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Water Availability Analysis

Boyd Family Vineyards P17-00379-UP
Planning Commission Hearing Date June 20, 2018

WATER AVAILABILITY ANALYSIS

BOYD FAMILY VINEYARDS

4042 BIG RANCH ROAD
NAPA, CA 94558
APN 036-190-003

SUMMIT

CIVIL STRUCTURAL WATER|WASTEWATER ELECTRICAL

Project No. 2017120
October 20, 2017
Revised: March 16, 2018

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LIST OF ENCLOSURES

PROJECT SUMMARY

Boyd Family Vineyards is applying for a Use Permit for the Boyd Family Vineyards winery located at 4042 Big Ranch Road, in Napa (APN: 036-190-003). The Use Permit Application includes the construction of a new 4,200 square foot winery with a production capacity of 30,000 gallons per year. The new winery will require 2 full-time employees, with a maximum of 6 full-time employees during crush or marketing events. Boyd Family Vineyards anticipates 15 maximum tasting room visitors per day with an average of 40 visitors per week. An additional 400 annual visitors are anticipated from 10 marketing events with up to 30 visitors and 1 marketing event with up to 100 visitors. Summit has prepared the following Water Availability Analysis, which provides a comparison between the proposed water use and the estimated available water capacity on the property.

SITE DESCRIPTION

Boyd Family Vineyards is made up of a single parcel with a total area of 21.88 acres, 13.68 acres of which are existing vineyard. The proposed winery will consist of a production facility, warehouse, tasting room, and an office all contained within a single building. The facility is located with agricultural areas to the north, south, east, and west, and is bounded on its easterly property line by the Napa River.

The water source for the property consists of one well which currently supplies domestic water for an existing main residence and guest cottage. The existing well also supplies irrigation water for the existing 13.68 acres of vineyard. Process wastewater from winery operations will be stored and hauled off-site for disposal and sanitary sewage from domestic sources disposed of in sub-surface disposal fields as discussed in the Wastewater Feasibility Study. Alternately, treated process wastewater can be re-used for vineyard irrigation to complement the irrigation supply from the existing well.

Refer to the Overall Site Plan attached for a general layout of the project components. These plans also include approximate property boundaries, existing buildings and agricultural development.

WATER DEMAND

EXISTING WATER DEMAND

Existing water uses on the property are based on the following:

- Existing 2 bedroom main residence
- Existing 1 bedroom guest cottage
- Irrigation of 13.68 acres of vineyard
- Irrigation of approximately 13,000 square feet landscaping

RESIDENTIAL DOMESTIC WATER DEMAND

Domestic water demand is from an existing 2 bedroom residence and 1 bedroom guest cottage. Per the Napa County Water Availability Analysis (WAA) - Guidance document, residential water demand includes landscaping, and is calculated as follows:

Primary Residence (2 BR)		=	0.5 ac-ft/yr
Secondary Residence (1 BR)		=	0.2 ac-ft/yr
Landscaping (13,000 ft^2)*	= 0.1 ac-ft/yr/1,000 ft^2 x 12,000 ft^2	=	1.2 ac-ft/yr
		=	**1.9 ac-ft/yr**

*Note: 1,000 ft^2 of landscaping is accounted for in the Primary Residence water demand per the County's WAA Guidance document, resulting in 12,000 ft^2 of remaining landscape used for the water demand calculation.

VINEYARD IRRIGATION WATER DEMAND

Water from the existing well is used to irrigate 13.68 acres of on-site vineyards. Napa County WAA guidelines for vineyard irrigation are 0.2 to 0.5 ac-ft/acre/year. The vineyard acreage below expresses the most conservative value possible, considering some amount of vineyard will be removed for the implementation of a pressure distribution system. Using the average water use for vineyard irrigation, the expected water demand for 13.68 acres of vineyard is:

13.68 acres x 0.35 ac-ft/acre/year	=	**4.79 ac-ft/yr**

Vineyard irrigation will typically begin in June when onsite soils begin to dry and continue until October, with the peak irrigation period between July and August. All vineyard irrigation water, unless reclaimed process wastewater is used, will be supplied by the existing well. Well water is not used for frost or heat protection because there are existing on-site fans.

PROPOSED WATER DEMAND

Proposed additional water demand will be required to supply a 30,000 gallon per year winery facility with 2-6 employees. All existing water demand will continue, with additional demand required by winery processes, winery employees, and winery visitors.

WINERY PROCESS WATER DEMAND

Water demand for wine production is expected to correlate to the process wastewater (PW) generated at the facility. The proposed wine production capacity is 30,000 gallons per year, with the projected process wastewater generation calculated as follows:

Proposed Annual Peak production	=	30,000 gal wine/year
PW generation rate	=	6 gal PW/gal wine[a]
Annual PW Flow	=	30,000 gal wine x 6 gal PW/gal wine
	=	180,000 gal PW/year
Average PW Flow	=	(180,000 gal PW/year) / (365 days)
	=	493 gal PW/day
Peak PW Flow	=	(180,000 gal PW/year x 16.4[b] %)/(30 days)
	=	984 gal PW/day ≈ 1,000 gal PW/day
Annual Production Water Demand	=	(180,000 gal water/yr) / (325,851 gal/ac-ft)
	=	**0.55 ac-ft water/yr**

[a] Generation rate based on industry standards

[b] Percentage of flows accounted for during the harvest month of September, based on water data from similar wineries

Process wastewater generation is expected to be equivalent to the process water demand for wine production. The expected annual water use associated with the proposed production capacity is 180,000 gallons per year, or 0.55 ac-ft per year. Winery process water demand will continue to be provided by the existing well.

DOMESTIC WATER DEMAND

Expected domestic water demand at the winery facility is determined based a maximum of 6 employees, 15 daily visitors, and marketing events. Sanitary sewage (SS) generation and winery domestic water demand are expected to be equivalent, except for SS generated from marketing events with more than 30 visitors, which will utilize portable toilets. The domestic water supply for marketing events will still be provided by existing on-site wells. In addition, it should be noted that a total of 2 persons occupy the primary residence and guest house throughout the year. As a result the combined number of persons on-site for more than 60 days a year is 23, therefore a public water system is not required. The proposed annual domestic water demand for the winery is outlined in Table 1. Residential domestic water demand is not calculated in Table 1, as it is an existing condition as presented in the Residential Domestic Water Demand section on pages 1 and 2.

Table 1. Proposed domestic water use at Boyd Family Vineyards.

Use Type	Maximum Quantity (persons/day)	Water Demand (gal/person)	Daily Demand (gal/day)	Number of Days (days/year)	Annual Water Use (gal/year)
FT Employee [d]	6	15	90	365	32,850
Tasting Visitors [a]	15	3	45	365	16,425
Event Visitors [b]	30	6	180	10	1,800
Event Visitors [b]	100	6	600	1	600
				Total Water Use (gal)	**51,675**
				Average Water Use (gpd)	**142**
				Peak Water Use (gpd)[c]	**735**
				Total Water Use (ac-ft/yr)	**0.16**

[a] Tasting is assumed to occur every day of the year to be conservative. Per capita water demand is based on Napa County PBES's "Regulations for Design, Construction, and Installation of Alternative Sewage Treatment Systems," Table 4: Wine Tasting Facility.
[b] Per capita water demand is based on Napa County PBES's "Regulations for Design, Construction, and Installation of Alternative Sewage Treatment Systems," Table 4: Wine Tasting Facility with an additional 3 gpcd due to the extended duration of marketing events.
[c] Peak daily domestic water use is based on the estimated peak sanitary sewage generation which includes employees, tasting visitors, and maximum event visitors (100).
[d] Peak number of employees assumed every day to be conservative.
The expected annual domestic water use for the proposed winery marketing and visitation plan is 51,675 gallons per year, or 0.16 ac-ft per year. Winery domestic water demand will continue to be provided by the existing well.

TOTAL WATER DEMAND

The total expected water demand of the property with the new winery facility is expected to be 7.40 ac-ft per year, compared to an existing water demand of 6.69 ac-ft per year. Please see Table 2 for a summary of existing and proposed annual water demand.

Table 2. Summary of existing and proposed annual water demand.

	Annual Water Demand (ac-ft/yr)
Existing Water Demand	
Domestic (Residential)*	1.90
Vineyard Irrigation	4.79
Total Existing Water Demand	**6.69**
Proposed Additional Water Demand	
Winery Process	0.55
Winery Domestic	0.16
Total Proposed Additional Water Demand	**0.71**
Total Proposed Water Demand	***7.40***

* Includes residential landscaping irrigation demand.

WATER AVAILABILITY

The typical allotment for Napa Valley Floor Areas is 1 ac-ft/ac/year; therefore, the Boyd Family Vineyards parcel would be allotted 21.88 ac-ft/year. However, based on December 2015 correspondence with Napa County it has been determined that the parcel lies within a special groundwater study area. A Tier I-Recharge Estimate is required due to the potential uncertainty of the geology in the area and a Tier II-Well Interference analysis is required to determine if there are impacted non-project wells located in close proximity to the existing project well. The total estimated water demand for process, domestic, and landscape uses of 7.4 ac-ft/year represents 34% of the water allotment. The proposed net increase in water demand for the proposed winery is 0.71 ac-ft/yr, or 3.2% of the water allotment.

TIER I ANALYSIS: ESTIMATED AVERAGE ANNUAL GROUNDWATER RECHARGE

A Tier I analysis is required of all parcels within the northeastern corner of the Napa Valley Subbasin Study Area as defined by Napa County PBES in December of 2015. Due to the proximity of the parcel in question to the heavily groundwater impacted Milliken, Sarco, Tulocay (MST) subbasin, a parcel specific groundwater recharge assessment is conducted to determine if any groundwater deficiencies could potentially exist.

Luhdorff & Scalmanini Consulting Engineers (LSCE) previously prepared a Hydrogeologic Conceptualization and Characterization of Conditions for the groundwater and hydrogeology of the Napa Valley, including a detailed study of the anticipated rainfall recharge in several individual watersheds. The property exists outside of a previously studied watershed, making precise assessments of the annual recharge difficult. The annual average recharge is thus calculated using a combination of adjacent watershed groundwater recharge estimates, approximate data on surface geology, soil characteristics, and annual precipitation.

Napa Subarea surface geology is visually estimated using Figure 3-1b, Figure 5-2, and Figure 5-7 of LSCE's characterization report. Cross Section E is in the approximate location of Boyd Vineyards and the surface geology is represented mostly by Alluvium deposits, Tertiary Quaternary sedimentary basin deposits, and some clay soil. Watersheds with high Alluvium deposits include the Napa River near Napa, Conn Creek, Napa River at St. Helena, Napa River at Calistoga, Tulocay Creek, and Napa Creek at Napa. On September 23, 2015 in a site evaluation conducted by Summit Engineering and a Napa County representative, sandy clay soils and clay soils were discovered. Comparing these soils to the Hydrologic Soils Group Textual Parameters (Table 8-6, L&S), predominantly groups C and D are expected in the area of interest. Of the aforementioned basins, Napa River near Napa, Conn Creek, Tulocay Creek, and Napa Creek at Napa all contain 80% or greater Hydrologic Soils Groups C and D (Table 8-7, L&S).

Annual precipitation was estimated from precipitation normals from the National Oceanic and Atmospheric Administration for the period between 1981-2010. The site precipitation was calculated as the average of the Napa State Hospital and Yountville stations. Annual average precipitation for this area is estimated to be 30.7 in/year.

Ultimately, recharge percent is estimated as an average of the Napa River near Napa, Conn Creek, Tulucay Creek, and Napa Creek at Napa watersheds. Taking the average recharge of these four basins (recharge tables 8-9 and 8-10 from the LSCE report), yields approximately 13.5% recharge of total precipitation. The typical

annual recharge for the 21.88 acre parcel will be approximately 7.57 ac-ft/year, which is greater than the annual demand of 7.4 ac-ft/year.

TIER II ANALYSIS: WELL INTERFERENCE

A Tier II analysis is not required for parcels located within the "Napa Valley Floor" per the WAA guidelines, unless substantial evidence indicates a potentially significant impact. As this parcel is located adjacent to the MST subbasin, this analysis is included to estimate any interference between wells and springs that could affect their supply capacity due to water usage. The objective of the Tier II analysis is to determine if any well (existing or in the future) within 500 ft of the project's wells could be affected by the drawdown of the project's wells. The analysis was performed for all wells onsite that are within 500 feet of the property line, to cover any possibility of an existing neighboring well or future well within a 500 ft range from the existing property wells.

- Method

  Using the Theis equation as indicated in the WAA Napa County guidelines, the groundwater drawdown from all property wells to the edge of the parcel was determined. The assumed closest distance that any neighboring well could be located is the edge of the parcel. Due to the limited data on the aquifer, values that would yield a conservative drawdown estimate were selected from Napa County Water Availability Analysis guidelines.

  Assumptions:

  - Aquifer Thickness of 75 ft.
  - Hydraulic Conductivity low range of 30 to 50 ft/day for project site (Water Availability Analysis Figure F-3)
  - Specific Storage range of 1.5×10^{-5} to 3.1×10^{-4} (1/ft) (Water Availability Analysis table F3)

  The Theis equation can be seen below along with an example calculation.

$$\text{Theis Equation: Drawdown} = \frac{\text{Flow}}{(4\pi \times \text{Transmissivity})} \times W(u)$$

$$W(u) = \int_u^{\infty} \frac{1}{\omega} e^{-\omega} d\omega$$

$$u = \frac{(\text{Distance}^2 \times \text{Specific Storage})}{(4 \times \text{Transmissivity} \times \text{Time})}$$

$$\text{Transmissivity} = \text{Hydraulic Conductivity} \times \text{Aquifer Thickness}$$

Example for the domestic well drawdown effect on possible wells on adjacent properties:

$$u = \frac{(123\ \text{ft})^2 \times (1.50 \text{ X } 10^{-5})}{4 \times 30 \frac{\text{ft}}{\text{day}} \times 75\ \text{ft} \times 1\text{day}} = 2.52 \times 10^{-5}$$

With this value of u, W(u) =10.03

$$\text{Drawdown} = \frac{100\,\frac{\text{gal}}{\text{min}} \times\ 0.1337\,\frac{\text{cuft}}{\text{gal}} \times 1{,}440\,\frac{\text{min}}{\text{day}}}{4\pi\ \times 30\,\frac{\text{ft}}{\text{day}} \times 75\ \text{ft}} \times 10.03 = 6.83\ \text{ft}$$

The table below shows a summary of the worst case scenario of drawdown results for the onsite well closest to neighboring non-project parcels. More detailed tables can be found in Enclosure D, Tier II Well Drawdown Calculation Tables.

Table 3. Well Drawdown Calculations

	Well Flow Rate (gpm)	Distance to Property Line (ft)	Estimated Drawdown (ft)
Domestic Well	100 [a]	123	6.83

[a] Based on the peak flow rate needed to satisfy the peak day demand

Results

Using very conservative estimates for aquifer thickness, specific storage, and hydraulic conductivity, based on values from the Water Availability Analysis guidelines adopted by Napa County, none of the wells should produce a drawdown greater than 10 feet on any existing or future wells that could be adjacent to the property. The Water Availability Analysis guidelines establish a 10 foot drawdown as the default criteria to determine significant adverse effects. Since the well's estimated drawdown is less than 10 feet, no significant drawdown impact is expected for wells on adjacent parcels.

DROUGHT CONSERVATION

The facility plans to use a Hold & Haul system for process wastewater generated at the facility and provide domestic wastewater disposal in pressure distribution and/or sub-surface drip dispersal fields. The wastewater feasibility study also proposes the option of reusing treated process wastewater for vineyard irrigation, potentially decreasing the proposed water demand for vineyard irrigation by 180,000 gallons, or 0.55 ac-ft/yr. Treated domestic and process wastewaters disposed of in subsurface systems will recharge the groundwater table through infiltration.

CONCLUSION

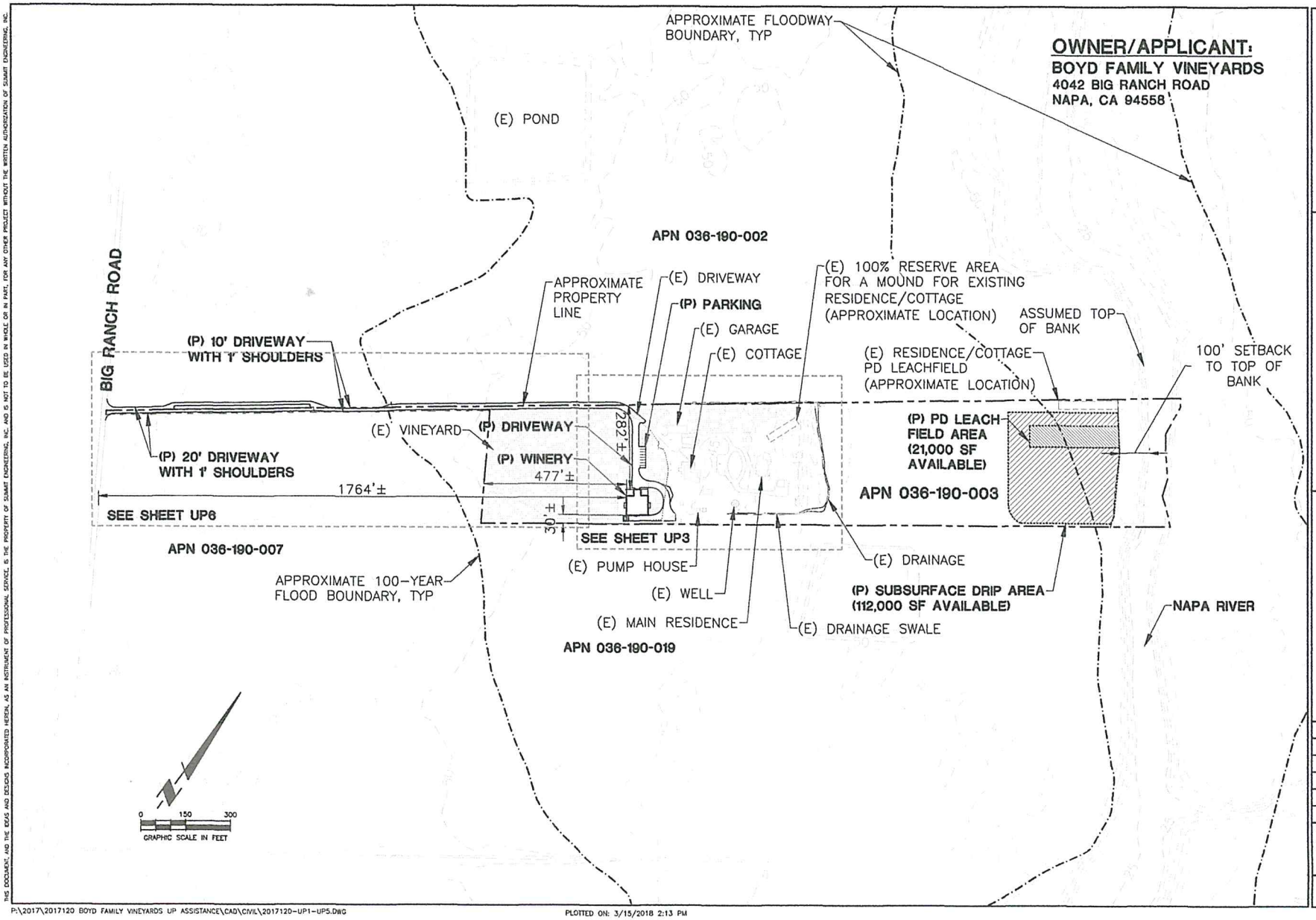
The total annual water demand of Boyd Family Vineyards for process, domestic and irrigation uses is projected to be 7.4 ac-ft/yr, which is well below the water allocation of 21.88 ac-ft/yr, and below the anticipated site specific recharge of 7.57 ac-ft/yr, when not accounting for subsurface groundwater inflow. The anticipated peak daily potable water demand for the parcel should be met by the existing 100 gpm on-site well.

Please contact us with any questions.

ENCLOSURE A

USE PERMIT APPLICATION SHEETS

UP2, UP3, & UP4



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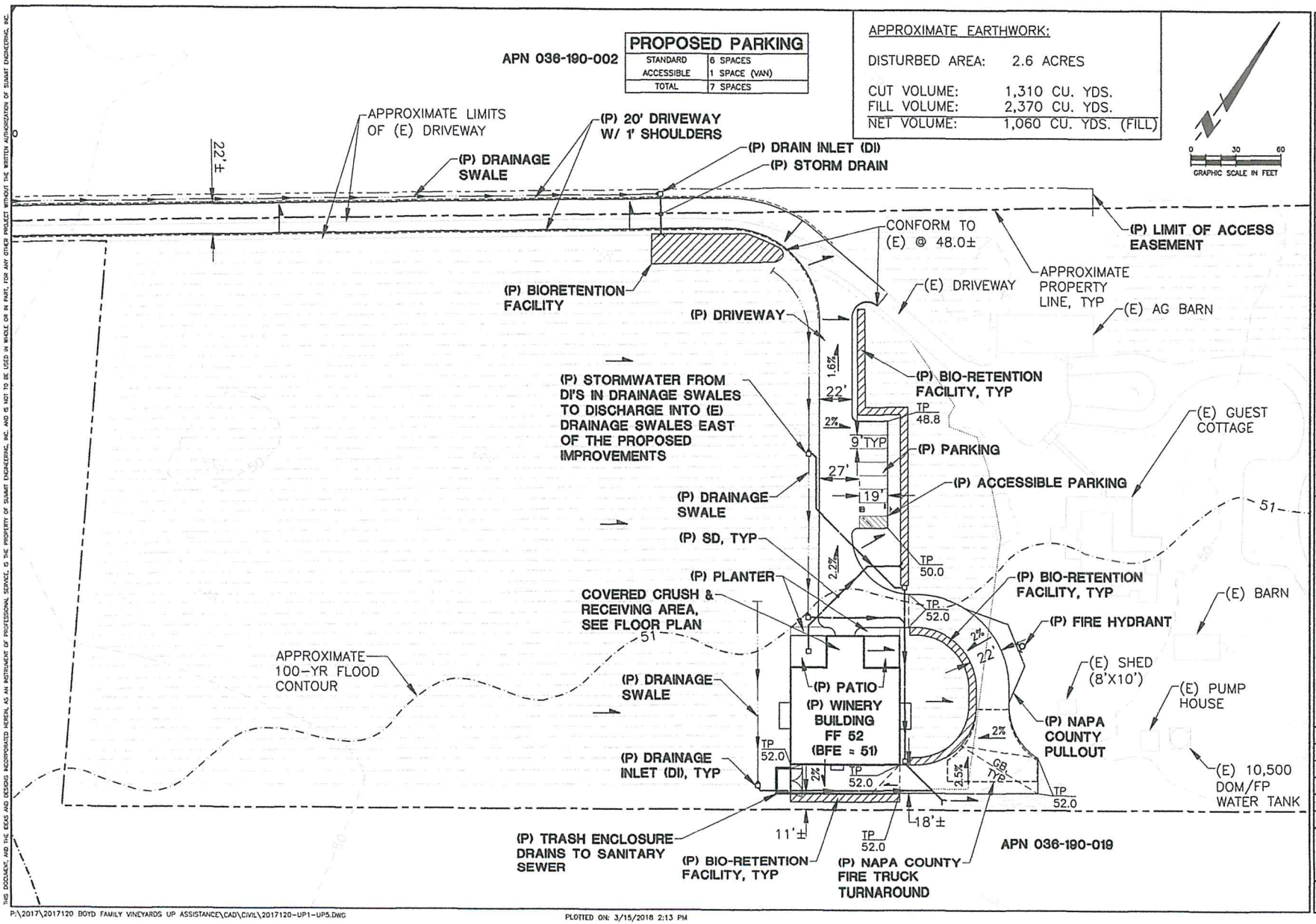
APN 036-190-003

USE PERMIT APPLICATION

OVERALL SITE PLAN

2017-10-20	USE PERMIT SUBMITTAL
2018-03-16	PERMIT RESUBMITTAL

DATE: 2017-09-20
JOB NO: 2017120
SCALE: AS SHOWN
DRAWN: JA
CHECKED: TCS
SHEET UP2



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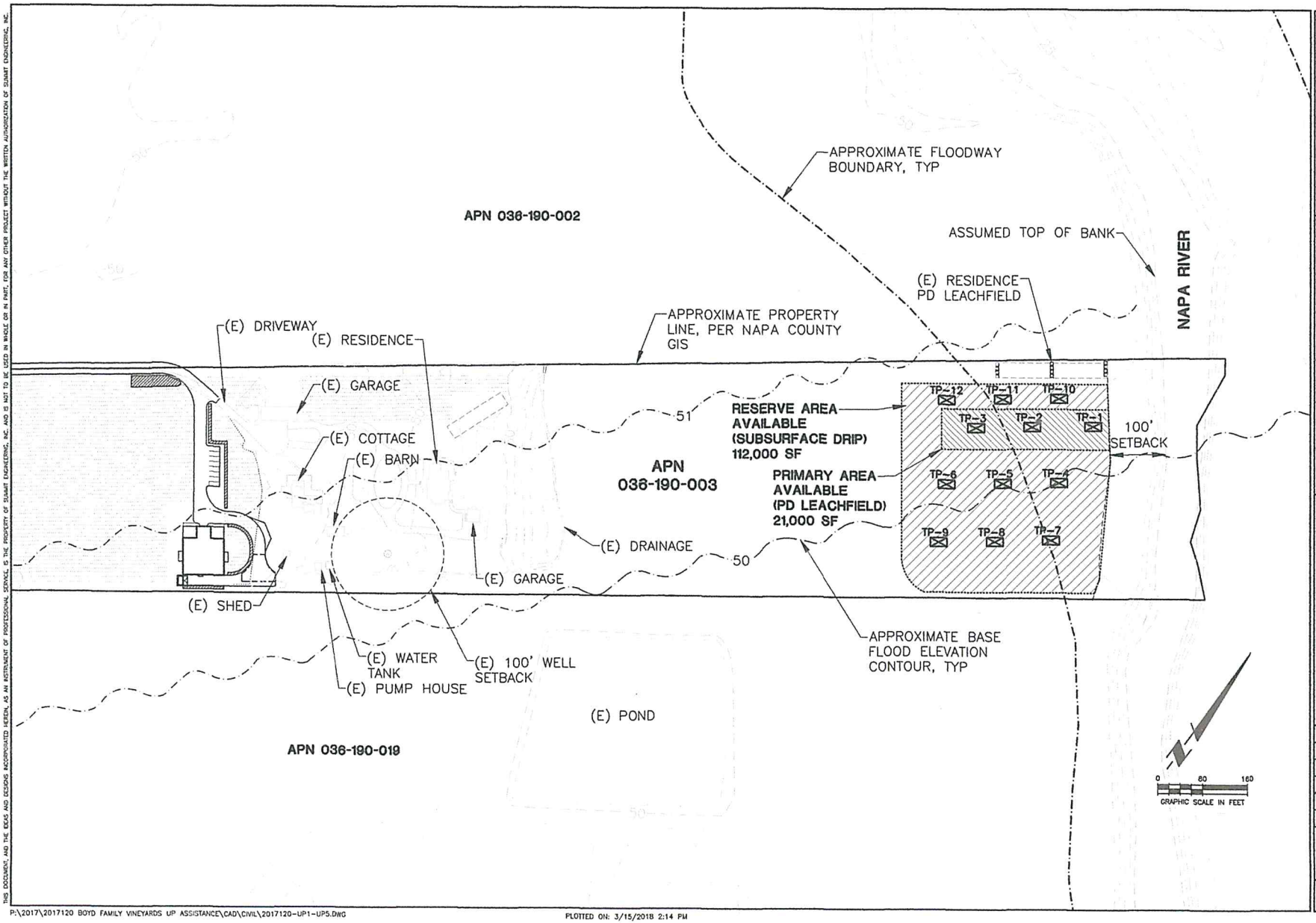
USE PERMIT APPLICATION

PRELIMINARY GRADING & DRAINAGE PLAN

2017-10-20	USE PERMIT SUBMITTAL
2018-03-15	PERMIT RESUBMITTAL

DATE: 2017-09-20
JOB NO: 2017120
SCALE: AS SHOWN
DRAWN: JA
CHECKED: TCS
SHEET **UP3**



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USE PERMIT APPLICATION

WASTEWATER SITE PLAN

2017-10-20	PERMIT SUBMITTAL
2018-03-16	PERMIT RESUBMITTAL

DATE: 2017-09-20
JOB NO: 2017120
SCALE: AS SHOWN
DRAWN: JA
CHECKED: CP
SHEET UP4

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