yr}{ac}\right) = 0.3\ af/yr$$

Previously Approved Vineyards to be planted – Underground Irrigation Only:

$$W_{A\_Vineyards} = \left(\frac{0.3\ af/yr}{ac}\right)(1.55ac + 0.11ac) = 0.498\ af/yr$$

New Proposed Vineyards – Underground Irrigation Only:

$$W_{P\_Vineyards} = \left(\frac{0.3\ af/yr}{ac}\right)(0.90ac) = 0.27\ af/yr$$

50% reduction for planting 1 acre of low-water varietal (e.g. Sauvignon Blanc):

$$W_{DRI\_Low-Water} = -0.5\left(\frac{0.3af/yr}{ac}\right)(1.0ac) = -0.15\ af/yr$$

Total Post-Project Vineyards – Irrigation Only:

$$W_{Vineyards} = 0.498\ af/yr + 0.27\ af/yr - 0.15\,af/yr = \mathbf{0.62\ af/yr}$$

Total Parcel 1 Water Use

$$W1_{Existing} = \mathbf{0.75\ af/yr}$$

$$W1_{Approved} = 0.75\ af/yr + 0.96\ af/yr = \mathbf{1.71\ af/yr}$$

$$W1_{Proposed} = 0.75\ af/yr + 0.62\ af/yr = \mathbf{1.37\ af/yr}$$

III. Parcel 2 – Winery (APN: 035-470-046)

Residential Water Use

Primary Residence to remain

$$W_{Primary} = \mathbf{0.75\ af/yr}$$

Non-Residential Water Use

Existing Agricultural

Existing Vineyards – Irrigation Only:

$$W_{E\_Vineyards} = \left(\frac{0.5\ af/yr}{ac}\right)(5.77ac) = 2.885\ af/yr$$

Approved Agricultural (P08-00345, P12-00401)

Previously Approved, Unplanted Vineyards – Irrigation Only:

$$W_{A\_Vineyards} = \left(\frac{0.5\ af/yr}{ac}\right)(0.16ac + 0.85ac) = 0.505\ af/yr$$

Total Existing and Approved Vineyards – Irrigation Only:

$$W_{Vineyards} = 2.885\ af/yr + 0.505\ af/yr = \mathbf{3.39\ af/yr}$$

Proposed Agricultural

Existing Vineyards to remain – Irrigation Only:

$$W_{E\_Vineyards} = \left(\frac{0.5\ af/yr}{ac}\right)(5.77ac - .20ac) = 2.785\ af/yr$$

Previously Approved Vineyards to be planted (0.38 ac to remain unplanted) – Underground Irrigation Only:

$$W_{A\_Vineyards} = \left(\frac{0.3\ af/yr}{ac}\right)(0.08ac + 0.55ac) = 0.189\ af/yr$$

New Proposed Vineyards – Underground Irrigation Only:

$$W_{P\_Vineyards} = \left(\frac{0.3\ af/yr}{ac}\right)(0.05ac) = 0.015\ af/yr$$

Total Post-Project Vineyards – Irrigation Only:

$$W_{Vineyards} = 2.785\ af/yr + 0.189\ af/yr + 0.015\ af/yr = \mathbf{2.99\ af/yr}$$

Existing Winery

Previously Approved Winery Process Water:

$$W_{Process} = \left(\frac{5\ gal.process\ water/gal.wine}{325{,}851\ gal/af}\right)(30{,}000\ gal.wine) = \mathbf{0.46\ af/yr}$$

Previously Approved Landscaping (Tier 1 WAA method):

$$W_{Landscaping} = \left(\frac{0.5\ af/yr}{100{,}000\ gal.of\ wine}\right)(30{,}000\ gal.of\ wine) = \mathbf{0.15\ af/yr}$$

Previously Approved Employees:

$$Shifts_{Full-time} = \left[(2)\left(\frac{1\ shift}{8\ hours}\right)\left(\frac{40\ hours}{week}\right)\right]\left[\frac{52\ weeks}{yr}\right] = 520\ shifts/yr$$

$$W_{Employees} = \left[\left(\frac{15\ gal./yr}{shift}\right)(520\ shifts)\right]\left[\frac{1\ af}{325{,}851\ gal.}\right] = \mathbf{0.02\ af/yr}$$

Previously Approved Visitors:

$$Visitors = \left(\frac{5\ visitors}{week}\right)\left(\frac{52\ weeks}{yr}\right) = 260\ visitors/yr$$

$$W_{Visitors} = \left[\left(\frac{3\ gal./yr}{visitor}\right)(260\ visitors)\right]\left[\frac{1\ af}{325{,}851\ gal.}\right] = \mathbf{0.01\ af/yr}$$

Proposed Winery Expansion

Proposed Winery Process Water:

$$W_{Process} = \left(\frac{5\ gal.process\ water/gal.wine}{325{,}851\ gal/af}\right)(50{,}000\ gal.wine) = \mathbf{0.77\ af/yr}$$

Proposed Landscaping (WELO Analysis, Estimated Total Water Use):

$$W_{Landscaping} = (266{,}824\ gal/yr)\left[\frac{1af}{325{,}851\ gal}\right] = \mathbf{0.82\ af/yr}$$

Proposed Employees:

$$Shifts_{Full-time} = \left[(7)\left(\frac{1\ shift}{8\ hours}\right)\left(\frac{40\ hours}{week}\right)\right]\left[\frac{52\ weeks}{yr}\right] = 1{,}820\ shifts/yr$$

$$Shifts_{Part-time} = \left[(5)\left(\frac{1\ shift}{8\ hours}\right)\left(\frac{40\ hours}{week}\right)\right]\left[\frac{12\ weeks}{yr}\right] = 300\ shifts/yr$$

$$W_{Employees} = \left[\left(\frac{15\ gal./yr}{shift}\right)(1{,}820\ shifts + 300\ shifts)\right]\left[\frac{1\ af}{325{,}851\ gal.}\right] = \mathbf{0.10\ af/yr}$$

Proposed Visitors:

$$Visitors = \left(\frac{256\ visitors}{week}\right)\left(\frac{52\ weeks}{yr}\right) = 13{,}312\ visitors/yr$$

$$W_{Visitors} = \left[\left(\frac{3\ gal./yr}{visitor}\right)(13{,}312\ visitors)\right]\left[\frac{1\ af}{325{,}851\ gal.}\right] = \mathbf{0.12\ af/yr}$$

Proposed Events:

$$\begin{aligned} Visitors = {} & \left[\left(\frac{2\ events}{month}\right)\left(\frac{30\ visitors}{event}\right)\left[\frac{12\ months}{yr}\right] + \left(\frac{10\ events}{yr}\right)\left(\frac{100\ visitors}{event}\right)\right] \\ & + \left(\frac{1\ event}{yr}\right)\left(\frac{200\ visitors}{event}\right) + \left(\frac{1\ event}{yr}\right)\left(\frac{300\ visitors}{event}\right) \\ & = 2{,}220\ event\ visitors/yr \end{aligned}$$

$$\begin{aligned} Event\ Staff = {} & \left(\frac{10\ event_{100}}{yr}\right)\left(\frac{5\ staff}{event_{100}}\right) + \left(\frac{1\ event_{200}}{yr}\right)\left(\frac{10\ staff}{event_{200}}\right) \\ & + \left(\frac{1\ event_{300}}{yr}\right)\left(\frac{15\ staff}{event_{300}}\right) = 75\ event\ staff/yr \end{aligned}$$

$$W_{Events} = \left[\left(\frac{15\ gal./yr}{person}\right)(2{,}220\ visitors + 75\ staff)\right]\left[\frac{1\ af}{325{,}851\ gal.}\right] = \mathbf{0.11\ af/yr}$$

Total Parcel 2 Water Use

$$W2_{Existing} = 0.75\ af/yr + 2.89\ af/yr = \mathbf{3.64\ af/yr}$$

$$\begin{aligned} W2_{Approved} = {} & 0.75\ af/yr + 3.39\ af/yr + 0.46\ af/yr + 0.15\ af/yr + 0.02\ af/yr \\ & + 0.01\ af/yr = \mathbf{4.78\ af/yr} \end{aligned}$$

$$\begin{aligned} W3_{Proposed} = {} & 0.75\ af/yr + 2.99\ af/yr + 0.77\ af/yr + 0.82\ af/yr + 0.10\ af/yr \\ & + 0.12\ af/yr + 0.11\ af/yr = \mathbf{5.66\ af/yr} \end{aligned}$$

Beneficial Use of Reclaimed Process Wastewater

Proposed Reclaimed Process Wastewater:

$$PW = 0.77\ af/yr$$

Beneficial Use of Harvested Rainwater

Average Annual Rainfall (PRISM), per RCS = 30.0 in/yr

Drought year, per RCS = 48% of average:

$$Drought\ year = 0.48(30.0\ in/yr) = 14.4\ in/yr$$

Proposed Rainwater Harvesting

Building	Roof Area	
Fermentation Room 1:	4,478	sf
Fermentation Room 2:	5,207	sf
Hospitality*:	0	sf
Office*:	0	sf
Outdoor Event Area:	1,204	sf
Parcel 1 Residence & Guest House:	1,760	sf
Parking Lot & Roof Terrace**:	14,397	sf
Total roof area	27,046	sf

* Rainwater harvesting systems to be constructed at a later date - not included in water balance.
** Collected separately for irrigation only.

Average Rainfall Year Harvested Rainwater:

$$RW_{Average\ Year} = (\ 30\ in/yr)(27{,}046\ sf)\left(\frac{1\ ac}{43{,}560\ sf}\right)\left(\frac{1\ ft}{12\ in}\right) = \mathbf{1.55\ af/yr}$$

Drought Year Harvested Rainwater:

$$RW_{Drought\ Year} = (\ 14.4\ in/yr)(27{,}046\ sf)\left(\frac{1\ ac}{43{,}560\ sf}\right)\left(\frac{1\ ft}{12\ in}\right) = \mathbf{0.75\ af/yr}$$

Total Groundwater Use

Average Rainfall Year Groundwater Use

$$GW_{Existing-Average} = 0.75\ af/yr + 3.64\ af/yr = \mathbf{4.39\ af/yr}$$

$$GW_{Approved-Average} = 1.71\ af/yr + 4.78\ af/yr = \mathbf{6.49\ af/yr}$$

$$GW_{Proposed-Average} = 1.37\ af/yr + 5.66\ af/yr - 0.77\ af/yr - 1.55\ af/yr = \mathbf{4.71\ af/yr}$$

Drought Year Groundwater Use

$$GW_{Existing-Drought} = 0.75\ af/yr + 3.64\ af/yr = \mathbf{4.39\ af/yr}$$

$$GW_{Approved-Drought} = 1.71\ af/yr + 4.78\ af/yr = \mathbf{6.49\ af/yr}$$

$$GW_{Proposed-Drought} = 1.52\ af/yr + 5.66\ af/yr - 0.77\ af/yr - 0.75\ af/yr = \mathbf{5.51\ af/yr}$$

Groundwater Sources

Well 4 (non-project well)

Existing supply to remain – 20% of Parcel 1 Residence:

$$W_{Well\ 4\ Existing} = (0.20)(0.75\, af/yr) = \mathbf{0.15\ af/yr}$$

Wells 1, 5, 7 (non-project wells)

Existing supply to remain – Parcel 2 Residence and Vineyards:

$$W_{Well\ 1,5,7\ Existing} = 0.75\, af/yr + 2.89\, af/yr = \mathbf{3.64\ af/yr}$$

Well 2 (non-project well)

Destroyed in 2014 earthquake. To be abandoned per Napa County Well Destruction Guidelines.

Wells 3, 6, 8 (project wells)

Average Rainfall Year Supply:

$$W_{3,6,8\ Existing-Average} = 4.39\, af/yr - 0.15\, af/yr - 3.64\, af/yr = \mathbf{0.60\ af/yr}$$

$$W_{3,6,8\ Approved-Average} = 6.49\, af/yr - 0.15\, af/yr - 3.64\, af/yr = \mathbf{2.70\ af/yr}$$

$$W_{3,6,8\ Proposed-Average} = 4.71\, af/yr - 0.15\, af/yr - 3.64\, af/yr = \mathbf{0.92\ af/yr}$$

Drought Year Supply:

$$W_{3,6,8\ Existing-Drought} = 4.39\, af/yr - 0.15\, af/yr - 3.64\, af/yr = \mathbf{0.60\ af/yr}$$

$$W_{3,6,8\ Approved-Drought} = 6.49\, af/yr - 0.15\, af/yr - 3.64\, af/yr = \mathbf{2.70\ af/yr}$$

$$W_{3,6,8\ Proposed-Drought} = 5.51\, af/yr - 0.15\, af/yr - 3.64\, af/yr = \mathbf{1.72\ af/yr}$$

Proposed Average Rainfall Year Pump Rate, 12 hr/day duty cycle:

$$Q_{3,6,8\ Proposed-Average} = (0.92\, af/yr)\left(\frac{325{,}851\, gal}{1\, af}\right)\left(\frac{1\, yr}{365\, days}\right)\left(\frac{1\, day}{12\, hrs}\right)\left(\frac{1\, hr}{60\, min}\right) = \mathbf{1.1\ gpm}$$

Proposed Drought Year Pump Rate, 12 hr/day (720 min/day) duty cycle:

$$Q_{3,6,8\ Proposed-Drought} = (1.72\, af/yr)\left(\frac{325{,}851\, gal}{1\, af}\right)\left(\frac{1\, yr}{365\, days}\right)\left(\frac{1\, day}{12\, hrs}\right)\left(\frac{1\, hr}{60\, min}\right) = \mathbf{2.1\ gpm}$$

Drought Year Water Balance - Wells 3, 6, 8

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	
					20-week irrigation season									
Vineyard					(0.00)	(0.00)	(0.00)	(0.00)	(0.00)				(0.00)	
Residential	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.60	
Winery														
Winery domestic water	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.33	
Winery process water	0.02	0.03	0.03	0.02	0.03	0.03	0.04	0.04	0.06	0.06	0.05	0.03	0.42	
Winery landscape irrigation	0.01	0.01	0.03	0.04	0.05	0.05	0.06	0.05	0.04	0.03	0.01	0.01	0.39	
Well water to storage	0.04	0.01	0.01	0.01	0.00	(0.02)	(0.02)	(0.02)	(0.03)	(0.01)	0.01	0.02		
TOTAL	**0.14**	**0.13**	**0.14**	**0.15**	**0.15**	**0.14**	**0.15**	**0.15**	**0.15**	**0.15**	**0.15**	**0.14**	**1.73**	
days in month (for pumping rate calc)	31	28	31	30	31	30	31	31	30	31	30	31		
hours of pumping per day (for pumping rate calc)	12	12	12	12	12	12	12	12	12	12	12	12	**Average:**	
pumping rate from 3, 6, and 8 COMBINED (drought year)	2.1	2.0	2.0	2.2	2.2	2.1	2.2	2.2	2.2	2.2	2.2	2.0	**2.1**	**gpm**
Well water storage for irrigation (AF)	0.09	0.10	0.11	0.12	0.10	0.08	0.06	0.04	0.01	0.00	0.01	0.03	**Max:**	
Well water storage for irrigation (gal)	29,327	32,585	35,844	39,102	32,585	26,068	19,551	13,034	3,259	0	3,259	9,776	**39,102**	**gal Well Water Tank**

Drought Year Water Balance - Reclaimed Process Wastewater

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	
					20-week irrigation season									
Vineyard					0.15	0.15	0.15	0.15	0.15				0.73	
Residential														
Winery														
Winery domestic water														
Winery process water	(0.03)	(0.05)	(0.05)	(0.04)	(0.05)	(0.05)	(0.07)	(0.08)	(0.11)	(0.11)	(0.08)	(0.06)	(0.77)	
Winery landscape irrigation	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.04	
TOTAL	**0.03**	**0.04**	**0.04**	**0.03**	**(0.10)**	**(0.10)**	**(0.08)**	**(0.07)**	**(0.04)**	**0.10**	**0.08**	**0.06**	**0.00**	
Reclaimed process wastewater storage required (AF)	0.28	0.32	0.37	0.40	0.30	0.20	0.12	0.04	0.00	0.10	0.19	0.25	**Max:**	
Reclaimed process wastewater storage required (gal)	90,703	105,254	119,430	130,733	96,661	64,865	37,994	13,847	0	34,177	61,227	81,003	**130,733**	**gal Recycled PWW Tank**

Drought Year Water Balance - Harvested Rainwater

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	
					20-week irrigation season									
Vineyard					0.00	0.00	0.00	0.00	0.00				0.00	
Residential														
Winery														
Winery domestic water														
Winery process water	0.01	0.02	0.02	0.02	0.02	0.02	0.03	0.04	0.05	0.05	0.04	0.03	0.35	
Winery landscape irrigation	0.01	0.01	0.03	0.04	0.05	0.06	0.06	0.05	0.04	0.03	0.01	0.01	0.40	
Rainfall - % of total (from Napa State Hospital averages)	20.4%	17.9%	13.5%	6.8%	2.7%	0.9%	0.1%	0.2%	1.3%	5.5%	12.1%	18.6%	100.0%	
Drought year (in)	2.94	2.58	1.94	0.97	0.39	0.12	0.01	0.04	0.19	0.79	1.74	2.68	14.40	
Drought year (AF)	(0.15)	(0.13)	(0.10)	(0.05)	(0.02)	(0.01)	(0.00)	(0.00)	(0.01)	(0.04)	(0.09)	(0.14)	(0.75)	
TOTAL	**0.13**	**0.10**	**0.05**	**(0.01)**	**(0.05)**	**(0.07)**	**(0.09)**	**(0.08)**	**(0.08)**	**(0.03)**	**0.04**	**0.10**	**0.00**	
Harvested rainwater storage required (AF)	0.27	0.37	0.42	0.41	0.36	0.29	0.20	0.12	0.03	0.00	0.04	0.14	**Max:**	
Harvested rainwater storage required (gal)	87,551	119,390	136,566	134,579	118,474	94,292	65,154	37,655	11,347	0	11,983	45,706	**136,566**	**gal Rainwater Tank**

Average Year Water Balance - Wells 3, 6, 8

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	
					20-week irrigation season									
Vineyard					(0.00)	(0.00)	(0.00)	(0.00)	(0.00)				(0.00)	
Residential	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.60	
Winery														
Winery domestic water	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.33	
Winery process water	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	
Winery landscape irrigation	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	
Well water to storage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
TOTAL	**0.08**	**0.08**	**0.08**	**0.08**	**0.08**	**0.08**	**0.08**	**0.08**	**0.08**	**0.08**	**0.08**	**0.08**	**0.92**	
days in month (for pumping rate calc)	31	28	31	30	31	30	31	31	30	31	30	31		
hours of pumping per day (for pumping rate calc)	12	12	12	12	12	12	12	12	12	12	12	12	**Average:**	
pumping rate from 3, 6, and 8 COMBINED (average year)	1.1	1.2	1.1	1.2	1.1	1.2	1.1	1.1	1.1	1.1	1.2	1.1	**1.1**	gpm
Well water storage for irrigation (AF)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**Max:**	
Well water storage for irrigation (gal)	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**gal Well Water Tank**

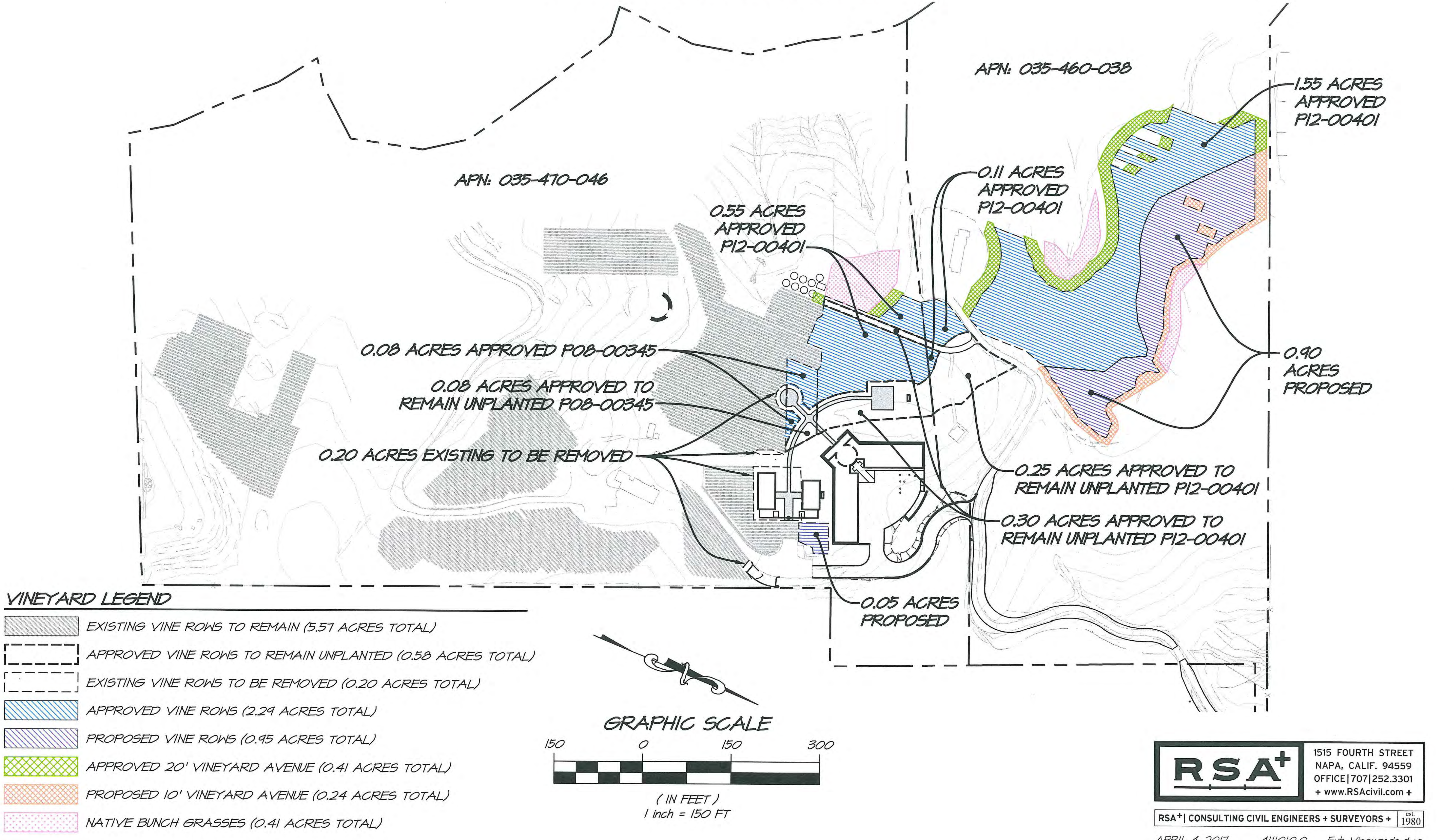
Average Year Water Balance - Reclaimed Process Wastewater

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	
					20-week irrigation season									
Vineyard					0.15	0.15	0.15	0.15	0.15				0.73	
Residential														
Winery														
Winery domestic water														
Winery process water	(0.03)	(0.05)	(0.05)	(0.04)	(0.05)	(0.05)	(0.07)	(0.08)	(0.11)	(0.11)	(0.08)	(0.06)	(0.77)	
Winery landscape irrigation	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.04	
TOTAL	**0.03**	**0.04**	**0.04**	**0.03**	**(0.10)**	**(0.10)**	**(0.08)**	**(0.07)**	**(0.04)**	**0.10**	**0.08**	**0.06**	**0.00**	
Reclaimed process wastewater storage required (AF)	0.28	0.32	0.37	0.40	0.30	0.20	0.12	0.04	0.00	0.10	0.19	0.25	**Max:**	
Reclaimed process wastewater storage required (gal)	90,703	105,254	119,430	130,732	96,661	64,864	37,993	13,847	0	34,176	61,227	81,002	**130,732**	**gal Recycled PWW Tank**

Average Year Water Balance - Harvested Rainwater

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	
					20-week irrigation season									
Vineyard					0.00	0.00	0.00	0.00	0.00				0.00	
Residential														
Winery														
Winery domestic water														
Winery process water	0.03	0.05	0.05	0.04	0.05	0.05	0.07	0.08	0.11	0.11	0.08	0.06	0.77	
Winery landscape irrigation	0.02	0.03	0.05	0.08	0.10	0.11	0.12	0.10	0.08	0.05	0.03	0.01	0.78	
Rainfall - % of total (from Napa State Hospital averages)	20.4%	17.9%	13.5%	6.8%	2.7%	0.9%	0.1%	0.2%	1.3%	5.5%	12.1%	18.6%	100.0%	
Average year (in)	6.13	5.37	4.05	2.03	0.82	0.26	0.02	0.07	0.39	1.65	3.62	5.59	30.00	
Average year (AF)	(0.32)	(0.28)	(0.21)	(0.11)	(0.04)	(0.01)	(0.00)	(0.00)	(0.02)	(0.09)	(0.19)	(0.29)	(1.55)	
TOTAL	**0.27**	**0.20**	**0.11**	**(0.01)**	**(0.10)**	**(0.15)**	**(0.18)**	**(0.17)**	**(0.17)**	**(0.08)**	**0.07**	**0.21**	**0.00**	
Harvested rainwater storage required (AF)	0.55	0.76	0.87	0.86	0.76	0.60	0.42	0.25	0.08	0.00	0.07	0.29	**Max:**	
Harvested rainwater storage required (gal)	180,406	246,430	282,319	278,828	246,121	196,699	136,769	79,874	24,598	0	23,994	93,432	**282,319**	**gal Rainwater Tank**

ANTHEM WINERY
VINEYARD EXHIBIT



Appendix A

Maximum Applied Water Allowance - Napa

Anthem Winery, based on planting plan dated 10/27/15

The following calculations will help you determine your site specific water budget and establish a planting mix that will allow you to meet your water budget. Your Estimated Total Water Use must be less than your Maximum Applied Water Allowance.

Section B2. Maximum Applied Water Allowance (MAWA)

MAWA = (ETo) (0.62)[(0.7x LA) + (0.4 x SLA)]

Where:

ETo = Annual Net Reference Evapotranspiration (inches)

0.7 = ET Adjustment Factor

LA = Landscaped Area (square feet)

0.62 = Conversion factor (to gallons per square foot)

SLA = Portion of the landscape area identified as Special Landscape Area (square feet)

0.4 = the additional ET adjustment factor for Special Landscape Area (1.0 - 0.6 = 0.4)

A.) Net Evapotranspiration Calculation

44.30 *(Annual ETo)*

27.50 *(Annual Rainfall)* x .25 = 6.88 *(Effective Rainfall)*

Net ETo Calculation = Annual ETo - Effective Rainfall = 37.43

B.) Adjusted Landscape Area Calculation

31248 *(Landscaped Area)* x 0.7 *Adjustment Factor* = 21873.6

0 *(Special Landscaped Area)* x 0.4 *Adjustment Factor* = 0

Sum of Adjusted Landscape Area = 21873.6

MAWA = 37.43 x 0.62 x 21873.6 = 507,544 gallons/year

Section B3. Estimated Total Water Use (ETWU)

A.) Net Evapotranspiration Calculation

Net ET Calculation = Annual ETo - Effective Rainfall = 37.43

B.) Adjusted Landscape Area Calculation

8800 *(Very Low water use plant sqft)* x 0.1 = 880

15248 *(Low water use plant sqft)* x 0.3 = 4574.4

7200 *(Moderate water use plant sqft)* x 0.6 = 4320

0 *(High water use plant sqft)* x 1.0 = 0

Sum of Adjusted Landscape Area = 9,774

ETWU = 37.43 x 0.62 x 9,774 / 0.85 = 266,824 gallons/year

Irrigation Efficiency Factor

Percent of total landscape Irrigated with Drip			
0-25%			0.71
26-50%			0.75
51-75%			0.80
76-100%			0.85

Section B1. Hydrozone Information Table

Zone	Plant Name	Water Use	Qty	Area/plant at maturity	Total Area of plants at maturity	Size	Method of irrigation	GPM	% of total landscaped area
1	Morus alba 'Fruitless'	Moderate	16	400	6400	36" box	Drip	1.6	20.48%
2	Fruit Tree TBD	Moderate	2	400	800	B&B	Drip	0.2	2.56%
3	Olea europaea 'Sevillano'	Very Low	10	400	4000	Field Dug	Drip	3.33	12.80%
4	Quercus agrifolia	Very Low	12	400	4800	72" box	Drip	4	15.36%
5	Arbutus 'Marina'	Low	8	400	3200	48" box	Drip	1.33	10.24%
6	Arctostaphylos 'Louis Edmunds'	Low	42	100	4200	5 gal	Drip	1.4	13.44%
6	Arctostaphylos 'Dr. Hurd'	Low	26	100	2600	24" box	Drip	1.73	8.32%
6	Ceanothus 'Yankee Point'	Low	13	100	1300	5 gal	Drip	0.43	4.16%
7	Perovskia atriplicifolia 'Blue Spires'	Low	128	9	1152	5 gal	Drip	4.27	3.69%
7	Salvia leucantha 'Midnight'	Low	321	4	1284	5 gal	Drip	10.7	4.11%
7	Agastache 'Blue Fortune'	Low	93	4	372	1 gal	Drip	1.55	1.19%
7	Agastache rupestris 'Licorice Mint'	Low	71	4	284	1 gal	Drip	1.18	0.91%
7	Erigeron karvinskianus	Low	184	4	736	1 gal	Drip	3.07	2.36%
8	Nepeta faassenii 'Blue Wonder'	Low	30	4	120	1 gal	Drip	0.5	0.38%
		Total area of all plants at maturity:			31,248				100.00%

Summary Hydrozone Table

Hydrozone		Area (sf)	% of Total Landscape Area
High Water Use		0	0.00%
Moderate Water Use		7,200	23.04%
Low Water Use		15,248	48.80%
Very Low Water Use		8,800	28.16%
	Total:	**31,248**	**100%**

NAPA STATE HOSPITAL, CA

Monthly Sum of Precipitation (Inches)

(46074)

File last updated on Sep 29, 2015
a = 1 day missing, b = 2 days missing, c = 3 days, ..etc..,
z = 26 or more days missing, A = Accumulations present
Long-term means based on columns; thus, the monthly row may not
sum (or average) to the long-term annual value.
MAXIMUM ALLOWABLE NUMBER OF MISSING DAYS : 5
Individual Months not used for annual or monthly statistics if more than 5 days are missing.
Individual Years not used for annual statistics if any month in that year has more than 5 days missing.

YEAR(S)	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
1893	4.27	2.19	4.28 n	1.05	0.49	0.00	0.00	0.00	0.19	0.17	4.03	1.86	14.25 a
1894	8.17	2.97	1.15	----- z	1.49 y	0.85	----- z	0.04	----- z	----- z	1.34	9.37	23.89 e
1895	9.35	2.92	2.21	1.11	----- z	----- z	----- z	----- z	1.16	0.03	1.72 w	1.47 v	16.78 f
1896	9.28	0.25	3.59 r	6.28	1.10	----- z	0.00	----- z	----- z	1.20	5.03	3.41	26.55 d
1897	----- z	5.68	5.37 r	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	5.68 k
1898	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	0.00 l
1899	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	0.00 l
1900	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	0.00 l
1901	----- z	----- z	----- z	----- z	1.11	0.00	0.00	0.00	0.89	1.32	3.88	2.15	9.35 d
1902	1.58	12.16	3.66	2.55	1.23	0.00	0.00	0.02	0.00	4.84 y	4.13	2.94 y	25.33 b
1903	3.22 w	2.11	5.15 s	----- z	0.00	0.00	0.00	0.00	0.00	----- z	4.25	----- z	6.36 e
1904	0.92	8.23 m	7.93	1.70 t	0.04	0.00	0.00	0.08	4.79	2.63	2.01	2.40	20.80 b
1905	4.40	2.77	3.44 s	----- z	----- z	0.00	0.00	0.00	0.00	----- z	1.00	1.17	9.34 d
1906	6.36 u	4.28	6.77 p	0.43	3.23 y	0.45 y	0.00	0.00	0.14	0.00	----- z	5.87 t	4.85 f
1907	6.50	4.44 s	8.37	0.42	0.26	0.85	0.00	0.00	0.01	0.62	----- z	4.37 q	17.03 c
1908	4.15 s	3.96 v	0.80	0.14	0.75	----- z	0.00	0.00	0.00	----- z	2.25	2.43 v	3.94 e
1909	15.04 g	7.22 k	3.02 w	0.00	0.00	0.02	0.00	0.00	----- z	1.62 w	2.45	6.61 s	2.47 f
1910	3.19	2.01	3.59 s	0.54	0.00	----- z	0.00	0.00	0.13	0.84	0.39	1.35	8.45 b
1911	13.50	2.22	5.17 v	1.32	0.21	0.03	0.00	0.00	0.00	0.53	0.75	2.05	20.61 a
1912	3.16	0.58	3.37	1.47	2.12	----- z	0.00	----- z	2.52	0.54	3.94	1.35	19.05 b
1913	4.53	0.30	2.08	0.94	0.55	0.20	0.01	0.00	0.00	0.51	5.22	7.45	21.79
1914	12.81	6.01	0.99	0.88	0.48	0.15	0.00	0.00	0.00	1.11	0.61	----- z	23.04 a
1915	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	0.80	6.65 v	0.80 k
1916	15.12	3.23	----- z	----- z	0.23	----- z	----- z	----- z	----- z	----- z	----- z	----- z	18.58 i
1917	----- z	6.19	1.28	0.92	0.51	0.00	0.00	0.00	0.09	0.00	0.47	1.30	10.76 a
1918	1.04	6.48	2.91	0.75	0.06	0.00	0.00	0.00	2.65	0.43	3.61	1.82	19.75
1919	3.75	11.46	2.98 a	0.14	0.02	0.00	0.00	0.00	0.44	0.37	0.30	4.62	24.08
1920	0.39	1.03	3.53	1.54	0.00	0.18	0.00	0.00	0.15	1.91	4.56	6.19	19.48
1921	6.44	1.28	1.55	0.64	1.19	0.00	0.00	0.00	0.04 a	0.62	1.55	----- z	13.31 a
1922	2.16	5.87	2.46	0.68	0.38	0.21	0.00	0.00	0.00	3.86	4.45	9.21	29.28
1923	3.09	0.54	0.02	4.92	0.00	0.00	0.00	0.26	0.64	0.26	0.35	0.84	10.92
1924	2.58	3.53	1.35	0.35	0.10	0.00	0.00 d	0.16	0.00	3.20	2.50	6.27	20.04
1925	1.37	10.39	2.64	2.49	2.83	0.02	0.00	0.00	0.45	0.56	2.91	1.14	24.80
1926	5.15	8.27	0.12	4.98	0.50	0.00	0.00	0.07	0.00	2.31	10.35	1.21	32.96
1927	3.56	10.83	2.96	2.50	0.56	0.51	0.00	0.00	0.00	2.21 a	4.04	5.77	32.94
1928	3.19	2.21	6.54	0.63	0.32	0.00	0.00	0.00	0.01	0.07	0.75	4.96	18.68
1929	1.08	1.18	1.80	1.87	0.08	1.95	0.00	0.00	0.00	0.04	0.00	5.10	13.10
1930	5.30	2.47	3.90	1.36	0.54	0.00	0.00	0.00	0.96	1.60	1.88	0.56	18.57
1931	6.20	0.95	2.01	0.62	1.46	0.52	0.00	0.00	0.00	0.66	2.88	11.58	26.88
1932	3.81	1.45	0.96	1.01	0.95	0.12	0.00 a	0.00	0.00	0.00	0.83	3.16	12.29
1933	5.59	1.07	2.02 j	1.87 a	0.08	1.95	0.00	0.00	0.00	2.19	0.00	4.91	17.66 a
1934	1.52	3.96	0.42	0.68	0.78	0.04	0.00	0.05	0.03	1.52	5.07	3.34	17.41
1935	5.54	1.85	4.42	3.52	0.02	0.00	0.00	0.21	0.02	2.10	0.88	2.45	21.01
1936	5.98	8.69	1.85	1.62	0.26	0.70	0.03	0.04	0.00	0.30	0.00	2.94	22.41
1937	4.14	6.27	6.40	0.91	0.03	0.65	0.20	0.00	0.00	1.23	3.75	5.17	28.75
1938	4.29	11.38	6.31	1.88	0.00	0.00	0.00	0.00	0.11	1.49	1.14	1.12	27.72
1939	2.58	1.87	2.38	0.36	1.22	0.00	0.00	0.00	0.03	0.49 c	0.12	1.32	10.37
1940	10.11	9.47	6.31	0.76	1.32	0.00	0.00	0.00	0.20	1.26	1.61	10.90	41.94
1941	8.84	7.27	5.26	5.20	1.45	0.07	0.00	0.00	0.00	2.60	2.88	9.52	43.09

YEAR(S)	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
1942	5.32	6.35	4.07	4.51	1.36	0.00	0.00	0.00	0.01	1.15	4.81	4.29	31.87
1943	8.17	1.68	3.47	1.60	0.00	0.06	0.00	0.00	0.00	0.66	1.54	2.29	19.47
1944	4.93	6.90	1.47	1.94	1.25	0.99	0.00	0.00	0.00	1.58	4.67	2.01 g	23.73 a
1945	1.10	4.87	3.88	0.26	0.95	0.00	0.00	0.00	0.00	3.40	3.21	9.69	27.36
1946	1.26	1.96	2.03	0.25	0.62	0.00 b	0.01	0.00 a	0.03	0.34	----- z	3.24	9.74 a
1947	0.80	2.87	4.63	0.78	0.43	1.16	0.00	0.00	0.00	4.65	0.96	0.58	16.86
1948	1.70	1.21	4.08	4.61	1.35	0.09	0.00	0.00	0.21	0.90	1.24	3.98	19.37
1949	1.87	2.75	6.33	0.00	0.20	0.00	0.00	0.20 a	0.00	0.00	2.44	2.16	15.95
1950	7.71	3.75	2.41	1.07	0.28	0.00	0.00	0.00	0.00	3.17	6.81	8.18	33.38
1951	5.59	2.11	2.09	0.84	1.52	0.00	0.00	0.00	0.06	1.24	3.83	8.64	25.92
1952	10.05	2.32	4.46	0.77	0.37	0.59	0.00	0.00	0.02	0.00	2.39	11.70	32.67
1953	5.03	0.00	3.37	3.17	0.63	0.58	0.00	0.10	0.00	0.44	3.35	0.88	17.55
1954	3.60	2.91	4.34	2.25	0.41	0.16	0.00	0.44	0.00	0.15	3.13	5.26	22.65
1955	3.04	1.96	0.53	1.93	0.20	0.00	0.00	0.00	0.58	0.07	2.32	16.13	26.76
1956	8.16	4.14	0.24	2.46	0.76	0.03	0.00	0.00 a	0.22	1.77	0.06	0.42	18.26
1957	2.95	5.18	2.06	1.57	3.60	0.25	0.00	0.00	1.31	2.88	0.75	3.67	24.22
1958	5.83	10.78	5.38	5.93	1.14	0.37	0.00	0.00	0.00	0.15	0.12	1.40	31.10
1959	5.48	7.60	1.09	0.19	0.00	0.00	0.00	0.00	2.37	0.00	0.00	1.92	18.65
1960	4.52	4.61	3.37	1.22	1.70	0.00	0.00	0.00	0.00	0.23	4.23	3.05	22.93
1961	4.10	1.63	3.92	1.21	0.21	0.03	0.00	0.08	0.23	0.14	3.01	3.02	17.58
1962	1.23	8.02	3.28	0.37	0.00	0.00	0.00	0.11	0.20	10.37	0.97	3.93	28.48
1963	4.71	3.79	4.91	5.66	0.44	0.00	0.00	0.00	0.29	2.83	5.71	0.73	29.07
1964	3.46	0.19	2.09	0.10	0.15	0.65	0.10	0.06	0.00	1.48	3.37	7.93	19.58
1965	5.18	0.80	1.68	3.29	0.00	0.00	0.04	0.85	0.00	0.03	5.11	3.78	20.76
1966	5.69	3.14	0.33	0.75	0.19	0.19	0.04	0.18	0.06	0.00	6.61	4.55	21.73
1967	11.65	0.46	6.08	5.42	0.12	1.95	0.00	0.00	0.09	0.80	1.49	2.07	30.13
1968	6.50	2.99	2.41	0.45	0.36	0.00	0.00	0.25	0.00	1.62	2.90	4.87	22.35
1969	8.30	7.58	1.03	1.59	0.00	0.03	0.00	0.00	0.00	3.14	1.30	7.22	30.19
1970	13.77	1.92	1.97	0.08	0.00	0.46	0.00	0.00	0.00	1.55	7.28	8.40	35.43
1971	1.68	0.28	3.57	0.49	0.21	0.00	0.00	0.00	0.24	0.09	2.30	4.81	13.67
1972	0.93	1.50	0.15	1.62	0.12	0.25	0.00	0.00	1.23	3.34	6.95	3.39	19.48
1973	11.37	5.61	3.10	0.11	0.02	0.00	0.00	0.00	0.41	1.64	10.51	4.40	37.17
1974	4.96	1.84	5.71	1.97	0.02	0.00	1.05	0.00	0.00	1.04	0.99	2.92	20.50
1975	2.39	6.79	7.17	1.30	0.03	0.00	0.14	0.00	0.00	3.64	0.79	0.46	22.71
1976	0.34	1.97	1.62	1.40	0.00	0.00	0.00	1.30	0.84	0.46	1.26	1.27	10.46
1977	1.75	1.50	2.58	0.48	1.21	0.00	0.00	0.00	0.72	0.49	7.90	5.91	22.54
1978	10.17	4.64	5.62	3.77	0.02	0.00	0.00	0.00	0.83	0.00	2.53	1.11	28.69
1979	10.34	5.35	1.98	1.79	----- z	0.00	0.00	0.00	0.00	3.59	3.22	7.29	33.56 a
1980	7.45	10.01	1.84	1.48	0.55	0.07	0.13	0.00	0.00	0.24	0.19	3.32	25.28
1981	5.92	1.58	4.03	0.32	0.44	0.00	0.00	0.00	0.17	2.64	7.44	7.66	30.20
1982	10.55	4.42	7.53	3.97	0.00	0.00	0.00 a	0.00	1.58	3.63	7.74	3.41	42.83
1983	7.70	10.62	11.07	3.94	0.49	0.00	0.00	0.73	0.86	0.77	7.98	7.08	51.24
1984	0.37	2.40	2.07	1.09	0.14	0.47	0.04	0.34	0.09	2.03	7.77	1.48	18.29
1985	1.75	2.79	4.42	0.08	0.03	0.05	0.00	0.00	0.79	0.78	3.88	2.97	17.54
1986	4.50	15.29	7.08	0.82	0.19	0.01	0.00	0.00	1.52	0.26	0.15	1.98	31.80
1987	4.11	4.63	4.28	0.16	0.00	0.00	0.00	0.00	0.00	1.52	2.20	7.65	24.55
1988	5.06	0.48	0.13	2.29 a	1.04	0.19	0.00	0.00 a	0.00	0.11	4.41	3.39	17.10
1989	1.37	1.37	6.79	0.90	0.08	0.09	0.00	0.00	2.31	1.48	1.68	0.00	16.07
1990	4.05	3.50	1.18	0.34	3.27	0.00	0.00	0.00	0.36	0.23	0.54 d	0.99	14.46
1991	0.46	3.05	10.64	0.33	0.15	0.40	0.00	0.16	0.01	2.47	0.84	2.18	20.69
1992	2.28	7.34	4.28	0.63	0.00	1.09	0.00	0.00	0.00	3.09	0.27	8.28	27.26
1993	8.90	5.87	2.08	1.54	1.39	0.71	0.00	0.00	0.00	1.15	3.49	3.50	28.63
1994	2.56	3.62	0.19	1.27	1.57	0.04	0.00	0.00	0.00	1.31	6.17	3.84	20.57
1995	13.66	0.54	11.97	1.26	3.10	0.90	0.00	0.00	0.00	0.00	0.18	8.90	40.51
1996	8.21	9.60 b	2.35 f	3.81	3.72	0.00	0.00	0.00	0.03	1.94	3.18	12.92	43.41 a
1997	10.50	0.46	0.86	0.57	0.79	0.23	0.00	0.82	0.03	1.26	7.95	2.56	26.03
1998	8.73	14.15	2.68	1.55	2.99	0.15	0.00	0.00	0.15	0.76	4.76	1.02	36.94
1999	3.15	9.83	2.70	2.88	0.13	0.00	0.00	0.00	0.04	0.75	2.84	0.91	23.23
2000	5.36	9.88	2.92	1.69	1.54	0.12	0.00	0.00	0.11	2.29	1.34	1.22	26.47
2001	4.34	7.26	1.08	0.46	0.00	0.26	0.00	0.00	0.50	0.51	6.17	9.45	30.03
2002	3.50	1.93	2.63	0.30	1.25	0.00	0.00	0.00	0.00	0.00	3.38	13.21	26.20
2003	2.68	3.99	4.98	3.97	1.85	0.00	0.00	0.62	0.03	0.25	3.14	7.70	29.21
2004	3.60	6.52	0.86	0.34	0.10	0.00	0.00	0.00	0.14	2.48	2.51	7.93	24.48
2005	4.31 a	3.88	3.42	1.57	2.37	0.90	0.00	0.00	0.01	0.67	2.25	15.49	34.87
2006	4.69	3.71	8.41	5.75	1.19	0.11	0.00	0.00	0.00	0.66	3.30	3.71	31.53
2007	0.36	5.12	0.35	1.29	0.35	0.00	0.00	0.00	0.05	2.01	1.05	4.10	14.68
2008	10.06	3.44	0.35	0.19	0.08	0.00	0.00	0.00	0.00	0.59	3.00	2.57	20.28

YEAR(S)	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
2009	0.97	9.20	1.01	0.95	1.47	0.05	0.00	0.00	0.15	5.06	0.83	2.14	21.83
2010	9.19	3.98	2.63	3.86	1.16	0.00	0.00	0.00	0.00	3.71	3.05	8.64	36.22
2011	1.28 w	4.02 t	8.94 !	0.59 w	1.89 v	2.61 w	0.00	0.00	0.00	1.33 x	1.55 s	0.18	0.18 h
2012	4.89	1.50	9.04	2.48 b	0.00	0.04	0.00 a	0.00	0.00	1.51	4.80 c	7.87 b	32.13
2013	0.74	0.35	0.93	1.19 a	0.34	0.68	0.00	0.00	0.67	0.00	1.13 a	0.71 b	6.74
2014	0.11 b	10.91	3.38	2.88 a	0.00 a	0.00	0.00	0.05	0.49	0.98	2.42	11.97	33.19
2015	0.02 a	2.72 a	0.10	2.12 c	0.02 a	0.17 a	0.01 a	0.00	----- z	----- z	----- z	----- z	5.16 d

SUM OF MONTHLY MEAN RAINFALL = 24.53

Period of Record Statistics

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN	
MEAN	5.01	4.39	3.31	1.66	0.67	0.21	0.02	0.06	0.32	1.35	2.96	4.57	24.78	
S.D.	3.51	3.45	2.54	1.53	0.84	0.40	0.10	0.19	0.69	1.47	2.36	3.61	8.16	
SKEW	0.78	0.98	1.15	1.32	1.76	2.64	9.50	4.16	3.68	2.56	0.97	1.05	0.50	
MAX	15.12	15.29	11.97	6.28	3.72	1.95	1.05	1.30	4.79	10.37	10.51	16.13	51.24	
MIN	0.02	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.74	
YRS	111.00	113.00	105.00	111.00	112.00	110.00	115.00	114.00	113.00	109.00	112.00	106.00	91.00	
%	20.4	17.9	13.5	6.8	2.7	0.9	0.1	0.2	1.3	5.5	12.1	18.6		100.0

MEMORANDUM

APPENDIX
DRILLER'S LOGS, PERMITS, AND MAPS
RECEIVED BY NAPA COUNTY

FEE 79 DATE 9/14/88
RECEIPT NO 22431 BY ml

NAPA COUNTY HEALTH DEPARTMENT
DIVISION OF ENVIRONMENTAL HEALTH

A.P. NO. 35-010-55
Bee #1392

APPLICATION & PERMIT TO CONSTRUCT A WATER WELL

NAME Gene Pieratt (Owner) ADDRESS 3095 Redwood Rd (Job Location)

NAME Bess David (Well Driller) ADDRESS 1115 MT George DATE 10/14/88

TYPE OF WORK: NEW WELL X RECONDITIONING ____ DEEPENING ____
TYPE I PERMIT X DESTROY ____ OTHER ____
TYPE II PERMIT ____ TEST HOLE ____

PROPOSED USE: DOMESTIC X IRRIGATION ____ INDUSTRIAL ____ MUNICIPAL ____
TEST WELL ____ OTHER ____ HOT WATER ____

Sewage Disposal on site (existing or proposed) Public ____ Individual X Private ____
Distance from well to any part of nearest sewage disposal system 125+ feet.
(Sketch of site to accompany application) County road setback 50' feet from centerline.

TYPE OF EQUIPMENT TO BE USED: Rotary X Cable ____ Hand Dug ____ Other ____

WORKER'S COMPENSATION COVERAGE: (Check one of the following)

☐ A certificate of current Worker's Compensation Insurance coverage is presently on file with this office.

☐ A certificate of current Worker's Compensation Insurance is being filed with this application.

☐ I certify that in the performance of the work for which this permit is issued I shall not employ any person in any manner so as to become subject to the Worker's Compensation laws in California.

David W Bess
Signature of Applicant

10/14/88
Date

FOR OFFICE USE ONLY

	Date	By	Remarks
Pre-Inspection			
Class II Approval			
Permit Issued	9/14/88	[illegible]	
Const. Inspection	9/21/88	[illegible]	21' x 2"
Final Inspection			
Well Log Rec.			

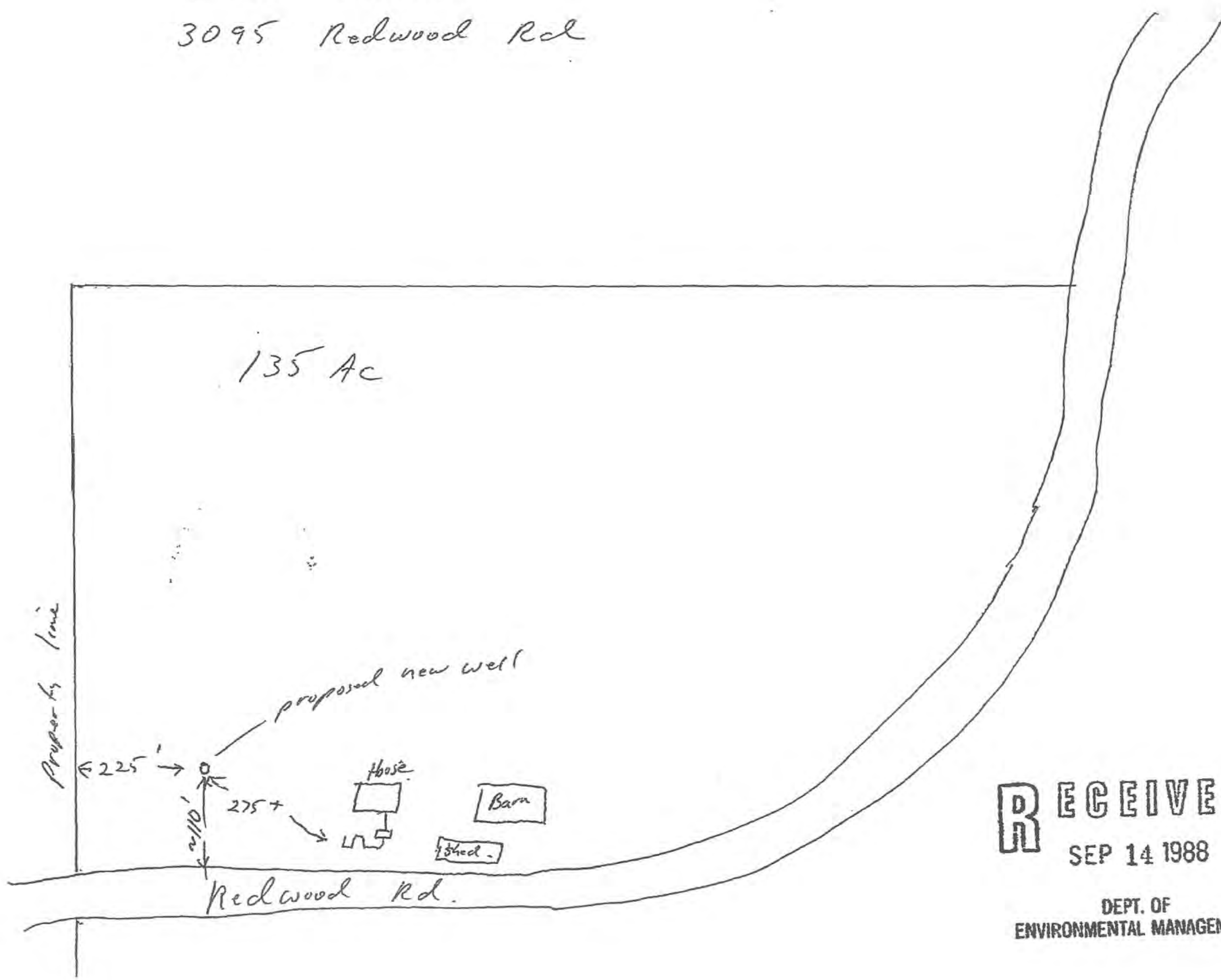
Old Wells to be Destroyed: ____

Other Remarks: ____

EH 91
Revised 12-80
White-Office Pink-Owner
Yellow-Return to Office Orange-Contractor

AP# 35-010-55

Gene Pieratt
3095 Redwood Rd



RECEIVED
SEP 14 1988
DEPT. OF
ENVIRONMENTAL MANAGEMENT

#3/18/91
1392

ORIGINAL
File with DWR

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
WATER WELL DRILLERS REPORT

Do not fill in

No. 366417

Notice of Intent No.
Local Permit No. or Date 9/14/88 AP# 35-010-55

State Well No.
Other Well No.

(1) OWNER: Name [redacted]
Address [redacted]
City [redacted] ZIP [redacted]

(2) LOCATION OF WELL (See instructions):
County Napa Owner's Well Number 2
Well address if different from above
Township Range Section
Distance from cities, roads, railroads, fences, etc.
Napa Rancho

WELL LOCATION SKETCH

(3) TYPE OF WORK:
New Well ☒ Deepening ☐
Reconstruction ☐
Reconditioning ☐
Horizontal Well ☐
Destruction ☐ (Describe destruction materials and procedures in Item 12)

(4) PROPOSED USE:
Domestic ☒
Irrigation ☐
Industrial ☐
Test Well ☐
Municipal ☐
Other ☐
(Describe)

(5) EQUIPMENT:
Rotary ☑ Reverse ☐
Cable ☐ Air ☑
Other ☐ Bucket ☐

(6) GRAVEL PACK:
Yes ☐ No ☑ Size 3/8
Diameter of bore 8"
Packed from 23 to 180 ft.

(7) CASING INSTALLED:
Steel ☐ Plastic ☑ Concrete ☐

(8) PERFORATIONS:
Type of perforation or size of screen

From ft.	To ft.	Dia. in.	Gage or Wall	From ft.	To ft.	Slot size
+2	180	5	.200	150	180	.030

(9) WELL SEAL:
Was surface sanitary seal provided? Yes ☑ No ☐ If yes, to depth 23 ft.
Were strata sealed against pollution? Yes ☐ No ☑ Interval ft.
Method of sealing Concrete Grout

(10) WATER LEVELS:
Depth of first water, if known 102 ft.
Standing level after well completion 72 ft.

(11) WELL TESTS:
Was well test made? Yes ☑ No ☐ If yes, by whom? Driller
Type of test Pump ☐ Bailer ☐ Air lift ☑
Depth to water at start of test 72 ft. At end of test 140' ft.
Discharge 50 gal/min after 2 hours Water temperature NA
Chemical analysis made? Yes ☐ No ☑ If yes, by whom?
Was electric log made Yes ☐ No ☑ If yes, attach copy to this report

(12) WELL LOG: Total depth 180 ft. Completed depth 180 ft.

from ft.	to ft.	Formation (Describe by color, character, size or material)
0	12	Top Soil
12	36	Dark Brown Clay
36	180	Blue Shale - Mixed
		with sand stone, Fractured

Work started 9/14 1988 Completed 9/25 1988

WELL DRILLER'S STATEMENT:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Signed [signature] (Well Driller)
NAME D Bess Pump & Well (Person, firm or corporation) (Typed or printed)
Address 2154 W Pueblo Ave
City Napa ZIP 94558
License No. 487027 Date of this report 9/25/88

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

DWR 188 (REV. 12-86) 86 96355

DATE 8/26/91
FEE 79-
RECEIPT NO. 29279
BY Cl

A.P.# 35-460-34/18
RECORD # ~~3607~~
#3867

NAPA COUNTY
DEPT. OF ENVIRONMENTAL MANAGEMENT
APPLICATION & PERMIT TO CONSTRUCT A WATER WELL

NAME Don Harms (Owner)   ADDRESS 3185 Dry Creek Napa (Job Location)

NAME Pulliam Drilling (Well Driller)   PHONE # 224 9396   ADDRESS 2877 Piedmont Napa   Napa

TYPE OF WORK New Class I PERMIT ✓ Test Hole Date Called In ____
New Class II PERMIT ____ U.S.G.S. Map Received ____
Well Reconstruction ____ Well Deepening ____ Horizontal Well ____
Well Destruction ____ High Hazard ____ Low Hazard ____ Hand Dug ____

PROPOSED USE DOMESTIC ____ IRRIGATION ✓ INDUSTRIAL ____ MUNICIPAL ____
TEST WELL ____ HOT WATER ____ (D.O.G. Clearance ____) OTHER ____

Sewage Disposal System (existing or proposed) Public ____ Individual ✓ Private ____
Distance from well to any part of nearest sewage disposal system 100 + feet.
Septic System Location Determined By: ____
Plot plan of well location received ____ County road setback ____ ft. from centerline.

WORKER'S COMPENSATION COVERAGE: (Check one of the following)
____ A certificate of current Worker's Compensation Insurance coverage is presently on file with this office.
____ A certificate of current Worker's Compensation Insurance is being filed with this application.
✓ I certify that in the performance of the work for which this permit is issued, I shall not employ any person in any manner so as to become subject to the Worker's Compensation laws in California.

****

TERMS OF PERMIT

1) Call at least 24 hours in advance to schedule an inspection.
2) Prior to receiving a Final Clearance on the well, a copy of the Department of Water Resources "Water Well Drillers Report" (DWR-188) must be returned to our Department.

Old Wells to be Destroyed: ____
Other Remarks: ____

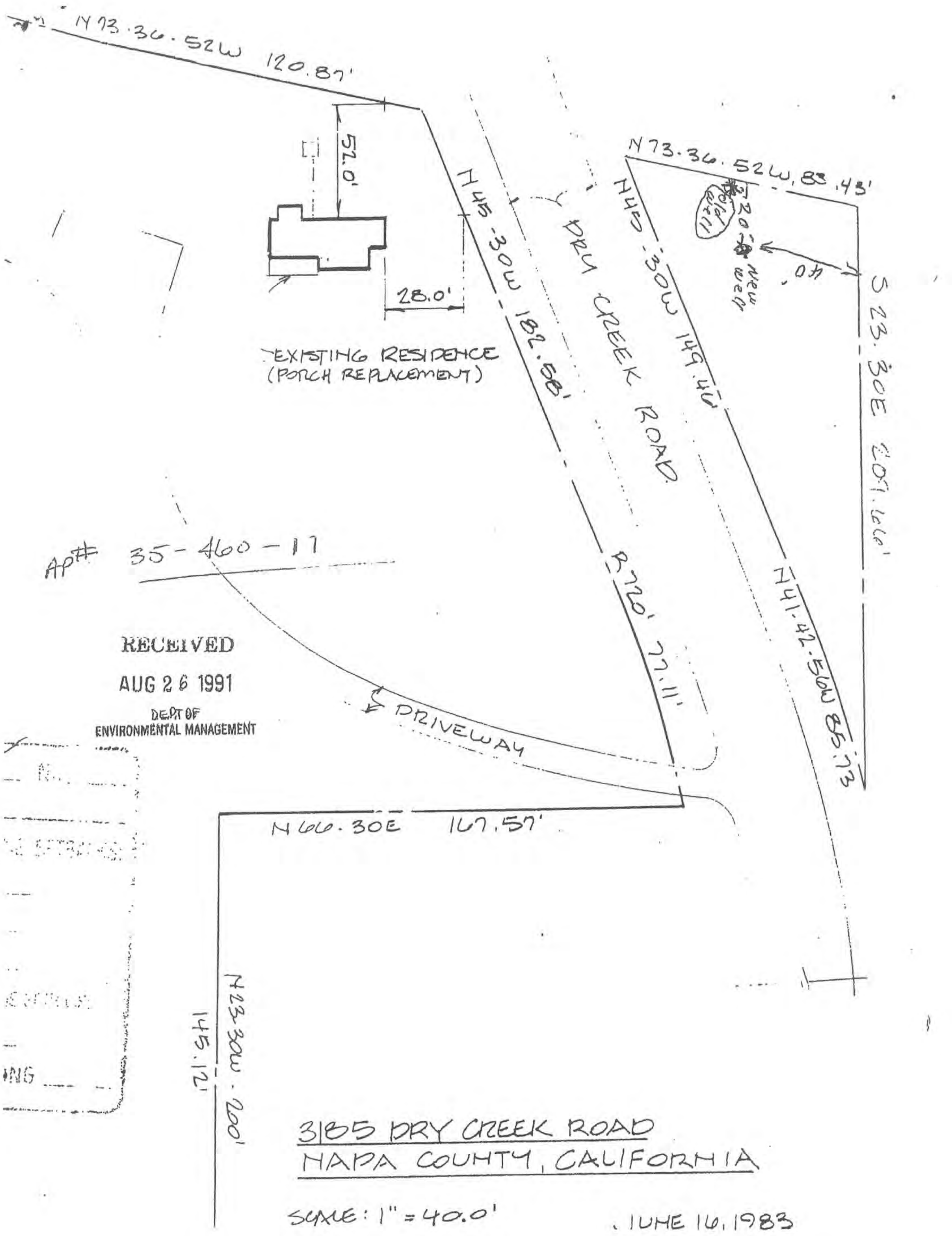
Tom Pulliam   8-26-91
Signature of Applicant   Date

****

FOR OFFICE USE ONLY

	Date	By	Remarks
City Clearance			
Pub. Works Clearance			
Pre-Inspection			
Class II Approval			
Permit Issued	8/26/91	J Michel	32 ft. seal (10.5 borehole, 5" casing.)
Const. Insp.	8/30/91	J Michel	
Well Log Rec.			
Final Insp.			

White-Office Yellow-Owner Pink-Contractor
EHM Form Letter#6 / 12-14-88


N73.36.52W 120.87'
52.0'
28.0'
EXISTING RESIDENCE
(PORCH REPLACEMENT)
N45.30W 182.58'
DRY CREEK ROAD
N45.30W 149.46
N73.36.52W, 83.43'
old well
20'
new well
40'
S23.30E 201.66'
N41.42.56W 85.73
R720' 77.11'
APN 35-460-17
RECEIVED
AUG 26 1991
DEPT OF
ENVIRONMENTAL MANAGEMENT
DRIVEWAY
N66.30E 167.57'
N23.30W 200'
145.12'
3185 DRY CREEK ROAD
NAPA COUNTY, CALIFORNIA
SCALE: 1" = 40.0'
JUNE 16, 1983

35-460-11 #3867 Chris

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES

WATER WELL DRILLERS REPORT

QUADRUPLICATE
Use to comply with local requirements

Do not fill in

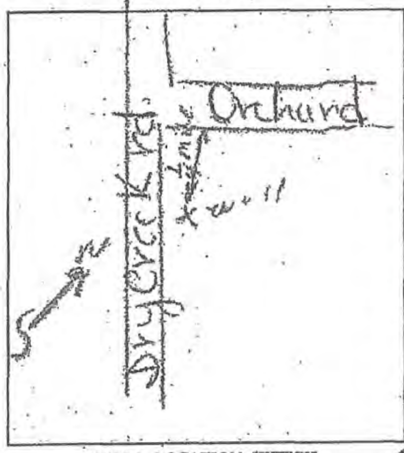
No. **384997**

State Well No. ______
Other Well No. ______

Notice of Intent No. ______
Local Permit No. or Date 2927 1/91

(1) OWNER: Name Don Harms
Address 3185 Dry Creek rd.
City Napa ZIP 94558

(2) LOCATION OF WELL (See instructions):
County 28 Owner's Well Number ______
Well address if different from above Same
Township 35 Range 4W Section 11
Distance from cities, roads, railroads, fences, etc. 4 mi. So of Orchard Ave on Dry Creek rd.



WELL LOCATION SKETCH

(3) TYPE OF WORK:
New Well ☑ Deepening ☐
Reconstruction ☐
Reconditioning ☐
Horizontal Well ☐
Destruction ☐ (Describe destruction materials and procedures in Item 12)

(4) PROPOSED USE:
Domestic ☑
Irrigation ☑
Industrial ☐
Test Well ☐
Municipal ☐
Other ☐
(Describe)

(5) EQUIPMENT:
Rotary ☑ Reverse ☐
Cable ☐ Air ☐
Other ☐ Bucket ☐

(6) GRAVEL PACK:
Yes ☑ No ☐ Size
Diameter of bore
Packed from 24 to 345 ft.

(7) CASING INSTALLED:
Steel ☐ Plastic ☑ Concrete ☐

(8) PERFORATIONS:
Type of perforation or size of screen

From ft.	To ft.	Dia. in.	Gage or Wall	From ft.	To ft.	Slot size
0	345	5	200	80	345	Factory

(9) WELL SEAL:
Was surface sanitary seal provided? Yes ☑ No ☐ If yes, to depth 24 ft.
Were strata sealed against pollution? Yes ☐ No ☑ Interval ______ ft.
Method of sealing Cement

(10) WATER LEVELS:
Depth of first water, if known ______ ft.
Standing level after well completion ______ ft.

(11) WELL TESTS:
Was well test made? Yes ☑ No ☐ If yes, by whom? Driller
Type of test Pump ☐ Bailer ☐ Air lift ☑
Depth to water at start of test 10 ft. At end of test 340 ft.
Discharge 32 gal/min after 5 hours Water temperature ______
Chemical analysis made? Yes ☐ No ☑ If yes, by whom?
Was electric log made Yes ☐ No ☑ If yes, attach copy to this report

(12) WELL LOG: Total depth 360 ft. Completed depth 345 ft.

from ft. to ft. Formation (Describe by color, character, size or material)

0 - 15 topsoil
15 - 16 sand
16 - 44' brown clay
44 - 47 sand & brown clay
47 - 175 brown clay
175 - 180 brown, black, red rock
180 - 210 brown clay
210 - 230 brown & black rock with brown clay
230 - 250 brown clay
250 - 260 [illegible] brown clay with rock
260 - 290 brown clay
290 - 310 blue clay & hard & brown rock
310 - 340 brown clay
340 - 360' brown clay some black rock

Work started 8-28 1991 Completed 9-4 1991

WELL DRILLER'S STATEMENT:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Signed [signature] (Well Driller)
NAME Pullium Well Drilling
(Person, firm, or corporation) (Typed or printed)
Address 2877 Redmont Ave.
City Napa ZIP 94558
License No. 412677 Date of this report 9-11-91

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

DWR 188 (REV. 12-86) 86 96355

CONFIDENTIAL NOT FOR PUBLIC WATER CODE SEC 13752

RECEIVED DEC 09 1991 DEPT. OF ENVIRONMENTAL MANAGEMENT

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RCS

RICHARD C. SLADE & ASSOCIATES LLC
CONSULTING GROUNDWATER GEOLOGISTS

March 23, 2018

To: Ms. Julie Arbuckle
Anthem Winery
Sent via email (jarbucke@sbcglobal.net)

Job No. 560-NPA01

From: Chris Wick, Anthony Hicke, and Richard Slade
Richard C. Slade & Associates LLC

Re: Response to Letter Titled
"Comments on Proposed Anthem Winery Draft Peer Review Response from Richard C. Slade & Associates, October 19, 2017"
Prepared by Luhdorff & Scalmanini Consulting Engineers (LSCE)
Dated January 22, 2018

We have reviewed the above-referenced letter from LSCE, and are providing the following additional information and/or analyses as requested therein. The specific comments from LSCE provided in their letter under the heading "Data Needed to Support Draft WAA Conclusions" are repeated in italicized text below. An RCS response to those recommended elements follows each of the reprinted original comments. Herein, the April 10, 2017 RCS-prepared Draft Memorandum titled "Results of Aquifer Testing of Project Wells and Napa County Tier 1 Water Availability Analysis for Proposed Anthem Winery" will be referred to as the "RCS WAA".

<u>LSCE Comment 1</u> - *"Given the very low pumping capacities demonstrated by aquifer tests reported in the Draft WAA and the need to import water to the parcels to meet existing demands in both 2013 and 2014, the Applicant should present all available flowmeter data and updated groundwater hydrographs at all monitored wells to document the ability of both the project wells and non-project wells to meet existing demands, to demonstrate the feasibility of pumping scenarios presented in the Draft Peer Review Response, and to support the conclusions of the Draft WAA."*

Because data from non-project wells are not necessary to support the WAA, the response below focuses on the project wells. It can be noted, however, that the total groundwater extraction from the non-project Wells 1, 5, and 7 (all serving the property owner's existing residence and vineyards on Parcel 2) has not exceeded the estimates presented in the RSA+ Tier 1 calculations for existing uses, and these three wells have been adequately supporting these existing uses on Parcel 2.

Figures 7C, 7E, and 7G, attached, are updated versions of the hydrographs for onsite Well Nos. 3, 6, and 8 (the onsite project wells that will be used to supply groundwater to the proposed project) that were originally presented in the RCS WAA. Data presented on Figures 7C, 7E, and 7G are updated through February 7, 2018. Because the hydrographs are updates of figures previously-provided in the RCS WAA, the figures presented herein are numbered to remain consistent with the previously-published data.

RCS has also recorded groundwater extraction data in the past at each onsite well beginning in roughly September 8, 2015 (except for Well 4, a non-project well), where no meter currently exists, but will be installed per RCS's and LSCE's recommendation). Based on the available data, the total groundwater extraction at the property does not appear to have exceeded the estimates presented in the RSA+ Tier 1 calculations for existing uses. Further, the existing onsite wells have performed adequately to support the non-project uses. For the project wells, the attached Table 1, "Totalizer Readings and Extraction Data, Project Wells, Anthem Winery," shows the groundwater extraction data collected from Well Nos. 3, 6, and 8 between September 8, 2015 and February 7, 2018.

LSCE Comment 2 - *"The Draft Peer Review Response and Draft WAA project a water demand for winery processes that is 29% below the rate referenced in the Water Availability Analysis Guidance Document (Napa County, 2015). The Applicant should provide a detailed rationale and documentation to support the proposed lower rate or recalculate the projected demand for winery process water use based on a rate of 7 gallons of water per gallon of wine produced."*

See attached letter from RSA+, the project engineer, in which a response to this comment is provided.

LSCE Comment 3 - *"The Draft Peer Review Response and Draft WAA project that all winery process water will be recaptured and reused without losses. The Applicant should provide a detailed rationale and documentation to support the projected 100% efficiency of winery process water reclamation or recalculate the available supply to account for losses."*

See attached letter from RSA+, the project engineer, in which a response to this comment is provided.

LSCE Comment 4 – *"The Applicant should provide supporting documentation to confirm the amounts of water and timing of delivery of water imported to the parcels in 2013 and 2014."*

Appended to this letter are copies of the invoices provided by the property owner for the water delivered to the property in 2013 and 2014 (referred to in the RCS WAA as "trucked water"). The invoices corroborate the statement from the October 19, 2017 Peer Review Response Memo prepared by RCS, as follows:

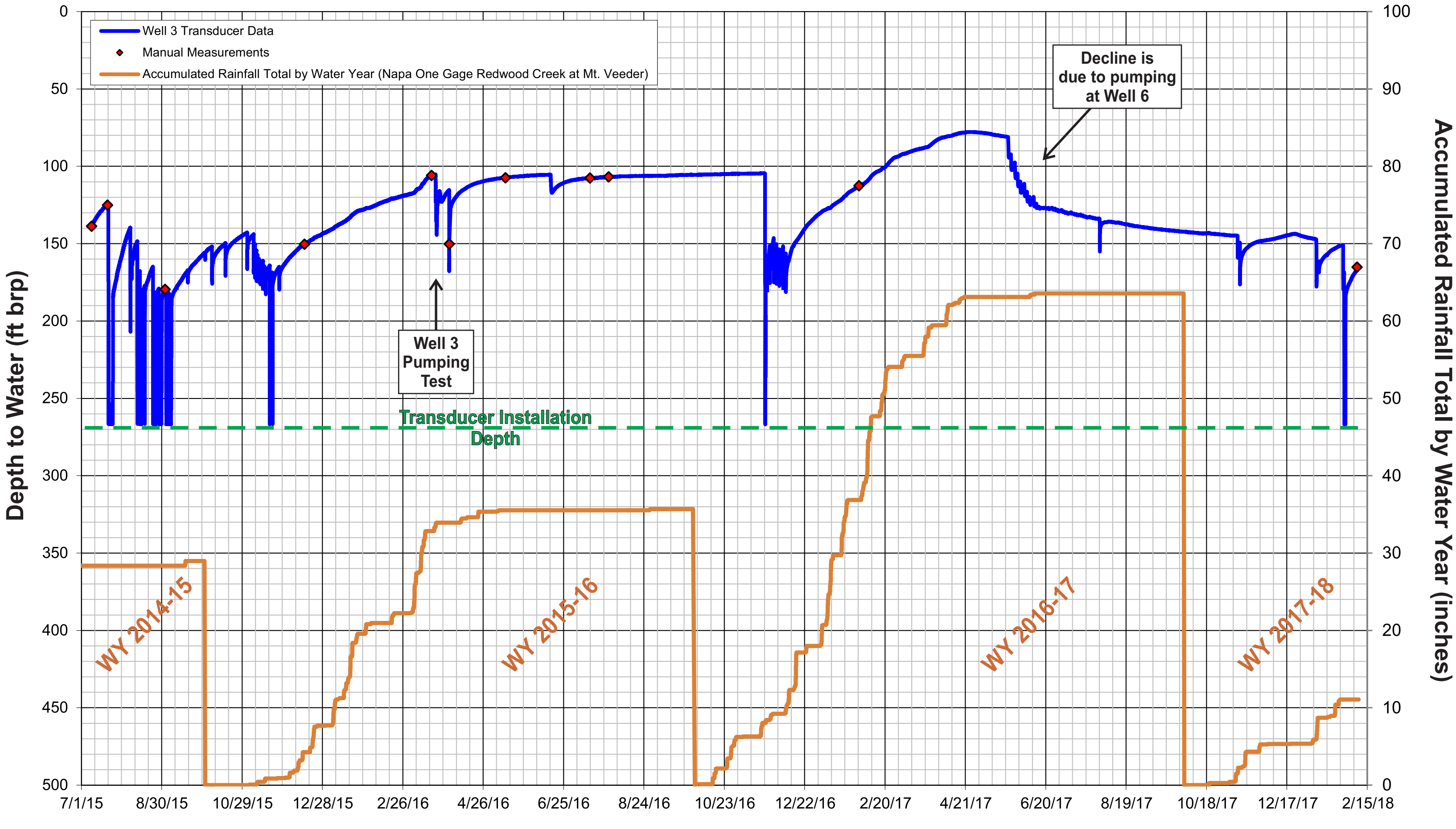
> *"As reported by the property owner, the following dates represent the only short periods of time in which water was trucked to the subject property:*
>
> *1) 143,000 gallons of water between Aug. 1 and Sept. 19, 2013.*
>
> *2) 152,750 gallons of water between July 16 and August 22, 2014.*
>
> *During those two events, the property owner imported only a fraction of the water necessary during its peak irrigation season in the 2013 and 2014 drought years for the following reasons:*
>
> - *Due to older infrastructure and irrigation plans for the property (that will be upgraded as part of the project), several vineyard blocks were irrigated*

simultaneously (in the future, irrigation of various blocks will be staggered over time).

- *The onsite vineyards did not yet have an underground irrigation system installed (underground irrigation systems reduce water use and allow for alternate irrigation cycles).*
- *Trucking in water was a preventative operational decision by the property owner to avoid the possibility of over pumping its few, then-existing wells.*
- *The property owner reports that they have had no reason to use and has not used outside (trucked-in) water since August 2014."*

The property owner also provides the following additional explanations for the decision to temporarily deliver water to the property in 2013 and 2014:

- The operational decision was made by the property owner at a time when trucking in water was relatively inexpensive, was tacitly encouraged by the City of Napa, and was considered to be a best practice to avoid over pumping wells serving vineyards during a drought; and
- Well 7 was constructed in early 2015 and has been used as an additional source of groundwater for existing onsite uses.

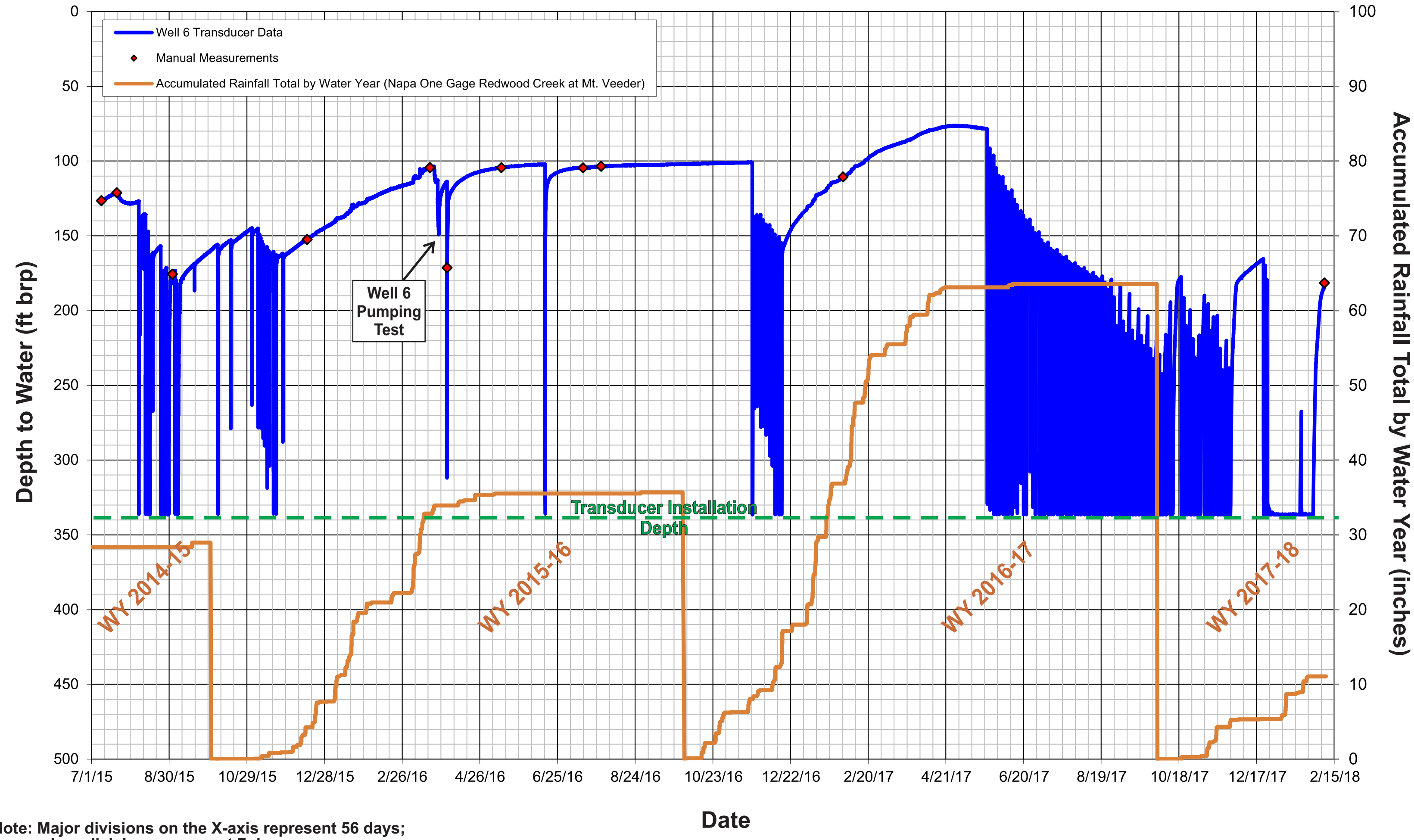


Note: Major divisions on the X-axis represent 56 days;
minor divisions represent 7 days.

RICHARD C. SLADE & ASSOCIATES LLC
CONSULTING GROUNDWATER GEOLOGISTS
14051 Burbank Boulevard, Ste. 300
Sherman Oaks, CA 91401
Southern California (818) 506-0418
Northern California (707) 963-3914
www.rcslade.com

Figure 7C
Water Level Data - Well 3
Anthem Winery

Job No. 560-NPA01 **March 2018**



Note: Major divisions on the X-axis represent 56 days; minor divisions represent 7 days.

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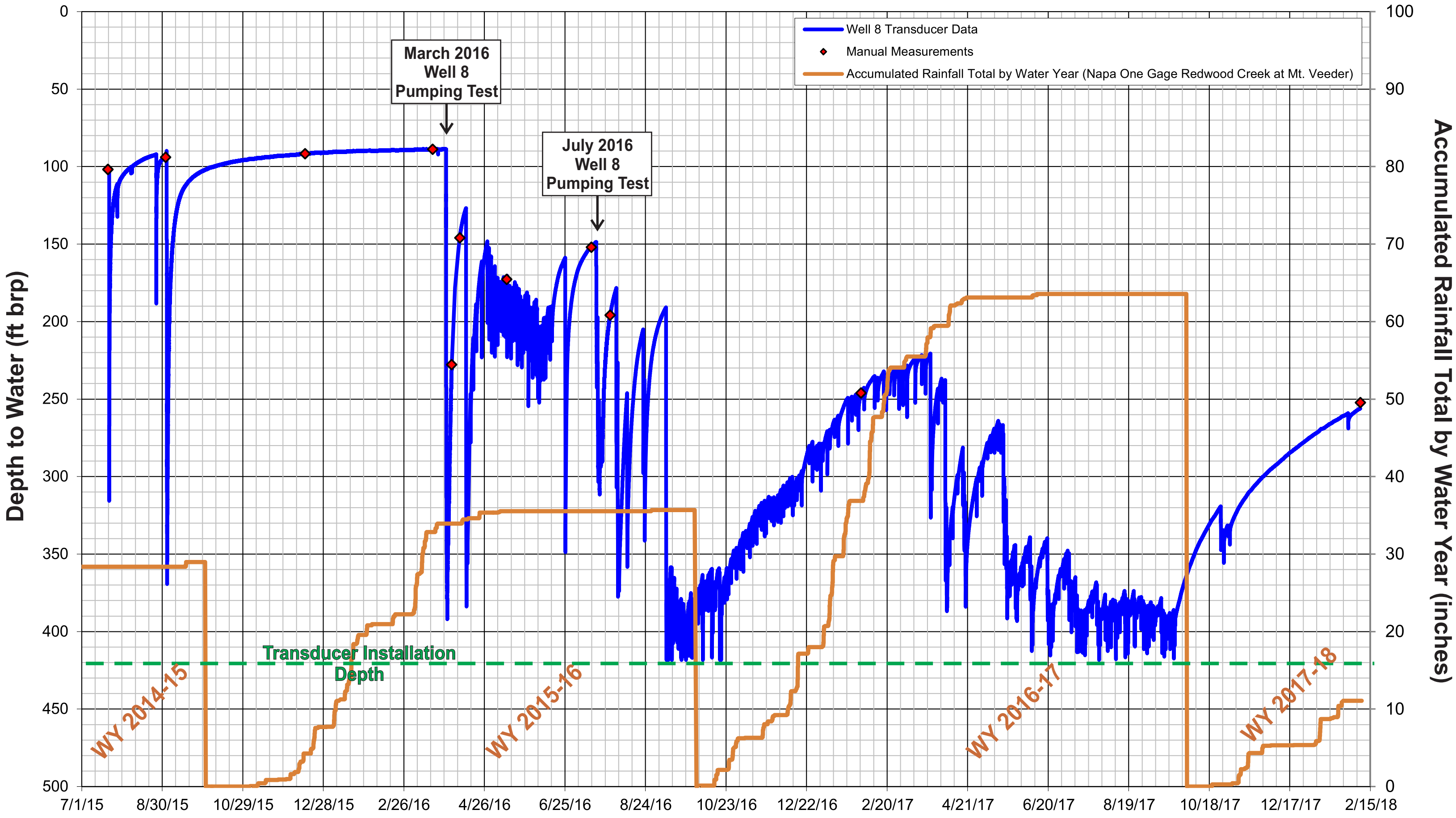
Figure 7E
Water Level Data - Well 6
Anthem Winery

Job No. 560-NPA01

March 2018



Note: Major divisions on the X-axis represent 56 days;
minor divisions represent 7 days.

RCS
RICHARD C. SLADE & ASSOCIATES LLC
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Figure 7G
Water Level Data - Well 8
Anthem Winery

Job No. 560-NPA01 **March 2018**

Totalizer Readings and Extraction Volumes
Anthem Winery

Date	Totalizer Reading (gal)		
	Well 3	Well 6	Well 8
7/8/2015	--	--	--
7/20/2015	--	--	--
9/1/2015	8597.9	11165.3	668.8
12/14/2015	16211.9	18554.7	5822.9
3/18/2016	16211.9	18554.8	5822.9
3/30/2016	18334.2	20843.9	15703.7
5/12/2016	18334.2	20844.0	30521.0
7/14/2016	18374.0	22125.3	47438.9
7/28/2016	18374.0	22125.3	55265.2
1/31/2017	25949.3	31579.8	138904.0
2/7/2018	31477.3	115655.7	243951.7

Annual Groundwater Extractions				
	Well 3	Well 6	Well 8	Total
2015 (from 7/8/2015 to 12/14/2015)				
Gallons	16211.9	18554.7	5822.9	40589.5
AF	0.05	0.06	0.02	0.12
2016 (from 12/14/2015 to 1/31/2017)				
Gallons	9737.4	13025.1	133081.1	0.0
AF	0.03	0.04	0.41	0.48
2017 (from 1/31/2017 to 2/7/2018)				
Gallons	5528.0	84075.9	105047.7	0.0
AF	0.02	0.26	0.32	0.60

Notes:
1. Total groundwater extraction volumes for 2015 are only partial since there are no totalizer data available prior to September 2015 for Wells 3, 6, 7, and 8.
2. It is assumed that the totalizer flow meter devices for Well 3, Well 6, and Well 8 were new at the time of installation and started at "0" gallons.
3. 1 AF = 325,851 gallons

APPENDIX

RSA+ LETTER TO NAPA COUNTY
IN RESPONSE TO COMMENTS
FOR PROPOSED ANTHEM WINERY

RSA+	RSA+	CONSULTING CIVIL ENGINEERS + SURVEYORS +	SERVING CALIFORNIA SINCE 1980	1515 FOURTH STREET NAPA, CALIFORNIA 94559 FAX | 707 | 252.4966 OFFICE | 707 | 252.3301
707 | 252.3301 | RSAcivil.com		HUGH LINN, PE, QSD, QSP PRINCIPAL + PRESIDENT hLinn@RSAcivil.com	CHRISTOPHER TIBBITS, PE, LS PRINCIPAL + VICE PRESIDENT cTibbits@RSAcivil.com	RSAcivil.com

#4111010.0
March 23, 2018

Donald Barella
Napa County Planning, Building, and Environmental Services
1195 Third Street, Suite 210
Napa, CA 94559

RE: Anthem Winery Use Permit - #P14-00320-UP
APN 035-470-046

Dear Donald:

Please find below RSA+'s response to Luhdorff and Scalmanini Consulting Engineers' comments dated January 22, 2018:

Comment 2: *The Draft Peer Review Response and Draft WAA project a water demand for winery processes that is 29% below the rate referenced in the Water Availability Analysis Guidance Document (Napa County, 2015). The Applicant should provide a detailed rationale and documentation to support the proposed lower rate or recalculate the projected demand for winery process water use based on a rate of 7 gallons of water per gallon of wine produced*

Response 2: **The Napa County Water Availability Analysis (WAA) Guidance Document adopts a guideline of 2.15 acre-feet of Process Water per 100,000 gallons of wine, which equates to 7 gallons of water to 1 gallon of wine. This is a conservative estimate, which has remained unchanged in the Napa County Use Permit process for at least 20 years. The 2015 WAA Guidance Document notes in Appendix B that each applicant is responsible for determining estimated water usage for their proposed project, and that each project has its own unique characteristics.**

In a 2016 presentation, Daniel A. Sumner at UC Davis estimated that "Big wineries," consisting of an 85% share of production in California, use approximately 3 gallons of water per gallon of wine. "Mid-sized wineries," consisting of a 10% share of production, use 6 gallons of water per gallon of wine. "Others," consisting of a 5% share of production, use up to 20 gallons of water per gallon of wine. See attached table of Estimated California Winery Water Use. The weighted average, based on percent share of production, is 4.15 gallons of water per gallon of wine.

Mr. Sumner did not define winery size categories in his presentation, but we typically consider large wineries to produce greater than 100,000 gallons annually, and small wineries to produce 10,000 gallons or less. For comparison, Anthem Winery is applying for a Use Permit to increase production to 50,000 gallons per year. With modern water-saving fixtures and best management practices Anthem

Winery Plans to use, we consider that it is reasonable to assume Anthem Winery can limit process water usage to 5 gallons water per gallon of wine.

Comment 3: *The Draft Peer Review Response and Draft WAA project that all winery process water will be recaptured and reused without losses. The Applicant should provide a detailed rationale and documentation to support the projected 100% efficiency of winery process water reclamation or recalculate the available supply to account for losses.*

Response 3: The design of Anthem Winery includes infrastructure and operational Best Management Practices to increase water efficiency and reduce losses. All processing will occur indoors, which will serve to minimize any process water losses due to evaporation during use. Process wastewater will be captured, treated, and stored in tanks instead of ponds, to avoid evaporation prior to re-use.

Sufficient storage will be provided to retain treated process wastewater until needed for irrigation. Approximately 95% of treated process wastewater will be stored and used for vineyard irrigation during the 20-week summer irrigation season. The remaining 0.04 acre-feet will be used for landscape irrigation throughout the year.

All new vineyards to be planted will include water-efficient underground irrigation, which will significantly reduce any losses during re-use. All landscape irrigation is designed to use high-efficiency drip irrigation.

Treated process wastewater will make up only 20% of on-site vineyard irrigation and 5% of landscape irrigation. With the above described operations and maintenance, it is unlikely there will be any calculable water losses associated with process water reclamation.

Please do not hesitate to contact me should you have any questions regarding the above.

Respectfully,

Bruce Fenton, P.E.
Project Manager

REGISTERED PROFESSIONAL ENGINEER
BRUCE FENTON
77859
Exp. 06/30/2019
CIVIL
STATE OF CALIFORNIA

BF/ms

Encl.

Estimated California Winery Water Use

California Wineries	Percent share of production	Gallons produced (millions)	Gallons Used for Production (millions)	Acre-feet of Water Used (thousand)	Gallons of water per gallon of wine
Big wineries	85	563	1,690	5.2	3
Mid-sized wineries	10	66	398	1.2	6
Others	5	33	663	2.0	20
Total/Ave.	100	663	2,751	8.4	4.15

Source: http://aic.ucdavis.edu/publications/Economic%20wine%20and%20water.pdf

APPENDIX

INVOICES FOR WATER DELIVERED TO ANTHEM WINERY IN 2013 AND 2014

PAID

(2000 gallon truck)

Invoice

SOLD TO Vinwerkes

~~SHIP TO~~ JOB

ADDRESS 1030 Seminary st. Suite C

ADDRESS 3454 Redwood Rd

CITY, STATE, ZIP Napa CA 94558

~~CITY, STATE, ZIP~~ Napa CA. 94558

CUSTOMER ORDER NO.	SOLD BY	TERMS	F.O.B.	DATE

ENTERED

ORDERED	SHIPPED	DESCRIPTION	PRICE	UNIT	AMOUNT
1	7/13/13	load Water	105 00		105 00
3	7/16/13	Loads Water	138 00		414 00
2	7/17/13	loads Water	138 00		276 00
2	7/18/13	Loads Water	138 00		276 00
2	7/19/13	Loads Water	138 00		276 00
3	7/21/13	Load Water SUN.	138 00		414 00
1	7/22/13	Load Water	138 00		138 00
2	7/24/13	Loads Water	138 00		276 00
3	7/25/13	Loads Annie 637-7714	138 00		414 00
2	7/26/13	Loads	138		276 00
		FAX 265-7714			$ 2865 00
		LUIS 320-8738			

A-5840 T-46706/46721

01-11

Invoice

SOLD TO Vinwerkes

SHIP TO

ADDRESS 1030 Seminary st. Suite C

ADDRESS 3454 Redwood Rd

CITY, STATE, ZIP Napa CA 94558

CITY, STATE, ZIP Napa CA. 94558

CUSTOMER ORDER NO.	SOLD BY	TERMS	F.O.B.	DATE

ENTERED

ORDERED	SHIPPED	DESCRIPTION	PRICE	UNIT	AMOUNT
3	7/28/13	Loads Water	138 00		414 00
2	7/29/13	Loads Water	138 00		276 00
2	7/30/13	Loads Water	138 00		276 00
2	7/31/13	Loads Water	138 00		276 00
4	8/2/14	Loads Water	138 00		552 00
1	8/2/13	Loads Water	138 00		138 00
3	8/5/13	Loads Water	138 00		414 00
2	8/6/13	Loads Water	138 00		276 00
2	8/8/13	Loads Water	138 00		276 00
		Annie 637 7714			$ 2898 00
		FAX 265 7714			

A-5840 T-46706/46721

01-11

$5763

HAM'S POTABLE WATER DELIVER
1084 FIRST AVE
NAPA CA 94558
707-815-2223 (2000 gallon truck)

211229

Invoice

SOLD TO	VinoWerkes	SHIP TO	JOB
ADDRESS	1030 Seminary St. Suite C	ADDRESS	3454 Redwood Rd
CITY, STATE, ZIP	Napa CA. 94558	CITY, STATE, ZIP	Napa CA 94558

CUSTOMER ORDER NO.	SOLD BY	TERMS	F.O.B.	DATE

ORDERED	SHIPPED	DESCRIPTION	PRICE	UNIT	AMOUNT
4	8/9/13	Loads Water	138.00		$552.00
3	8/12/13	Loads Water	138.00		414.00
2	8/13/13	Loads Water	138.00		276.00
2	8/14/13	Loads Water	138.00		276.00
2	8/15/13	Loads Water	138.00		276.00
1	8/16/13	Load Water	138.00		138.00
1	8/19/13	Load Water	138.00		138.00
1	8/20/13	Load Water	138.00		138.00
2	8/23/13	Loads Water	138.00		276.00
1	8/24/13	Load Water SAT.	138.00		138.00
					$2622.00

A-5840 T-46706/46721

01-11

Bingham's Potable Water Delivery

Thank you

PAID

BINGHAM'S POTABLE WATER DELIVERY
1084 FIRST AVE
NAPA CA 94558
707-815-2223

(2000 gallon truck)

No. 471770

Invoice

SOLD TO: Vineweekes

ADDRESS: 1030 Seminary St Suite C

CITY, STATE, ZIP: Napa, CA 94558

~~SHIP TO~~ JOB

ADDRESS: 3454 Redwood Rd

CITY, STATE, ZIP: Napa CA 94558

CUSTOMER ORDER NO.	SOLD BY	TERMS	F.O.B.	DATE

ORDERED	SHIPPED	DESCRIPTION	PRICE	UNIT	AMOUNT
2	8/27/13	loads water	138.00		276.00
2	8/29/13	loads water	138.00		276.00
1	8/30/13	Load Water	138.00		138.00
2	9/2/13	Loads Water	138.00		276.00
1	9/5/13	Load Water	138.00		138.00
2	9/10/13	Load Water	138.00		276.00
1	9/12/13	Load Water	138.00		138.00
					$1518.00

A-6840 T-48700/48721 01-11

Vinewerkes, Inc.

1030 Seminary St, STE C
Napa, CA 94559
707-257-2989

Invoice

Date	Invoice #
7/25/2014	18591

PAID

Client
Anthem Winery and Vineyards, LLC. 3454 Redwood Rd. Napa, CA 94558

Due date	Account Mgr.	Work Period
7/25/2014	JAT	7/7-7/20/14

Item	Description	Qty	Unit price	Amount
474	August Management Fee	1	400.00	400.00
	SUBTOTAL			400.00
249	**IRRIGATION**			
251.4 Irrigate	Irrigate	5	32.00	160.00
252.4 Irrigation R...	Irrigation R&M	3	32.00	96.00
	SUBTOTAL			256.00
349	**PEST/DISEASE CONTROL**			
355.4 Mildew Con...	Mildew Control - Operator/Equipment	10	90.00	900.00
370.4 Mildew Con...	Mildew Control - Operator/Bak-Pak Sprayer	10	45.00	450.00
925	Equipment Move In	2	85.00	170.00
544	PPE: Personal Protective Equipment	2	10.00	20.00
	SUBTOTAL			1,540.00
399	**FERTILIZER SOIL AMMENDMENT**			
402.4 Fertilizer A...	Fertilizer Additions - Hand Labor	5.5	32.00	176.00
	SUBTOTAL			176.00
449	**CANOPY MANAGEMENT**			
453.2 Leafing	Leafing	63	22.00	1,386.00
453.3 Leafing	Leafing	9.5	25.00	237.50
453.4 Leafing	Leafing	3	32.00	96.00
	SUBTOTAL			1,719.50
599	***DEVELOPMENT & PREPARATION**			
611.4 Misc. Labor	Misc. Labor: delivering water (11 trips) (3250 gallon truck)	11	225.00	2,475.00
614.4 Tree Removal	Tree Removal	2.5	32.00	80.00
	SUBTOTAL			2,555.00
		Total		

Labor rate includes all applicable state and federal payroll taxes, workers compensation, and overhead. Supplies are at cost.

#23968.07
#14167.04

Vinewerkes, Inc.

1030 Seminary St, STE C
Napa, CA 94559
707-257-2989

Invoice

Date	Invoice #
8/8/2014	18611

Client
Anthem Winery and Vineyards, LLC, 3454 Redwood Rd. Napa, CA 94558

Due date	Account Mgr.	Work Period
8/8/2014	JAT	7/21-8/3/14

Item	Description	Qty	Unit price	Amount
249	**IRRIGATION**			
251.4 Irrigate	Irrigate	10.5	32.00	336.00
	SUBTOTAL			336.00
449	**CANOPY MANAGEMENT**			
453.2 Leafing	Leafing	86.5	22.00	1,903.00
453.3 Leafing	Leafing	11	25.00	275.00
453.4 Leafing	Leafing	1.5	32.00	48.00
455.2 Crop Thin	Crop Thin	213.5	22.00	4,697.00
455.3 Crop Thin	Crop Thin	30.5	25.00	762.50
455.4 Crop Thin	Crop Thin	6.5	32.00	208.00
	SUBTOTAL			7,893.50
599	***DEVELOPMENT & PREPARATION**			
611.4 Misc. Labor	Misc. Labor: delivering water, 7 loads (3250 gallon truck)	18	225.00	4,050.00
	SUBTOTAL			4,050.00
899	**EQUIPMENT RENTAL**			
922	Portable Restroom	4	25.00	100.00
941	Weedeater + Labor	83.5	40.00	3,340.00
	SUBTOTAL			3,440.00
855	Liability Insurance 1.50%	15,719	0.015	235.79
			Total	$15,955.29

Labor rate includes all applicable state and federal payroll taxes, workers compensation, and overhead. Supplies are at cost.

Vinewerkes, Inc.

1030 Seminary St, STE C
Napa, CA 94559
707-257-2989

Invoice

Date	Invoice #
8/22/2014	18633

Client
Anthem Winery and Vineyards, LLC, 3454 Redwood Rd. Napa, CA 94558

Due date	Account Mgr.	Work Period
8/22/2014	JAT	8/4-8/17/14

Item	Description	Qty	Unit price	Amount
474	September Management Fee	1	400.00	400.00
	SUBTOTAL			400.00
249	**IRRIGATION**			
251.4 Irrigate	Irrigate	9.5	32.00	304.00
	SUBTOTAL			304.00
349	**PEST/DISEASE CONTROL**: Installing the bird net			
352.2 Deer/Bird/G...	Deer/Bird/Gopher control	16	22.00	352.00
352.3 Deer/Bird/G...	Deer/Bird/Gopher control	9.5	25.00	237.50
352.4 Deer/Bird/G...	Deer/Bird/Gopher control	3	32.00	96.00
	SUBTOTAL			685.50
399	**FERTILIZER SOIL AMMENDMENT**			
402.4 Fertilizer A...	Fertilizer Additions - Hand Labor	1.5	32.00	48.00
	SUBTOTAL			48.00
549	**VINEYARD LAYOUT / TRELLIS**			
556.2 Misc. Trelli...	Misc. Trellis Labor	37.5	22.00	825.00
	SUBTOTAL			825.00
599	***DEVELOPMENT & PREPARATION**			
611.4 Misc. Labor	Misc. Labor: Delivering water, 18 loads (3250 gallon truck)	18	225.00	4,050.00
	SUBTOTAL			4,050.00
	Reimbursable Expenses:			
	V22: calcium nitrate		26.851	26.85
	SUBTOTAL			26.85
855	Liability Insurance 1.50%	6,339	0.015	95.09
			Total	$6,434.44

Labor rate includes all applicable state and federal payroll taxes, workers compensation, and overhead. Supplies are at cost.

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TIER 1 WATER USE CALCULATIONS

For

Anthem Winery
3454 Redwood Rd
Napa, CA

RECEIVED

JUN 20 2018

Napa County Planning, Building
& Environmental Services

APN 035-470-046

REGISTERED PROFESSIONAL ENGINEER
BRUCE FENTON
77859
Exp. 06/30/2019
CIVIL
STATE OF CALIFORNIA

Prepared for

Julie Arbuckle
3454 Redwood Rd
Napa, CA 94558

Project #4111010.0

March 17, 2015
Revised: June 5, 2018

I. Executive Summary

These calculations demonstrate that the proposed total ground water use on both parcels is less than the estimated groundwater recharge rate for normal, “Average Rainfall”, and dry, “Drought” years. The currently approved groundwater use on both parcels is greater than the estimated groundwater recharge rate.

The methods used in this analysis are based on the Final Adopted Napa County Water Availability Analysis guidance document, dated May 12, 2015.

The existing and proposed water use for the Anthem Winery parcels are as follows:

Usage Type	Existing [af/yr]	*Approved [af/yr]*	Proposed [af/yr]
Parcel 1 – Vineyard (APN: 035-460-038)			
Residential	0.75	*0.75*	0.75
Vineyard	0.00	*0.96*	0.62
Parcel 1 Water Use	**0.75**	***1.71***	**1.37**
Parcel 2 – Winery (APN: 035-470-046)			
Residential	0.75	*0.75*	0.75
Vineyard	2.89	*3.39*	3.00
Winery			
Process Water	0.00	*0.46*	0.77
Landscaping	0.00	*0.15*	0.82
Employees	0.00	*0.02*	0.10
Visitors	0.00	*0.01*	0.12
Events	0.00	*0.00*	0.11
Parcel 2 Water Use	**3.64**	***4.78***	**5.67**
Additional Water Supply (Average Rainfall Year)			
Reclaimed Process Wastewater	0.00	*0.00*	-0.77
Harvested Rainwater	0.00	*0.00*	-1.55
Total Groundwater Use (Average Rainfall Year)	**4.39**	***6.49***	**4.72**
Additional Water Supply (Drought Year)			
Reclaimed Process Wastewater	0.00	*0.00*	-0.77
Harvested Rainwater	0.00	*0.00*	-0.75
Total Groundwater Use (Drought Year)	**4.39**	***6.49***	**5.52**

The proposed average pump rate for project wells (3, 6, and 8 combined) during Average Rainfall years is 1.1 gpm, on a 12 hour/day duty cycle. Similarly, the average proposed pump rate for project wells during Drought years is 2.1 gpm. Sufficient water storage will be provided on site to normalize pump rates throughout the year. Refer to attached Water Balance for monthly water production, use, and storage schedule.

II. Parcel 1 – Vineyard (APN: 035-460-038)

Residential Water Use

Existing primary residence + guest house to remain (3 bedrooms total):

$$W_{Residential} = \mathbf{0.75\ af/yr}$$

Non-Residential Water Use

Approved Agricultural (P12-00401)

Previously Approved, Unplanted Vineyards – Irrigation Only:

$$W_{A\_Vineyards} = \left(\frac{0.5\ af/yr}{ac}\right)(1.91ac) = \mathbf{0.96\ af/yr}$$

Proposed Agricultural

40% reduction in vineyard demand due to proposed switch to water-efficient underground irrigation:

$$Q_{DRI} = 0.6\left(\frac{0.5\ af/yr}{ac}\right) = 0.3\ af/yr$$

Previously Approved Vineyards to be planted – Underground Irrigation Only:

$$W_{A\_Vineyards} = \left(\frac{0.3\ af/yr}{ac}\right)(1.55ac + 0.11ac) = 0.498\ af/yr$$

New Proposed Vineyards – Underground Irrigation Only:

$$W_{P\_Vineyards} = \left(\frac{0.3\ af/yr}{ac}\right)(0.90ac) = 0.27\ af/yr$$

50% reduction for planting 1 acre of low-water varietal (e.g. Sauvignon Blanc):

$$W_{DRI\_Low-Water} = -0.5\left(\frac{0.3af/yr}{ac}\right)(1.0ac) = -0.15\ af/yr$$

Total Post-Project Vineyards – Irrigation Only:

$$W_{Vineyards} = 0.498\ af/yr + 0.27\ af/yr - 0.15\, af/yr = \mathbf{0.62\ af/yr}$$

Total Parcel 1 Water Use

$$W1_{Existing} = \mathbf{0.75\ af/yr}$$

$$W1_{Approved} = 0.75\ af/yr + 0.96\ af/yr = \mathbf{1.71\ af/yr}$$

$$W1_{Proposed} = 0.75\ af/yr + 0.62\ af/yr = \mathbf{1.37\ af/yr}$$

III. Parcel 2 – Winery (APN: 035-470-046)

Residential Water Use

Primary Residence to remain

$$W_{Primary} = \mathbf{0.75\ af/yr}$$

Non-Residential Water Use

Existing Agricultural

Existing Vineyards – Irrigation Only:

$$W_{E\_Vineyards} = \left(\frac{0.5\ af/yr}{ac}\right)(5.77ac) = 2.885\ af/yr$$

Approved Agricultural (P08-00345, P12-00401)

Previously Approved, Unplanted Vineyards – Irrigation Only:

$$W_{A\_Vineyards} = \left(\frac{0.5\ af/yr}{ac}\right)(0.16ac + 0.85ac) = 0.505\ af/yr$$

Total Existing and Approved Vineyards – Irrigation Only:

$$W_{Vineyards} = 2.885\ af/yr + 0.505\ af/yr = \mathbf{3.39\ af/yr}$$

Proposed Agricultural

Existing Vineyards to remain – Irrigation Only:

$$W_{E\_Vineyards} = \left(\frac{0.5\ af/yr}{ac}\right)(5.77ac - .20ac) = 2.785\ af/yr$$

Previously Approved Vineyards to be planted (0.38 ac to remain unplanted) – Underground Irrigation Only:

$$W_{A\_Vineyards} = \left(\frac{0.3\ af/yr}{ac}\right)(0.08ac + 0.58ac) = 0.198\ af/yr$$

New Proposed Vineyards – Underground Irrigation Only:

$$W_{P\_Vineyards} = \left(\frac{0.3\ af/yr}{ac}\right)(0.05ac) = 0.015\ af/yr$$

Total Post-Project Vineyards – Irrigation Only:

$$W_{Vineyards} = 2.785\ af/yr + 0.198\ af/yr + 0.015\ af/yr = \mathbf{3.00\ af/yr}$$

Existing Winery

Previously Approved Winery Process Water:

$$W_{Process} = \left(\frac{5\ gal.process\ water/gal.wine}{325{,}851\ \ gal/af}\right)(30{,}000\ gal.wine) = \mathbf{0.46\ \ af/yr}$$

Previously Approved Landscaping (Tier 1 WAA method):

$$W_{Landscaping} = \left(\frac{0.5\ \ af/yr}{100{,}000\ gal.of\ wine}\right)(30{,}000\ gal.of\ wine) = \mathbf{0.15\ \ af/yr}$$

Previously Approved Employees:

$$Shifts_{Full-time} = \left[(2)\left(\frac{1\ shift}{8\ hours}\right)\left(\frac{40\ hours}{week}\right)\right]\left[\frac{52\ weeks}{yr}\right] = 520\ \ shifts/yr$$

$$W_{Employees} = \left[\left(\frac{15\ gal./yr}{shift}\right)(520\ shifts)\right]\left[\frac{1\ af}{325{,}851\ gal.}\right] = \mathbf{0.02\ af/yr}$$

Previously Approved Visitors:

$$Visitors = \left(\frac{5\ visitors}{week}\right)\left(\frac{52\ weeks}{yr}\right) = 260\ visitors/yr$$

$$W_{Visitors} = \left[\left(\frac{3\ gal./yr}{visitor}\right)(260\ visitors)\right]\left[\frac{1\ af}{325{,}851\ gal.}\right] = \mathbf{0.01\ af/yr}$$

Proposed Winery Expansion

Proposed Winery Process Water:

$$W_{Process} = \left(\frac{5\ gal.process\ water/gal.wine}{325{,}851\ \ gal/af}\right)(50{,}000\ gal.wine) = \mathbf{0.77\ \ af/yr}$$

Proposed Landscaping (WELO Analysis, Estimated Total Water Use):

$$W_{Landscaping} = (266{,}824\ gal/yr)\left[\frac{1af}{325{,}851\ gal}\right] = \mathbf{0.82\ af/yr}$$

Proposed Employees:

$$Shifts_{Full-time} = \left[(7)\left(\frac{1\ shift}{8\ hours}\right)\left(\frac{40\ hours}{week}\right)\right]\left[\frac{52\ weeks}{yr}\right] = 1{,}820\ \ shifts/yr$$

$$Shifts_{Part-time} = \left[(5)\left(\frac{1\ shift}{8\ hours}\right)\left(\frac{40\ hours}{week}\right)\right]\left[\frac{12\ weeks}{yr}\right] = 300\ \ shifts/yr$$

$$W_{Employees} = \left[\left(\frac{15\ gal./yr}{shift}\right)(1{,}820\ shifts + 300\ shifts)\right]\left[\frac{1\ af}{325{,}851\ gal.}\right] = \mathbf{0.10\ af/yr}$$

Proposed Visitors:

$$Visitors = \left(\frac{256\ visitors}{week}\right)\left(\frac{52\ weeks}{yr}\right) = 13{,}312\ visitors/yr$$

$$W_{Visitors} = \left[\left(\frac{3\ gal./yr}{visitor}\right)(13{,}312\ visitors)\right]\left[\frac{1\ af}{325{,}851\ gal.}\right] = \mathbf{0.12\ af/yr}$$

Proposed Events:

$$\begin{aligned} Visitors &= \left[\left(\frac{2\ events}{month}\right)\left(\frac{30\ visitors}{event}\right)\left[\frac{12\ months}{yr}\right] + \left(\frac{10\ events}{yr}\right)\left(\frac{100\ visitors}{event}\right)\right] \\ &\quad + \left(\frac{1\ event}{yr}\right)\left(\frac{200\ visitors}{event}\right) + \left(\frac{1\ event}{yr}\right)\left(\frac{300\ visitors}{event}\right) \\ &\quad = 2{,}220\ event\ visitors/yr \end{aligned}$$

$$\begin{aligned} Event\ Staff &= \left(\frac{10\ event_{100}}{yr}\right)\left(\frac{5\ staff}{event_{100}}\right) + \left(\frac{1\ event_{200}}{yr}\right)\left(\frac{10\ staff}{event_{200}}\right) \\ &\quad + \left(\frac{1\ event_{300}}{yr}\right)\left(\frac{15\ staff}{event_{300}}\right) = 75\ event\ staff/yr \end{aligned}$$

$$W_{Events} = \left[\left(\frac{15\ gal./yr}{person}\right)(2{,}220\ visitors + 75\ staff)\right]\left[\frac{1\ af}{325{,}851\ gal.}\right] = \mathbf{0.11\ af/yr}$$

Total Parcel 2 Water Use

$$W2_{Existing} = 0.75\ af/yr + 2.89\ af/yr = \mathbf{3.64\ af/yr}$$

$$\begin{aligned} W2_{Approved} &= 0.75\ af/yr + 3.39\ af/yr + 0.46\ af/yr + 0.15\ af/yr + 0.02\ af/yr \\ &\quad + 0.01\ af/yr = \mathbf{4.78\ af/yr} \end{aligned}$$

$$\begin{aligned} W3_{Proposed} &= 0.75\ af/yr + 3.00\ af/yr + 0.77\ af/yr + 0.82\ af/yr + 0.10\ af/yr \\ &\quad + 0.12\ af/yr + 0.11\ af/yr = \mathbf{5.67\ af/yr} \end{aligned}$$

Beneficial Use of Reclaimed Process Wastewater

Proposed Reclaimed Process Wastewater:

$$PW = 0.77\ af/yr$$

Beneficial Use of Harvested Rainwater

Average Annual Rainfall (PRISM), per RCS = 30.0 in/yr

Drought year, per RCS = 48% of average:

$$Drought\ year = 0.48(30.0\ in/yr) = 14.4\ in/yr$$

Proposed Rainwater Harvesting

Building	Roof Area	
Fermentation Room 1:	4,478	sf
Fermentation Room 2:	5,207	sf
Hospitality*:	0	sf
Office*:	0	sf
Outdoor Event Area:	1,204	sf
Parcel 1 Residence & Guest House:	1,760	sf
Parking Lot & Roof Terrace**:	14,397	sf
Total roof area	27,046	sf

* Rainwater harvesting systems to be constructed at a later date - not included in water balance.
** Collected separately for irrigation only.

Average Rainfall Year Harvested Rainwater:

$$RW_{Average\ Year} = (\ 30\ in/yr)(27{,}046\ sf)\left(\frac{1\ ac}{43{,}560\ sf}\right)\left(\frac{1\ ft}{12\ in}\right) = \mathbf{1.55\ af/yr}$$

Drought Year Harvested Rainwater:

$$RW_{Drought\ Year} = (\ 14.4\ in/yr)(27{,}046\ sf)\left(\frac{1\ ac}{43{,}560\ sf}\right)\left(\frac{1\ ft}{12\ in}\right) = \mathbf{0.75\ af/yr}$$

Total Groundwater Use

Average Rainfall Year Groundwater Use

$$GW_{Existing-Average} = 0.75\ af/yr + 3.64\ af/yr = \mathbf{4.39\ af/yr}$$

$$GW_{Approved-Average} = 1.71\ af/yr + 4.78\ af/yr = \mathbf{6.49\ af/yr}$$

$$GW_{Proposed-Average} = 1.37\ af/yr + 5.67\ af/yr - 0.77\ af/yr - 1.55\ af/yr = \mathbf{4.72\ af/yr}$$

Drought Year Groundwater Use

$$GW_{Existing-Drought} = 0.75\ af/yr + 3.64\ af/yr = \mathbf{4.39\ af/yr}$$

$$GW_{Approved-Drought} = 1.71\ af/yr + 4.78\ af/yr = \mathbf{6.49\ af/yr}$$

$$GW_{Proposed-Drought} = 1.52\ af/yr + 5.67\ af/yr - 0.77\ af/yr - 0.75\ af/yr = \mathbf{5.52\ af/yr}$$

Groundwater Sources

Well 4 (non-project well)

Existing supply to remain – 20% of Parcel 1 Residence:

$$W_{Well\ 4\ Existing} = (0.20)(0.75\ af/yr) = \mathbf{0.15\ af/yr}$$

Wells 1, 5, 7 (non-project wells)

Existing supply to remain – Parcel 2 Residence and Vineyards:

$$W_{Well\ 1,5,7\ Existing} = 0.75\ af/yr + 2.89\ af/yr = \mathbf{3.64\ af/yr}$$

Well 2 (non-project well)

Destroyed in 2014 earthquake. To be abandoned per Napa County Well Destruction Guidelines.

Wells 3, 6, 8 (project wells)

Average Rainfall Year Supply:

$$W_{3,6,8\ Existing-Average} = 4.39\ af/yr - 0.15\ af/yr - 3.64\ af/yr = \mathbf{0.60\ af/yr}$$

$$W_{3,6,8\ Approved-Average} = 6.49\ af/yr - 0.15\ af/yr - 3.64\ af/yr = \mathbf{2.70\ af/yr}$$

$$W_{3,6,8\ Proposed-Average} = 4.72\ af/yr - 0.15\ af/yr - 3.64\ af/yr = \mathbf{0.93\ af/yr}$$

Drought Year Supply:

$$W_{3,6,8\ Existing-Drought} = 4.39\ af/yr - 0.15\ af/yr - 3.64\ af/yr = \mathbf{0.60\ af/yr}$$

$$W_{3,6,8\ Approved-Drought} = 6.49\ af/yr - 0.15\ af/yr - 3.64\ af/yr = \mathbf{2.70\ af/yr}$$

$$W_{3,6,8\ Proposed-Drought} = 5.52\ af/yr - 0.15\ af/yr - 3.64\ af/yr = \mathbf{1.73\ af/yr}$$

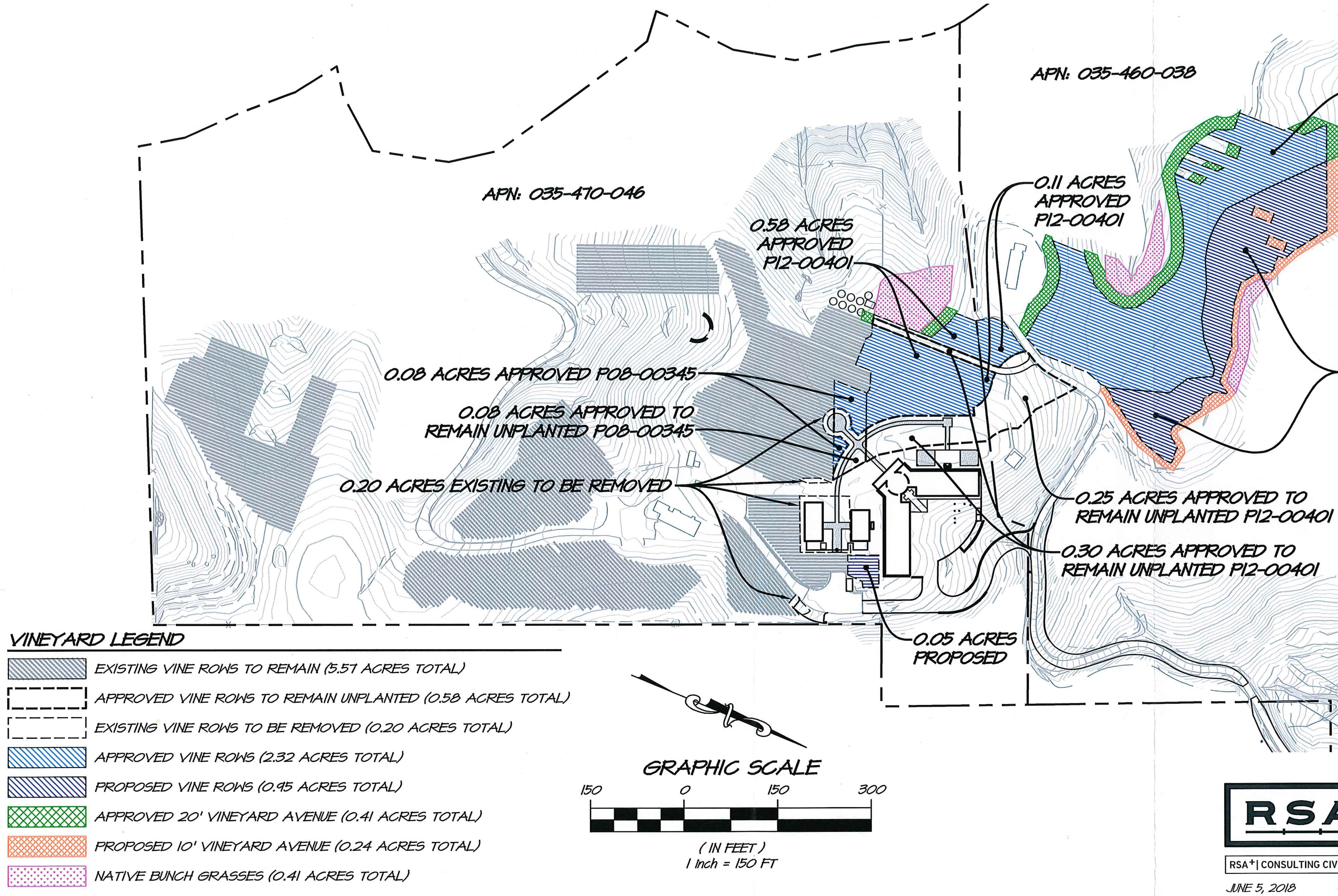
Proposed Average Rainfall Year Pump Rate, 12 hr/day duty cycle:

$$Q_{3,6,8\ Proposed-Average} = (0.93\ af/yr)\left(\frac{325{,}851\ gal}{1\ af}\right)\left(\frac{1\ yr}{365\ days}\right)\left(\frac{1\ day}{12\ hrs}\right)\left(\frac{1\ hr}{60\ min}\right) = \mathbf{1.1\ gpm}$$

Proposed Drought Year Pump Rate, 12 hr/day (720 min/day) duty cycle:

$$Q_{3,6,8\ Proposed-Drought} = (1.73\ af/yr)\left(\frac{325{,}851\ gal}{1\ af}\right)\left(\frac{1\ yr}{365\ days}\right)\left(\frac{1\ day}{12\ hrs}\right)\left(\frac{1\ hr}{60\ min}\right) = \mathbf{2.1\ gpm}$$

ANTHEM WINERY
VINEYARD EXHIBIT



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Drought Year Water Balance - Wells 3, 6, 8

					20-week irrigation season									
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	
Vineyard					(0.00)	(0.00)	(0.00)	(0.00)	(0.00)				(0.00)	
Residential	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.60	
Winery														
Winery domestic water	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.33	
Winery process water	0.02	0.03	0.03	0.02	0.03	0.03	0.04	0.04	0.06	0.06	0.05	0.03	0.42	
Winery landscape irrigation	0.01	0.01	0.03	0.04	0.05	0.05	0.06	0.05	0.04	0.03	0.01	0.01	0.39	
Well water to storage	0.04	0.01	0.01	0.01	0.00	(0.02)	(0.02)	(0.02)	(0.03)	(0.01)	0.01	0.02		
TOTAL	**0.14**	**0.13**	**0.14**	**0.15**	**0.15**	**0.14**	**0.15**	**0.15**	**0.15**	**0.15**	**0.15**	**0.14**	**1.73**	
days in month (for pumping rate calc)	31	28	31	30	31	30	31	31	30	31	30	31		
hours of pumping per day (for pumping rate calc)	12	12	12	12	12	12	12	12	12	12	12	12	**Average:**	
pumping rate from 3, 6, and 8 COMBINED (drought year)	2.1	2.0	2.0	2.2	2.2	2.1	2.2	2.2	2.2	2.2	2.2	2.0	**2.1**	**gpm**
Well water storage for irrigation (AF)	0.09	0.10	0.11	0.12	0.10	0.08	0.06	0.04	0.01	0.00	0.01	0.03	**Max:**	
Well water storage for irrigation (gal)	29,327	32,585	35,844	39,102	32,585	26,068	19,551	13,034	3,259	0	3,259	9,776	**39,102**	**gal Well Water Tank**

Drought Year Water Balance - Reclaimed Process Wastewater

					20-week irrigation season									
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	
Vineyard					0.15	0.15	0.15	0.15	0.15				0.73	
Residential														
Winery														
Winery domestic water														
Winery process water	(0.03)	(0.05)	(0.05)	(0.04)	(0.05)	(0.05)	(0.07)	(0.08)	(0.11)	(0.11)	(0.08)	(0.06)	(0.77)	
Winery landscape irrigation	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.04	
TOTAL	**0.03**	**0.04**	**0.04**	**0.03**	**(0.10)**	**(0.10)**	**(0.08)**	**(0.07)**	**(0.04)**	**0.10**	**0.08**	**0.06**	**0.00**	
Reclaimed process wastewater storage required (AF)	0.28	0.32	0.37	0.40	0.30	0.20	0.12	0.04	0.00	0.10	0.19	0.25	**Max:**	
Reclaimed process wastewater storage required (gal)	90,703	105,254	119,430	130,733	96,661	64,865	37,994	13,847	0	34,177	61,227	81,003	**130,733**	**gal Recycled PWW Tank**

Drought Year Water Balance - Harvested Rainwater

					20-week irrigation season									
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	
Vineyard					0.00	0.00	0.00	0.00	0.00				0.00	
Residential														
Winery														
Winery domestic water														
Winery process water	0.01	0.02	0.02	0.02	0.02	0.02	0.03	0.04	0.05	0.05	0.04	0.03	0.35	
Winery landscape irrigation	0.01	0.01	0.03	0.04	0.05	0.06	0.06	0.05	0.04	0.03	0.01	0.01	0.40	
Rainfall - % of total (from Napa State Hospital averages)	20.4%	17.9%	13.5%	6.8%	2.7%	0.9%	0.1%	0.2%	1.3%	5.5%	12.1%	18.6%	100.0%	
Drought year (in)	2.94	2.58	1.94	0.97	0.39	0.12	0.01	0.04	0.19	0.79	1.74	2.68	14.40	
Drought year (AF)	(0.15)	(0.13)	(0.10)	(0.05)	(0.02)	(0.01)	(0.00)	(0.00)	(0.01)	(0.04)	(0.09)	(0.14)	(0.75)	
TOTAL	**0.13**	**0.10**	**0.05**	**(0.01)**	**(0.05)**	**(0.07)**	**(0.09)**	**(0.08)**	**(0.08)**	**(0.03)**	**0.04**	**0.10**	**0.00**	
Harvested rainwater storage required (AF)	0.27	0.37	0.42	0.41	0.36	0.29	0.20	0.12	0.03	0.00	0.04	0.14	**Max:**	
Harvested rainwater storage required (gal)	87,551	119,390	136,566	134,579	118,474	94,292	65,154	37,655	11,347	0	11,983	45,706	**136,566**	**gal Rainwater Tank**

Average Year Water Balance - Wells 3, 6, 8

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	
					----------------- 20-week irrigation season -----------------									
Vineyard					(0.00)	(0.00)	(0.00)	(0.00)	(0.00)				(0.00)	
Residential	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.60	
Winery														
Winery domestic water	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.33	
Winery process water	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	
Winery landscape irrigation	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	
Well water to storage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
TOTAL	**0.08**	**0.08**	**0.08**	**0.08**	**0.08**	**0.08**	**0.08**	**0.08**	**0.08**	**0.08**	**0.08**	**0.08**	**0.92**	
days in month (for pumping rate calc)	31	28	31	30	31	30	31	31	30	31	30	31		
hours of pumping per day (for pumping rate calc)	12	12	12	12	12	12	12	12	12	12	12	12	**Average:**	
pumping rate from 3, 6, and 8 COMBINED (average year)	1.1	1.2	1.1	1.2	1.1	1.2	1.1	1.1	1.1	1.1	1.2	1.1	**1.1**	**gpm**
Well water storage for irrigation (AF)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**Max:**	
Well water storage for irrigation (gal)	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**gal Well Water Tank**

Average Year Water Balance - Reclaimed Process Wastewater

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	
					----------------- 20-week irrigation season -----------------									
Vineyard					0.15	0.15	0.15	0.15	0.15				0.73	
Residential														
Winery														
Winery domestic water														
Winery process water	(0.03)	(0.05)	(0.05)	(0.04)	(0.05)	(0.05)	(0.07)	(0.08)	(0.11)	(0.11)	(0.08)	(0.06)	(0.77)	
Winery landscape irrigation	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.04	
TOTAL	**0.03**	**0.04**	**0.04**	**0.03**	**(0.10)**	**(0.10)**	**(0.08)**	**(0.07)**	**(0.04)**	**0.10**	**0.08**	**0.06**	**0.00**	
Reclaimed process wastewater storage required (AF)	0.28	0.32	0.37	0.40	0.30	0.20	0.12	0.04	0.00	0.10	0.19	0.25	**Max:**	
Reclaimed process wastewater storage required (gal)	90,703	105,254	119,430	130,732	96,661	64,864	37,993	13,847	0	34,176	61,227	81,002	**130,732**	**gal Recycled PWW Tank**

Average Year Water Balance - Harvested Rainwater

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	
					----------------- 20-week irrigation season -----------------									
Vineyard					0.00	0.00	0.00	0.00	0.00				0.00	
Residential														
Winery														
Winery domestic water														
Winery process water	0.03	0.05	0.05	0.04	0.05	0.05	0.07	0.08	0.11	0.11	0.08	0.06	0.77	
Winery landscape irrigation	0.02	0.03	0.05	0.08	0.10	0.11	0.12	0.10	0.08	0.05	0.03	0.01	0.78	
Rainfall - % of total (from Napa State Hospital averages)	20.4%	17.9%	13.5%	6.8%	2.7%	0.9%	0.1%	0.2%	1.3%	5.5%	12.1%	18.6%	100.0%	
Average year (in)	6.13	5.37	4.05	2.03	0.82	0.26	0.02	0.07	0.39	1.65	3.62	5.59	30.00	
Average year (AF)	(0.32)	(0.28)	(0.21)	(0.11)	(0.04)	(0.01)	(0.00)	(0.00)	(0.02)	(0.09)	(0.19)	(0.29)	(1.55)	
TOTAL	**0.27**	**0.20**	**0.11**	**(0.01)**	**(0.10)**	**(0.15)**	**(0.18)**	**(0.17)**	**(0.17)**	**(0.08)**	**0.07**	**0.21**	**0.00**	
Harvested rainwater storage required (AF)	0.55	0.76	0.87	0.86	0.76	0.60	0.42	0.25	0.08	0.00	0.07	0.29	**Max:**	
Harvested rainwater storage required (gal)	180,406	246,430	282,319	278,828	246,121	196,699	136,769	79,874	24,598	0	23,994	93,432	**282,319**	**gal Rainwater Tank**

Appendix A

Maximum Applied Water Allowance - Napa
Anthem Winery, based on planting plan dated 10/27/15

The following calculations will help you determine your site specific water budget and establish a planting mix that will allow you to meet your water budget. Your Estimated Total Water Use must be less than your Maximum Applied Water Allowance.

Section B2. Maximum Applied Water Allowance (MAWA)

MAWA = (ETo) (0.62)[(0.7x LA) + (0.4 x SLA)]

Where:
ETo = Annual Net Reference Evapotranspiration (inches)
0.7 = ET Adjustment Factor
LA = Landscaped Area (square feet)
0.62 = Conversion factor (to gallons per square foot)
SLA = Portion of the landscape area identified as Special Landscape Area (square feet)
0.4 = the additional ET adjustment factor for Special Landscape Area (1.0 - 0.6 = 0.4)

A.) Net Evapotranspiration Calculation

44.30 *(Annual ETo)*

27.50 *(Annual Rainfall)* x .25 = 6.88 *(Effective Rainfall)*

Net ETo Calculation = Annual ETo - Effective Rainfall = 37.43

B.) Adjusted Landscape Area Calculation

31248 *(Landscaped Area)* x 0.7 *Adjustment Factor* = 21873.6

0 *(Special Landscaped Area)* x 0.4 *Adjustment Factor* = 0

Sum of Adjusted Landscape Area = 21873.6

MAWA = 37.43 x 0.62 x 21873.6 = 507,544 gallons/year

Section B3. Estimated Total Water Use (ETWU)

A.) Net Evapotranspiration Calculation

Net ET Calculation = Annual ETo - Effective Rainfall = 37.43

B.) Adjusted Landscape Area Calculation

8800 *(Very Low water use plant sqft)* x 0.1 = 880

15248 *(Low water use plant sqft)* x 0.3 = 4574.4

7200 *(Moderate water use plant sqft)* x 0.6 = 4320

0 *(High water use plant sqft)* x 1.0 = 0

Sum of Adjusted Landscape Area = 9,774

ETWU = 37.43 x 0.62 x 9,774 / 0.85 = 266,824 gallons/year

Irrigation Efficiency Factor

Percent of total landscape Irrigated with Drip	
0-25%	0.71
26-50%	0.75
51-75%	0.80
76-100%	0.85

Section B1. Hydrozone Information Table

Zone	Plant Name	Water Use	Qty	Area/plant at maturity	Total Area of plants at maturity	Size	Method of irrigation	GPM	% of total landscaped area
1	Morus alba 'Fruitless'	Moderate	16	400	6400	36" box	Drip	1.6	20.48%
2	Fruit Tree TBD	Moderate	2	400	800	B&B	Drip	0.2	2.56%
3	Olea europaea 'Sevillano'	Very Low	10	400	4000	Field Dug	Drip	3.33	12.80%
4	Quercus agrifolia	Very Low	12	400	4800	72" box	Drip	4	15.36%
5	Arbutus 'Marina'	Low	8	400	3200	48" box	Drip	1.33	10.24%
6	Arctostaphylos 'Louis Edmunds'	Low	42	100	4200	5 gal	Drip	1.4	13.44%
6	Arctostaphylos 'Dr. Hurd'	Low	26	100	2600	24" box	Drip	1.73	8.32%
6	Ceanothus 'Yankee Point'	Low	13	100	1300	5 gal	Drip	0.43	4.16%
7	Perovskia atriplicifolia 'Blue Spires'	Low	128	9	1152	5 gal	Drip	4.27	3.69%
7	Salvia leucantha 'Midnight'	Low	321	4	1284	5 gal	Drip	10.7	4.11%
7	Agastache 'Blue Fortune'	Low	93	4	372	1 gal	Drip	1.55	1.19%
7	Agastache rupestris 'Licorice Mint'	Low	71	4	284	1 gal	Drip	1.18	0.91%
7	Erigeron karvinskianus	Low	184	4	736	1 gal	Drip	3.07	2.36%
8	Nepeta faassenii 'Blue Wonder'	Low	30	4	120	1 gal	Drip	0.5	0.38%
	Total area of all plants at maturity:				31,248				100.00%

Summary Hydrozone Table

Hydrozone		Area (sf)	% of Total Landscape Area
High Water Use		0	0.00%
Moderate Water Use		7,200	23.04%
Low Water Use		15,248	48.80%
Very Low Water Use		8,800	28.16%
	Total:	**31,248**	**100%**

NAPA STATE HOSPITAL, CA

Monthly Sum of Precipitation (Inches)

(46074)

File last updated on Sep 29, 2015
a = 1 day missing, b = 2 days missing, c = 3 days, ..etc..,
z = 26 or more days missing, A = Accumulations present
Long-term means based on columns; thus, the monthly row may not
sum (or average) to the long-term annual value.
MAXIMUM ALLOWABLE NUMBER OF MISSING DAYS : 5
Individual Months not used for annual or monthly statistics if more than 5 days are missing.
Individual Years not used for annual statistics if any month in that year has more than 5 days missing.

YEAR(S)	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
1893	4.27	2.19	4.28 n	1.05	0.49	0.00	0.00	0.00	0.19	0.17	4.03	1.86	14.25 a
1894	8.17	2.97	1.15	----- z	1.49 y	0.85	----- z	0.04	----- z	----- z	1.34	9.37	23.89 e
1895	9.35	2.92	2.21	1.11	----- z	----- z	----- z	----- z	1.16	0.03	1.72 w	1.47 v	16.78 f
1896	9.28	0.25	3.59 r	6.28	1.10	----- z	0.00	----- z	----- z	1.20	5.03	3.41	26.55 d
1897	----- z	5.68	5.37 r	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	5.68 k
1898	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	0.00 l
1899	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	0.00 l
1900	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	0.00 l
1901	----- z	----- z	----- z	----- z	1.11	0.00	0.00	0.00	0.89	1.32	3.88	2.15	9.35 d
1902	1.58	12.16	3.66	2.55	1.23	0.00	0.00	0.02	0.00	4.84 y	4.13	2.94 y	25.33 b
1903	3.22 w	2.11	5.15 s	----- z	0.00	0.00	0.00	0.00	0.00	----- z	4.25	----- z	6.36 e
1904	0.92	8.23 m	7.93	1.70 t	0.04	0.00	0.00	0.08	4.79	2.63	2.01	2.40	20.80 b
1905	4.40	2.77	3.44 s	----- z	----- z	0.00	0.00	0.00	0.00	----- z	1.00	1.17	9.34 d
1906	6.36 u	4.28	6.77 p	0.43	3.23 y	0.45 y	0.00	0.00	0.14	0.00	----- z	5.87 t	4.85 f
1907	6.50	4.44 s	8.37	0.42	0.26	0.85	0.00	0.00	0.01	0.62	----- z	4.37 q	17.03 c
1908	4.15 s	3.96 v	0.80	0.14	0.75	----- z	0.00	0.00	0.00	----- z	2.25	2.43 v	3.94 e
1909	15.04 g	7.22 k	3.02 w	0.00	0.00	0.02	0.00	0.00	----- z	1.62 w	2.45	6.61 s	2.47 f
1910	3.19	2.01	3.59 s	0.54	0.00	----- z	0.00	0.00	0.13	0.84	0.39	1.35	8.45 b
1911	13.50	2.22	5.17 v	1.32	0.21	0.03	0.00	0.00	0.00	0.53	0.75	2.05	20.61 a
1912	3.16	0.58	3.37	1.47	2.12	----- z	0.00	----- z	2.52	0.54	3.94	1.35	19.05 b
1913	4.53	0.30	2.08	0.94	0.55	0.20	0.01	0.00	0.00	0.51	5.22	7.45	21.79
1914	12.81	6.01	0.99	0.88	0.48	0.15	0.00	0.00	0.00	1.11	0.61	----- z	23.04 a
1915	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	----- z	0.80	6.65 v	0.80 k
1916	15.12	3.23	----- z	----- z	0.23	----- z	----- z	----- z	----- z	----- z	----- z	----- z	18.58 i
1917	----- z	6.19	1.28	0.92	0.51	0.00	0.00	0.00	0.09	0.00	0.47	1.30	10.76 a
1918	1.04	6.48	2.91	0.75	0.06	0.00	0.00	0.00	2.65	0.43	3.61	1.82	19.75
1919	3.75	11.46	2.98 a	0.14	0.02	0.00	0.00	0.00	0.44	0.37	0.30	4.62	24.08
1920	0.39	1.03	3.53	1.54	0.00	0.18	0.00	0.00	0.15	1.91	4.56	6.19	19.48
1921	6.44	1.28	1.55	0.64	1.19	0.00	0.00	0.00	0.04 a	0.62	1.55	----- z	13.31 a
1922	2.16	5.87	2.46	0.68	0.38	0.21	0.00	0.00	0.00	3.86	4.45	9.21	29.28
1923	3.09	0.54	0.02	4.92	0.00	0.00	0.00	0.26	0.64	0.26	0.35	0.84	10.92
1924	2.58	3.53	1.35	0.35	0.10	0.00	0.00 d	0.16	0.00	3.20	2.50	6.27	20.04
1925	1.37	10.39	2.64	2.49	2.83	0.02	0.00	0.00	0.45	0.56	2.91	1.14	24.80
1926	5.15	8.27	0.12	4.98	0.50	0.00	0.00	0.07	0.00	2.31	10.35	1.21	32.96
1927	3.56	10.83	2.96	2.50	0.56	0.51	0.00	0.00	0.00	2.21 a	4.04	5.77	32.94
1928	3.19	2.21	6.54	0.63	0.32	0.00	0.00	0.00	0.01	0.07	0.75	4.96	18.68
1929	1.08	1.18	1.80	1.87	0.08	1.95	0.00	0.00	0.00	0.04	0.00	5.10	13.10
1930	5.30	2.47	3.90	1.36	0.54	0.00	0.00	0.00	0.96	1.60	1.88	0.56	18.57
1931	6.20	0.95	2.01	0.62	1.46	0.52	0.00	0.00	0.00	0.66	2.88	11.58	26.88
1932	3.81	1.45	0.96	1.01	0.95	0.12	0.00 a	0.00	0.00	0.00	0.83	3.16	12.29
1933	5.59	1.07	2.02 j	1.87 a	0.08	1.95	0.00	0.00	0.00	2.19	0.00	4.91	17.66 a
1934	1.52	3.96	0.42	0.68	0.78	0.04	0.00	0.05	0.03	1.52	5.07	3.34	17.41
1935	5.54	1.85	4.42	3.52	0.02	0.00	0.00	0.21	0.02	2.10	0.88	2.45	21.01
1936	5.98	8.69	1.85	1.62	0.26	0.70	0.03	0.04	0.00	0.30	0.00	2.94	22.41
1937	4.14	6.27	6.40	0.91	0.03	0.65	0.20	0.00	0.00	1.23	3.75	5.17	28.75
1938	4.29	11.38	6.31	1.88	0.00	0.00	0.00	0.00	0.11	1.49	1.14	1.12	27.72
1939	2.58	1.87	2.38	0.36	1.22	0.00	0.00	0.00	0.03	0.49 c	0.12	1.32	10.37
1940	10.11	9.47	6.31	0.76	1.32	0.00	0.00	0.00	0.20	1.26	1.61	10.90	41.94
1941	8.84	7.27	5.26	5.20	1.45	0.07	0.00	0.00	0.00	2.60	2.88	9.52	43.09

YEAR(S)	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
1942	5.32	6.35	4.07	4.51	1.36	0.00	0.00	0.00	0.01	1.15	4.81	4.29	31.87
1943	8.17	1.68	3.47	1.60	0.00	0.06	0.00	0.00	0.00	0.66	1.54	2.29	19.47
1944	4.93	6.90	1.47	1.94	1.25	0.99	0.00	0.00	0.00	1.58	4.67	2.01 g	23.73 a
1945	1.10	4.87	3.88	0.26	0.95	0.00	0.00	0.00	0.00	3.40	3.21	9.69	27.36
1946	1.26	1.96	2.03	0.25	0.62	0.00 b	0.01	0.00 a	0.03	0.34	----- z	3.24	9.74 a
1947	0.80	2.87	4.63	0.78	0.43	1.16	0.00	0.00	0.00	4.65	0.96	0.58	16.86
1948	1.70	1.21	4.08	4.61	1.35	0.09	0.00	0.00	0.21	0.90	1.24	3.98	19.37
1949	1.87	2.75	6.33	0.00	0.20	0.00	0.00	0.20 a	0.00	0.00	2.44	2.16	15.95
1950	7.71	3.75	2.41	1.07	0.28	0.00	0.00	0.00	0.00	3.17	6.81	8.18	33.38
1951	5.59	2.11	2.09	0.84	1.52	0.00	0.00	0.00	0.06	1.24	3.83	8.64	25.92
1952	10.05	2.32	4.46	0.77	0.37	0.59	0.00	0.00	0.02	0.00	2.39	11.70	32.67
1953	5.03	0.00	3.37	3.17	0.63	0.58	0.00	0.10	0.00	0.44	3.35	0.88	17.55
1954	3.60	2.91	4.34	2.25	0.41	0.16	0.00	0.44	0.00	0.15	3.13	5.26	22.65
1955	3.04	1.96	0.53	1.93	0.20	0.00	0.00	0.00	0.58	0.07	2.32	16.13	26.76
1956	8.16	4.14	0.24	2.46	0.76	0.03	0.00	0.00 a	0.22	1.77	0.06	0.42	18.26
1957	2.95	5.18	2.06	1.57	3.60	0.25	0.00	0.00	1.31	2.88	0.75	3.67	24.22
1958	5.83	10.78	5.38	5.93	1.14	0.37	0.00	0.00	0.00	0.15	0.12	1.40	31.10
1959	5.48	7.60	1.09	0.19	0.00	0.00	0.00	0.00	2.37	0.00	0.00	1.92	18.65
1960	4.52	4.61	3.37	1.22	1.70	0.00	0.00	0.00	0.00	0.23	4.23	3.05	22.93
1961	4.10	1.63	3.92	1.21	0.21	0.03	0.00	0.08	0.23	0.14	3.01	3.02	17.58
1962	1.23	8.02	3.28	0.37	0.00	0.00	0.00	0.11	0.20	10.37	0.97	3.93	28.48
1963	4.71	3.79	4.91	5.66	0.44	0.00	0.00	0.00	0.29	2.83	5.71	0.73	29.07
1964	3.46	0.19	2.09	0.10	0.15	0.65	0.10	0.06	0.00	1.48	3.37	7.93	19.58
1965	5.18	0.80	1.68	3.29	0.00	0.00	0.04	0.85	0.00	0.03	5.11	3.78	20.76
1966	5.69	3.14	0.33	0.75	0.19	0.19	0.04	0.18	0.06	0.00	6.61	4.55	21.73
1967	11.65	0.46	6.08	5.42	0.12	1.95	0.00	0.00	0.09	0.80	1.49	2.07	30.13
1968	6.50	2.99	2.41	0.45	0.36	0.00	0.00	0.25	0.00	1.62	2.90	4.87	22.35
1969	8.30	7.58	1.03	1.59	0.00	0.03	0.00	0.00	0.00	3.14	1.30	7.22	30.19
1970	13.77	1.92	1.97	0.08	0.00	0.46	0.00	0.00	0.00	1.55	7.28	8.40	35.43
1971	1.68	0.28	3.57	0.49	0.21	0.00	0.00	0.00	0.24	0.09	2.30	4.81	13.67
1972	0.93	1.50	0.15	1.62	0.12	0.25	0.00	0.00	1.23	3.34	6.95	3.39	19.48
1973	11.37	5.61	3.10	0.11	0.02	0.00	0.00	0.00	0.41	1.64	10.51	4.40	37.17
1974	4.96	1.84	5.71	1.97	0.02	0.00	1.05	0.00	0.00	1.04	0.99	2.92	20.50
1975	2.39	6.79	7.17	1.30	0.03	0.00	0.14	0.00	0.00	3.64	0.79	0.46	22.71
1976	0.34	1.97	1.62	1.40	0.00	0.00	0.00	1.30	0.84	0.46	1.26	1.27	10.46
1977	1.75	1.50	2.58	0.48	1.21	0.00	0.00	0.00	0.72	0.49	7.90	5.91	22.54
1978	10.17	4.64	5.62	3.77	0.02	0.00	0.00	0.00	0.83	0.00	2.53	1.11	28.69
1979	10.34	5.35	1.98	1.79	----- z	0.00	0.00	0.00	0.00	3.59	3.22	7.29	33.56 a
1980	7.45	10.01	1.84	1.48	0.55	0.07	0.13	0.00	0.00	0.24	0.19	3.32	25.28
1981	5.92	1.58	4.03	0.32	0.44	0.00	0.00	0.00	0.17	2.64	7.44	7.66	30.20
1982	10.55	4.42	7.53	3.97	0.00	0.00	0.00 a	0.00	1.58	3.63	7.74	3.41	42.83
1983	7.70	10.62	11.07	3.94	0.49	0.00	0.00	0.73	0.86	0.77	7.98	7.08	51.24
1984	0.37	2.40	2.07	1.09	0.14	0.47	0.04	0.34	0.09	2.03	7.77	1.48	18.29
1985	1.75	2.79	4.42	0.08	0.03	0.05	0.00	0.00	0.79	0.78	3.88	2.97	17.54
1986	4.50	15.29	7.08	0.82	0.19	0.01	0.00	0.00	1.52	0.26	0.15	1.98	31.80
1987	4.11	4.63	4.28	0.16	0.00	0.00	0.00	0.00	0.00	1.52	2.20	7.65	24.55
1988	5.06	0.48	0.13	2.29 a	1.04	0.19	0.00	0.00 a	0.00	0.11	4.41	3.39	17.10
1989	1.37	1.37	6.79	0.90	0.08	0.09	0.00	0.00	2.31	1.48	1.68	0.00	16.07
1990	4.05	3.50	1.18	0.34	3.27	0.00	0.00	0.00	0.36	0.23	0.54 d	0.99	14.46
1991	0.46	3.05	10.64	0.33	0.15	0.40	0.00	0.16	0.01	2.47	0.84	2.18	20.69
1992	2.28	7.34	4.28	0.63	0.00	1.09	0.00	0.00	0.00	3.09	0.27	8.28	27.26
1993	8.90	5.87	2.08	1.54	1.39	0.71	0.00	0.00	0.00	1.15	3.49	3.50	28.63
1994	2.56	3.62	0.19	1.27	1.57	0.04	0.00	0.00	0.00	1.31	6.17	3.84	20.57
1995	13.66	0.54	11.97	1.26	3.10	0.90	0.00	0.00	0.00	0.00	0.18	8.90	40.51
1996	8.21	9.60 b	2.35 f	3.81	3.72	0.00	0.00	0.00	0.03	1.94	3.18	12.92	43.41 a
1997	10.50	0.46	0.86	0.57	0.79	0.23	0.00	0.82	0.03	1.26	7.95	2.56	26.03
1998	8.73	14.15	2.68	1.55	2.99	0.15	0.00	0.00	0.15	0.76	4.76	1.02	36.94
1999	3.15	9.83	2.70	2.88	0.13	0.00	0.00	0.00	0.04	0.75	2.84	0.91	23.23
2000	5.36	9.88	2.92	1.69	1.54	0.12	0.00	0.00	0.11	2.29	1.34	1.22	26.47
2001	4.34	7.26	1.08	0.46	0.00	0.26	0.00	0.00	0.50	0.51	6.17	9.45	30.03
2002	3.50	1.93	2.63	0.30	1.25	0.00	0.00	0.00	0.00	0.00	3.38	13.21	26.20
2003	2.68	3.99	4.98	3.97	1.85	0.00	0.00	0.62	0.03	0.25	3.14	7.70	29.21
2004	3.60	6.52	0.86	0.34	0.10	0.00	0.00	0.00	0.14	2.48	2.51	7.93	24.48
2005	4.31 a	3.88	3.42	1.57	2.37	0.90	0.00	0.00	0.01	0.67	2.25	15.49	34.87
2006	4.69	3.71	8.41	5.75	1.19	0.11	0.00	0.00	0.00	0.66	3.30	3.71	31.53
2007	0.36	5.12	0.35	1.29	0.35	0.00	0.00	0.00	0.05	2.01	1.05	4.10	14.68
2008	10.06	3.44	0.35	0.19	0.08	0.00	0.00	0.00	0.00	0.59	3.00	2.57	20.28

YEAR(S)	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
2009	0.97	9.20	1.01	0.95	1.47	0.05	0.00	0.00	0.15	5.06	0.83	2.14	21.83
2010	9.19	3.98	2.63	3.86	1.16	0.00	0.00	0.00	0.00	3.71	3.05	8.64	36.22
2011	1.28 w	4.02 t	8.94 l	0.59 w	1.89 v	2.61 w	0.00	0.00	0.00	1.33 x	1.55 s	0.18	0.18 h
2012	4.89	1.50	9.04	2.48 b	0.00	0.04	0.00 a	0.00	0.00	1.51	4.80 c	7.87 b	32.13
2013	0.74	0.35	0.93	1.19 a	0.34	0.68	0.00	0.00	0.67	0.00	1.13 a	0.71 b	6.74
2014	0.11 b	10.91	3.38	2.88 a	0.00 a	0.00	0.00	0.05	0.49	0.98	2.42	11.97	33.19
2015	0.02 a	2.72 a	0.10	2.12 c	0.02 a	0.17 a	0.01 a	0.00	----- z	----- z	----- z	----- z	5.16 d

SUM OF MONTHLY MEAN RAINFALL = 24.53

Period of Record Statistics

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
MEAN	5.01	4.39	3.31	1.66	0.67	0.21	0.02	0.06	0.32	1.35	2.96	4.57	24.78
S.D.	3.51	3.45	2.54	1.53	0.84	0.40	0.10	0.19	0.69	1.47	2.36	3.61	8.16
SKEW	0.78	0.98	1.15	1.32	1.76	2.64	9.50	4.16	3.68	2.56	0.97	1.05	0.50
MAX	15.12	15.29	11.97	6.28	3.72	1.95	1.05	1.30	4.79	10.37	10.51	16.13	51.24
MIN	0.02	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.74
YRS	111.00	113.00	105.00	111.00	112.00	110.00	115.00	114.00	113.00	109.00	112.00	106.00	91.00
%	20.4	17.9	13.5	6.8	2.7	0.9	0.1	0.2	1.3	5.5	12.1	18.6	100.0