ATTACHMENT 8D:

Sebastien Marineau-Mes Vineyard
Water Availability Analysis (WAA)

Includes: Attachment D Form
June 13, 2022
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Property Owner:
Sebastien Marineau-Mes
619 Diamond St
San Francisco, CA 94114

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Site Map:
See attached Water Availability Map

Background:
The subject site is located at 4000 Silverado Trail, Calistoga, CA, 94515, APN 021-010-077. Parcel size is 5.67 (based on Adobe Associates, Inc., Lot Line Adjustment Map, May 25, 2021). The parcel contains about ¾ ac of existing vineyard. The central portion of the parcel is planned for a residence. The upland portion of the site is steepest at the top (eastern) end. Vegetation was heavily impacted by the 2020 Glass Fire. Soils in the project area are 109, Boomer gravelly loam, volcanic bedrock, which is described as well-drained soils on uplands derived from weathered mixed igneous rocks (HSG=C) [2]. Plant cover is typically Douglas-fir, ponderosa pine, black oak, manzanita, poison oak, and madrone. The closest blueline stream is Dutch Henry Creek, located about 650 ft west of the development area.

The Napa County Electronic Document Retrieval site was reviewed for well log files for the subject site and adjacent parcels within the 500 ft radius. Wells within the 500 ft radius were identified for the neighboring parcel about 440 ft to the north (APN 021-010-076), see WAA Vicinity Map. Many electronic well documents were reviewed for neighboring parcels, but no other wells were identified within the 500 ft radius. Any wells outside the 500 ft radius depicted on the WAA map should be considered *approximate* locations for schematic purposes only.

Parameters of wells pertinent to this project review are summarized in TABLE 1.

TABLE 1 Well Information

APN	Year	Status	WH Elev *ft asl*	Casing Diam. *in*	Flow Rate *GPM*	Annular Seal *ft: type*	Total Depth *ft bg*	Screened Interval *ft bg*
021-010-077	2012	In use "Upper Well" (future vineyard & residence)	318	5	22.5[1]	0-50: cement	340	200 – 220 and 260 – 340
021-010-077	2001	In use "Lower Well" (existing residence)	303	6	10[2]	0-24: cement	340	120 – 300 and 320 – 340
021-010-076	2014	In use (existing residence)	314	5	13[3]	0-5: cement 5-22: bent. chips	100	30 – 80

[1]Well pump test by Ray's Well Testing Service Inc., 8/11/21
[2]Well pump test by McLean & Williams, 8/14/13
[3]Air Lift test at time of drilling by McLean & Williams, 4/10/01

Due to the proximity of one neighboring well, a review of potential drawdown impacts was conducted. The Water Availability Analysis (WAA) Guidance Document (Adopted May 12, 2015), presents results that show wells pumping less than 30 gpm for periods less than 24-consecutive hours will likely have negligible drawdown at distances beyond 25 ft in a confined aquifer (pg 35).

A recent well test (by Ray's Well Testing Service Inc., 8/11/21) recorded a stabilized flow rate of 22.5 GPM for the subject site's "Upper Well" that is proposed for use in the new vineyard. No irrigation sets would exceed a maximum duration of 8 – 10 consecutive hours in any 24 hr period. As such, the project well meets the criteria stated in the WAA guidance document (pumping less than 30 gpm for less than 24-hrs) and no neighboring wells are less than 25 ft away. Given the construction of the wells on and off-site as well as operating constraints, no measurable drawdown is expected at neighboring wells as a result of project well use parameters.

Overland flow sheets to the west and discharges to the roadside ditch along the eastern side of Silverado Trail. The closest blueline stream is Dutch Henry Creek (notated as Biter Creek on some maps, which merges with Dutch Henry Creek upstream of the project area), located about 650 ft west of the subject site, which is within the 1500 ft radius.

Per the WAA Guidance Document, very low flow wells (up to 10 GPM) may be 500 ft or more away from a surface water channel (see **TABLE 2**). Although the "Upper Well" was tested at 22.5 GPM in 2021, the operational yield of the well will not exceed 3 GPM, based on proposed water uses (see **TABLE 4**).

Furthermore, there are several items which further limit any negative impacts to surface waters:

1. The project well (aka "Upper Well") does not meet the WAA definition of a *moderate to high pumping capacity well* (casing diameter greater than 6 in and capable of producing more than 30 GPM).
2. Annular seal of at least 50 ft
3. Uppermost perforations are 200 ft below grage (100+ ft deeper than recommended)
4. The hydraulic conductivity of the aquifer (ash, volcanic rock) is likely quite low (<0.5 ft/day), which indicates a lower potential zone of influence for the pumping well.

Reference table from WAA Guidance Document included below (**TABLE 2**).
Based on the operational yield of the well and other construction and geological factors, there is not potential for negative impact to surface waters. To further assure low draw on the well, a mechanical flow control valve will be installed, per attached wellhead schematic and flow control valve specification sheet.

TABLE 2 **WAA Guidance Document Table,** Well Distance Standards and Construction Assumptions; Very low capacity pumping rates (i.e., less than 10 gpm), constructed in unconsolidated deposits in the upper part of the aquifer system (unconfined aquifer conditions).

Aquifer Hydraulic Conductivity (ft/day)	Acceptable Distance from Surface Water Channel			Minimum Surface Seal Depth (feet)	Depth of Uppermost Perforations (feet)
	500 feet	1000 feet	1500 feet		
80	✓			50	100
50	✓			50	100
30	✓			50	100
0.5	✓			50	100

Water Supply Capacity:

The water supply well ("Upper Well") for the proposed new vineyard has a measured flow rate of 22.5 gpm. The proposed use of the well is for a single-family residence, pool, and the new vineyard. The existing vineyard is irrigated by a separate existing well ("Lower Well"). No pond, spring, or surface water use is proposed on-site. All groundwater uses on the parcel are considered in this analysis ("Lower Well" and "Upper Well").

The applicant will plant about 1.09 total acres of vines on a 6 ft x 4 ft spacing, which is the same spacing as the existing vineyard. The same vineyard manager will farm the existing and proposed posed vineyard, so water use assumptions are the same for all vines. Irrigation estimates are detailed in **TABLE 3** and total on-site groundwater use is summarized in **TABLE 4**.

TABLE 3 **CURRENT and FUTURE Vineyard Irrigation Estimates**

Variable	Units	Current VB	Future VB	Total VB		
VB net	ac	0.75	1.09	1.84		
row spacing	ft	6		-		
vine spacing	ft	4		-		
Vines per Acre	vines/ac	1815		-		
TOTAL Vines	vines	1,361	1,978	3,340		
long-term	gal/vine/yr	55		-		
establish	gal/vine/yr	75		-		
long-term	af/yr	0.23	0.33	0.56	0.3	af/acre/yr
establish	af/yr	0.31	0.46	0.77	0.4	af/acre/yr

TABLE 4 **Total On-Site Groundwater Usage Estimates**

	Current Water Use AF/yr	Future Water Use AF/yr	Operation Days	Peak Daily Demand (gal/day)	Operating Yield (GPM)
Residential	-	0.50	140	1,164	0.8
Guest House	-	0.10	140	233	0.2
Pool	-	0.05	140	116	0.1
Landscaping	-	0.43	140	1,001	0.7
Vineyard	0.23	0.56	140	1,312	0.9
Total	**0.23**	**1.64**		**3,826**	**2.7**

Future vineyard usage assumes a covered pool and about ½ ac of landscaping. Current water usage is estimated at 0.23 AF/yr with a total future water usage of about 1.64 AF/yr (**TABLE 4**). The "Lower Well" (10 GPM) and "Upper Well" (22.5 GPM), which are equivalent to about 16 AF/yr and 36 AF/yr, respectively, have more than enough capacity to support the proposed irrigation and domestic water uses for the site. As a conservative measure, storage was not considered and a 140 operation days were assumed for all water usages, which will inflate the estimated peak daily demand and operational yield of the well. As such, the yield to support all proposed water uses on-site is less than 3 GPM.

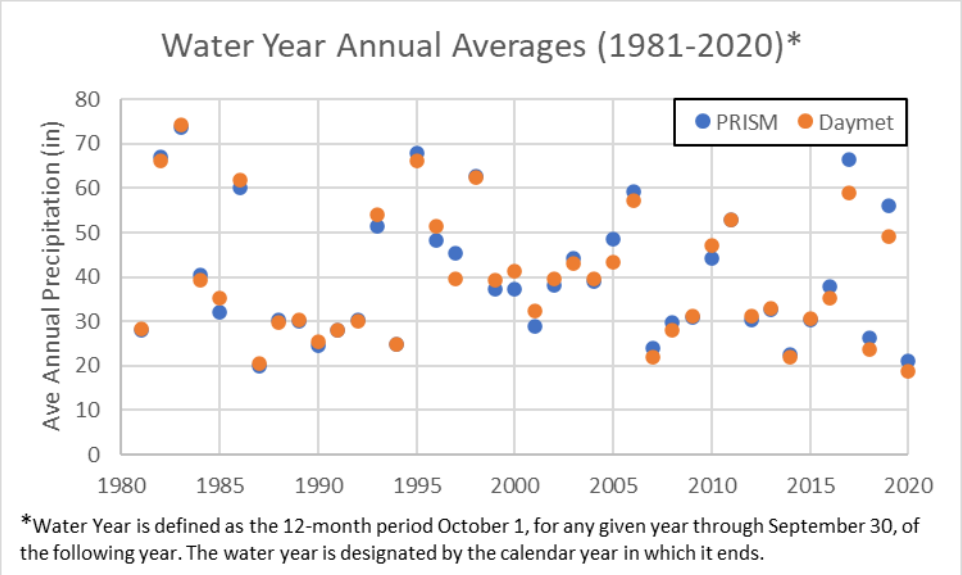
Aquifer Recharge:

Recharge was based on a parcel analysis where the proposed project is to be installed (APN 021-010-077, 5.67 ac). The property is zoned "AW" and the project area is located fully within the "Valley Floor" region. Following the Napa BOS determination in spring 2022, all Napa Valley regions must adhere to a 0.3 AF/ac/yr limitation on water use. For this project, the 5.67 ac parcel results in a 1.7 AF/ac/yr allotment.

Recharge based on precipitation data used rainfall data downloaded from DayMet [4] and PRISM [3] for the pixel that contained the subject site from 1980 to 2021 (Figure 1). Annual averages were calculated based on the "Water Year", which is defined by the USGS as the 12-month period October 1, for any given year through September 30, of the following year. The water year is designated by the calendar year in which it ends. The Water Year was chosen for this methodology based on two primary reasons:

1. From a Hydrologic Perspective, it makes sense to use water years (Oct – Sep), rather than calendar years, since it represents the accumulation of precipitation in a given rainy season. Similarly, the water year also represents precipitation that is available for recharge preceding the irrigation season.
2. From a practical perspective, in the Napa Valley Region, the water year data would be mostly complete at the start of the irrigation season (typ. May-Sep), since precipitation during the latter months of the water year is not typical. One would have data from the preceding rainy season, and may be able to make irrigation adjustments accordingly, whereas the calendar year precipitation data would obviously be incomplete.

Figure 1 Average Annual Precipitation



Based on available data, the most recent 10-yrs of data from PRISM and DayMet were used to calculate average precipitation as well as maximum and minimum precipitation.

TABLE 5 Average Annual Precipitation based on Water Year

Water Year	PRISM in	DayMet in
2011	53	53
2012	30	31
2013	33	33
2014	23	22
2015	30	31
2016	38	35
2017	66	59
2018	26	24
2019	56	49
2020	21	19
AVE	37	
MAX	66	
MIN	19	

Average Water Year rainfall across both datasets was 37 in/yr. A recharge volume was calculated for the parcel based on the property acreage (5.67 acres) and an infiltration rate of 14%, based on results for the "Napa River at St Helena Watershed" region, in which the subject site is located [5].

(5.67 acres)*(37in/yr)*(ft/12in)*(14%) = 2.45 AF/yr

Total future groundwater usage (including future residential development and future vineyard) is about 1.64 AF/yr (**TABLE 4**), which results in a net positive water balance of about 0.8 AF/yr.

No alternative water sources are required for this project.

References:

1. *Custom Soil Reource Report for Napa County, California, Sebastien Marineau-Mes*, from USDA NRCS Web Soil Survey, May 2022
2. Lambert, G., Kashiwagi, J. et al., Soil Survey of Napa County, California, USDA in cooperation with UC Agricultural Experiment Station, August 1978
3. *PRISM Time Series Data by Location, https://prism.oregonstate.edu/explorer/*
4. Thornton; M.M.; R. Shrestha; Y. Wei; P.E. Thornton; S. Kao; and B.E. Wilson. 2020. Daymet: Daily Surface Weather Data on a 1-km Grid for North America; Version 4. ORNL DAAC; Oak Ridge; Tennessee; USA. https://daymet.ornl.gov/single-pixel/
5. Updated Hydrogeologic Conceptualization and Characterization of Conditions, Prepared for Napa County, by Luhdorff & Scalmanini Consulting Engineers & MBK Engineers, January 2013
6. USGS California Department of Water Resources and CA Division of Mines map and information sources from 1900-1960, isohyetal_cnty.shp from Napa County GIS Data Catalog.

Attachments:

WAA Vicinity Map
Attachment D, form
Wellhead Schematic
Flow Control Valve Specification Sheet
“Upper Well” Flow Test and Well Log
“Lower Well” Flow Test and Well Log
“Neighbor Well”, 021-010-076 Well Log