



MEMORANDUM

January 17, 2024

To: Mr. Matt Bueno & Mr. Jim Bushey
PPI Engineering, Inc. (PPI)
Sent via email: mbueno@ppiengineering.com
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Job No. 745-NPA01

Cc: Ms. Sophie Drucker & Mr. Joe Papendick
Boisset Collection
Sent via email: sophie.drucker@boisset.com
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From: Anthony Hicke and Edward Linden
Richard C. Slade & Associates LLC (RCS)

A handwritten signature in blue ink, appearing to read "Anthony Hicke", is written over the "From:" line and extends towards the professional seal.



Re: Results of Napa County Tier 1 Water Availability Analysis for a
Proposed Vineyard Development Project at
Boisset Collection Wappo Hill
5681 Silverado Trail, Napa, CA (APN 039-040-042)

Introduction

This Memorandum presents the key findings, conclusions, and preliminary recommendations regarding a Water Availability Analysis (WAA) for a proposed new vineyard development at the Boisset Collection Wappo Hill property, located at 5681 Silverado Trail in Napa, California (referred to herein as the "subject property"). RCS understands that the proposed project consists of the development of 13.1 acres of new vineyards within the boundaries of the property.

This document was prepared on behalf of the property owner to provide hydrogeologic analyses pertaining to the proposed vineyard development project in conformance with Napa County's WAA Guidelines (Napa County, 2015), and with recent updates to those Guidelines by Napa County (2022a & 2023a).

A "Tier 1" WAA ("Groundwater Use for Napa County") is required for the proposed project because the proposed project will result in new groundwater demands for a discretionary project. A "Tier 1" WAA consists of calculating an estimate of the annual groundwater recharge that may occur at the subject property and comparing that estimate to the proposed groundwater use at the property. A "Tier 2" WAA ("Well & Spring Interference") is not required for the proposed project because no known offsite wells or springs owned by others exist within the County-defined setbacks for these water sources. In addition, a "Tier 3" WAA ("Groundwater / Surface Water Interaction") is not required because the project well is not located within the County's "Significant Stream" buffer areas (PBES & LSCE, 2023b), which includes the "public trust" area for the purposes of WAA preparation (Napa County, 2024). Further details in support of the applicability of the WAA requirements to the proposed vineyard development project are presented later in this Memorandum.



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Site Conditions

The subject property is comprised by a single 53.7-acre¹ parcel identified by Napa County Assessor's Parcel Number (APN) 039-040-042 that is situated east of the town of Yountville, in Napa County, California. Figure 1, "Regional Map," shows: the approximate boundaries of the subject property (Napa County, 2023b); Napa County's "Significant Streams" and "Significant Streams" 1,500-foot buffer areas (PBES & LSCE, 2023a & b); the local and regional watersheds (LSCE & MBK, 2013); and the local boundaries of the Napa Valley Subbasin of the Napa-Sonoma Groundwater Basin, as defined by the California Department of Water Resources (DWR, 2021a). The entire subject property is seen on Figure 1 to be located outside of the local groundwater basin.

From communications with and review of data provided by the property owner and PPI Engineering, Inc. (PPI, the project engineer), from the field reconnaissance visit by a RCS geologist to the subject property on July 2, 2021, and from review of data and documents associated with the general vicinity of the subject property, the following key items were noted and/or observed (refer to Figure 2, "Property Map"):

- Significant developments that currently exist on the subject property include two residences, a pool, a tennis court, minor landscaping, an animal paddock, and one water well. No vineyards currently exist onsite.
- All existing onsite water demands are currently met by groundwater pumped from an offsite well under common ownership, located to the west of the subject property. Note that this offsite well is not shown within the extent of the Figures attached to this report that show the locations of wells (Figures 1 & 2), because it will not be used in connection with the project.
- A new water well on the subject property, known as the Gate Hill Well, was recently constructed and subjected to pumping tests. The Gate Hill Well was constructed to meet the future groundwater demands of the proposed onsite vineyards and is thus referred to as the "project well" herein. An unsuccessful borehole was also attempted onsite prior to drilling of the Gate Hill Well, discussed further below.
- Development on offsite areas near the subject property includes vineyards, various buildings, and large undeveloped areas covered by native vegetation.
- During the July 2021 site visit, the RCS geologist traveled along roads within and in the immediate vicinity of the subject property to identify possible locations of nearby, offsite wells. RCS refers to such work as a "windshield survey." During this survey, the RCS geologist attempted to identify possible offsite well locations by observing typical well-house enclosures, pressure tanks, storage tanks, power lines, or direct observation of wellheads.
- RCS geologists identified the approximate locations of several possible offsite wells owned by others that are likely to currently exist, based on the field observations of the RCS geologist that performed the site visit, on RCS internal records, and on various records retrieved by RCS from the County's Electronic Document Retrieval website (PBES, 2022) and the State Department of Water Resources (DWR) Well Completion Reports Webpage (2021b), which included numerous well completion reports (WCRs). These possible offsite well locations are shown on Figure 2 at approximate locations determined from available observations and documentation. The locations of these offsite wells owned by others are not considered to be an exhaustive representation of all nearby offsite wells

¹ Assessed area per Napa County (2023b)



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owned by others in the area of the subject property. Other wells owned by others may also exist in the area. It should be noted that the current status of these offsite wells is unknown; it is possible that one or more of these wells were abandoned or are unused, and others may longer exist. Note that none of the offsite wells shown on Figure 2 are within the County-defined setback distances that would necessitate a Tier 2 WAA (discussed further under the "WAA Tier 2" section).

- No offsite springs owned by others are known to exist within 1,500 feet of the project well, based on RCS's review of the National Hydrography Database (USGS, 2023).
- The eastern and western edges of the property intersect with portions of Napa County's "Significant Streams" 1,500-foot buffer area (PBES & LSCE, 2023b), but the project well is not located within that 1,500-foot buffer area.

Local Geologic Conditions

Figure 3, "Geologic Map," depicts the types, lateral extents, and boundaries between the various earth materials mapped at ground surface in the region by others and was adapted by RCS from the results of regional geologic field mapping published by the California Geological Survey (Wagner & Gutierrez, 2017). The earth materials mapped at ground surface² at and proximal to the subject property include the following, from geologically youngest to oldest:

Recent Sedimentary Deposits (map symbols Qhty, Qha, and Qf)

Stream terrace (Qhty) and various alluvial deposits (map symbols Qha and Qf) were mapped by others within the view of Figure 3. These recent sedimentary deposits are typically comprised of varied unconsolidated to poorly consolidated layers and lenses of clastic (granular) materials including sand, silt, clay, and gravel, occasionally with some larger rock clasts. However, Wagner & Gutierrez (2017) do not show recent sedimentary deposits within the boundary of the subject property, or in areas directly upslope of the subject property. Recent sedimentary deposits are therefore not expected to directly or significantly influence the availability of groundwater at the subject property and are therefore not discussed further herein.

Sonoma Volcanics (map symbols Psvbsl, Pgisl, and Psvdg)

According to the information presented in Wagner & Gutierrez (2017), the various volcanic rocks of the Sonoma Volcanics range in geologic age from late Miocene to late Pliocene (approximately 8.2 to 2.5 million years ago [mya], based on radiometric age) and include many types of volcanic rocks and volcanic deposits. The specific units belonging to the Sonoma Volcanics that were mapped within the view of Figure 3 include Andesite flow breccia of Stags Leap Volcanic Center (Psvbsl), Stags Leap Stock within Andesite of Stags Leap Volcanic Center (Pgisl), and Dacite of Mt. George (Psvdg). These volcanic rocks tend to be harder and more resistant to weathering compared to some of the other ash-type volcanic materials and volcanoclastic materials that belong to the Sonoma Volcanics in the region. These harder and more weathering-resistant volcanic rocks appear to act as ridge-forming units on the subject property; in particular, Psvdg is shown to form the high point on the property, at an elevation of greater than 580 feet (see Figure 3).

² Note that 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 any type of mass movement including but not limited to landslides and debris flows, and/or on the potential impact that any type of mass movement might have on any structures, wells, or other developments.



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The driller-reported descriptions of the earth materials encountered in two boreholes that were recently drilled onsite suggest that the rocks beneath at least a portion of the subject property are indeed rocks of the Sonoma Volcanics. The maximum thickness of the Sonoma Volcanics rocks beneath the subject property is not known, but this thickness is likely at least 900 feet based on the driller's descriptions of the earth material encountered in the recent, but unsuccessful, borehole that was mentioned above. This opinion is based primarily on RCS's interpretations of the reported driller's descriptions of the earth materials encountered in the two recent onsite boreholes, on observations made by the RCS geologist during the July 2021 site visit, and on review of the descriptions of the earth materials mapped at the subject property by Wagner & Gutierrez (2017).

Great Valley Sequence (map symbol KJgv)

These rocks are comprised of a complex assemblage of geologically ancient rocks of Late Jurassic to Late Cretaceous geologic age (approximately 162 to 66 million years ago). The Great Valley Sequence rocks within the view of Figure 3 are reportedly undivided (KJgv) from other portions of the Great Valley Sequence. They are shown in Wagner & Gutierrez (2017) as occurring throughout a large portion of the central and northeastern sections of the subject property, and these ground surface exposures continue to the north and northeast within the view of Figure 3. Great Valley Sequence rocks include a diverse variety of rocks ranging from well-consolidated and/or cemented clastic sedimentary rocks to various types of metamorphic rocks. Wagner & Gutierrez (2017) describe KJgv as "marine shale, sandstone, and conglomerate", which are metasedimentary earth materials.

In addition to the reported surface exposures of KJgv within the view of Figure 3, these ancient rocks are known to underlie the Sonoma Volcanics beneath the subject property, but at unknown depths, and they are generally considered to be the bedrock in this region.

Geologic Observations by RCS Geologist

Several ground surface exposures of earth materials were observed by the RCS geologist during the July 2021 site visit. Access to representative in situ rock outcrops was limited and difficult over most of the subject property because of the heavy vegetative cover and rugged terrain. However, all the rocks observed by the geologist were likely igneous in origin. No apparent exposures of metasedimentary rocks were observed by the RCS Geologist during the site visit, in contrast with the mapped KJgv materials shown to cover a large portion of the subject property in Wagner & Gutierrez (2017). However, because of the generally incompetent character of many Great Valley Sequence materials, it is possible that soil development and other surficial processes have buried and transformed the possible onsite occurrences of KJgv to the point of being unrecognizable at the surface of the subject property.



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Geologic Structure³

Review of the geologic map shown on Figure 3 shows that the earth materials in the immediate vicinity of the subject property have been subjected to deformation over geologic time. Evidence of deformation can be observed in several places throughout the map area, specifically where faults have been mapped by others. Recent faults have not been mapped within the view of Figure 3 (USGS, 2020a), but several approximately located faults (bold dashed lines) that separate some of the different rock types shown on Figure 3 occur within and near the subject property. No bedding orientation measurements (commonly referred to strike and dip measurements) were reported in Wagner & Gutierrez (2017) within the view of Figure 3, but two foliation orientations are shown in the northeastern portion of the view, on the Pgisl outcrop. These foliation measurements are steeply to vertically dipping. In addition, no geologic fold traces are shown within the view of Figure 3. Therefore, significant folding of the earth materials in the immediate vicinity of the subject property does not appear to be present, based on the information reviewed herein.

Local Hydrogeologic Conditions

The earth materials described above can generally be separated into two basic categories, based on the relative capacity of the materials to store and transmit groundwater to wells. These two basic categories are Potentially Water-Bearing Materials and Potentially Non-Water-Bearing Rocks, as discussed below.

Potentially Water-Bearing Materials

The Sonoma Volcanics are considered by RCS to be the principal water-bearing materials beneath the subject property and its immediate environs. As discussed above, the materials belonging to the Sonoma Volcanics beneath the subject property include various types of volcanic rocks. These earth materials tend to produce more groundwater when and where they are hard and highly fractured, and/or deeply weathered. Where such zones occur, these rocks are considered the main potentially water-bearing units in the region. The intrusive and extrusive volcanic rocks of the Sonoma Volcanics like the onsite Psvbsl, Pgisl, and Psvdg units of Wagner & Gutierrez (2017) tend to be hard, but tuff and ash flow deposits can exist as relatively hard, competent deposits (described as “welded”), or as softer, more friable deposits. Softer ash flows and deeply weathered volcanic tuffs tend to be fine-grained, clay-rich, and often have limited permeability; thus, these fine-grained ashy and tuffaceous materials are typically only capable of providing groundwater to wells at limited flow rates.

The occurrence and movement of groundwater that might be developed from the harder volcanic rocks typically depends on the number, spatial arrangement, frequency of occurrence, openness, and interconnectedness of fractures in these rocks, as well as the amount of recharge (deep percolation of rainfall, irrigation, etc.) that occurs in the region, and particularly in the watershed catchment area upstream of the subject property.

From RCS’s long-term experience with these materials, and based on our numerous water well construction projects in Napa County over the years, pumping capacities of wells that pump groundwater from these hard volcanic rocks can range widely, from rates as low as a few gallons per minute (gpm), if consolidated soft tuff and ash flow deposits are abundant, to rates as high as

³ Our hydrogeologic work herein does not include any efforts to define or determine local seismicity; to define or determine the potential activity of any possible faults in the region; or to define or determine the potential for onsite fault rupture. Furthermore, it is not known if any of the faults or other possible structural features in the area of the subject property influence groundwater flow (e.g., act as groundwater flow barriers).



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a few to perhaps even several hundred gpm or more, if hard and highly fractured rocks are more abundant.

Potentially Nonwater-Bearing Rocks

This category includes the geologically older regional bedrock, which includes the metasedimentary and metaigneous rocks of the Great Valley Sequence. These rocks are shown in Wagner & Gutierrez (2017) as occurring at ground surface over a portion of the subject property, but they are also known to comprise the regional bedrock directly beneath the Sonoma Volcanics in the region. These diverse and geologically old rocks are well-cemented, well-lithified, and typically have very low permeability.

As a result of the high degree of consolidation and/or cementation and the relatively old geologic age of these diverse rocks, they are typically considered to be non-water-bearing for the purposes of a water-supply well. These rocks typically lack sufficient permeability and intergranular (primary) porosity to permit even nominal rates of groundwater to be extracted by wells. However, some groundwater may be present in open joints, fractures, and bedding planes, or where these bedrock materials are relatively more coarse-grained. However, even in areas with potentially favorable conditions, production from wells perforated within these older rocks are often low, with successful wells often only capable of producing water at no more than a few gpm, at best. Furthermore, the quality of the groundwater produced from such wells can be marginal to poor in terms of various naturally occurring constituents.

Groundwater Basins

Groundwater basin boundaries in California have been defined and designated by the State Department of Water Resources (DWR) in their Bulletin 118, "California Groundwater" (2021a). Those DWR groundwater basin boundaries are the same as those used to define groundwater basin boundaries for the purposes of preparing a Groundwater Sustainability Plan (GSP) for the many groundwater basins in the State. The local groundwater basin defined in DWR Bulletin 118 (2021a) is known as the Napa Valley Subbasin of the Napa-Sonoma Groundwater Basin. As shown on Figures 1 and 2, the entire subject property lies outside of the boundaries of this local, DWR-recognized, groundwater basin.

Local Watersheds

Review of data watershed boundary acquired from LSCE & MBK (2013) show that the subject property is located within the "Napa River Watershed near Napa" (see Figure 1). As suggested by the name, this watershed is tributary to the Napa River.

Key Data for Existing Onsite Well

As stated above, only one water supply well exists onsite – the Gate Hill Well; the location of this well is shown on Figures 2 and 3.

Well Construction Data

Key well construction details derived from the State Well Completion Report (WCR; included in Appendix) for the onsite Gate Hill Well include the following:

- Drilled and constructed in 2023
- Borehole depth: 600 feet below ground surface (bgs)
- Casing depth: 598 feet bgs
- Casing material: SDR-21 PVC



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- Casing outer diameter: 8-5/8 inches
- Casing perforation depths: interspersed with blank casing between the depths of 218 feet bgs and 578 feet bgs
- Total perforated length of casing: 300 feet
- Casing perforation type: 0.032-inch milled slots (factory-cut slots)
- Sanitary seal: 58 feet bgs depth, comprised of 10.3 sack cement

Summary of Key Airlifting “Test” Data

The WCR for the Gate Hill Well shows that the original post-construction static water level (SWL) in the well was at a depth of 77 feet bgs and that the well had an original post-construction airlift⁴ “test” rate of 400 gallons per minute (gpm) over a two-hour period of airlifting.

Pumping Tests of Existing Onsite Well

A 9-hour step drawdown pumping test and a 12-hour constant rate pumping test were successively performed in the Gate Hill Well as part of the WAA preparation process, using a temporary test pump installed to a depth of approximately 428 feet below the wellhead reference point (ft brp). These pumping tests were performed in June 2023 by Oakville Pump Service, Inc. (OPS), of Napa, California. The purposes of the testing were to further develop the recently constructed well and to help determine the future operational pumping rate of the well with a permanent pump. Observation well monitoring was not performed as part of this testing because no known wells exist within 500 feet of the new well and no other onsite wells exist. Data collected by OPS during these tests are provided in the Appendix to this report. The final pumping rate of the Gate Hill Well at the end of the constant rate pumping test was 76 gpm, based on the results of the June 2023 testing performed by OPS. The SWL and pumping water levels (PWLs) reported and logged by the temporarily installed water level logging pressure transducer (referred to herein as “data logger”) were calibrated by RCS using manual water level measurements by OPS; both sets of water level measurements are shown on Figure 4, “Gate Hill Well Hydrograph of Pumping Tests”. Additional details on the tests are provided below.

Data Collection

Water level, flow rate, and flow volume data were collected in the Gate Hill Well by OPS personnel throughout the testing process. Regular water level data and flow values were recorded throughout the testing process by OPS personnel.

Results of Step Drawdown Testing

The step drawdown pumping test of the Gate Hill Well was performed on June 12, 2023, using the temporarily installed test pump. Key data available from this pumping test by OPS are as follows:

- A SWL of 65.9 ft bgs was recorded by the data logger in the Gate Hill Well before the step drawdown test began. The length of time since the well was last pumped was 64 hours; that prior pumping was performed as part of the initial development pumping by OPS, which occurred for a period of 9 hours on June 9, 2023.

⁴ As a rule of thumb, RCS geologists estimate that normal operational pumping rates for a new well equipped with a permanent pump are typically on the order of only about one-half or less of the airlifting rate reported on a driller’s log.



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- The step drawdown test of the Gate Hill Well consisted of three separate pumping rate steps with successively higher nominal flow rates of 50 gpm, 100 gpm, and 150 gpm. Each of these steps was pumped for a continuous period of 3 hours.
- Based on flow rate data recorded by the pumper, the Gate Hill Well was pumped at average rates of 51 gpm, 99 gpm, and 148 gpm during the first, second, and third steps, respectively.
- The PWLs at the end of each successive step were 70.6 ft bgs, 77.1 ft bgs, and 84.9 ft bgs, respectively, which can be used to calculate the short-term specific capacity⁵ values for the new well of approximately 10.9, 8.8, and 7.8 gpm/ft ddn (gallons per minute per foot of water level drawdown) at the end successive step rate. Based on the available data, which are shown on Figure 4, PWLs steadily declined during the latter portions of each step rate, with an expectedly greater average rate of decline during in each successively higher pumping rate step. At no time during the step drawdown testing did the PWLs in the Gate Hill Well stabilize or reach equilibrium.
- Water level recovery was recorded to occur in the well, following cessation of pumping. Water levels recovered to 73% of the pre-step drawdown test SWL after 12 hours of non-pumping; to 83% of the pre-step drawdown test SWL after 24 hours of non-pumping; to 91% of the pre-step drawdown test SWL after 48 hours of non-pumping; and to 94% of the pre-step drawdown test SWL after 62 hours of non-pumping; immediately before commencement of the subsequent 24-hour constant rate pumping test.
- After the end of the step drawdown test recovery period, a 12-hour constant rate test was performed in the Gate Hill Well, as described below.

Results of Constant Rate Testing

The constant rate pumping test of the Gate Hill Well was performed on June 15, 2023, using the temporarily installed test pump. Key data available from this pumping test by OPS include:

- A SWL of 67.1 ft bgs was recorded by the data logger in the Gate Hill Well before the constant rate test began. The length of time since the well had been last pumped was 62 hours.
- RCS calculated the average flow rate throughout the duration of the test to be approximately 76 gpm. As with the step drawdown test data, these flow rate data are based on the data recordings by the OPS pumper. At the beginning of the test, the pumping rate was recorded to be 87 gpm, but this rate declined to a range of 75-77 gpm for the remainder of the test following the first 10 minutes of pumping.
- Initial water level drawdown was moderate during the early portion of the test, dropping by 4.6 feet by the end of the first hour. After that period, water level drawdown occurred progressively more gradually. During the final hour of pumping, the rate of water level drawdown was 0.4 ft/hour. The final PWL, recorded at the end of the test, was 80.1 ft bgs (water level drawdown of 13 ft). At no time during the constant rate test did PWLs stabilize in the Gate Hill Well.
- A longer-term (12-hour) specific capacity of 5.8 gpm/ft ddn is calculated for the Gate Hill Well, based on the average pumping rate of 76 gpm, and the final PWL was at 80.1 ft bgs.

⁵ Here, specific capacity (units are gallons per minute per foot of water level drawdown, or gpm/ft ddn) is a measure of the pumping rate in the well (in gpm) divided by the water level drawdown (in feet of drawdown, ft ddn) created in the well while pumping at a given rate.



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- Water level recovery in the well following cessation of pumping for the constant rate pumping test occurred slowly, and similar to that following the pumping for the prior step drawdown test. Water levels recovered to 65% of the pre-constant rate test SWL after 12 hours of non-pumping, to 78% of the pre-constant rate test SWL after 24 hours of non-pumping, to 90% of the pre-constant rate test SWL after 48 hours of non-pumping, to 101% of the pre-constant rate test SWL after 96 hours of non-pumping, and to 115% of the pre-constant rate test SWL after approximately 2 weeks of non-pumping (at which time the data logger was removed from the well by OPS).
- Compared with the pre-step test SWL (65.9 ft bgs), the 2-week recovery water level following the end of the constant rate test was at 65.2 ft bgs, or about 0.7 ft higher than the pre-test SWL. The more-than-complete water level recovery recorded in the new well following the pumping tests suggests that the aquifer system from which the new well extracts water might be areally extensive, and that it might be capable of providing groundwater to the well at a rate on the order of 76 gpm, given ample recovery time between pumping periods. Repeated pumping of the new well at high rates (greater than 76 gpm), for extended periods of time (greater than 12 hours), and without adequate rest (recovery) periods could potentially lead to water level drawdown in the well that will decrease the performance and efficiency of the well over both the short- and long-term.
- As described above, the Gate Hill Well was pumped at a rate of 76 gpm for a continuous period of 12 hours, with a water level drawdown of only 13 ft at the end of that pumping period. However, based on the relatively slow water level recovery following each successive period of pumping, the resulting PWLs will progressively decrease. This well is more likely capable of pumping at a rate on the order of 50 gpm during the irrigation season.

Water Demands

Existing Water Demands

Based on information provided by Mr. Joe Papendick, Director of Gardens for Boisset Collection, total existing onsite water demands are:

- roughly 5.4 AFY⁶;
- comprised of water supply to two onsite residences, onsite landscaping, an onsite swimming pool, and livestock watering; and
- met by water pumped from an offsite well that is reportedly under common ownership with the subject property.

No long-term totalizer records or other reliable data are known to exist with respect to annual groundwater volumes pumped from the offsite well for these existing onsite uses.

The water demands for the existing onsite developments are not expected to change significantly following development of the proposed onsite vineyards, and may possibly decrease by less than 0.01 AFY due to a possible shift of water supply for livestock watering, from the offsite well to the Gate Hill Well. Mr. Papendick estimated watering of livestock that are kept onsite annually totals roughly 600 gallons (~0.002 AFY). Thus, these existing demands are expected to remain at 5.4 AFY, the water source (offsite well) will not change, and the types of uses will not change, except for the minor change to livestock watering described above.

⁶ AFY = acre-feet per year; 1 acre-foot = 325,851 gallons.



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Proposed Water Demands

As described above, no significant changes to the existing onsite water demands are proposed (except for possibly livestock watering), in terms of water source (the offsite well), types of onsite uses (two residences, landscaping, and a swimming pool), and annual demand total (5.4 AFY).

However, based on communications with Ms. Sophie Drucker, Director of Winegrowing at Boisset Collection, Mr. Papendick, and PPI, and also on standard estimates presented in Napa County's WAA Guidelines (2015), significant new onsite water demands will result as part of the subject vineyard development project and are expected to be as follows:

- 6.55 AFY for irrigation of 13.1 acres of proposed onsite vineyards
(0.5 AFY/acre⁷ × 13.1 acres of vineyard)
- 3.28 AFY for heat protection for 13.1 acres of proposed onsite vineyards
(0.25 AFY/acre⁸ × 13.1 acres of vineyard)

The sum of these proposed future onsite uses of groundwater pumped from the Gate Hill Well is 9.83 AFY. Note that one or more future fire suppression tanks are also proposed to be filled by the Gate Hill Well. However, because filling of these/those tank(s) is not a regularly recurring event, a consideration of tank demand is not included in the calculations presented in this Memorandum. Also note that livestock watering, which may shift to being supplied by the Gate Hill Well in the future, is not reflected above because the annual demand for this use is anticipated to be less than 0.01 AFY.

Annual irrigation demands are not expected to vary in response to wet vs dry years. According to Ms. Drucker: *"The site has very thin soils. Because of the low water holding capacity, we anticipate that the demands will be stable between wet and dry years. Rootstocks will be selected based on extensive soil studies. We also plan to implement deficit irrigation practices which are standard in farming of high-quality wine grapes."*

Proposed Pumping Rates

To conservatively estimate the required overall pumping rate required to meet the proposed onsite vineyard groundwater demand of 9.83 AFY, the following assumptions and calculations are provided:

- Groundwater pumping would only occur on a 50% operational basis (12 hours per day and 7 days per week) during the irrigation season.
- The irrigation season would be 20 weeks long each year.
- All groundwater pumping for heat protection would occurring during this 20-week irrigation season.

Therefore, the pumping rate required from the Gate Hill Well to meet the proposed new onsite demands would be approximately 32 gpm, assuming the 50% operational pumping basis, and is calculated as follows:

$$\text{Required Pumping Rate} = 9.83 \text{ AFY} * \frac{325,851 \text{ gallons}}{\text{AF}} * \frac{\text{year}}{20 \text{ weeks}} * \frac{\text{week}}{7 \text{ days}} * \frac{\text{day}}{720 \text{ minutes}}^9 \cong 32 \text{ gpm}$$

⁷ Estimated unit water use rate for vineyard irrigation= 0.2 to 0.5 AFY/acre of vineyard (Napa County, 2015).

⁸ Estimate unit water use rate for vineyard heat protection= 0.25 AFY/acre of vineyard (Napa County, 2015).

⁹ Factor for 12-hour per day (50%) operational basis.



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As noted above, the Gate Hill Well is likely capable of pumping groundwater at a rate on the order of 50 gpm for daily pumping events during future irrigation seasons. Thus, the Gate Hill Well can provide an operational pumping rate capacity to meet the required demands (32 gpm) of the proposed uses of the Gate Hill Well (i.e., irrigation of onsite vineyards and livestock watering).

Tier 1 WAA – “Groundwater Use for Napa County”

Napa County recently promulgated new guidelines for WAA preparation with respect to groundwater recharge calculations in response to the Governor’s Executive Order N-7-22 (Napa County, 2022a & 2023a) and the ongoing drought in the State. The County has mandated that groundwater recharge estimates presented in WAAs for projects outside of the Napa Valley Subbasin of the Napa-Sonoma Valley Groundwater Basin must be calculated on a parcel-specific basis, and that the calculations must consider “average rainfall” to be the average annual rainfall that has occurred in the last 10 water years¹⁰, such as defined in the County’s 10-year average precipitation dataset (PBES & LSCE, 2022). Conversely, if a parcel lies within the Napa Valley Subbasin, or other specific areas of Napa County, the allowable groundwater usage allotments must be calculated as 0.3 AFY of allowable groundwater usage for each assessed acre of land attributed to the subject property. Because the subject property is not located within the local DWR-defined groundwater basin, groundwater recharge must be calculated for the subject property via the parcel-specific method¹¹.

Parcel-Specific Precipitation

Spatial analysis of the County’s 10-year average rainfall data set (PBES & LSCE, 2022) determined that the area-weighted average annual rainfall for the 10-water-year period 2012 to 2021 at the subject property is 25.5 inches (see Table 1, “Calculation of Estimated Groundwater Recharge”). Multiplying this average by the assessed area of the subject property (53.7 acres), then dividing by a factor of 12 to convert from inches to feet, results in a total volume of approximately 114.1 AFY. This value is the average volume of rainfall that the subject property might receive each water year, using the County’s current 10-year average methodology, but it does not consider either the estimated deep percolation (groundwater recharge) rate at the subject property or the effect of onsite ground surface slopes on the estimated deep percolation rate.

Parcel-Specific 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 parcel and subsequently undergoes deep percolation, ultimately entering the local aquifer system beneath the parcel. The actual percentage of rainfall that undergoes deep percolation is a function of numerous local and regional conditions, including ground surface slopes; soil types; ground cover; evapotranspiration; and the frequency, intensity, and duration of rainfall, among other possible factors.

Estimates of groundwater recharge as a percentage of rainfall were presented for several watersheds that are tributary to the Napa River in LSCE & MBK (2013). Those watershed boundaries are shown on Figures 8-3 and 8-4 of LSCE & MBK (2013), and a local subset is shown on Figure 1 of this Memorandum. The watershed that contains the entire subject property is

¹⁰ Here, a water year is defined as beginning on October 1 and ending on September 30 of the following year (e.g., water year 2021 begins on October 1, 2020, and ends on September 30, 2021).

¹¹ A “prolonged drought analysis” is no longer required for WAA preparation due to the required use of the 10-year annual rainfall average or the unit groundwater use of 0.3 AFY/acre (Napa County, 2022b).



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referred to by LSCE & MBK (2013) as the "Napa River Watershed near Napa". This watershed was characterized on Table 8-10 of LSCE & MBK (2013) as having a 17% deep percolation rate, referred to thereon as "Recharge (% of Precip.)". Therefore, the 17% deep percolation rate of LSCE & MBK (2013) for the Napa River Watershed near Napa was used for the groundwater recharge calculations presented herein for the subject property.

Multiplication of the LSCE & MBK groundwater recharge rate (17%) with the average approximate volume of rainfall that the subject property receives on each water year (114.1 AFY), results in a property-specific average groundwater recharge rate of 19.4 AFY, using the County's current 10-year precipitation average methodology (see Table 1). However, this calculation still does not directly consider the possible effect of the ground surface slope on the potential for deep percolation for the property.

Effect of Slope on Groundwater Recharge Potential

Any estimate of the percentage of rainfall that enters an aquifer system via deep percolation that relies on estimates of rainfall, evapotranspiration, and surface water outflow for an entire watershed, such as the estimates provided by LSCE & MBK (2013), inherently includes the effects of ground surface slope. To provide a more site-specific estimate of the potential effects of ground slope on groundwater recharge at the subject parcel, a ground surface slope analysis is provided below.

Many basic geologic references assume that recharge potential is reduced on steeper slopes because steeper slopes tend to increase surface water runoff rates and less time is therefore available for rainfall to percolate (infiltrate) into the ground before running off as surface flow. Page 56 of LSCE & MBK (2013) asserts that deep percolation recharge from rainfall is "significantly reduced" for land areas with slopes angles (inclinations) >30 degrees. On page 11 of LSCE & MBK (2013), an assessment of slope angles >30 degrees is also mentioned, and this was attributed to a prior LSCE report, namely "LSCE 2011" therein; that document is likely to be the reference listed as "2011a" on page 134 of LSCE & MBK (2013). LSCE (2011) states on page 29 that "areas in which the slope of the land surface exceeds 30 degrees, beyond which recharge potential is significantly reduced." No other references or data are presented in any of the above-referenced documents to quantify the qualitative description of "significantly reduced". Because the various factors that affect groundwater recharge are likely interrelated (Yeh et al., 2009), assigning a value to define the amount that recharge is diminished as a function of slope is extremely difficult. No references were reviewed by RCS that quantify the possible reduction of deep percolation that might occur as a function of ground surface slope angle.

The watershed-wide estimates of the deep percolation rate of rainfall for the entire Napa River Watershed near Napa were based on water balance calculations that included rainfall throughout the entire watershed (LSCE & MBK, 2013). As discussed above, those watershed-scale calculations inherently include all slopes within the watershed, including slopes >30 degrees. Therefore, to provide a more conservative and site-specific estimate of groundwater recharge for the subject property, it is assumed that deep percolation at the subject property does not occur on areas with slope >30 degrees, and that rainfall that occurs on the >30-degree-sloped areas would leave the property through some other hydrologic process (e.g., surface runoff, evapotranspiration, etc.).

The results of the slope-dependent groundwater recharge calculations for the subject property are shown on Table 1. Thereon, the proportions of the ground surface on the subject property that are ≤30 degrees and >30 degrees are presented, based on spatial analysis of a U.S. Geological Survey (USGS) digital elevation model (2020b). Within the boundary of the subject



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property, 97.1% of the ground surface (roughly 52.1 acres) was determined to be sloped at ≤ 30 degrees, whereas the remaining 2.9% of the ground surface (roughly 1.6 acres) was determined to be sloped at > 30 degrees. Table 1 also shows separate values for the average annual rainfall on those differently sloped portions of the property. Thus, if it is assumed that rainfall does not undergo deep percolation over the 1.6-acre portion of the subject property with slopes > 30 degrees, the remaining average annual recharge that is estimated to occur at the subject property would be 18.8 AFY (25.5 inches of rainfall over the more gently sloped areas multiplied by the 52.1-acre area of the more gently sloped areas, divided by a factor of 12 to convert from inches to feet, and multiplied by the 17% coefficient for deep percolation rate). Therefore, if it is assumed that no deep percolation occurs on the steeply sloped (> 30 degrees) portions of the property, the estimated annual groundwater recharge volume falls by 0.6 AFY (from 19.4 AFY).

In accordance with current Napa County guidelines (2015 & 2023a) and based on the conservative analyses presented above, average annual groundwater recharge at the subject property, and thus allowable groundwater extractions from the subject property, would be 18.8 AFY. This estimate of groundwater recharge and allowable groundwater extractions exceeds the 9.83 AFY onsite groundwater extractions proposed for the subject property. Because total proposed onsite groundwater extractions (9.83 AFY) are less than the estimate average annual groundwater recharge at the property (18.8 AFY), the Tier 1 WAA conditions are satisfied for the proposed new vineyard development and for the other existing groundwater uses that would continue in the future at the subject property.

Tier 2 WAA – Review of Possible “Well & Spring Interference”

Review of publicly available records for evidence of nearby wells owned by others (PBES, 2022; DWR, 2021b), and for nearby offsite springs (USGS, 2023), did not result in discovery of any known wells or springs owned by others within 500 feet or 1,500 feet, respectively, of the location of the project well (the Gate Hill Well). Therefore, the Tier 2 WAA requirements for the proposed vineyard development project are presumptively met, and a Tier 2 WAA is not necessary (Napa County, 2015 & 2023a).

Tier 3 WAA – Review of Possible “Groundwater/Surface Water Interaction”

Napa County has published information defining which Rivers, Streams, and Creeks within the County are considered “significant” for the purposes of Tier 3 WAA review. These “Significant Streams” are defined by Napa County on two GIS layers referred to as “Significant Streams” and “Significant Streams_1500ft_Buffer” (PBES & LSCE, 2023a & b). These two layers were used by RCS to determine if there were any “Significant Streams” near the subject property, and if the project well (the Gate Hill Well) is located within a 1,500 ft buffer zone around a “Significant Stream”. According to the County’s updates to WAA requirements (Napa County, 2023a), a Tier 3 WAA is required if a project well lies within 1,500 ft of a “Significant Stream”.

Figures 1 and 2 show the spatial relationship between the subject property and the nearby Significant Streams 1,500-foot buffer areas. Figure 2 also shows that the location of the project well (the Gate Hill Well) is located entirely outside of the 1,500-foot “Significant Streams” buffer areas. The Tier 3 WAA requirements for the proposed vineyard development project are therefore presumptively met, and a Tier 3 WAA is not necessary (Napa County, 2015 & 2023a).



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Key Conclusions and Recommendations

1. The proposed project is the development of 13.1 acres of new vineyards at the subject property.
2. All existing onsite water demands are currently met by an offsite well under common ownership to the subject property, for which a water easement with the subject property reportedly exists. These demands currently total 5.4 AFY for the subject property, and they are not expected to change significantly in terms of volumetric demand, water source, or the types of demands following development of the proposed onsite vineyard areas.
3. Total water demand for the project (i.e., vineyard irrigation and vineyard heat protection) has been estimated to be 9.83 AFY.
4. The water demands of the proposed project will be met solely by groundwater pumped from the new onsite Gate Hill Well.
5. Parcel-specific groundwater recharge at the subject property is calculated to be 18.8 AFY. This calculation assumes deep percolation does not occur on areas of the subject property that exceed ground surface slopes of 30 degrees, and it also assumes that 17% of the average area-weighted 10-year precipitation that has been estimated to annually fall directly on areas of the subject property with ground surface slopes of ≤ 30 degrees undergoes deep percolation, ultimately becoming groundwater. This conservatively calculated recharge volume is greater than the total groundwater demand proposed for the property of 9.83 AFY. Therefore, the project complies with the Napa County Tier 1 WAA requirements (Napa County, 2015 & 2023a).
6. The Gate Hill Well, which was constructed into fractured rocks of the Sonoma Volcanics, was subjected to a 9-hour step drawdown pumping test at average step rates of 51, 99, and 148 gpm; and a 12-hour constant rate pumping test, at an average rate of 76 gpm. The water level drawdown at the end of the 12-hour constant rate test was 13 feet, as measured by the contracted pump company. This well has a specific capacity of 5.8 gpm/ft dd at that pumping rate, as of the date of that constant rate pumping test. Note, during future irrigation-season pumping at operational rates on the order of 50 gpm, the specific capacity of this well will be greater, and the resulting water level drawdown will be smaller.
7. Based on the results of the pumping tests of the Gate Hill Well, it appears that it will be capable of meeting the estimated groundwater demands of the proposed onsite vineyard development (32 gpm). No water extracted from the Gate Hill Well will be used offsite, and no water from the Gate Hill Well will be used to meet existing onsite water demands other than possibly for existing livestock water demands (less than 0.01 AFY).
8. A Tier 2 WAA is not necessary for the proposed project because the project well (the Gate Hill Well) is located greater than 500 feet from the locations of offsite wells owned by others, and greater than 1,500 feet from the locations of known offsite springs owned by others (Napa County, 2015 & 2023a).
9. A Tier 3 WAA is not necessary for the proposed project because the project well (the Gate Hill Well) is located outside of the 1,500-foot buffer zone around Napa County's Significant Streams (Napa County, 2015 & 2023a).
10. RCS recommends initiation of a groundwater monitoring program for the Gate Hill Well and the shared offsite well. This would include the regular, frequent, and ongoing monitoring of static and pumping water levels in those two wells, and also the monitoring of the instantaneous flow rates and cumulative pumped volumes from the project well (the Gate Hill Well).

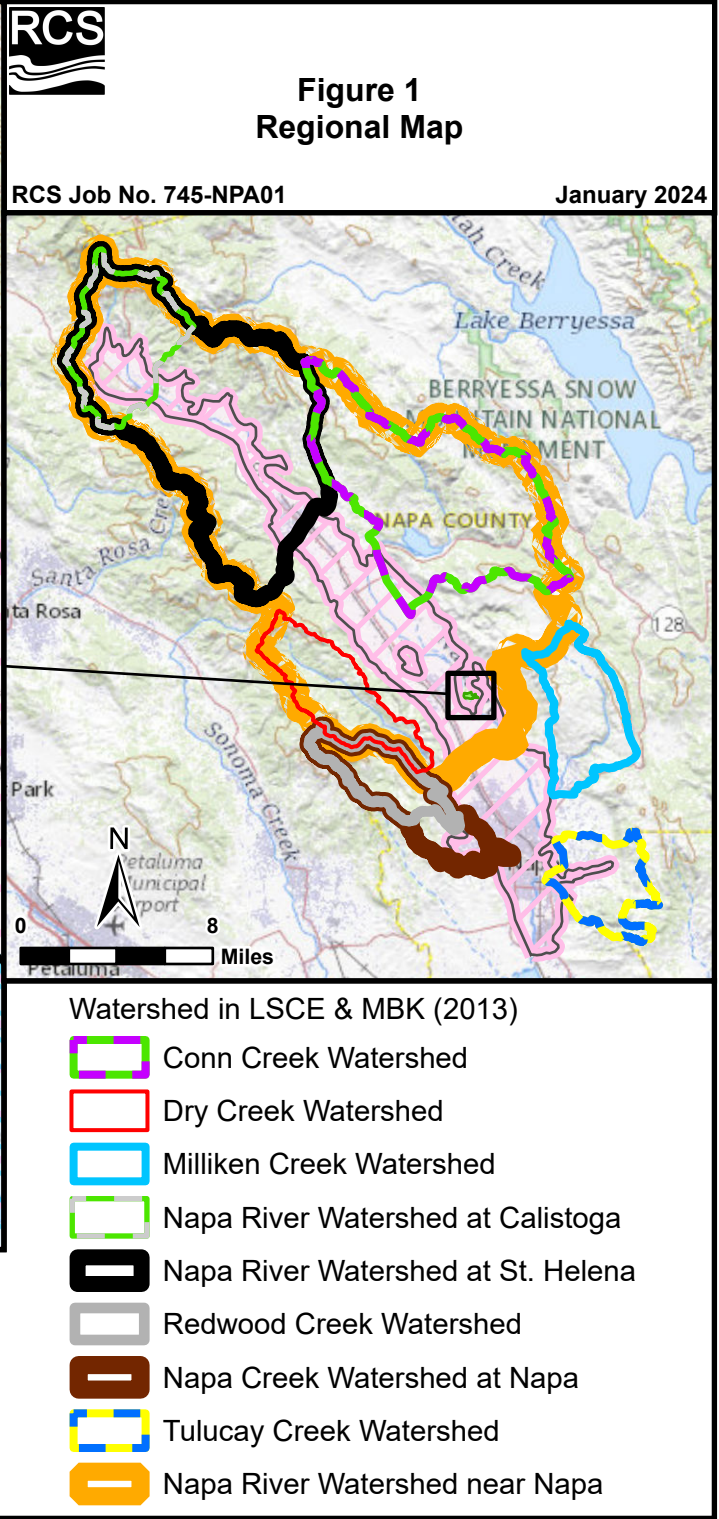
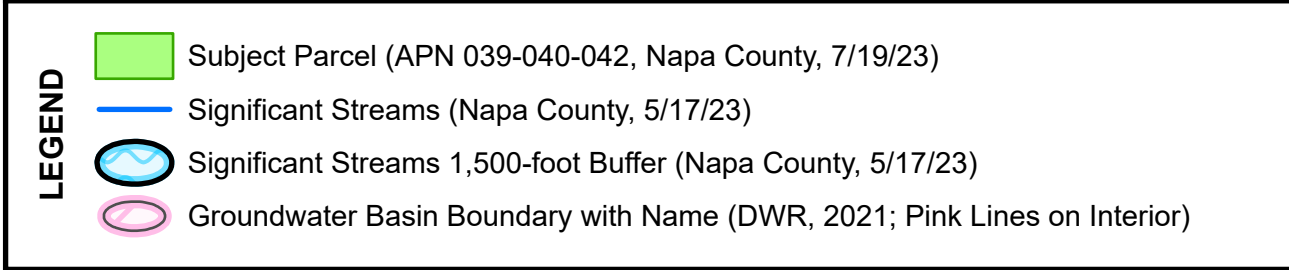
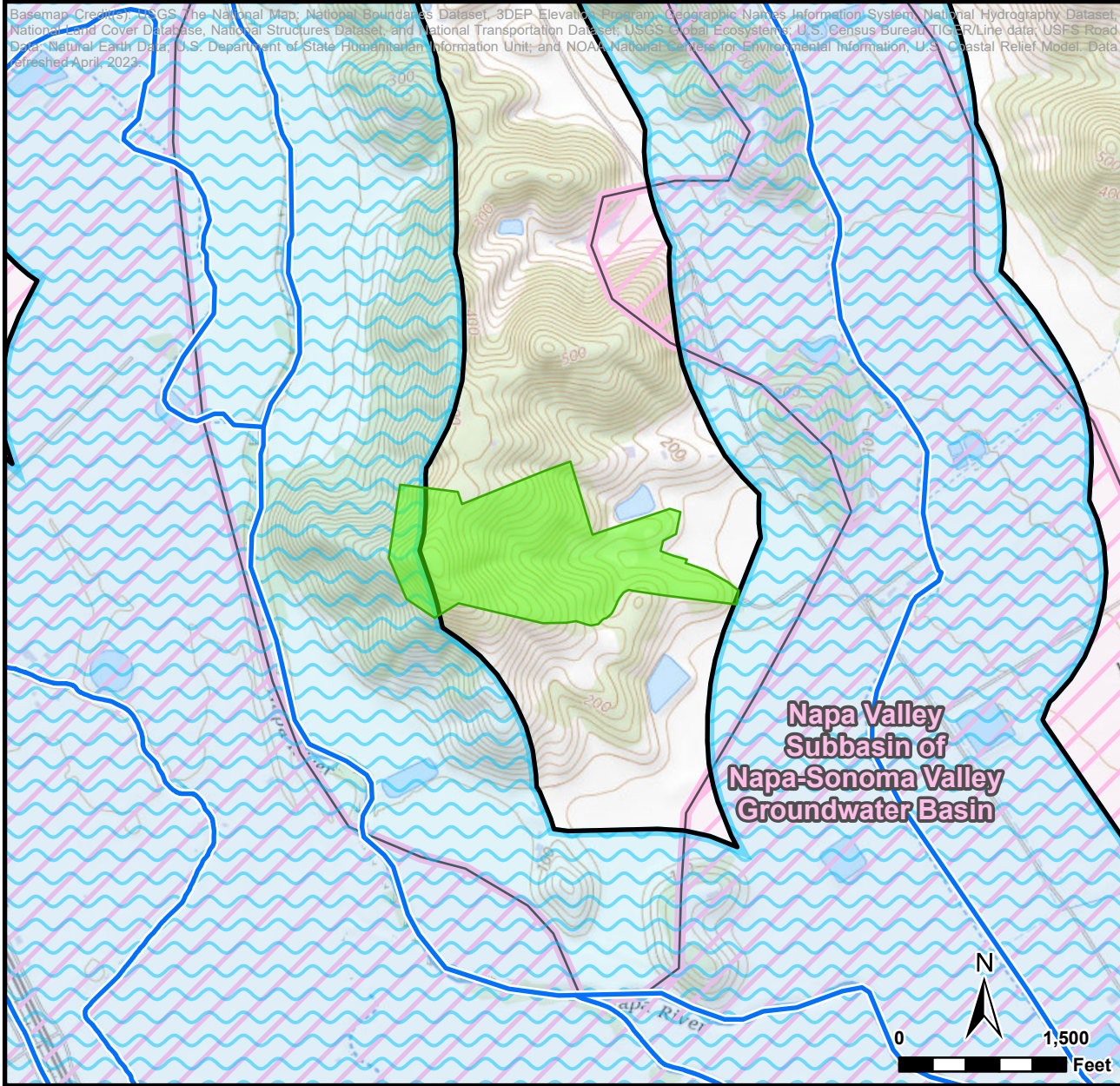


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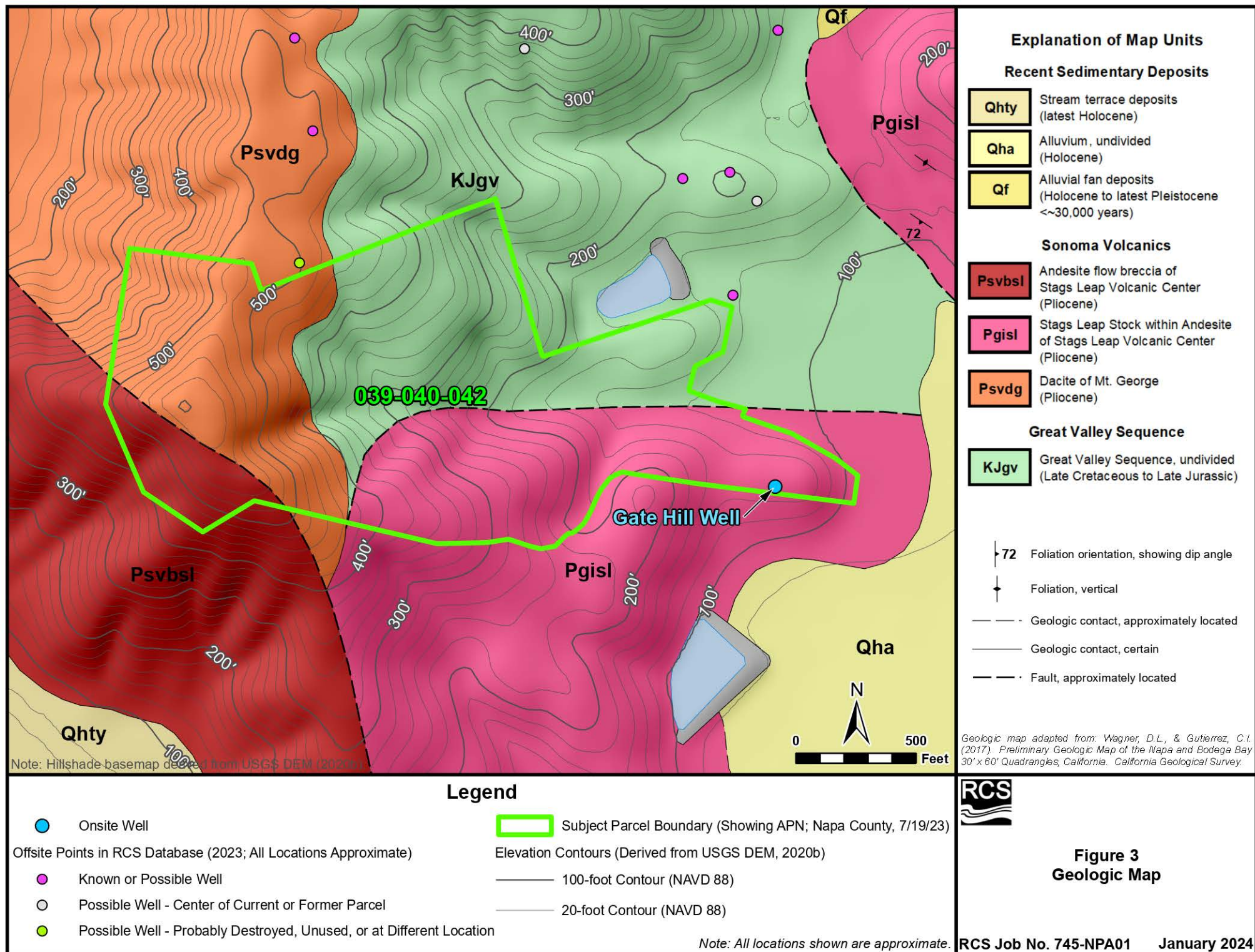
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Basemap Credits: USGS The National Map; National Boundaries Dataset; 3DEP Elevation Program; Geographic Names Information System; National Hydrography Dataset; National Land Cover Database; National Structures Dataset; and National Transportation Dataset; USGS Global Ecosystems; U.S. Census Bureau TIGER/Line data; USFS Road Data; Natural Earth Data; U.S. Department of State Humanitarian Information Unit; and NOAA National Center for Environmental Information, U.S. Coastal Relief Model. Data refreshed April, 2023.







Manual Water Levels by Pumper
Datalogger-Recorded Water Levels

LEGEND



RCS Job No. 745-NPA01

Figure 4 Hydrograph of Gate Hill Well Pumping Tests

January 2024

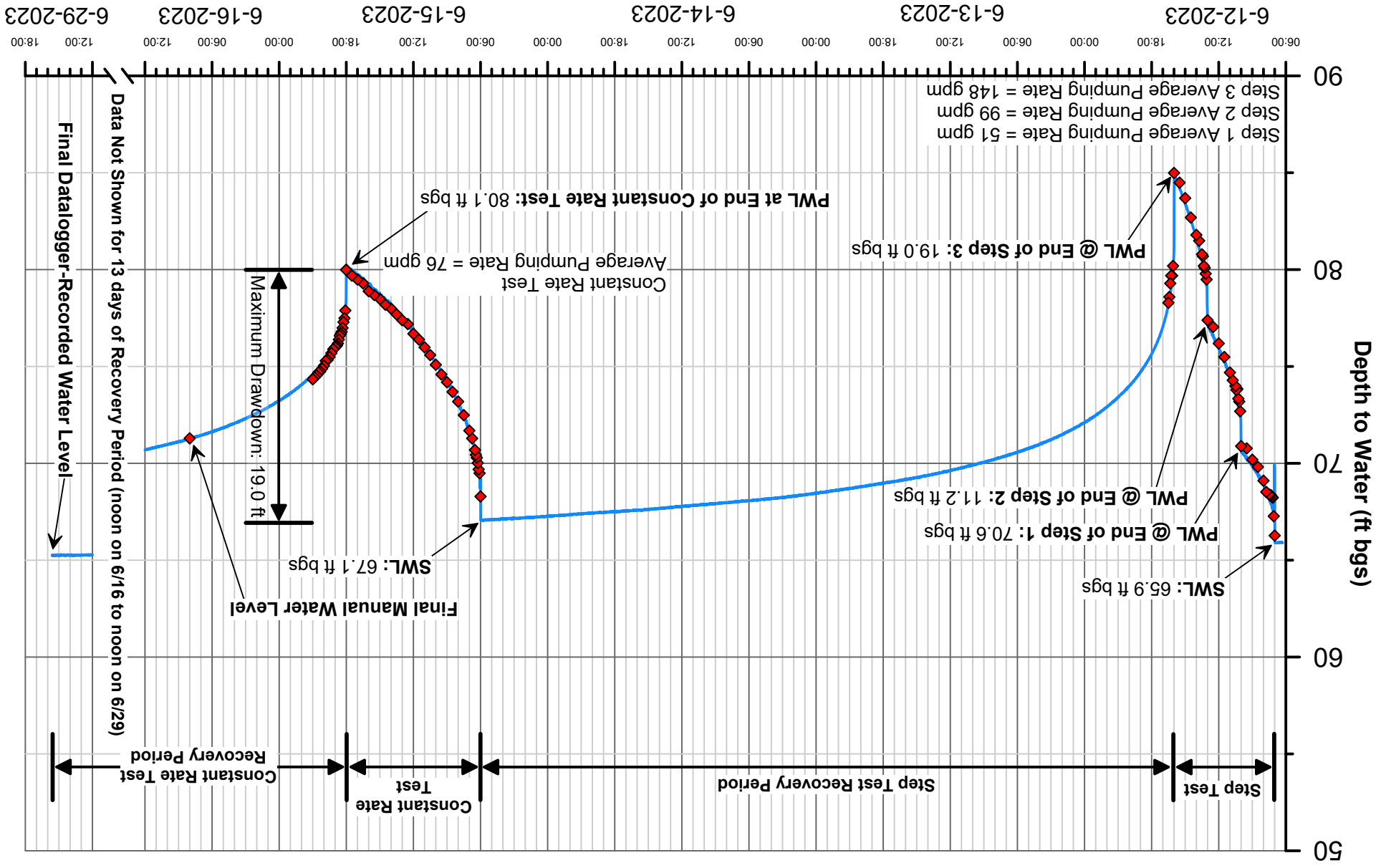


Table 1
Calculation of Estimated Groundwater Recharge

Analysis Area	Entire Property			Property Area Divided by Slope ⁽¹⁾				Groundwater Recharge Assumptions and Estimates			
	Area	Average Annual Rainfall ⁽²⁾		Area of Portion		Average Annual Rainfall ⁽²⁾ on Portion		Deep Percolation Occurs at Uniform Rate Over Entire Property		Deep Percolation Occurs Only on Areas of ≤30° Slope	
		Amount	Volume			Amount	Volume	Deep Percolation		Deep Percolation	
	(acres)	(in)	(AF)	(%)	(acres)	(in)	(AF)	Percentage	Annual Volume	Percentage	Annual Volume
Boisset Collection Wappo Hill Property ⁽³⁾	53.7	25.5	114.1	≤30°: 97.1%	52.1	25.5	110.7	17.00%	18.8	17.00%	18.8
				>30°: 2.9%	1.6	25.6	3.4	17.00%	0.6	0.00%	0.0
					Σ=53.7		Σ=114.1		Σ=19.4		Σ=18.8

Note: The deep percolation rate reported by LSCE & MBK (2013) for the Napa River Watershed near Napa is 17%.

(1) Ground surface slopes calculated from USGS DEM (2020b).

(2) Area-Weighted Average Rainfall for Boisset Collection Wappo Hill Property calculated from Napa County 10-Year Average Rainfall Dataset (PBES & LSCE, 2022).

(3) All areas reported for subject property are based on the County-assessed area reported in Napa County's GIS Parcel Layer (2023b).



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APPENDIX

State Well Completion Report
(WCR2022-011892)
&
Pumping Logs from OPS (June 2023)

for

Gate Hill Well

State of California
Well Completion Report
Form DWR 188 Submitted 10/11/2022
WCR2022-011892

Owner's Well Number 1-2022 Date Work Began 09/09/2022 Date Work Ended 10/05/2022
Local Permit Agency Napa County Planning Building and Environmental Services
Secondary Permit Agency _____ Permit Number E22-00023 Permit Date 06/17/2022

Well Owner (must remain confidential pursuant to Water Code 13752)		Planned Use and Activity	
Name	<u>DESIREE, INC.,</u>	Activity	<u>New Well</u>
Mailing Address	<u>849 Zinfandel Lane</u>	Planned Use	<u>Water Supply Irrigation - Agriculture</u>
City	<u>St. Helena</u>		
State	<u>Ca</u>		
Zip	<u>94574</u>		

Well Location									
Address <u>5681 Silverado TR</u>					APN <u>039-040-042</u>				
City <u>Napa</u>		Zip <u>94558</u>		County <u>Napa</u>		Township <u>06 N</u>			
Latitude <u>38</u> <u>23</u> <u>48</u> <u>N</u>		Longitude <u>-122</u> <u>19</u> <u>44</u> <u>W</u>				Range <u>04 W</u>			
Deg. Min. Sec.		Deg. Min. Sec.				Section <u>05</u>			
Dec. Lat. <u>38.3966667</u>		Dec. Long. <u>-122.3288889</u>				Baseline Meridian <u>Mount Diablo</u>			
Vertical Datum _____		Horizontal Datum <u>WGS84</u>				Ground Surface Elevation _____			
Location Accuracy _____		Location Determination Method _____				Elevation Accuracy _____			
						Elevation Determination Method _____			

Borehole Information				Water Level and Yield of Completed Well			
Orientation	<u>Vertical</u>	Specify _____		Depth to first water	<u>215</u>	(Feet below surface)	
Drilling Method	<u>Direct Rotary</u>	Drilling Fluid	<u>Air</u>	Depth to Static			
Total Depth of Boring	<u>600</u>	Feet		Water Level	<u>77</u>	(Feet)	Date Measured <u>10/05/2022</u>
Total Depth of Completed Well	<u>598</u>	Feet		Estimated Yield*	<u>400</u>	(GPM)	Test Type <u>Air Lift</u>
				Test Length	<u>2</u>	(Hours)	Total Drawdown _____ (feet)
				*May not be representative of a well's long term yield.			

Geologic Log - Free Form		
Depth from Surface Feet to Feet		Description
0	64	tan ash with embedded cobbles
64	205	90% gray volcanics / 10% gray ash
205	215	gray ash
215	325	gray volcanics
325	400	light gray volcanics
400	460	fractured gray volcanics
460	500	gray volcanics with pyrite
500	600	fractured gray volcanics

Casings										
Casing #	Depth from Surface Feet to Feet		Casing Type	Material	Casings Specificatons	Wall Thickness (inches)	Outside Diameter (inches)	Screen Type	Slot Size if any (inches)	Description
1	0	218	Blank	PVC	OD: 8.625 in. SDR: 21 Thickness: 0.410 in.	0.41	8.625			
1	218	318	Screen	PVC	OD: 8.625 in. SDR: 21 Thickness: 0.410 in.	0.41	8.625	Milled Slots	0.032	
1	318	338	Blank	PVC	OD: 8.625 in. SDR: 21 Thickness: 0.410 in.	0.41	8.625			
1	338	418	Screen	PVC	OD: 8.625 in. SDR: 21 Thickness: 0.410 in.	0.41	8.625	Milled Slots	0.032	
1	418	438	Blank	PVC	OD: 8.625 in. SDR: 21 Thickness: 0.410 in.	0.41	8.625			
1	438	538	Screen	PVC	OD: 8.625 in. SDR: 21 Thickness: 0.410 in.	0.41	8.625	Milled Slots	0.032	
1	538	558	Blank	PVC	OD: 8.625 in. SDR: 21 Thickness: 0.410 in.	0.41	8.625			
1	558	578	Screen	PVC	OD: 8.625 in. SDR: 21 Thickness: 0.410 in.	0.41	8.625	Milled Slots	0.032	
1	578	598	Blank	PVC	OD: 8.625 in. SDR: 21 Thickness: 0.410 in.	0.41	8.625			

Annular Material					
Depth from Surface Feet to Feet		Fill	Fill Type Details	Filter Pack Size	Description
0	58	Cement	10.3 Sack Mix		
58	598	Other Fill	See description.		#6 sand

Other Observations:

Borehole Specifications		
Depth from Surface Feet to Feet		Borehole Diameter (inches)
0	60	15
60	600	12

Certification Statement			
I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief			
Name <u>HUCKFELDT WELL DRILLING INC</u>			
Person, Firm or Corporation			
<u>994 KAISER ROAD</u>	<u>NAPA</u>	<u>CA</u>	<u>94558</u>
Address	City	State	Zip
Signed <u>electronic signature received</u>	<u>10/11/2022</u>	<u>439746</u>	
C-57 Licensed Water Well Contractor	Date Signed	C-57 License Number	

DWR Use Only											
CSG #	State Well Number				Site Code			Local Well Number			
N						W					
Latitude Deg/Min/Sec						Longitude Deg/Min/Sec					
TRS:											
APN:											

Gate Hill Well Step Drawdown Test (p1/3)

[illegible]

Gate Hill Well Step Drawdown Test (p2/3)

[illegible]

Gate Hill Well Step Drawdown Test (p3/3)

		AQUIFER TESTING FIELD DATA SHEET STEP DRAWDOWN TEST DATA - STEP 1			RCS Job No.: 745-NPA01 Date: <u>6-12-23</u>
OWNER: Desiree, Inc. WELL NAME: New Well - Wappo Hill		HEIGHT of REFERENCE POINT (R.P.) in ft above ground surface =		Sheet <u>3</u> of <u>3</u> Observers: <u>Ed Whitecotton</u>	
TYPE OF TEST: Step Drawdown Pumping Test - Pumping Portion Step 1				PUMPING RATE (calculate at end of step):	
Time of Day	Elapsed Time (min)	Depth to Water from R.P. (ft)		Totalizer Reading Units: _____	Comments/ Remarks/ Other Data
1300	0	(SWL) 79.2		(Initial Totalizer) 40546.6	This is the initial, non pumping data before pumping begins. Please take picture of initial totalizer.
	5	81.3	140.2	41247.9	
	10	81.6	142.5	41960.8	
	15	81.9	150.4	42713.1	
	20	82	149.8	43462.1	
	25	82.5	149.2	44208.2	
	30	82.6	149.6	44956.4	TB 2.41
	45	83.3	149.4	47197.9	
1400	60	83.6	149.2	49435.9	
1430	90	84.5	148.46	53904.7	TB .84
1500	120	85.5	148.4	58356	
1530	150	86.3	148.1	62800	TB .71
1600	180	86.8	147.9	67239.2	Final Pumping Water level of step
Recovery 05		82			
10		81.5			
15		81.5			
20		80.10			
25		80.4			
30		80.1			



AQUIFER TESTING FIELD DATA SHEET STEP DRAWDOWN TEST DATA - STEP 1

RCS Job No.: 745-NPA01

Date: 6-15-23

OWNER: Desiree, Inc.

HEIGHT of
REFERENCE POINT (R.P.) in ft
above ground surface =

Sheet 1 of

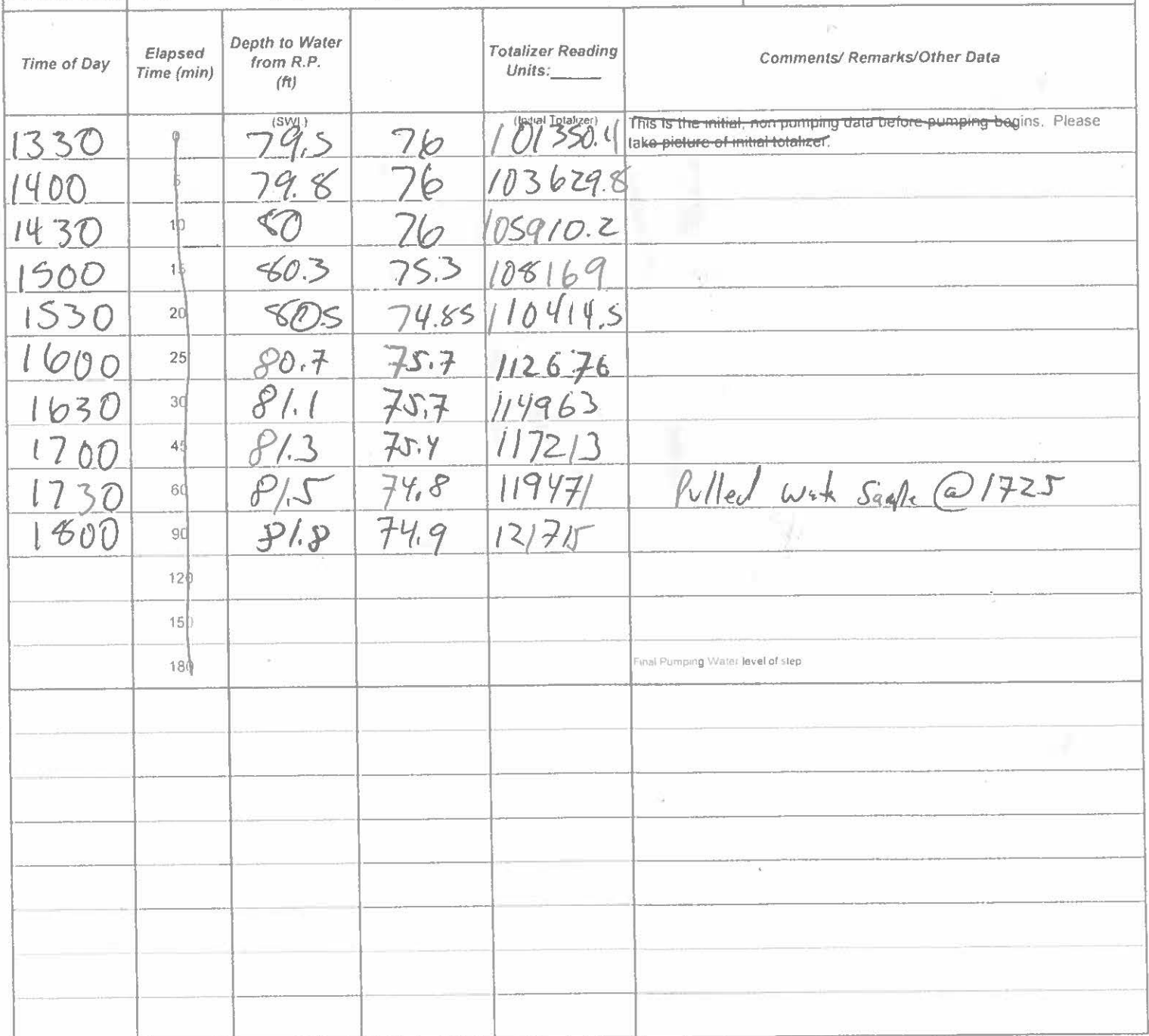
WELL NAME: New Well - Wappo Hill

Observers:

TYPE OF TEST: Step Drawdown Pumping Test - Pumping Portion Step 1

PUMPING RATE (calculate at end of step):

Time of Day	Elapsed Time (min)	Depth to Water from R.P. (ft)	Totalizer Reading Units:	Comments/ Remarks/Other Data
600 AM	0	(SWL) 70.1	(Initial Totalizer) 67239.4	This is the initial, non pumping data before pumping begins. Please take picture of initial totalizer.
	5	71.3	87.46 67676.7	
	10	71.5	76.6 68059.8	
	15	71.85	76.6 68442.9	
	20	72.1	76.6 68825.9	
	25	72.25	76.4 69207.8	
	30	72.5	76.5 69590.3	
	45	73.1	75.9 70730.1	
700	60	73.5	75.9 71869.1	
30	90	74.3	75.6 74137.8	
800	120	75	75.3 76396.8	
830	150	75.5	75.8 78670.7	
900	180	76	75.7 80941.8	Final Pumping Water level of step
930		76.4	75.6 83211.9	
1000		76.9	75.4 85474.9	
1030		77.4	75 87726.6	
1100		77.8	75 89977.2	
1130		78.2	74.9 92225.8	
1200		78.5	76 94507.1	
1230		79	75.9 96785.1	
1300		79.2	76 99067.5	



Time

6-15-23

Recovery

Hrs	Minutes	Container Size (gallons)	Time Fill (sec)	Pump Static (psi)	Clarity (0- Good, 10- Bad)	GPM	Depth to Water (ft)	Meter Reading	Notes
			Enter Static Water level Here-->>						
0	0	1800	81.8					121782	Pump off
	5	1805	79.7						
	10		79.3						
	15		79.1						
	20		78.8						
	25		78.5						
	30	1830	78.5						
	35		78.4						
	40		78.2						
	45		78.0						
	50		77.9						
	55		77.85						
1	60	1900	77.8						
	65								
	70	1910	77.7						
	75								
	80	1920	77.5						
	85								
	90	1930	77.3						
	95								
	100	1940	77.15						
	105	~~1940~~	~~77.15~~						
	110	1950	77.1						
	115								
2	120	2000	~~76.8~~ 76.85						
	125								
	130	2010	76.7						
	135								
	140	2020	76.55						
	145								
	150	2030	76.50						
	155								
	160	2040	76.35						
	165								
	170	2050	76.25						
	175								
3	180	2100	76.15						
	185								
1/16/23	190	0800	73.1						6-16-23
	195								
	200								
	205								
	210								
	215								
	220								
	225								
	230								
	235								
4	240								
	245								
	250								