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**Revised Water Availability Analysis
prepared by RSA+ dated May 7, 2026**



WATER AVAILABILITY ANALYSIS

For

PALOMA VINEYARDS
4013 SPRING MOUNTAIN ROAD
ST. HELENA, CA 94574

APN 022-150-008

Prepared for:
Paloma Vineyard
4013 Spring Mountain Road
St. Helena, CA 94574



Project #4119046.0
May 07, 2026



Table of Contents

EXECUTIVE SUMMARY	1
VINEYARD IRRIGATION	2
WATER SAVING PRACTICES	2
WATER USAGE CALCULATIONS.....	3

Appendices

1. Site Maps
2. Tier III Significant Streams Map
3. Groundwater Recharge Rate Calculation



EXECUTIVE SUMMARY

These calculations document the existing and proposed water use for Paloma Vineyards. The calculations reflect what the original use permit allowed for in visitation and captures the existing residential uses on the parcel as well. The existing winery is located on APN 022-150-008. The parcel has an area of 17.1 acres. A Vicinity map for the site can be found in Appendix 1. There are two (2) residences on the property as well as the winery. As part of the use permit modification a new tasting room is proposed as well as an increase in visitors. There will be no increase in production, employees, or vineyard area.

A site-specific Groundwater Recharge Rate was calculated for the site and has been included in Appendix 3. Based on the site-specific analysis, we have adopted a groundwater recharge rate of 0.76 ac-ft/ac/year for parcel 022-150-008. This yields an annual estimated recharge (Allowable Water Allotment) of 12.99 ac/ft per year.

The owner has informed RSA+ that there are two (2) wells on the property. Only one (1) well on the west side of the property is in use and it supplies domestic, process, and irrigation water for the winery, visitor center, residence, and vineyards. The other well will be abandoned per Napa County standards.

Below is a summary of the existing and proposed water use. Detailed calculations can be found on the following page.

Usage Type	Existing Usage [af/yr]	Standard Usage [af/yr]	Proposed Usage [af/yr]
Vineyard Irrigation	5.605	3.924	3.924
Winery			
Process Water	0.258	0.258	0.147
Domestic Water	0.086	0.139	0.139
Residences	1.500	1.500	1.500
Totals (Acre-ft per year)	7.449	5.821	5.710
Groundwater Recharge (Acre ft per year)	12.99	12.99	12.99

The proposed water demand of 5.710 ac-ft per year results in a decrease of 1.739 af/ac over the estimated existing water demand by utilizing a reduction in vineyard irrigation which is discussed below. This proposed water usage is less than the estimated annual recharge of 12.99 ac-ft per year in an average rainfall year.

As demonstrated in the table above, the proposed project will reduce water usage from the existing condition and therefore a Tier II analysis is not required. In addition to the proposed reduction in groundwater usage, the site is not located within 1500 feet of a significant stream so a Tier III analysis is also not required. An exhibit showing the limits of the 1500-foot significant streams setback can be found in Appendix 2.



VINEYARD IRRIGATION

These calculations document the existing and proposed water use for the vineyard irrigation at Paloma Vineyards. The calculations are based on that there are no changes proposed to the vineyard area. At the time of the initial preparation of the WAA there was no replant planned. Since then a vineyard replant has been initiated due to disease prompting revisiting of the WAA and vineyard irrigation. The vineyard replant and establishment of vines will take place over the next 10 years. Standard vineyard irrigation values were adopted to allow for vineyard replant and vine establishment (0.5 ac-ft/yr). This is considered to be an appropriate demand as it usually applied to established vines.

Once vines are established, Paloma Vineyards proposes that their water efficient irrigation practices will reduce water irrigation demand. Their estimated water demand for the established vineyards adopting these practices is 0.35 af/ac-yr. The calculation is based on the current vineyard practices, current watering methods, and anticipated number of vines and grape varieties for the future replant. This calculation also builds in a buffer for any unplanned increased water demand for irrigation following the replant.

This demand is appropriate for the vineyard due to the high rainfall levels at the property. Spring Mountain receives the highest annual average rainfall of any area in the Napa Valley. County data shows a 10-year average rainfall of 34.01 inches for the property.

Based on the proposed replanting program, water demand is expected to reduce from 0.50 af/ac-yr to 0.35 af/ac-yr over a period of 10 years.

WATER SAVING PRACTICES

Paloma Vineyards is proposing winery operations that will ensure water usage is consistent with or better than the industry standard for process water. Water conservation measures to reduce water usage throughout the facility will include shutoff valves for hoses and reducing the volume of hot water for more conservative barrel cleaning practices. In addition, floor cleaning will be performed as needed with handwashing and push brooms in place of using hoses. These practices allow adoption of four (4) gallons of process wastewater per gallon of wine. In order to confirm current wastewater production level a flow meter will be placed on the existing wastewater system. This site-specific wastewater generation is consistent with other efficient wineries encountered.



WATER USAGE CALCULATIONS

Existing Vineyard Irrigation and Landscaping Water Demand

Vineyard – Irrigation from well – (0.50 af/ac-yr x 11.21 acres vineyard) = 5.605 af/yr

Existing Winery Process Water Demand

Process Water – (2.15 af / 100,000 gallon-wine x 12,000 gal wine/year) = 0.258 af/yr

Existing Residential Water Demand

Domestic Water – (Main Dwelling – 0.75 af/yr x 2 dwelling) = 1.500 af/yr

Existing Winery Domestic Water Demand

FT Employees – (15 gal/person/day x 365 employees/day days/yr x 2 = 0.034 af/yr

PT Employees – (15 gal/person/day x 365 employees/day days/yr x 1 = 0.017 af/yr

Average Visitors – (3 gal/person x 52 weeks/yr 65 visitors/week) = 0.031 af/yr

Marketing Events – (25 visitors @ 15 gal/guest x 2 days/yr) = 0.002 af/yr

Marketing Events – (50 visitors @ 15 gal/guest x 1 days/yr) = 0.002 af/yr

Total = 0.086 af/yr

Total Existing Water Demand Total = 7.449 af/yr

Proposed Vineyard Irrigation and Landscaping Water Demand

Vineyard – Irrigation from well – (0.35 af/ac-yr x 11.21 acres vineyard) = **Proposed Standard** 3.924 af/yr **Proposed Reduced** 3.924 af/yr

Proposed Winery Process Water Demand

⁽¹⁾⁽²⁾ Process Water – (2.15 af / 100,000-gallon wine x 12,000 gal wine/year) = 0.258 af/yr 0.147 af/yr

Proposed Residential Water Demand

Domestic Water – (Main Dwelling – 0.75 af/yr x 2 dwelling) = 1.500 af/yr 1.500 af/yr

Proposed Winery Domestic Water Demand

FT Employees – (15 gal/person/day x 365 employees/day days/yr x 2 = 0.034 af/yr 0.034 af/yr

PT Employees – (15 gal/person/day x 365 employees/day days/yr x 1 = 0.017 af/yr 0.017 af/yr

⁽³⁾ Average Visitors – (3 gal/person x 52 weeks/yr 176 visitors/week) = 0.084 af/yr 0.084 af/yr

⁽⁴⁾ Marketing Events – (25 visitors @ 15 gal/guest x 2 days/yr) = 0.002 af/yr 0.002 af/yr

⁽⁴⁾ Marketing Events – (50 visitors @ 15 gal/guest x 1 days/yr) = 0.002 af/yr 0.002 af/yr

Total = 0.139 af/yr 0.139 af/yr

Total Proposed Water Demand Total = 5.821 af/yr 5.710 af/yr

Estimates per Napa County Water Availability Analysis – Guidance Document, May 12, 2015 unless noted:

⁽¹⁾ 2.15 ac-ft per 100,000 gallons wine per Napa County WAA – Guidance Document

⁽²⁾ Reduced water uses to four (4) gallons per gallon of wine or 1.23 ac-ft per 100,000 gallons wine

⁽³⁾ 3 gallons of water per guest per Napa County WAA – Guidance Document

⁽⁴⁾ 15 gallons of water per guest per Napa County WAA – Guidance Document



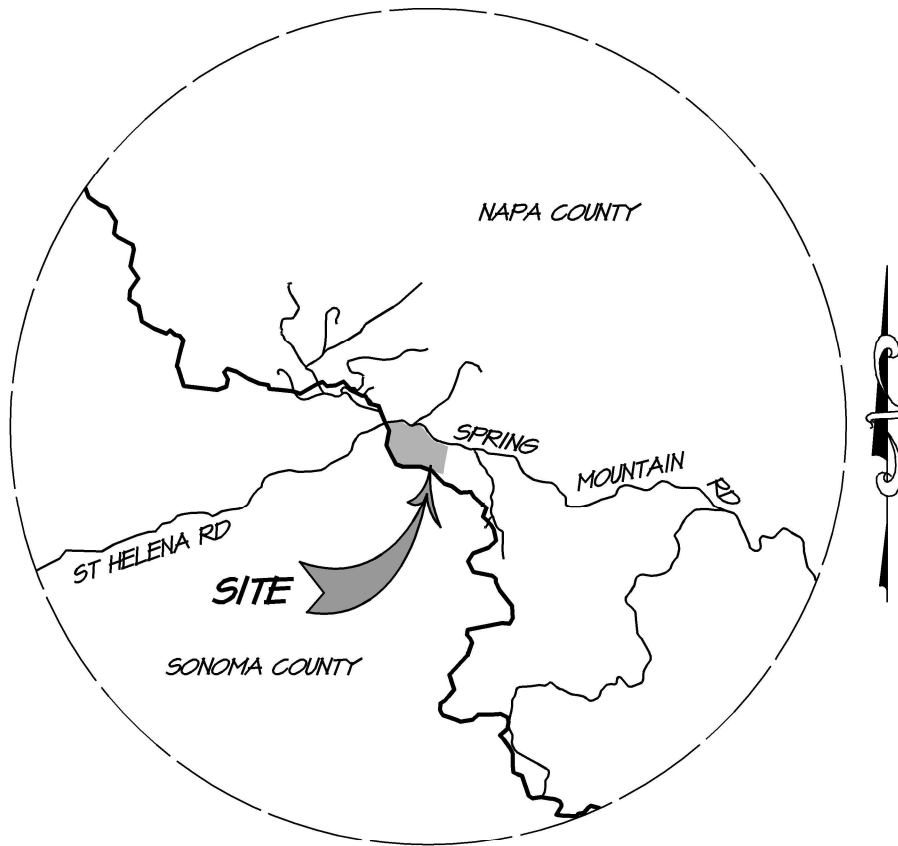
Appendix 1

Site Maps

PALOMA VINEYARDS

VICINITY MAP

SAINT HELENA CALIFORNIA



VICINITY MAP

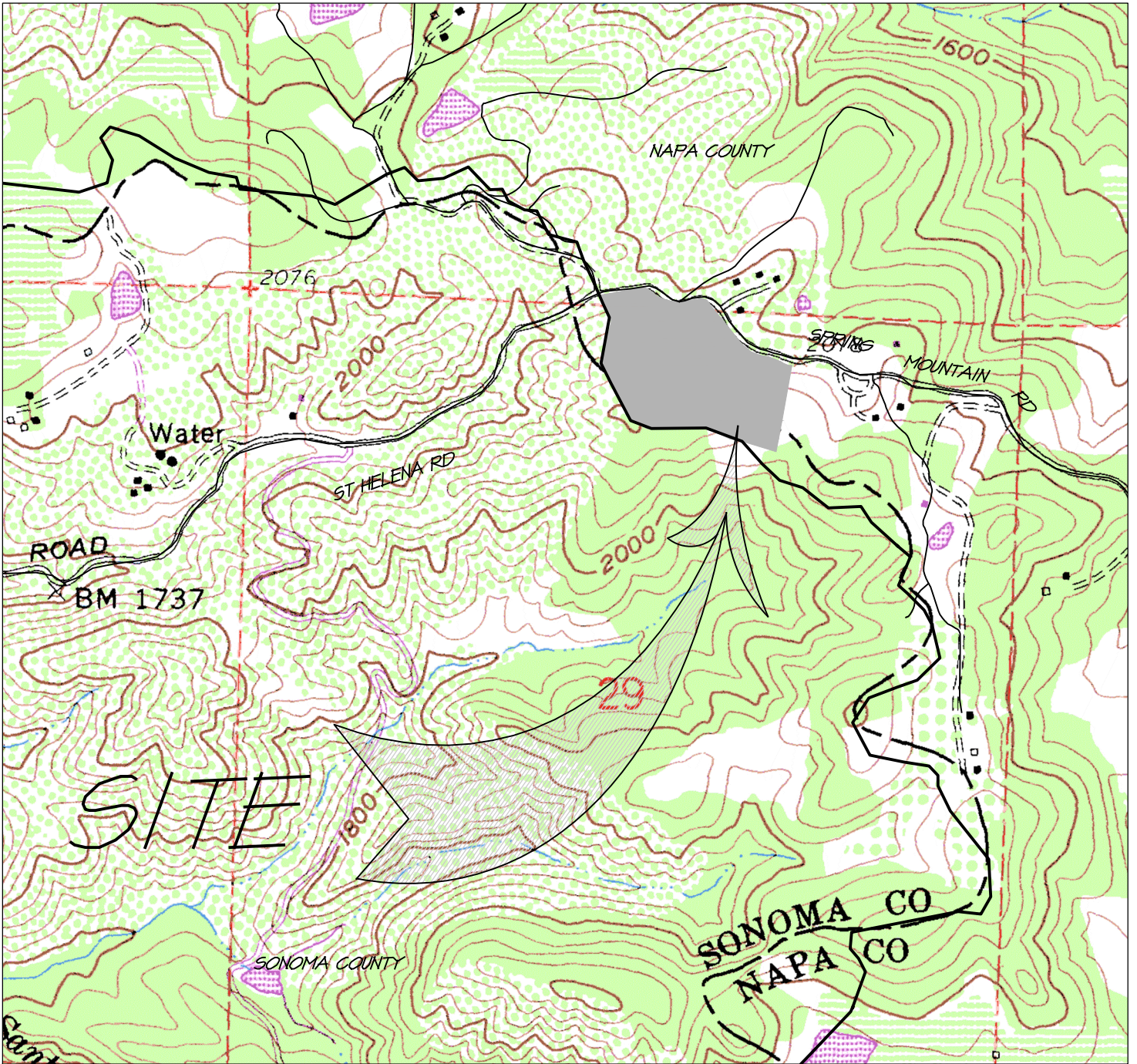
SCALE: 1" = 4000'

RSA⁺	1515 FOURTH STREET
	NAPA, CALIF. 94559
	OFFICE 707 252.3301
	+ www.RSAcivil.com +

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10/02/2023 4119046.0

PALOMA VINEYARDS USGS MAP

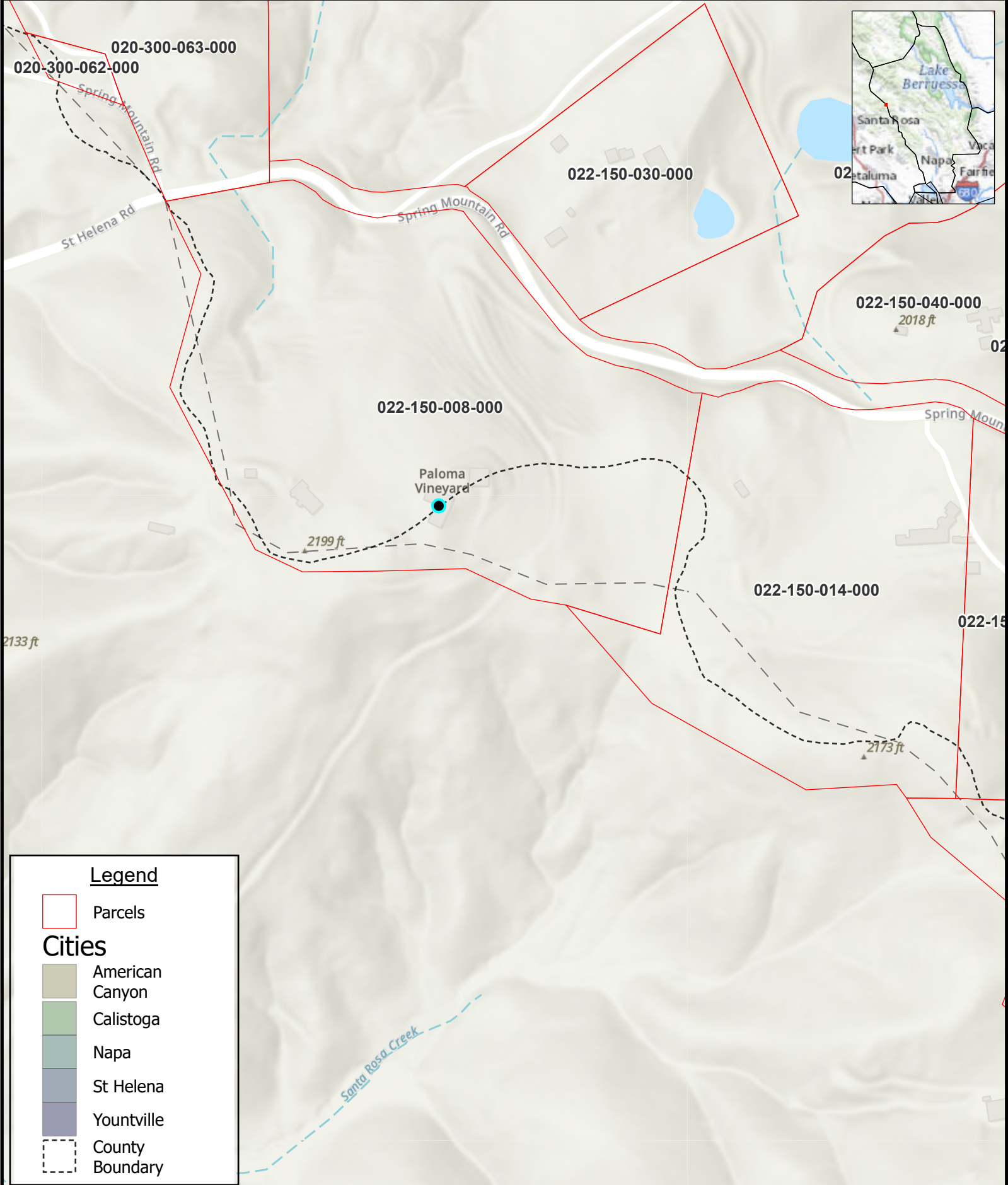
SAINT HELENA CALIFORNIA



(IN FEET)
1 inch = 1000 FT

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Legend

- Parcels

Cities

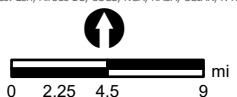
- American Canyon
- Calistoga
- Napa
- St Helena
- Yountville
- County Boundary

Esri Community Maps Contributors, County of Napa, Sonoma County, California State Parks, © OpenStreetMap, Microsoft, Esri, HERE, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, Bureau of Land Management, EPA, NPS, US Census Bureau, USDA, Sources: Esri, Airbus DS, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS,



County of Napa

Printed On: 9/25/2023



Disclaimer: This map was prepared for informational purposes only. No liability is assumed for the accuracy of the data delineated hereon.



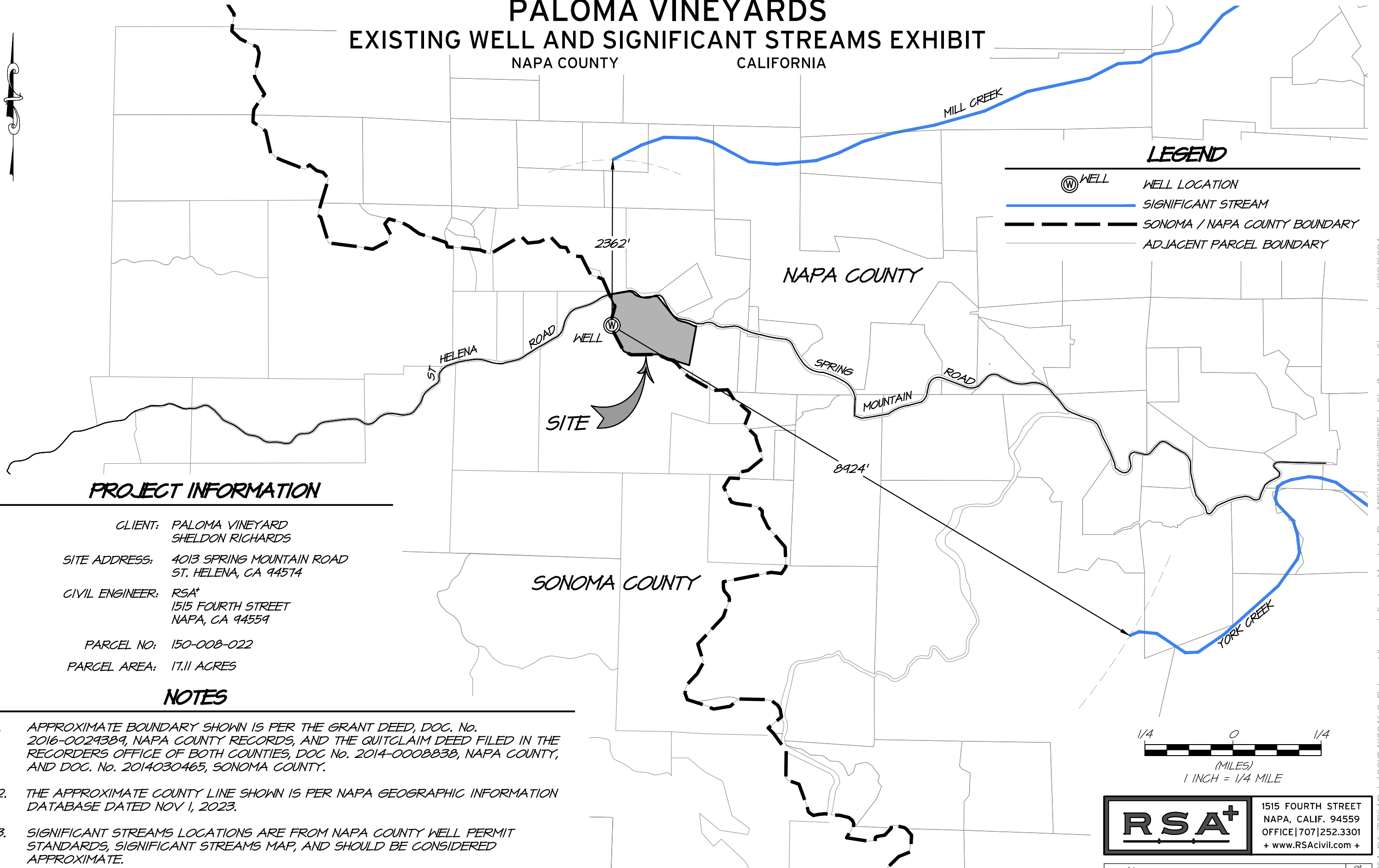
Appendix 2

Tier III Significant Streams Map





PALOMA VINEYARDS

EXISTING WELL AND SIGNIFICANT STREAMS EXHIBIT

NAPA COUNTY CALIFORNIA



LEGEND

-  WELL
-  SIGNIFICANT STREAM
-  SONOMA / NAPA COUNTY BOUNDARY
-  ADJACENT PARCEL BOUNDARY

PROJECT INFORMATION

CLIENT: PALOMA VINEYARD
SHELDON RICHARDS

SITE ADDRESS: 4013 SPRING MOUNTAIN ROAD
ST. HELENA, CA 94574

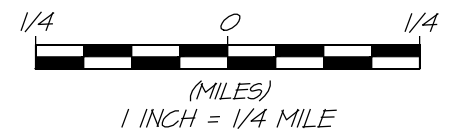
CIVIL ENGINEER: RSA⁺
1515 FOURTH STREET
NAPA, CA 94559

PARCEL NO: 150-008-022

PARCEL AREA: 17.11 ACRES

NOTES

1. APPROXIMATE BOUNDARY SHOWN IS PER THE GRANT DEED, DOC. No. 2016-0029389, NAPA COUNTY RECORDS, AND THE QUITCLAIM DEED FILED IN THE RECORDERS OFFICE OF BOTH COUNTIES, DOC No. 2014-0008838, NAPA COUNTY, AND DOC. No. 2014030465, SONOMA COUNTY.
2. THE APPROXIMATE COUNTY LINE SHOWN IS PER NAPA GEOGRAPHIC INFORMATION DATABASE DATED NOV 1, 2023.
3. SIGNIFICANT STREAMS LOCATIONS ARE FROM NAPA COUNTY WELL PERMIT STANDARDS, SIGNIFICANT STREAMS MAP, AND SHOULD BE CONSIDERED APPROXIMATE.



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\\RSA-DC-3\RSAData\2019\4119046.0_Paloma_Vineyard_Spring_Mountain_Road\DESIGN\EXHIBITS\Exh-Significant Streams.dwg 11/22/2024



Appendix 3

Groundwater Recharge Rate Calculation



ANNUAL GROUNDWATER RECHARGE RATE

For

PALOMA VINEYARDS
4013 SPRING MOUNTAIN ROAD
ST. HELENA, CA 94574

APN 022-150-008

Prepared for:
Paloma Vineyard
4013 Spring Mountain Road
St. Helena, CA 94574

Project #4119046.0
October 4, 2023



INTRODUCTION

This report determines the annual groundwater recharge rate for the Paloma Vineyards property. The existing winery and two (2) residences use the same driveway located on APN 022-150-008. As part of the use permit modification a new tasting room is proposed as well as an increase in visitors. There will be no increase in production or vineyard area. The parcel is overlapping into Sonoma County resulting in a parcel spanning two Counties. The project proposes a lot line adjustment in favor of adding the smaller parcel into the larger parcel for a total area of 19.8 ± acres that is evaluated in this report. The Napa County APN parcel currently has an area of ± 17.1 acres. The parcel has slopes ranging from 5-30%.

For the analysis, the parcel has been divided into four areas, impervious, vineyard, grassland, and coastal oak tree areas.

METHODOLOGY

The groundwater recharge rate has been determined by examining the annual rainfall, runoff and species-specific evapotranspiration during winter months. Napa County's new 10-year PRISM data was used to determine the annual rainfall amount and site runoff volumes. It was determined that the average annual rainfall amounts to 34.01 inches per year.

The runoff volumes were determined by calculating the site-specific runoff coefficient. The runoff coefficients were calculated using aerial images to view the terrain and the county topography to estimate the slopes in each area.

The evapotranspiration losses were calculated using the Water Use Classifications of Landscape Species (WUCOLS) methodology for the vineyard, grassland, and coastal oak tree areas. Only evapotranspiration from the winter was considered, as it is assumed that evapotranspiration in summer will be from irrigation water.

The groundwater recharge rate was calculated as the difference of the total annual rainfall and losses from the stormwater runoff and evapotranspiration. Refer to attached calculations.

$$\text{Average Recharge Rate} = \text{Average Rainfall} - \text{Runoff} - \text{Evapotranspiration}$$

CONCLUSION

The Paloma Vineyard property has an average annual rainfall of 34.01 inches per year, equating to 56.10 acre-feet per year for the parcel.

Total evapotranspiration volume that occurs through the vineyard, grassland, and oak tree areas is 3.26 acre-feet per year. The stormwater runoff from the parcels totals 37.79 acre-feet per year. The total average evapotranspiration and runoff is 41.05 acre-feet per year. This equates to a groundwater recharge rate of 15.06 acre-feet per year, or 0.76 acre-feet per acre per year.



**Paloma Vineyards
Groundwater Recharge Rate**

Parcels 020-440-004 & 020-400-012

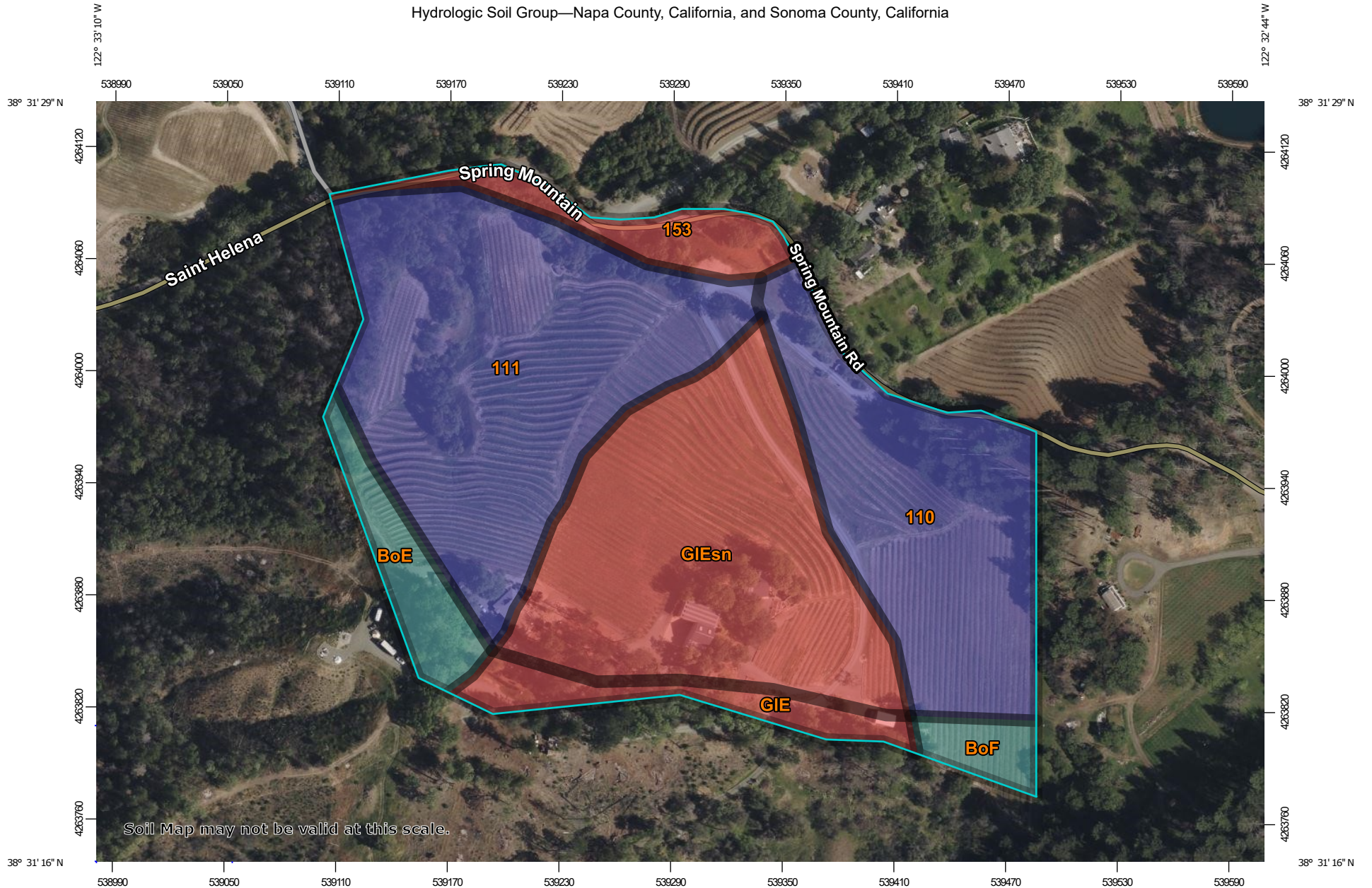
Site Description	Hydrologic Soil Group	Area (ft ²)	Area (ac)	Total Annual Rainfall (in/yr)	Total Rainfall (ft ³ /yr)
Impervious Area	B	72,816	1.67	34.01	206,373
Vineyard Area	B	606,562	13.92	34.01	1,719,098
Grass and Shrubs	B	31,208	0.72	34.01	88,449
Coastal Oak Trees	B	151,686	3.48	34.01	429,903
Total			19.80	34.01	2,443,823

Evapotranspiration (ET ₀)										
Site	January (Et ₀) (in)	February (Et ₀) (in)	March (Et ₀) (in)	October (Et ₀) (in)	November (Et ₀) (in)	December (Et ₀) (in)	Total ET ₀ (in)	Landscape Coefficient (k _c)	Landscape Evapotrans. (Et _c) (in) = Total Et ₀ x k _c	Total Landscape Evapotranspiration (ft ³ /yr)
Impervious Area	0	0	0	0	0	0	0	0	0.00	0
Vineyard Area	1.24	1.68	3.41	3.41	1.8	0.93	12.47	0.08	1.00	50,426
Grass and Shrubs	1.24	1.68	3.41	3.41	1.8	0.93	12.47	0.68	8.48	22,053
Coastal Oak Trees	1.24	1.68	3.41	3.41	1.8	0.93	12.47	0.44	5.49	69,356
Total										141,834

Runoff		
Site	Run-Off Coefficient (C)	Total Runoff (ft ³ /yr)
Impervious Area	0.98	202,245
Vineyard Area	0.64	1,100,223
Grass and Shrubs	0.58	51,300
Coastal Oak Trees	0.68	292,334
Total		1,646,102

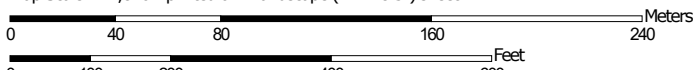
Groundwater Recharge Rate						
Site	Total Rainfall (ft ³ /yr)	Total Crop Evapotranspiration (ft ³ /yr)	Total Runoff (ft ³ /yr)	Total Stormwater loss on site (ft ³ /yr)	Groundwater Recharge Rate (ft ³ /yr)	Groundwater Recharge Rate (ac-ft/ac/yr)
Impervious Area	206,373	0	202,245	202,245	4,127	0.06
Vineyard Area	1,719,098	50,426	1,100,223	1,150,648	568,450	0.94
Grass and Shrubs	88,449	22,053	51,300	73,353	15,096	0.48
Coastal Oak Trees	429,903	69,356	292,334	361,690	68,213	0.45
Total	2,443,823	141,834	1,646,102	1,787,936	655,886	0.76

Hydrologic Soil Group—Napa County, California, and Sonoma County, California



































Soil Map may not be valid at this scale.

Map Scale: 1:2,870 if printed on A landscape (11" x 8.5") sheet.



Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

MAP LEGEND

Area of Interest (AOI)		 C	C
	Area of Interest (AOI)	 C/D	C/D
Soils		 D	D
Soil Rating Polygons		 Not rated or not available	Not rated or not available
	A	Water Features	
	A/D	 Streams and Canals	Streams and Canals
	B	Transportation	
	B/D	 Rails	Rails
	C	 Interstate Highways	Interstate Highways
	C/D	 US Routes	US Routes
	D	 Major Roads	Major Roads
	Not rated or not available	 Local Roads	Local Roads
Soil Rating Lines		Background	
	A	 Aerial Photography	Aerial Photography
	A/D		
	B		
	B/D		
	C		
	C/D		
	D		
	Not rated or not available		
Soil Rating Points			
	A		
	A/D		
	B		
	B/D		

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at scales ranging from 1:20,000 to 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
 Web Soil Survey URL:
 Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Napa County, California
 Survey Area Data: Version 16, Sep 11, 2023

Soil Survey Area: Sonoma County, California
 Survey Area Data: Version 17, Sep 11, 2023

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Mar 26, 2022—Apr 25, 2022

MAP LEGEND

MAP INFORMATION

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
110	Boomer-Forward-Felta complex, 30 to 50 percent slopes	B	4.7	21.4%
111	Boomer-Forward-Felta complex, 5 to 30 percent slopes	B	7.4	33.2%
153	Henneke gravelly loam, 4 to 46 percent slopes, MLRA 15	D	1.1	4.9%
GIEsn	Goulding cobbly clay loam, 15 to 30 percent slopes	D	6.4	28.8%
Subtotals for Soil Survey Area			19.6	88.4%
Totals for Area of Interest			22.2	100.0%

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
BoE	Boomer loam, 7 to 50 percent slopes, moist, MLRA 15	C	1.1	4.8%
BoF	Boomer loam, 30 to 50 percent slopes	C	0.5	2.2%
GIE	Goulding cobbly clay loam, 15 to 30 percent slopes	D	1.0	4.6%
Subtotals for Soil Survey Area			2.6	11.6%
Totals for Area of Interest			22.2	100.0%

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

A weather station is mounted on a white tripod in an open field. The station includes a wind vane, a cup anemometer, a radiation shield, and a solar panel. The background shows a clear blue sky and a green field.

REFERENCE EVAPOTRANSPIRATION ZONES

CALIFORNIA IRRIGATION MANAGEMENT INFORMATION SYSTEM

The color map inside shows the reference evapotranspiration zones in California. It may be used to help in urban and agricultural water management planning and water budgeting, as well as designing irrigation systems, planning irrigation schedules, and designing open water evaporation systems.

The map was developed as a cooperative project between the Department of Land, Air and Water Resources, University of California, Davis and the Office of Water Use Efficiency, California Department of Water Resources; Baryohay Davidoff.

The map was prepared by David W. Jones, 1999. The data was developed by Richard L. Snyder, Simon Eching, and Helena Gomez-MacPherson. The background data came from Teale and USGS sources.

CALIFORNIA IRRIGATION MANAGEMENT INFORMATION SYSTEM (CIMIS)
REFERENCE EVAPOTRANSPIRATION ZONES



DEPARTMENT OF
 WATER RESOURCES



UNIVERSITY OF
 CALIFORNIA, DAVIS

STATE OF CALIFORNIA
 ARNOLD SCHWARZENEGGER, GOVERNOR

DEPARTMENT OF WATER RESOURCES
 LESTER A. SNOW, DIRECTOR

Lambert Conformal Conic Projection
 1927 North American Datum

Reference EvapoTranspiration (ETo) Zones

- | | |
|---|---|
| <p>1 COASTAL PLAINS HEAVY FOG BELT lowest ETo in California, characterized by dense fog</p> <p>2 COASTAL MIXED FOG AREA less fog and higher ETo than zone 1</p> <p>3 COASTAL VALLEYS & PLAINS & NORTH COAST MOUNTAINS more sunlight than zone 2</p> <p>4 SOUTH COAST INLAND PLAINS & MOUNTAINS NORTH OF SAN FRANCISCO more sunlight and higher summer ETo than zone 3</p> <p>5 NORTHERN INLAND VALLEYS valleys north of San Francisco</p> <p>6 UPLAND CENTRAL COAST & LOS ANGELES BASIN higher elevation coastal areas</p> <p>7 NORTHEASTERN PLAINS</p> <p>8 INLAND SAN FRANCISCO BAY AREA inland area near San Francisco with some marine influence</p> <p>9 SOUTH COAST MARINE TO DESERT TRANSITION inland area between marine & desert climates</p> <p>10 NORTH CENTRAL PLATEAU & CENTRAL COAST RANGE cool, high elevation areas with strong summer sunlight; zone has limited climate data & the zones selection is somewhat subjective</p> | <p>11 CENTRAL SIERRA NEVADA mountain valleys east of Sacramento with some influence from delta breeze in summer</p> <p>12 EAST SIDE SACRAMENTO-SAN JOAQUIN VALLEY low winter & high summer ETo with slightly lower ETo than zone 14</p> <p>13 NORTHERN SIERRA NEVADA northern Sierra Nevada mountain valleys with less marine influence than zone 11</p> <p>14 MID-CENTRAL VALLEY, SOUTHERN SIERRA NEVADA, TEHACHAPI & HIGH DESERT MOUNTAINS high summer sunshine and wind in some locations</p> <p>15 NORTHERN & SOUTHERN SAN JOAQUIN VALLEY slightly lower winter ETo due to fog and slightly higher summer ETo than zones 12 & 14</p> <p>16 WESTSIDE SAN JOAQUIN VALLEY & MOUNTAINS EAST & WEST OF IMPERIAL VALLEY</p> <p>17 HIGH DESERT VALLEYS valleys in the high desert near Nevada and Arizona</p> <p>18 IMPERIAL VALLEY, DEATH VALLEY & PALO VERDE low desert areas with high sunlight & considerable heat advection</p> |
|---|---|

Monthly Average Reference Evapotranspiration by ETo Zone (inches/month)

Zone	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1	0.93	1.40	2.48	3.30	4.03	4.50	4.65	4.03	3.30	2.48	1.20	0.62	32.9
2	1.24	1.68	3.10	3.90	4.65	5.10	4.96	4.65	3.90	2.79	1.80	1.24	39.0
3	1.86	2.24	3.72	4.80	5.27	5.70	5.58	5.27	4.20	3.41	2.40	1.86	46.3
4	1.86	2.24	3.41	4.50	5.27	5.70	5.89	5.58	4.50	3.41	2.40	1.86	46.6
5	0.93	1.68	2.79	4.20	5.58	6.30	6.51	5.89	4.50	3.10	1.50	0.93	43.9
6	1.86	2.24	3.41	4.80	5.58	6.30	6.51	6.20	4.80	3.72	2.40	1.86	49.7
7	0.62	1.40	2.48	3.90	5.27	6.30	7.44	6.51	4.80	2.79	1.20	0.62	43.3
8	1.24	1.68	3.41	4.80	6.20	6.90	7.44	6.51	5.10	3.41	1.80	0.93	49.4
9	2.17	2.80	4.03	5.10	5.89	6.60	7.44	6.82	5.70	4.03	2.70	1.86	55.1
10	0.93	1.68	3.10	4.50	5.89	7.20	8.06	7.13	5.10	3.10	1.50	0.93	49.1
11	1.55	2.24	3.10	4.50	5.89	7.20	8.06	7.44	5.70	3.72	2.10	1.55	53.1
12	1.24	1.96	3.41	5.10	6.82	7.80	8.06	7.13	5.40	3.72	1.80	0.93	53.4
13	1.24	1.96	3.10	4.80	6.51	7.80	8.99	7.75	5.70	3.72	1.80	0.93	54.3
14	1.55	2.24	3.72	5.10	6.82	7.80	8.68	7.75	5.70	4.03	2.10	1.55	57.0
15	1.24	2.24	3.72	5.70	7.44	8.10	8.68	7.75	5.70	4.03	2.10	1.24	57.9
16	1.55	2.52	4.03	5.70	7.75	8.70	9.30	8.37	6.30	4.34	2.40	1.55	62.5
17	1.86	2.80	4.65	6.00	8.06	9.00	9.92	8.68	6.60	4.34	2.70	1.86	66.5
18	2.48	3.36	5.27	6.90	8.68	9.60	9.61	8.68	6.90	4.96	3.00	2.17	71.6

Variability between stations within single zones is as high as 0.02 inches per day for zone 1 and during winter months in zone 13. The average standard deviation of the ETo between estimation sites within a zone for all months is about 0.01 inches per day for the 200 sites used to develop the map.



STATE OF CALIFORNIA
THE NATURAL RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES

CIMIS Information
www.cimis.water.ca.gov



Zoom to



10-Year Avg. Rainfall

2012 - 2021 Water Years
(PRISM)
[PBES]

Avg rainfall, in inches:
34.01

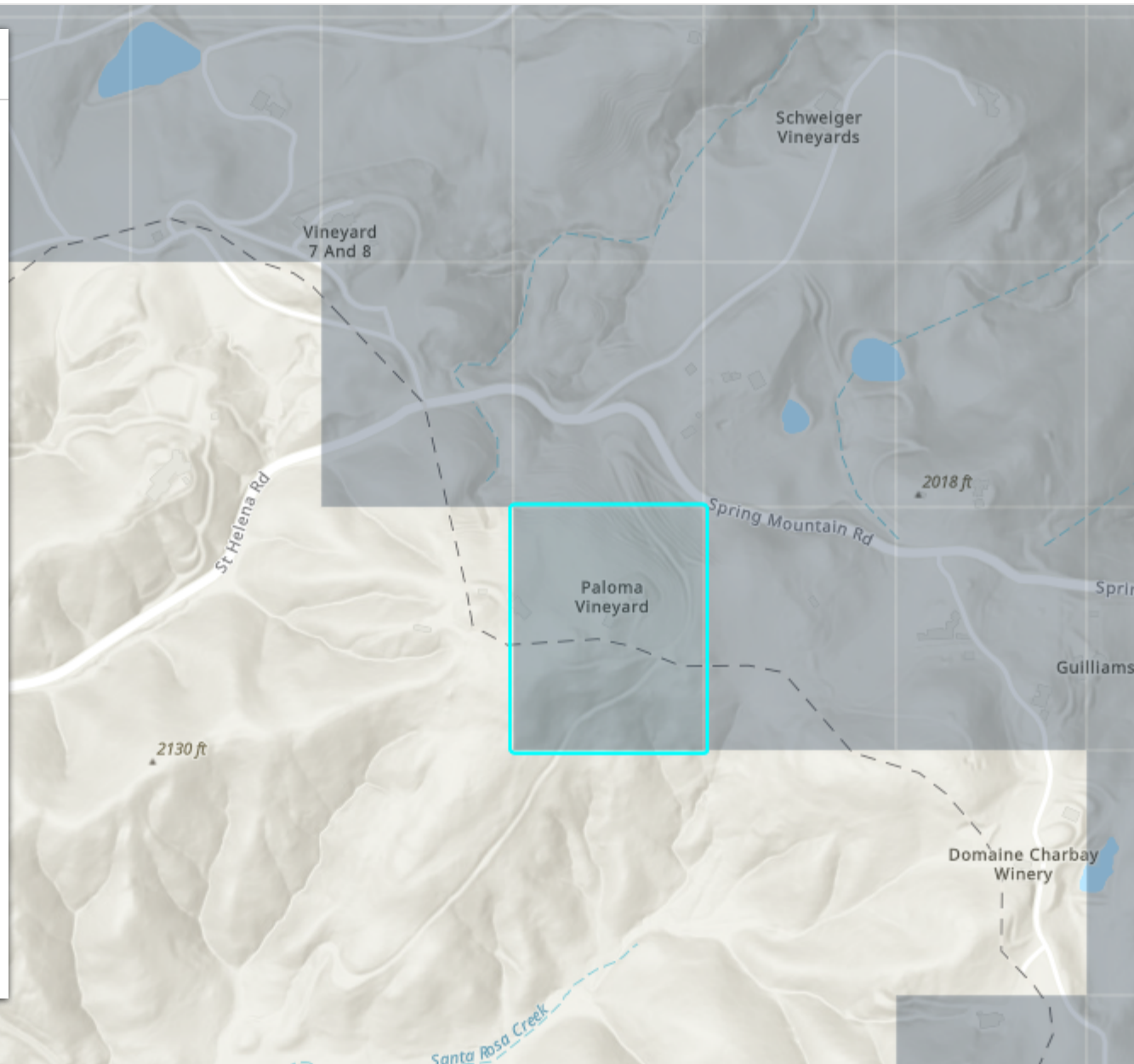
LAYER DESCRIPTION:

Average rainfall per water year (i.e. Oct. to Sep.), expressed in inches, for the ten-year period 2012 to 2021.

This layer to be used to determine average rainfall values for Napa County's Water Availability Analysis.

Data are derived from the PRISM dataset, Oregon State University (<https://prism.oregonstate.edu>).

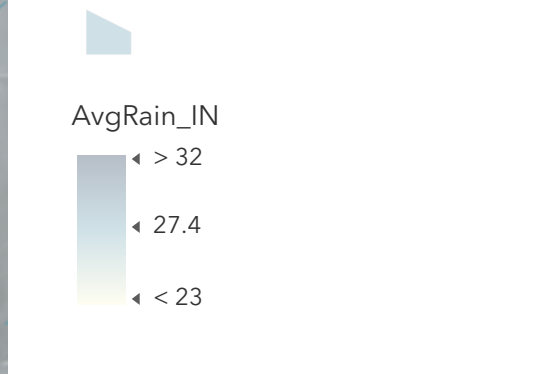
For questions, or to report an error or omission, please send an email to [PBES GIS Staff](#).



MeanPrecip_WY_2012_2021_PRISM

Properties

MeanPrecip_WY_2012_2021_PRISM

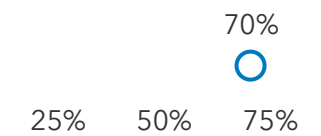


Appearance

Blending

Normal

Transparency



Visibility

Visible range



Refresh interval

Automatically refresh layer



Feature display order

Custom parameters



TABLE 1. Crop coefficients used in daily modeling of soil water processes in vineyards, oak trees and grasslands

Vineyards		Oak trees		Grasslands	
Period	K _c	Period	K _c	Period	K _c
3/1–4/15	0.10	3/1–3/31	0.5	3/1–3/15	0.90
4/16–4/30	0.20	4/1–10/1	0.6	3/16–4/30	0.95
5/1–5/15	0.25	10/2–11/25	0.5	5/1–5/15	0.25
5/16–5/31	0.30	11/26–2/28	0.4	5/16–6/15*	0.10
6/1–6/15	0.35			6/16*–10/13	0.00
6/16–6/30	0.40			10/14–10/31	0.25
7/1–9/30	0.50			11/1–2/28	0.75
10/1–10/15	0.30				
10/16–10/31	0.20				
11/1–11/15	0.15				
11/16–11/30	0.05				
12/1–2/28	0.01				

Sources: Allen et al. 1998 (grasses and trees); Caprile 2007 (vineyards).

* Variable date depending on available soil moisture.

Oak Trees - weighted average for October to March

Time Period	# of Days	K _c	Days * K _c	
3/1-3/31	31	0.5	15.5	
10/01	1	0.6	0.6	Weighted K _c = 80.7/182 = 0.44
10/2-11/25	55	0.5	27	
11/26-2/28	95	0.4	37.6	
Totals=	182		80.7	

Vineyard - weighted average for October to March

Time Period	# of Days	K _c	Days * K _c	
3/1-4/15	31	0.1	3.1	
10/1-10/15	15	0.3	4.5	Weighted K _c = 14.7/182 = 0.08
10/16-10/31	16	0.2	3.2	
11/1-11/15	15	0.15	2.25	
11/16-11/30	15	0.05	0.75	
12/1-2/28	90	0.01	0.9	
Total=	182		14.7	

Grasslands - weighted average for October to March

Time Period	# of Days	K _c	Days * K _c	
3/1-3/15	15	0.9	13.5	Weighted K _c = 123.2/182 = 0.68
3/16-3/31	16	0.95	15.2	
10/1-10/13	13	0.00	0.00	
10/14-10/31	18	0.25	4.5	
11/1-2/28	120	0.75	90	
Totals=	182		123.2	

WATERSHED TYPES AND FACTORS

WATERSHED TYPES AND FACTORS				
Run-off Producing Features	Extreme	High	Normal	Low
Relief	0.28 – 0.38 Steep, rugged terrain, with average slopes above 30%	0.28 0.20 – 0.28 Rolling, with average slopes of 10 to 30%	0.14 – 0.20 Rolling, with average slopes of 5 to 10%	0.08 – 0.14 Relatively flat land, with average slopes of 0 to 5%
Soil Infiltration	0.14 0.12 – 0.16 No effective soil cover either rock or thin soil mantle of negligible infiltration capacity.	0.08 – 0.12 Slow to take up water; clay or shallow loam soils of low infiltration capacity imperfectly or poorly drained.	0.06 – 0.08 Normal; well drained light and medium textured soils sandy loams, silt and loams.	0.04 – 0.06 Slow to take up water; clay or shallow loam soils of low infiltration capacity imperfectly or poorly drained.
Vegetation Cover	0.12 – 0.16 No effective plant cover; bare or very sparse cover.	0.08 – 0.12 Poor to fair; clean cultivation crops or poor natural cover; less than 20% of drainage area under good cover.	0.06 – 0.08 Fair to good; about 50% of area in good grassland or woodland; not more than 50% of area in cultivated crops.	0.06 0.04 – 0.06 Good to excellent; about 90% of drainage area in good grassland, woodland, or equivalent crop.
Surface	0.10 – 0.12 Negligible; surface depressions, few and shallow; drainage ways steep and small; no marshes.	0.10 0.08 – 0.10 Low well-defined system of small drainage ways; no ponds or marsh.	0.06 – 0.08 Normal; considerable surface depression storage; lakes, ponds, and marshes.	0.04 – 0.06 High; surface storage high; drainage system not sharply defined; large floodplain storage or large number of ponds or marshes.

THE RUNOFF FACTOR IS DETERMINED BY THE SUM OF THE FACTORS FOR RELIEF INFILTRATION, COVER, AND SURFACE. NOT APPLICABLE TO BUILT UP AREAS.

FIGURE 3

$\text{Sum} = 0.28 + 0.14 + 0.06 + 0.10 = 0.58$

WATERSHED TYPES AND FACTORS

WATERSHED TYPES AND FACTORS				
Run-off Producing Features	Extreme	High	Normal	Low
Relief	<div style="border: 1px solid red; padding: 2px; display: inline-block;">0.38</div> 0.28 – 0.38 Steep, rugged terrain, with average slopes above 30%	0.20 – 0.28 Rolling, with average slopes of 10 to 30%	0.14 – 0.20 Rolling, with average slopes of 5 to 10%	0.08 – 0.14 Relatively flat land, with average slopes of 0 to 5%
Soil Infiltration	<div style="border: 1px solid red; padding: 2px; display: inline-block;">0.12</div> 0.12 – 0.16 No effective soil cover either rock or thin soil mantle of negligible infiltration capacity.	0.08 – 0.12 Slow to take up water; clay or shallow loam soils of low infiltration capacity imperfectly or poorly drained.	0.06 – 0.08 Normal; well drained light and medium textured soils sandy loams, silt and loams.	0.04 – 0.06 Slow to take up water; clay or shallow loam soils of low infiltration capacity imperfectly or poorly drained.
Vegetation Cover	0.12 – 0.16 No effective plant cover; bare or very sparse cover.	0.08 – 0.12 Poor to fair; clean cultivation crops or poor natural cover; less than 20% of drainage area under good cover.	0.06 – 0.08 Fair to good; about 50% of area in good grassland or woodland; not more than 50% of area in cultivated crops.	<div style="border: 1px solid red; padding: 2px; display: inline-block;">0.06</div> 0.04 – 0.06 Good to excellent; about 90% of drainage area in good grassland, woodland, or equivalent crop.
Surface	<div style="border: 1px solid red; padding: 2px; display: inline-block;">0.12</div> 0.10 – 0.12 Negligible; surface depressions, few and shallow; drainage ways steep and small; no marshes.	0.08 – 0.10 Low well-defined system of small drainage ways; no ponds or marsh.	0.06 – 0.08 Normal; considerable surface depression storage; lakes, ponds, and marshes.	0.04 – 0.06 High; surface storage high; drainage system not sharply defined; large floodplain storage or large number of ponds or marshes.

THE RUNOFF FACTOR IS DETERMINED BY THE SUM OF THE FACTORS FOR RELIEF INFILTRATION, COVER, AND SURFACE. NOT APPLICABLE TO BUILT UP AREAS.

FIGURE 3

Sum = 0.38 + 0.12 + 0.06 + 0.12 = 0.68

Vineyard Area

WATERSHED TYPES AND FACTORS

RUN-OFF PRODUCING CHARACTERISTICS OF WATERSHEDS SHOWING FACTORS FOR EACH CHARACTERISTIC FOR VARIOUS WATERSHED TYPES				
WATERSHED TYPES AND FACTORS				
Run-off Producing Features	Extreme	High	Normal	Low
Relief	0.28 – 0.38 Steep, rugged terrain, with average slopes above 30%	0.24 0.20 – 0.28 Rolling, with average slopes of 10 to 30%	0.14 – 0.20 Rolling, with average slopes of 5 to 10%	0.08 – 0.14 Relatively flat land, with average slopes of 0 to 5%
Soil Infiltration	0.16 0.12 – 0.16 No effective soil cover either rock or thin soil mantle of negligible infiltration capacity.	0.08 – 0.12 Slow to take up water; clay or shallow loam soils of low infiltration capacity imperfectly or poorly drained.	0.06 – 0.08 Normal; well drained light and medium textured soils sandy loams, silt and loams.	0.04 – 0.06 Slow to take up water; clay or shallow loam soils of low infiltration capacity imperfectly or poorly drained.
Vegetation Cover	0.12 – 0.16 No effective plant cover; bare or very sparse cover.	0.12 0.08 – 0.12 Poor to fair; clean cultivation crops or poor natural cover; less than 20% of drainage area under good cover.	0.06 – 0.08 Fair to good; about 50% of area in good grassland or woodland; not more than 50% of area in cultivated crops.	0.04 – 0.06 Good to excellent; about 90% of drainage area in good grassland, woodland, or equivalent crop.
Surface	0.12 0.10 – 0.12 Negligible; surface depressions, few and shallow; drainage ways steep and small; no marshes.	0.08 – 0.10 Low well-defined system of small drainage ways; no ponds or marsh.	0.06 – 0.08 Normal; considerable surface depression storage; lakes, ponds, and marshes.	0.04 – 0.06 High; surface storage high; drainage system not sharply defined; large floodplain storage or large number of ponds or marshes.

THE RUNOFF FACTOR IS DETERMINED BY THE SUM OF THE FACTORS FOR RELIEF INFILTRATION, COVER, AND SURFACE. NOT APPLICABLE TO BUILT UP AREAS.

FIGURE 3

Sum = 0.24 + 0.16 + 0.12 + 0.12 = 0.64

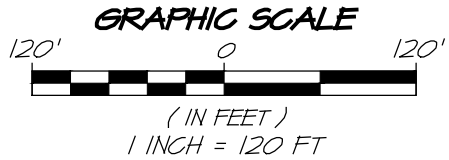
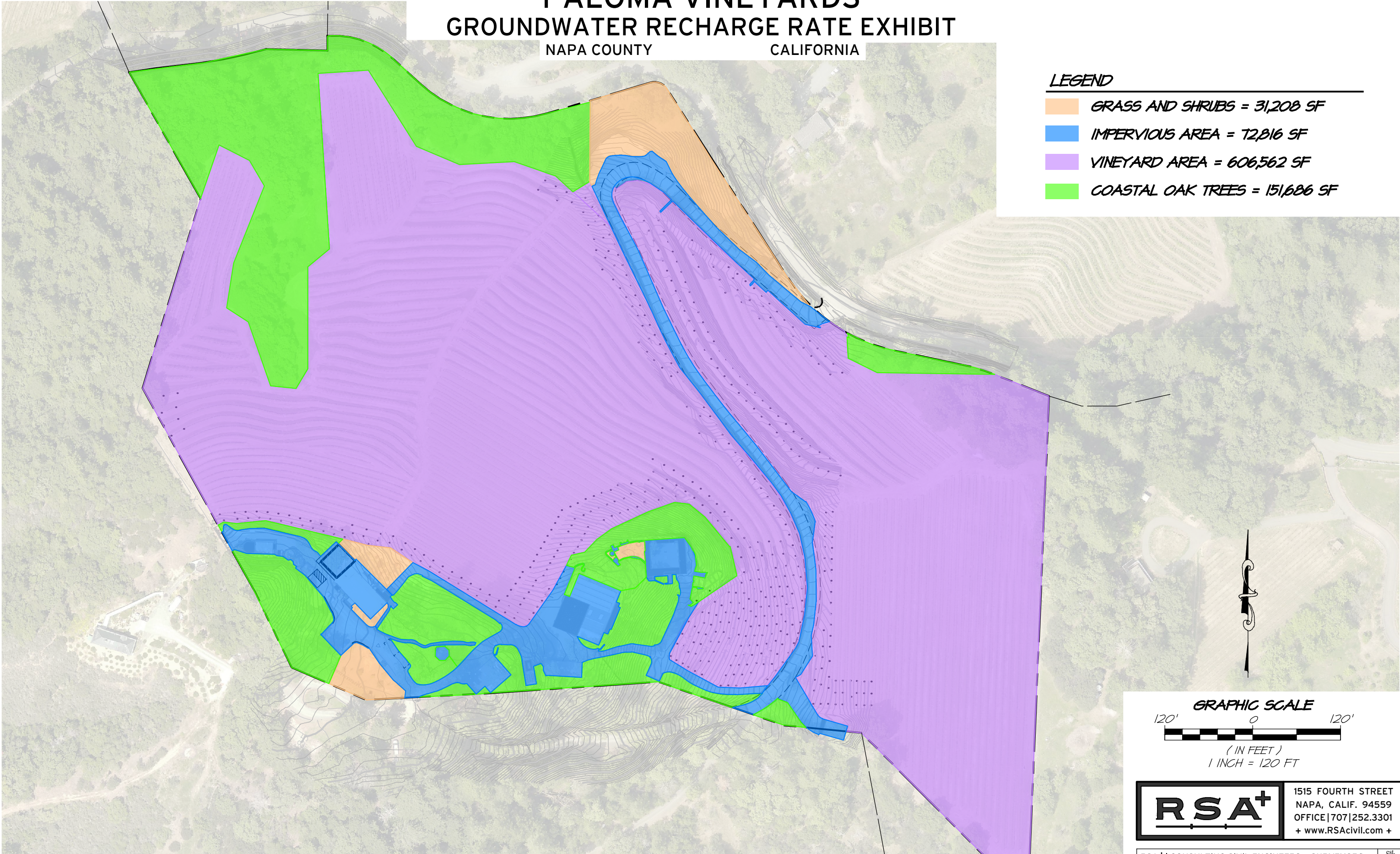
PALOMA VINEYARDS GROUNDWATER RECHARGE RATE EXHIBIT

NAPA COUNTY

CALIFORNIA

LEGEND

- GRASS AND SHRUBS = 31,208 SF
- IMPERVIOUS AREA = 72,816 SF
- VINEYARD AREA = 606,562 SF
- COASTAL OAK TREES = 151,686 SF



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OCT 4, 2023

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\\Client\RS\2019\4119046.0_Paloma_Vineyard_Spring_Mountain_Road\DESIGN\EXHIBITS\Exh-Groundwater_Recharge.dwg | 10/04/2023