



VINEYARD DESIGN  
EROSION CONTROL  
WATER DEVELOPMENT  
DRAINAGE  
PERMITTING  
GPS/GIS

2800 Jefferson Street  
Napa, California 94558  
707-253-1806  
www.ppiengineering.com

## MEMORANDUM

Date: March 11, 2021

To: Patrick Ryan, Napa County Planning, Building, and Environmental Services

From: James R. Bushey, P.E.  
Cody J. Corsetti, P.E.

Cc: John McDowell, Napa County Planning, Building, and Environmental Services

Re: Veeder Ridge LLC Track I ECP  
3665 Redwood Road  
APN 035-080-027  
Hydrologic Analysis

This memo transmits the findings of a hydrologic analysis for the above-referenced Track I Erosion Control Plan (ECP). HydroCAD software was used to estimate pre- and post-project runoff from the watershed containing the proposed development areas. The software uses the Natural Resource Conservation Service (NRCS) TR-20 method to calculate runoff. The analysis uses the Type IA 24-hr storm distribution and includes site-specific National Oceanic and Atmospheric Administration (NOAA) point precipitation data for the ranch.

One (1) watershed was delineated for the hydrologic modeling. Watershed 1 flows into Redwood Creek. Please see the attached figures for the location of the watershed.

Soils within the watershed were obtained from the NRCS Web Soil Survey and are classified as the following:

- Bressa-Dibble complex, 15 to 30 percent slopes (map unit symbol 113)
- Fagan clay loam, 30 to 50 percent slopes (map unit symbol 133)
- Felton gravelly loam, 30 to 50 percent slopes (map unit symbol 136)

All soils within the watershed boundary are classified as Hydrologic Soil Group (HSG) C. Please see the attached figures for soil type delineations within the vicinity of the watershed.

Land use areas were initially delineated based on the 1993 and 2018 Napa County aerial photo and both PPI and Napa County contours. A site visit was then conducted on August 4, 2020 by Cody Corsetti of PPI Engineering to ground truth the aerial photo and determine the existing

land use conditions. Block 1A was planted without the benefit of an Erosion Control Plan. Existing canopy conditions were determined using aerial imagery from 1993 before the vineyard existed, while ground cover values were determined via existing site conditions at the time of the site visit (ground cover was assumed to match Block 3). The land use hydrologic conditions were classified based on the respective covers as poor (less than 50% cover), fair (50%-75% cover), or good (greater than or equal to 75% cover). The HydroCAD software analyzes the land use data along with the corresponding soil HSGs to determine a weighted Curve Number (CN) for runoff calculations. Please see the attached figures for existing and proposed land use delineations.

The Time of Concentration (Tc) flow paths within the watershed were determined using both PPI and Napa County contours. The flow path was drafted from the hydrologically most distant point (longest travel time) in the watershed to the watershed outlet per NRCS standards. The Tc did not change from pre- to post-project conditions because the flow path in the watershed did not flow through any proposed drainage/erosion control elements. Please see the attached figures for both the pre- and post-project Tc flow paths for the watershed.

Pre- and post-project runoff calculations from the HydroCAD models for the Watershed 1 outlet are summarized in Table 1 below. Runoff was calculated for the 2-, 10-, 50- and 100-year storms respectively.

**Table 1. Watershed Summary**

	Runoff (cfs)		
	Watershed 1		
	Pre- Project	Post- Project	Increase/ Decrease
2-Year Storm	12.92	12.92	0.00
10-Year Storm	31.76	31.76	0.00
50-Year Storm	54.13	54.13	0.00
100-Year Storm	64.25	64.25	0.00

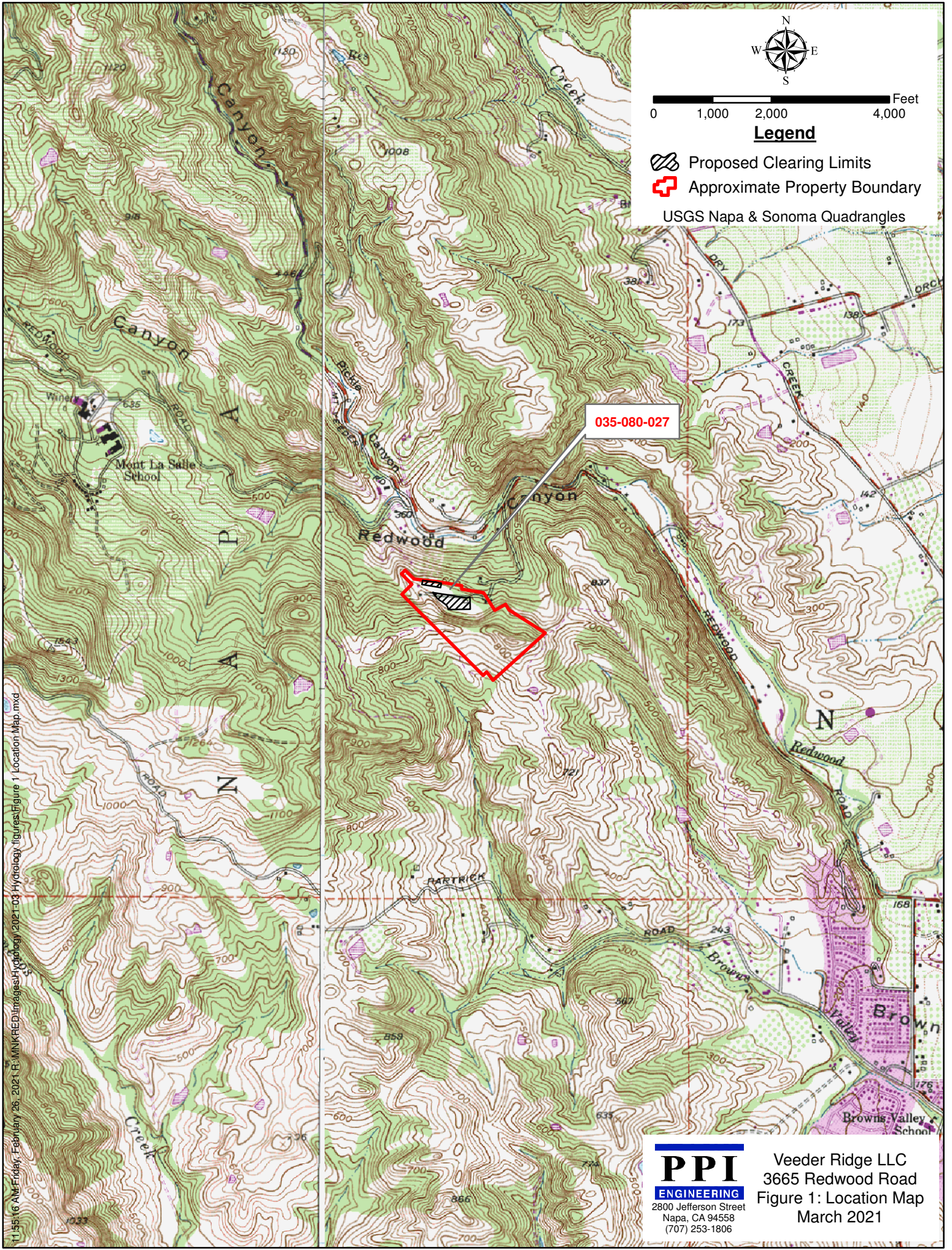
Watershed 1 shows no change in runoff from pre- to post-project conditions for all storm events analyzed. This is because neither the curve number (CN) nor the time of concentration (Tc) in the watershed changed for post-project analysis. Please see the attached HydroCAD analyses for inputs, details, and summaries of the hydrologic modeling. Based on our analysis, there are no predicted net runoff increases, and no negative hydrologic impacts are expected as a result of this project. The project as proposed is in compliance with Napa County's General Plan policy requiring no net increase in runoff.



# **ATTACHMENT A**

## **SUPPORTING FIGURES**





0 1,000 2,000 4,000 Feet

### Legend

- Proposed Clearing Limits
- Approximate Property Boundary

USGS Napa & Sonoma Quadrangles

035-080-027

**PPI**  
ENGINEERING  
2800 Jefferson Street  
Napa, CA 94558  
(707) 253-1806

Veeder Ridge LLC  
3665 Redwood Road  
Figure 1: Location Map  
March 2021





0 150 300 600 Feet

**Legend**

- Ephemeral Stream mapped by WRA
- Approximate Property Boundary
- PPI 10' Index Contours
- PPI 2' Intermediate Contours
- Napa County 25' Index Contours
- Napa County 5' Intermediate Contours

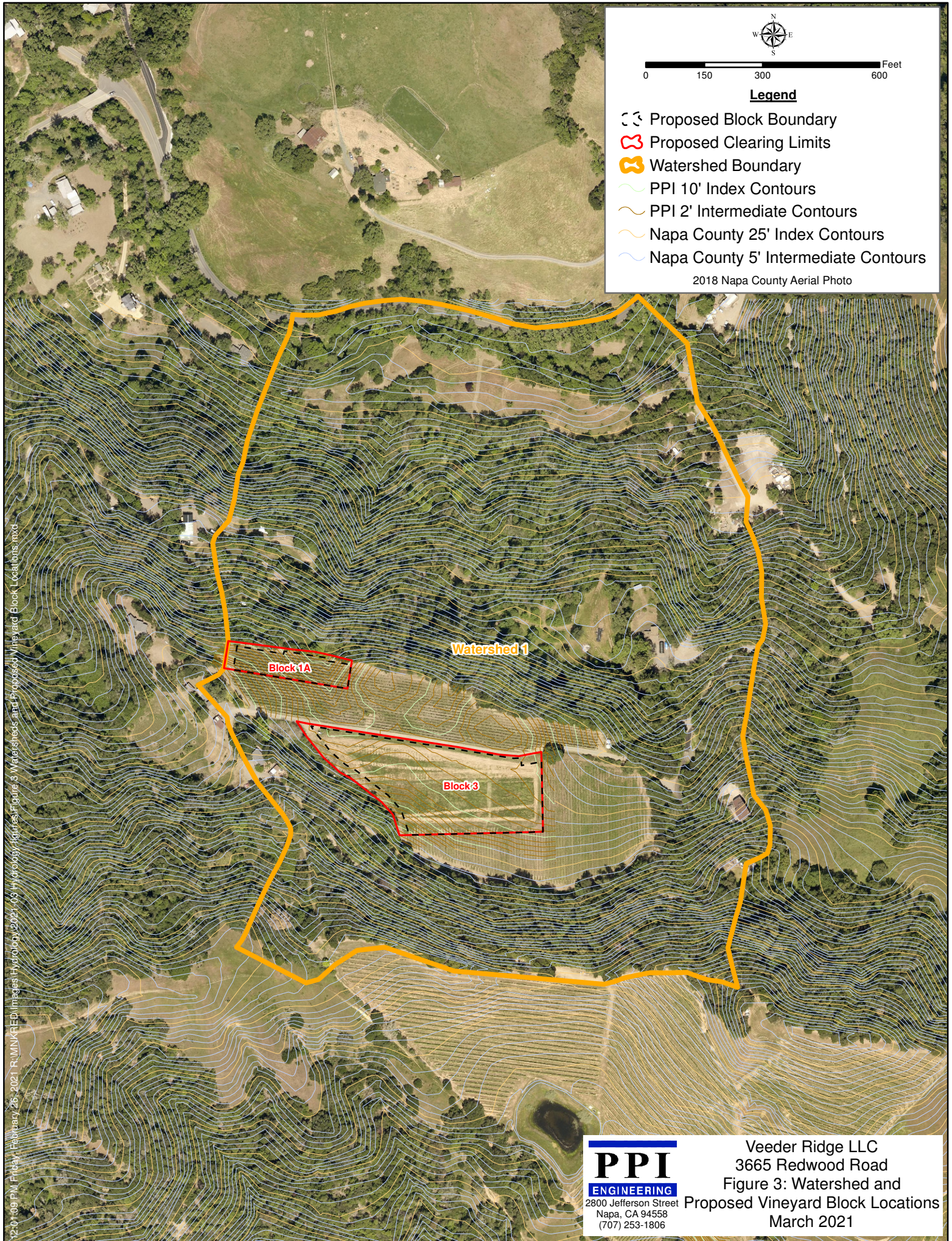
2018 Napa County Aerial Photo

11:57:47 AM Friday, February 26, 2021 H:\MNR\RED\Images\_Hydrology\2021-03\_Hydrology\Figure 2 Property Boundary.mxd

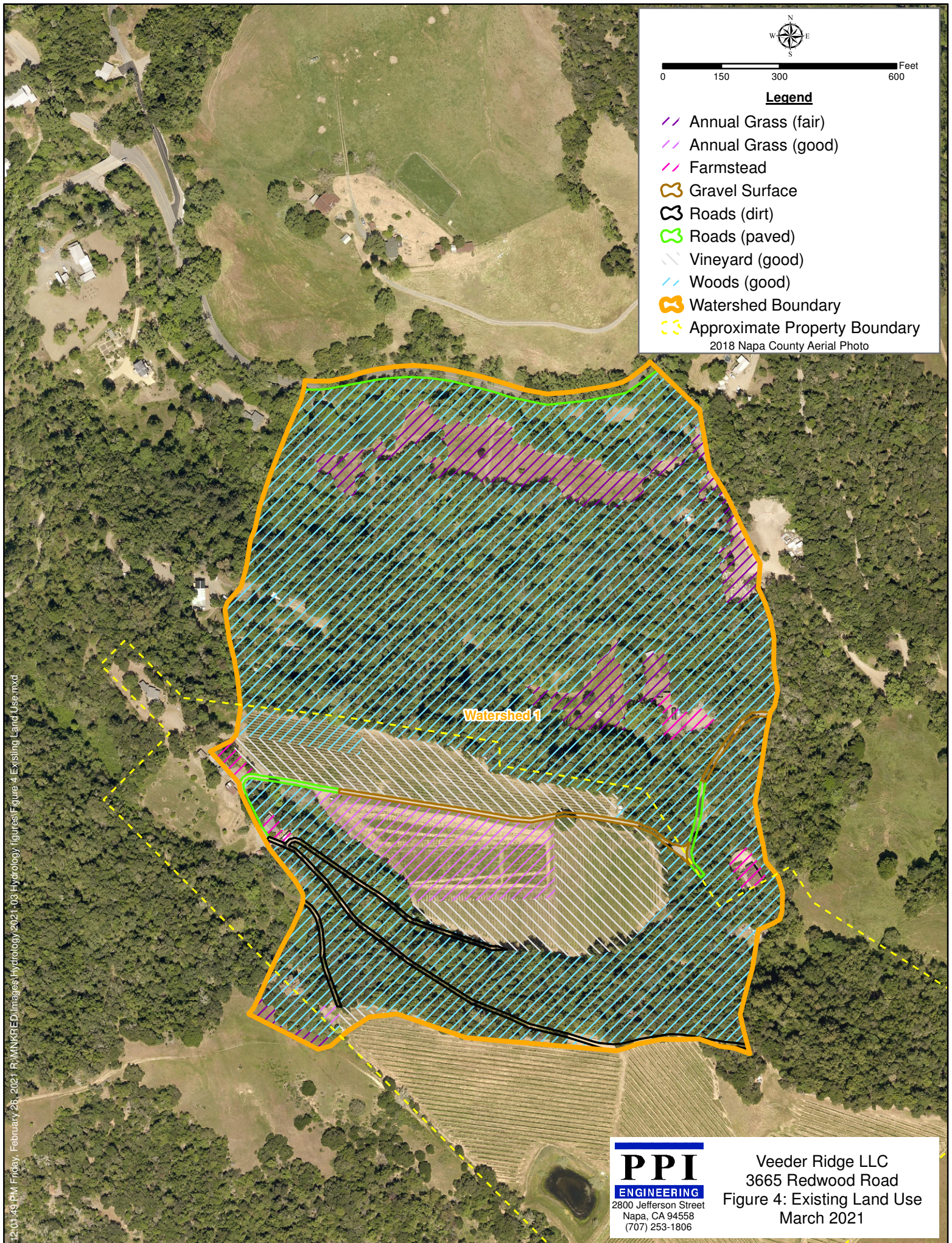
**PPI**  
ENGINEERING  
2800 Jefferson Street  
Napa, CA 94558  
(707) 253-1806

Veeder Ridge LLC  
3665 Redwood Road  
Figure 2: Property Boundary  
March 2021

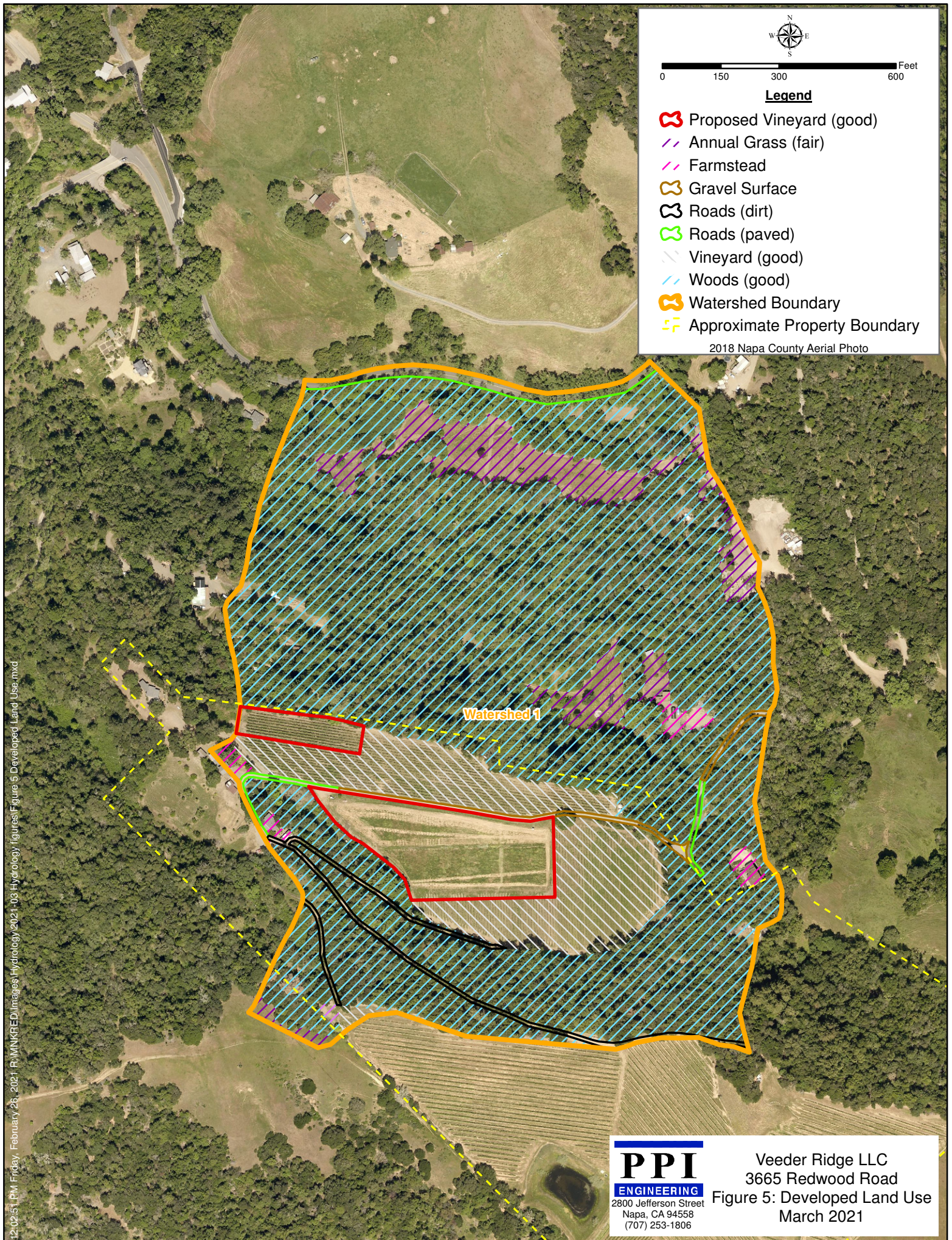




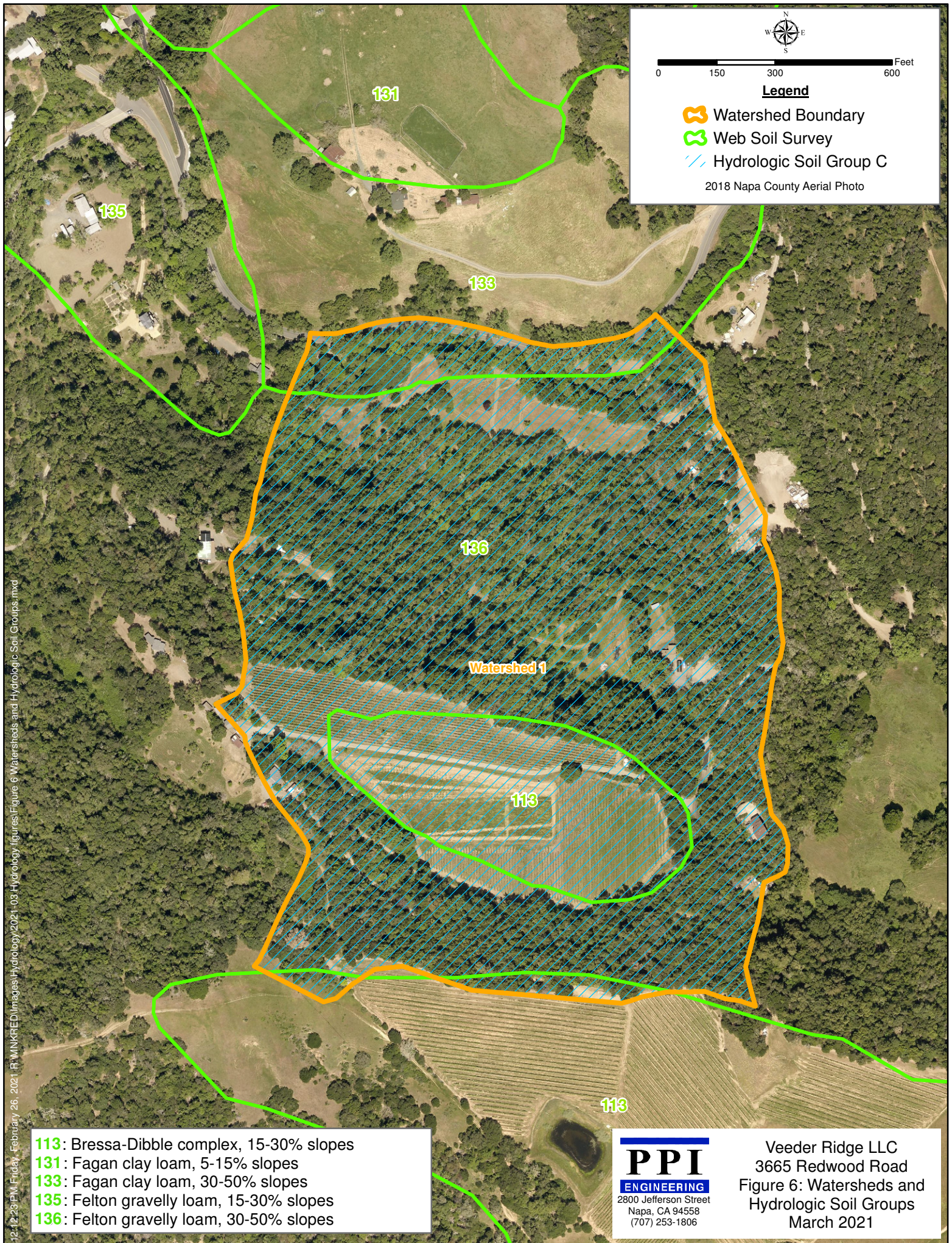




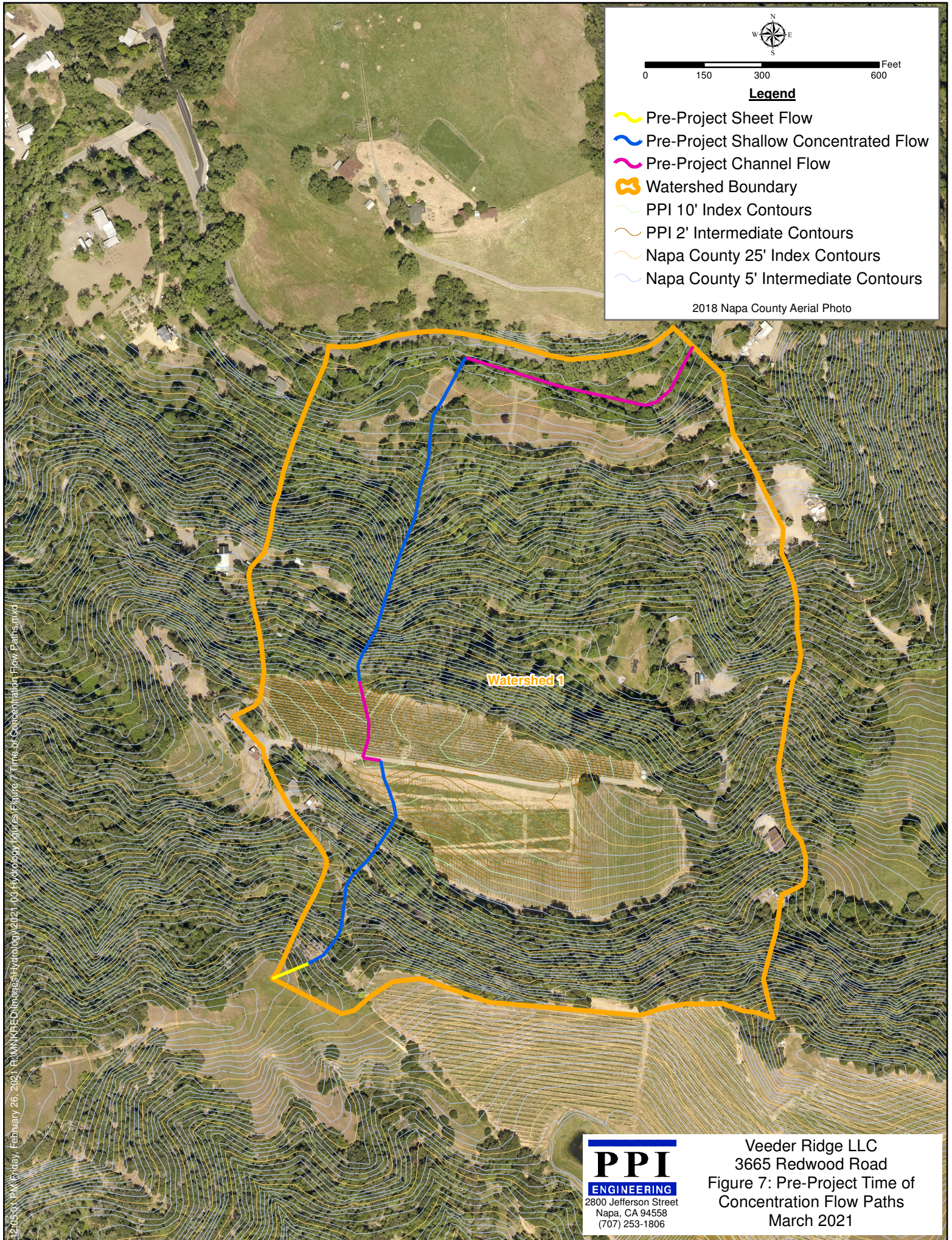






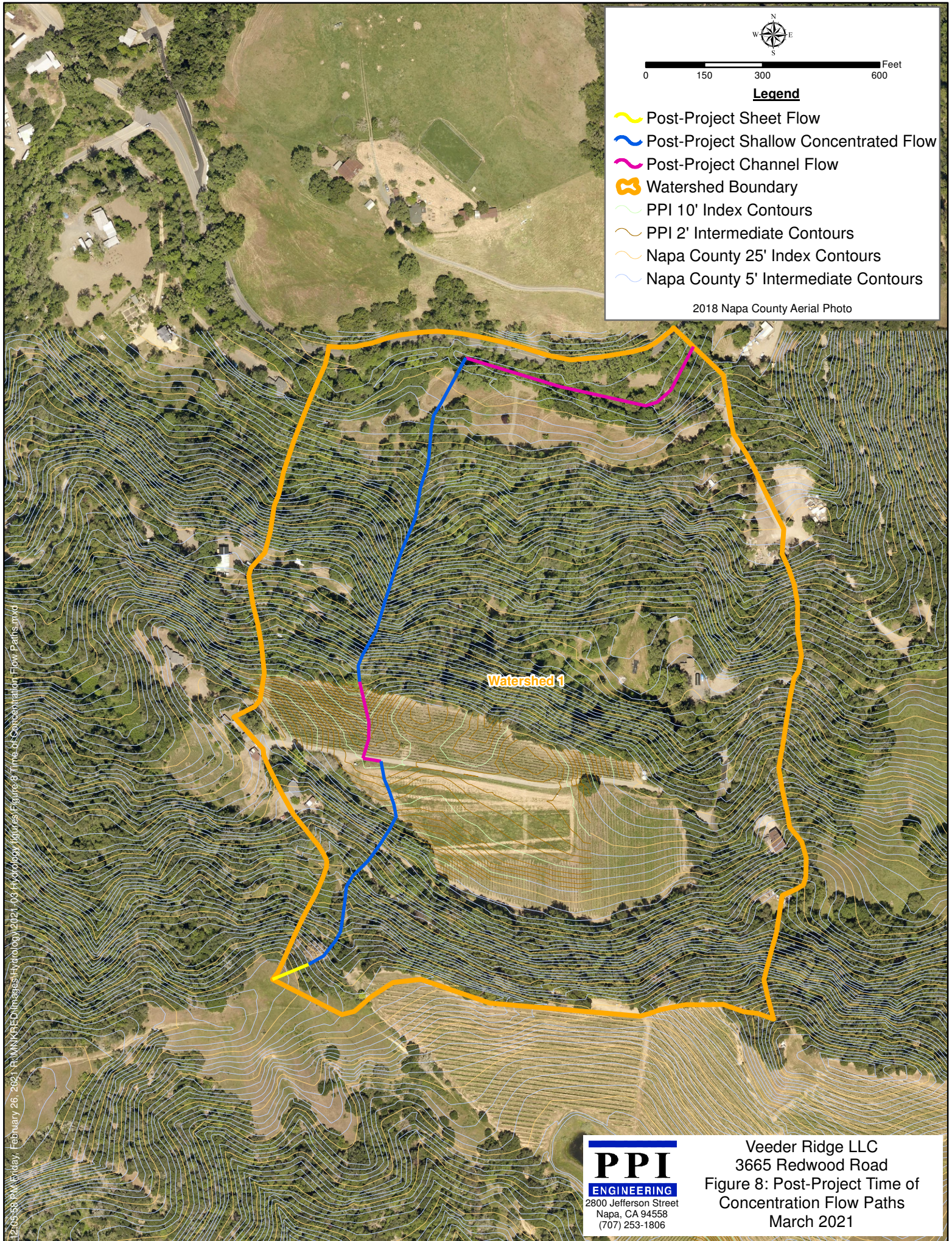






12:05:01 PM Friday, February 26, 2021 R:\MKNRED\InraesHydrology\2021\_03\_Hydrology\figures\Figure 7 Time of Concentration Flow Paths.mxd



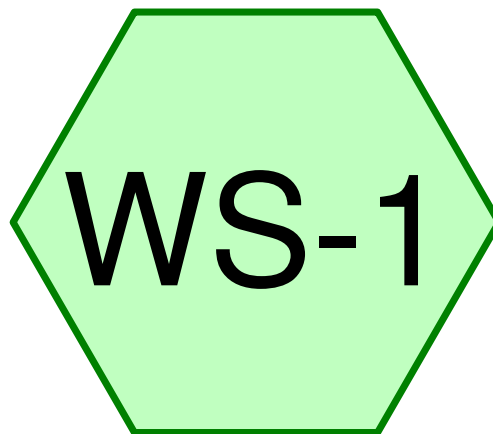


12:05:58 PM Friday, February 26, 2021 R:\MKNRED\InchesHydrology\2021\_03\_Hydrology\figures\Figure 8 Time of Concentration Flow Paths.mxd

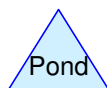
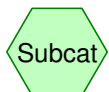


# **ATTACHMENT B**

## **HYDROCAD ANALYSES**



# Subcat WS-1



**Veeder Ridge LLC Pre-Project**

Prepared by PPI Engineering

HydroCAD® 10.10-5a s/n 09429 © 2020 HydroCAD Software Solutions LLC

Type IA 24-hr 2-Year Rainfall=3.92"

Printed 3/11/2021

Page 2

**Summary for Subcatchment WS-1: Subcat WS-1**

Runoff = 12.92 cfs @ 8.11 hrs, Volume= 5.724 af, Depth= 1.40"

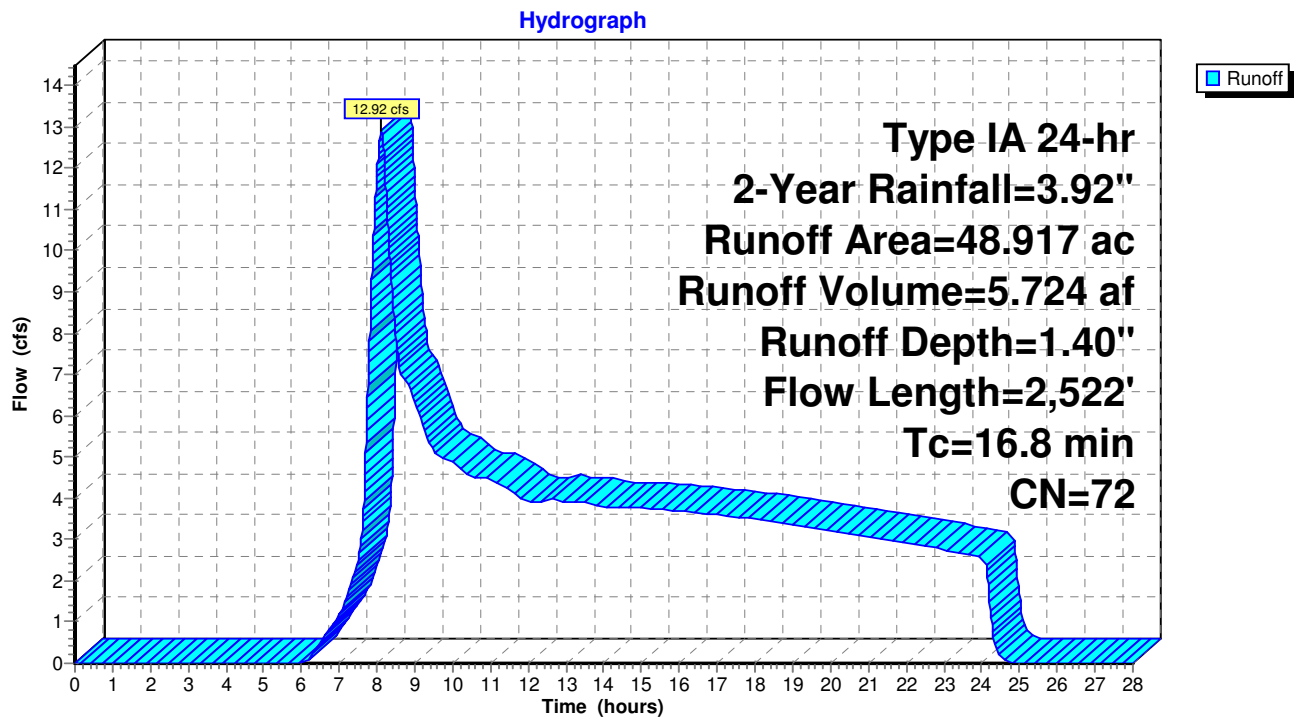
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-28.00 hrs, dt= 0.01 hrs  
Type IA 24-hr 2-Year Rainfall=3.92"

Area (ac)	CN	Description
* 0.000	0	, HSG C
3.295	79	Annual Grass, Fair, HSG C
2.593	75	Annual Grass, Good, HSG C
0.547	87	Dirt roads, HSG C
0.571	82	Farmsteads, HSG C
0.299	96	Gravel surface, HSG C
0.736	98	Paved roads w/curbs & sewers, HSG C
5.380	75	Vineyard, Good, HSG C
35.496	70	Woods, Good, HSG C
48.917	72	Weighted Average
48.182		98.50% Pervious Area
0.736		1.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	100	0.2300	0.34		<b>Sheet Flow, Sheet</b> Grass: Dense n= 0.240 P2= 3.92"
2.5	457	0.3700	3.04		<b>Shallow Concentrated Flow, Shallow - Woodland</b> Woodland Kv= 5.0 fps
1.2	149	0.0900	2.10		<b>Shallow Concentrated Flow, Shallow - Pasture</b> Short Grass Pasture Kv= 7.0 fps
0.2	47	0.0200	3.51	7.02	<b>Trap/Vee/Rect Channel Flow, Ditch</b> Bot.W=0.00' D=1.00' Z= 2.0 '/' Top.W=4.00' n= 0.035
0.3	202	0.1300	10.14	3.54	<b>Pipe Channel, 8" SWCPP</b> 8.0" Round Area= 0.3 sf Perim= 2.1' r= 0.17' n= 0.016 PPI 8in CPP
5.2	885	0.3200	2.83		<b>Shallow Concentrated Flow, Shallow - Woodland</b> Woodland Kv= 5.0 fps
2.5	682	0.0100	4.47	89.47	<b>Trap/Vee/Rect Channel Flow, Stream</b> Bot.W=2.00' D=2.00' Z= 4.0 '/' Top.W=18.00' n= 0.035
16.8	2,522	Total			

**Subcatchment WS-1: Subcat WS-1**



**Veeder Ridge LLC Pre-Project**

Prepared by PPI Engineering

HydroCAD® 10.10-5a s/n 09429 © 2020 HydroCAD Software Solutions LLC

Type IA 24-hr 10-Year Rainfall=5.90"

Printed 3/11/2021

Page 4

**Summary for Subcatchment WS-1: Subcat WS-1**

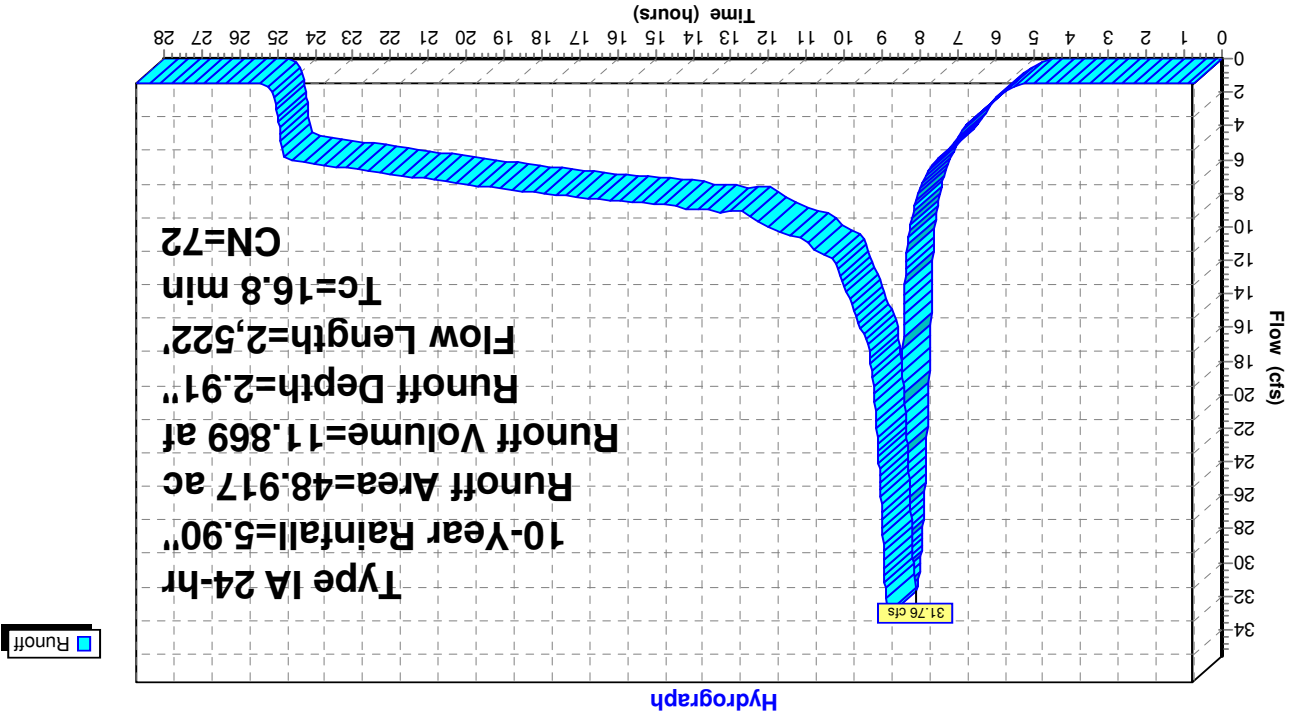
Runoff = 31.76 cfs @ 8.08 hrs, Volume= 11.869 af, Depth= 2.91"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-28.00 hrs, dt= 0.01 hrs  
Type IA 24-hr 10-Year Rainfall=5.90"

Area (ac)	CN	Description
* 0.000	0	, HSG C
3.295	79	Annual Grass, Fair, HSG C
2.593	75	Annual Grass, Good, HSG C
0.547	87	Dirt roads, HSG C
0.571	82	Farmsteads, HSG C
0.299	96	Gravel surface, HSG C
0.736	98	Paved roads w/curbs & sewers, HSG C
5.380	75	Vineyard, Good, HSG C
35.496	70	Woods, Good, HSG C
48.917	72	Weighted Average
48.182		98.50% Pervious Area
0.736		1.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	100	0.2300	0.34		<b>Sheet Flow, Sheet</b> Grass: Dense n= 0.240 P2= 3.92"
2.5	457	0.3700	3.04		<b>Shallow Concentrated Flow, Shallow - Woodland</b> Woodland Kv= 5.0 fps
1.2	149	0.0900	2.10		<b>Shallow Concentrated Flow, Shallow - Pasture</b> Short Grass Pasture Kv= 7.0 fps
0.2	47	0.0200	3.51	7.02	<b>Trap/Vee/Rect Channel Flow, Ditch</b> Bot.W=0.00' D=1.00' Z= 2.0 '/' Top.W=4.00' n= 0.035
0.3	202	0.1300	10.14	3.54	<b>Pipe Channel, 8" SWCPP</b> 8.0" Round Area= 0.3 sf Perim= 2.1' r= 0.17' n= 0.016 PPI 8in CPP
5.2	885	0.3200	2.83		<b>Shallow Concentrated Flow, Shallow - Woodland</b> Woodland Kv= 5.0 fps
2.5	682	0.0100	4.47	89.47	<b>Trap/Vee/Rect Channel Flow, Stream</b> Bot.W=2.00' D=2.00' Z= 4.0 '/' Top.W=18.00' n= 0.035
16.8	2,522	Total			

Subcatchment WS-1 : Subcat WS-1



**Veeder Ridge LLC Pre-Project**

Prepared by PPI Engineering

HydroCAD® 10.10-5a s/n 09429 © 2020 HydroCAD Software Solutions LLC

Type IA 24-hr 50-Year Rainfall=7.96"

Printed 3/11/2021

Page 6

**Summary for Subcatchment WS-1: Subcat WS-1**

Runoff = 54.13 cfs @ 8.08 hrs, Volume= 18.994 af, Depth= 4.66"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-28.00 hrs, dt= 0.01 hrs  
Type IA 24-hr 50-Year Rainfall=7.96"

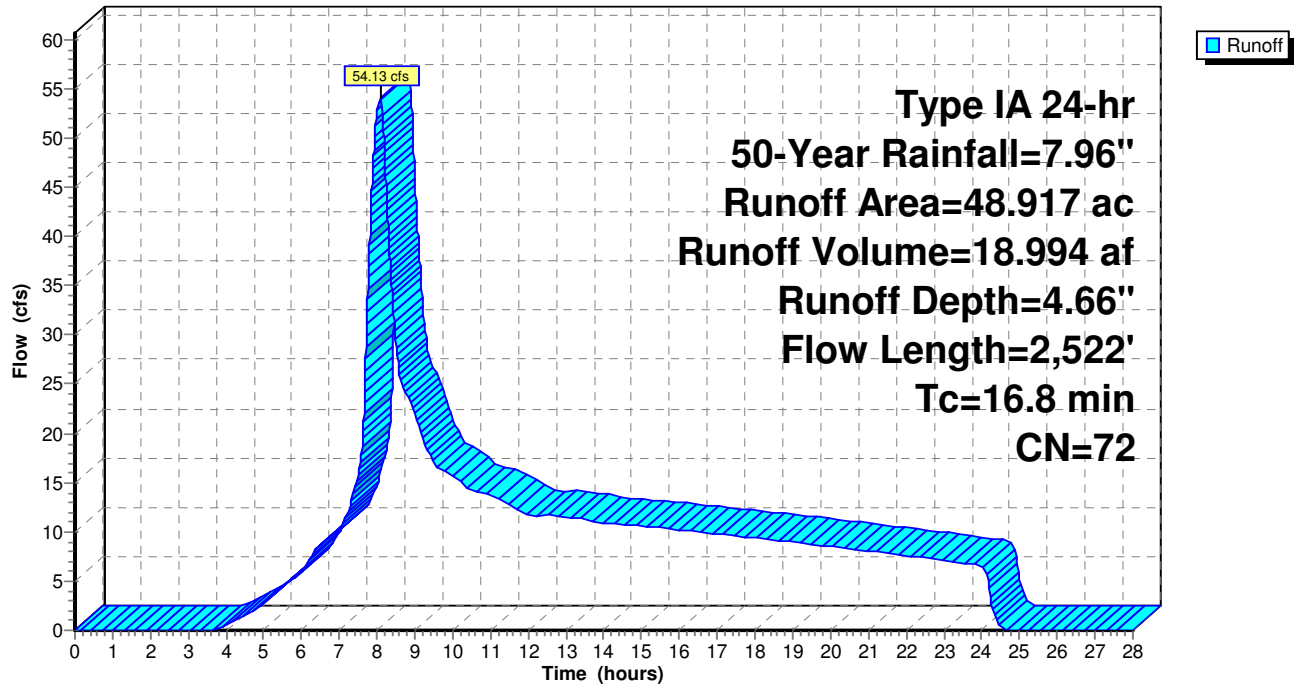
Area (ac)	CN	Description
* 0.000	0	, HSG C
3.295	79	Annual Grass, Fair, HSG C
2.593	75	Annual Grass, Good, HSG C
0.547	87	Dirt roads, HSG C
0.571	82	Farmsteads, HSG C
0.299	96	Gravel surface, HSG C
0.736	98	Paved roads w/curbs & sewers, HSG C
5.380	75	Vineyard, Good, HSG C
35.496	70	Woods, Good, HSG C
48.917	72	Weighted Average
48.182		98.50% Pervious Area
0.736		1.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	100	0.2300	0.34		<b>Sheet Flow, Sheet</b> Grass: Dense n= 0.240 P2= 3.92"
2.5	457	0.3700	3.04		<b>Shallow Concentrated Flow, Shallow - Woodland</b> Woodland Kv= 5.0 fps
1.2	149	0.0900	2.10		<b>Shallow Concentrated Flow, Shallow - Pasture</b> Short Grass Pasture Kv= 7.0 fps
0.2	47	0.0200	3.51	7.02	<b>Trap/Vee/Rect Channel Flow, Ditch</b> Bot.W=0.00' D=1.00' Z= 2.0 '/' Top.W=4.00' n= 0.035
0.3	202	0.1300	10.14	3.54	<b>Pipe Channel, 8" SWCPP</b> 8.0" Round Area= 0.3 sf Perim= 2.1' r= 0.17' n= 0.016 PPI 8in CPP
5.2	885	0.3200	2.83		<b>Shallow Concentrated Flow, Shallow - Woodland</b> Woodland Kv= 5.0 fps
2.5	682	0.0100	4.47	89.47	<b>Trap/Vee/Rect Channel Flow, Stream</b> Bot.W=2.00' D=2.00' Z= 4.0 '/' Top.W=18.00' n= 0.035
16.8	2,522	Total			

**Subcatchment WS-1: Subcat WS-1**

Hydrograph





**Veeder Ridge LLC Pre-Project**

Prepared by PPI Engineering

HydroCAD® 10.10-5a s/n 09429 © 2020 HydroCAD Software Solutions LLC

Type IA 24-hr 100-Year Rainfall=8.85"

Printed 3/11/2021

Page 8

**Summary for Subcatchment WS-1: Subcat WS-1**

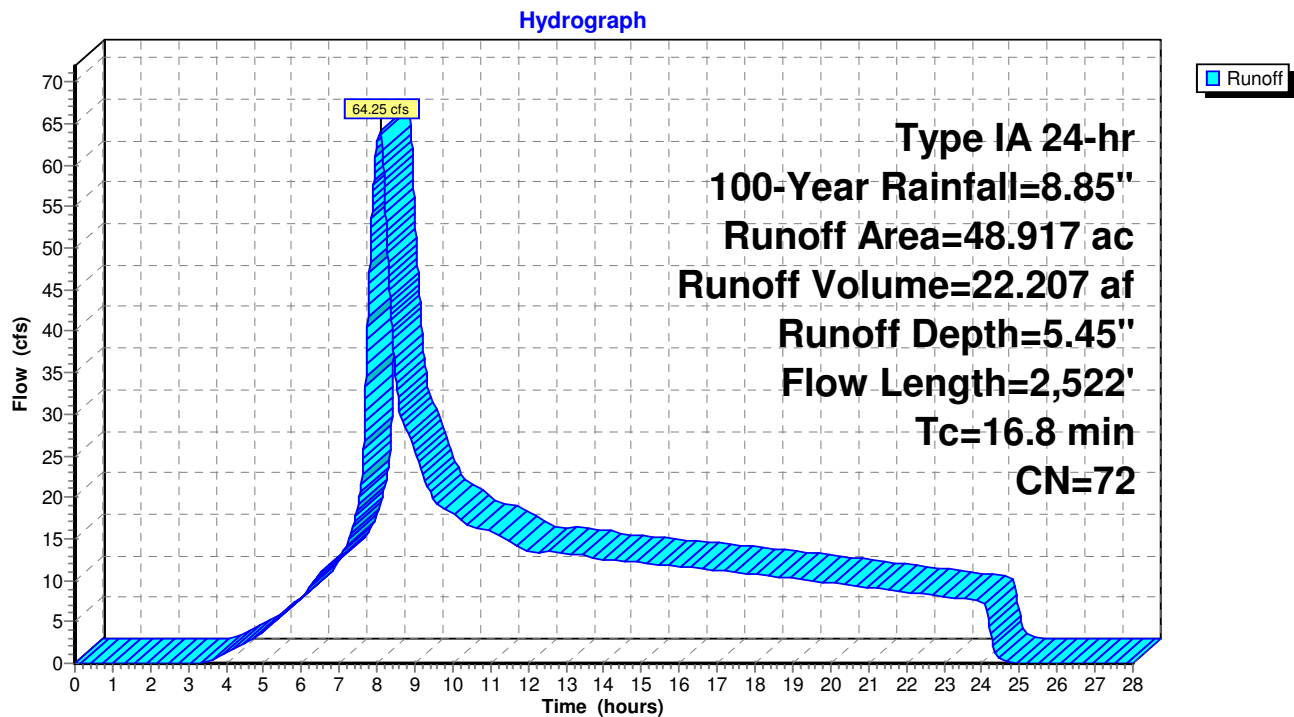
Runoff = 64.25 cfs @ 8.08 hrs, Volume= 22.207 af, Depth= 5.45"

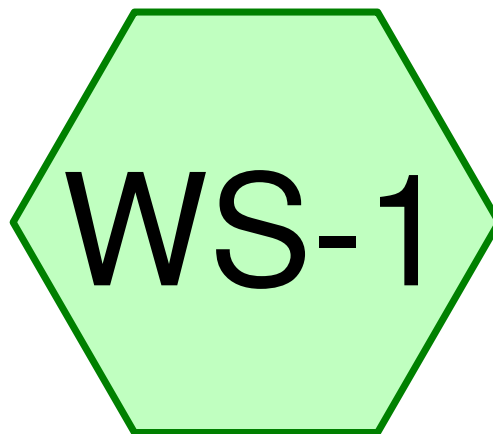
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-28.00 hrs, dt= 0.01 hrs  
Type IA 24-hr 100-Year Rainfall=8.85"

Area (ac)	CN	Description
* 0.000	0	, HSG C
3.295	79	Annual Grass, Fair, HSG C
2.593	75	Annual Grass, Good, HSG C
0.547	87	Dirt roads, HSG C
0.571	82	Farmsteads, HSG C
0.299	96	Gravel surface, HSG C
0.736	98	Paved roads w/curbs & sewers, HSG C
5.380	75	Vineyard, Good, HSG C
35.496	70	Woods, Good, HSG C
48.917	72	Weighted Average
48.182		98.50% Pervious Area
0.736		1.50% Impervious Area

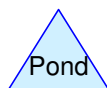
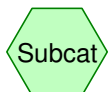
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	100	0.2300	0.34		<b>Sheet Flow, Sheet</b> Grass: Dense n= 0.240 P2= 3.92"
2.5	457	0.3700	3.04		<b>Shallow Concentrated Flow, Shallow - Woodland</b> Woodland Kv= 5.0 fps
1.2	149	0.0900	2.10		<b>Shallow Concentrated Flow, Shallow - Pasture</b> Short Grass Pasture Kv= 7.0 fps
0.2	47	0.0200	3.51	7.02	<b>Trap/Vee/Rect Channel Flow, Ditch</b> Bot.W=0.00' D=1.00' Z= 2.0 '/' Top.W=4.00' n= 0.035
0.3	202	0.1300	10.14	3.54	<b>Pipe Channel, 8" SWCPP</b> 8.0" Round Area= 0.3 sf Perim= 2.1' r= 0.17' n= 0.016 PPI 8in CPP
5.2	885	0.3200	2.83		<b>Shallow Concentrated Flow, Shallow - Woodland</b> Woodland Kv= 5.0 fps
2.5	682	0.0100	4.47	89.47	<b>Trap/Vee/Rect Channel Flow, Stream</b> Bot.W=2.00' D=2.00' Z= 4.0 '/' Top.W=18.00' n= 0.035
16.8	2,522	Total			

**Subcatchment WS-1: Subcat WS-1**





# Subcat WS-1



**Veeder Ridge LLC Post-Project**

Prepared by PPI Engineering

HydroCAD® 10.10-5a s/n 09429 © 2020 HydroCAD Software Solutions LLC

Type IA 24-hr 2-Year Rainfall=3.92"

Printed 3/11/2021

Page 11

**Summary for Subcatchment WS-1: Subcat WS-1**

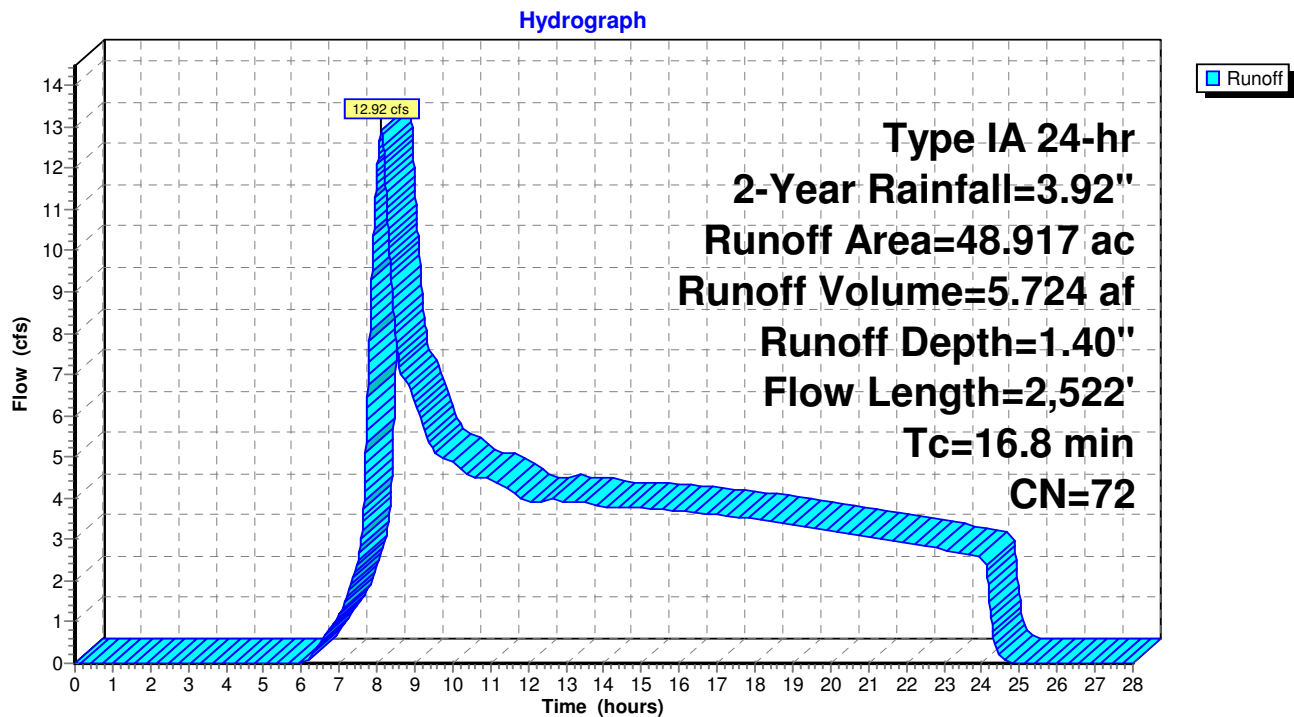
Runoff = 12.92 cfs @ 8.11 hrs, Volume= 5.724 af, Depth= 1.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-28.00 hrs, dt= 0.01 hrs  
Type IA 24-hr 2-Year Rainfall=3.92"

Area (ac)	CN	Description
* 0.000	0	, HSG C
3.295	79	Annual Grass, Fair, HSG C
0.045	75	Annual Grass, Good, HSG C
0.547	87	Dirt roads, HSG C
0.571	82	Farmsteads, HSG C
0.299	96	Gravel surface, HSG C
0.736	98	Paved roads w/curbs & sewers, HSG C
8.481	75	Vineyard, Good, HSG C
34.943	70	Woods, Good, HSG C
48.917	72	Weighted Average
48.182		98.50% Pervious Area
0.736		1.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	100	0.2300	0.34		<b>Sheet Flow, Sheet</b> Grass: Dense n= 0.240 P2= 3.92"
2.5	457	0.3700	3.04		<b>Shallow Concentrated Flow, Shallow - Woodland</b> Woodland Kv= 5.0 fps
1.2	149	0.0900	2.10		<b>Shallow Concentrated Flow, Shallow - Pasture</b> Short Grass Pasture Kv= 7.0 fps
0.2	47	0.0200	3.51	7.02	<b>Trap/Vee/Rect Channel Flow, Ditch</b> Bot.W=0.00' D=1.00' Z= 2.0 '/' Top.W=4.00' n= 0.035
0.3	202	0.1300	10.14	3.54	<b>Pipe Channel, 8" SWCPP</b> 8.0" Round Area= 0.3 sf Perim= 2.1' r= 0.17' n= 0.016
5.2	885	0.3200	2.83		<b>Shallow Concentrated Flow, Shallow - Woodland</b> Woodland Kv= 5.0 fps
2.5	682	0.0100	4.47	89.47	<b>Trap/Vee/Rect Channel Flow, Stream</b> Bot.W=2.00' D=2.00' Z= 4.0 '/' Top.W=18.00' n= 0.035
16.8	2,522	Total			

**Subcatchment WS-1: Subcat WS-1**



**Veeder Ridge LLC Post-Project**

Prepared by PPI Engineering

HydroCAD® 10.10-5a s/n 09429 © 2020 HydroCAD Software Solutions LLC

Type IA 24-hr 10-Year Rainfall=5.90"

Printed 3/11/2021

Page 13

**Summary for Subcatchment WS-1: Subcat WS-1**

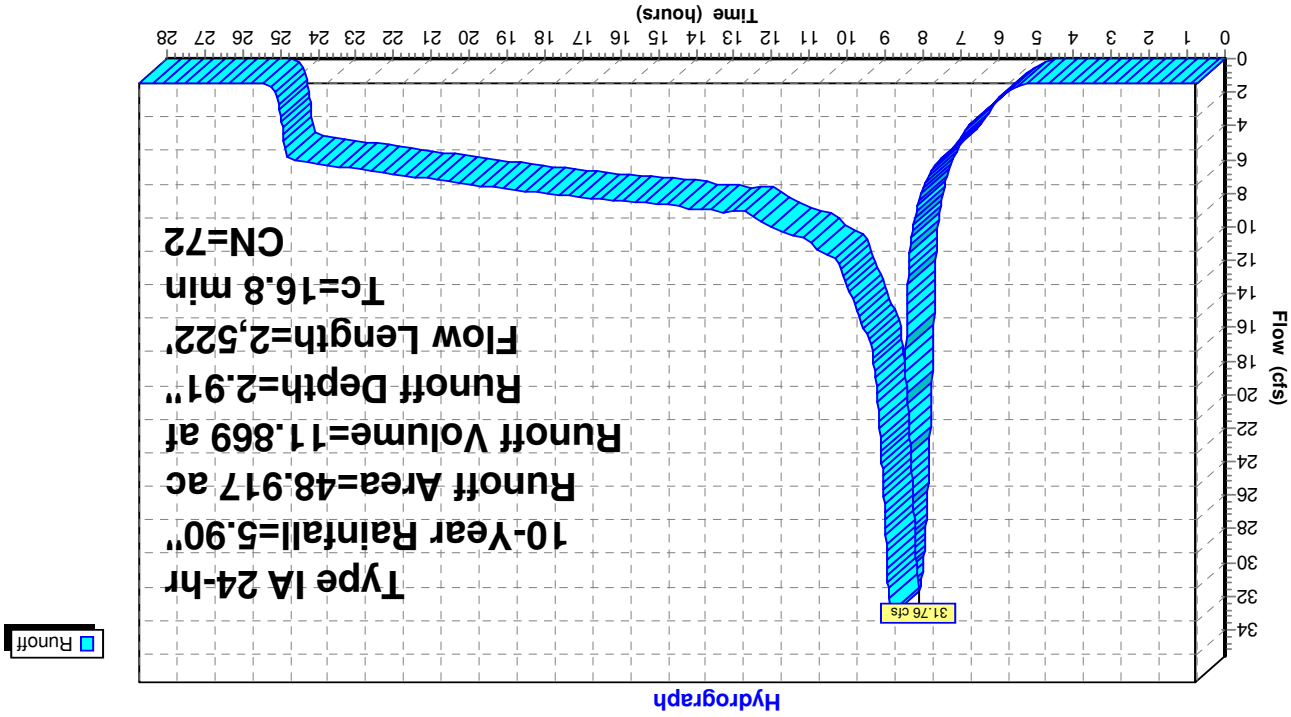
Runoff = 31.76 cfs @ 8.08 hrs, Volume= 11.869 af, Depth= 2.91"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-28.00 hrs, dt= 0.01 hrs  
Type IA 24-hr 10-Year Rainfall=5.90"

Area (ac)	CN	Description
* 0.000	0	, HSG C
3.295	79	Annual Grass, Fair, HSG C
0.045	75	Annual Grass, Good, HSG C
0.547	87	Dirt roads, HSG C
0.571	82	Farmsteads, HSG C
0.299	96	Gravel surface, HSG C
0.736	98	Paved roads w/curbs & sewers, HSG C
8.481	75	Vineyard, Good, HSG C
34.943	70	Woods, Good, HSG C
48.917	72	Weighted Average
48.182		98.50% Pervious Area
0.736		1.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	100	0.2300	0.34		<b>Sheet Flow, Sheet</b> Grass: Dense n= 0.240 P2= 3.92"
2.5	457	0.3700	3.04		<b>Shallow Concentrated Flow, Shallow - Woodland</b> Woodland Kv= 5.0 fps
1.2	149	0.0900	2.10		<b>Shallow Concentrated Flow, Shallow - Pasture</b> Short Grass Pasture Kv= 7.0 fps
0.2	47	0.0200	3.51	7.02	<b>Trap/Vee/Rect Channel Flow, Ditch</b> Bot.W=0.00' D=1.00' Z= 2.0 '/' Top.W=4.00' n= 0.035
0.3	202	0.1300	10.14	3.54	<b>Pipe Channel, 8" SWCPP</b> 8.0" Round Area= 0.3 sf Perim= 2.1' r= 0.17' n= 0.016
5.2	885	0.3200	2.83		<b>Shallow Concentrated Flow, Shallow - Woodland</b> Woodland Kv= 5.0 fps
2.5	682	0.0100	4.47	89.47	<b>Trap/Vee/Rect Channel Flow, Stream</b> Bot.W=2.00' D=2.00' Z= 4.0 '/' Top.W=18.00' n= 0.035
16.8	2,522	Total			

Subcatchment WS-1 : Subcat WS-1



**Veeder Ridge LLC Post-Project**

Prepared by PPI Engineering

HydroCAD® 10.10-5a s/n 09429 © 2020 HydroCAD Software Solutions LLC

Type IA 24-hr 50-Year Rainfall=7.96"

Printed 3/11/2021

Page 15

**Summary for Subcatchment WS-1: Subcat WS-1**

Runoff = 54.13 cfs @ 8.08 hrs, Volume= 18.994 af, Depth= 4.66"

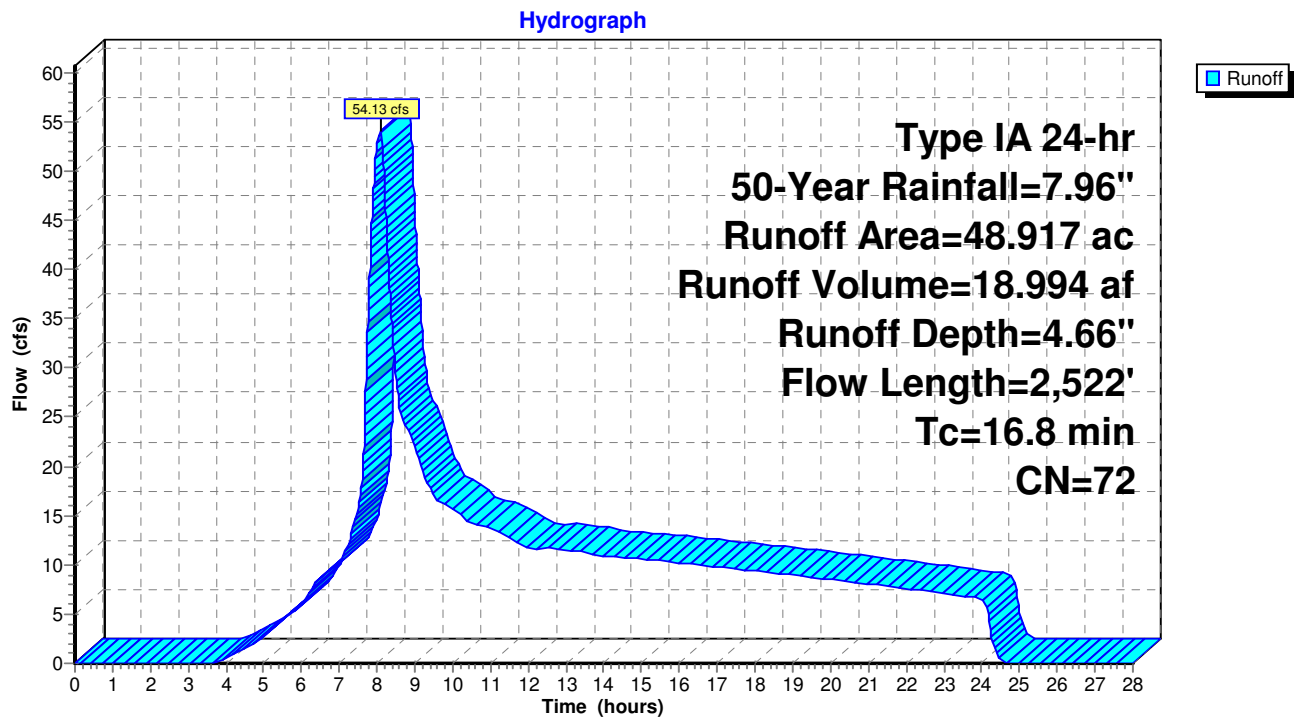
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-28.00 hrs, dt= 0.01 hrs  
Type IA 24-hr 50-Year Rainfall=7.96"

Area (ac)	CN	Description
* 0.000	0	, HSG C
3.295	79	Annual Grass, Fair, HSG C
0.045	75	Annual Grass, Good, HSG C
0.547	87	Dirt roads, HSG C
0.571	82	Farmsteads, HSG C
0.299	96	Gravel surface, HSG C
0.736	98	Paved roads w/curbs & sewers, HSG C
8.481	75	Vineyard, Good, HSG C
34.943	70	Woods, Good, HSG C
48.917	72	Weighted Average
48.182		98.50% Pervious Area
0.736		1.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	100	0.2300	0.34		<b>Sheet Flow, Sheet</b> Grass: Dense n= 0.240 P2= 3.92"
2.5	457	0.3700	3.04		<b>Shallow Concentrated Flow, Shallow - Woodland</b> Woodland Kv= 5.0 fps
1.2	149	0.0900	2.10		<b>Shallow Concentrated Flow, Shallow - Pasture</b> Short Grass Pasture Kv= 7.0 fps
0.2	47	0.0200	3.51	7.02	<b>Trap/Vee/Rect Channel Flow, Ditch</b> Bot.W=0.00' D=1.00' Z= 2.0 '/' Top.W=4.00' n= 0.035
0.3	202	0.1300	10.14	3.54	<b>Pipe Channel, 8" SWCPP</b> 8.0" Round Area= 0.3 sf Perim= 2.1' r= 0.17' n= 0.016
5.2	885	0.3200	2.83		<b>Shallow Concentrated Flow, Shallow - Woodland</b> Woodland Kv= 5.0 fps
2.5	682	0.0100	4.47	89.47	<b>Trap/Vee/Rect Channel Flow, Stream</b> Bot.W=2.00' D=2.00' Z= 4.0 '/' Top.W=18.00' n= 0.035
16.8	2,522	Total			



**Subcatchment WS-1: Subcat WS-1**



**Veeder Ridge LLC Post-Project**

Prepared by PPI Engineering

HydroCAD® 10.10-5a s/n 09429 © 2020 HydroCAD Software Solutions LLC

Type IA 24-hr 100-Year Rainfall=8.85"

Printed 3/11/2021

Page 17

**Summary for Subcatchment WS-1: Subcat WS-1**

Runoff = 64.25 cfs @ 8.08 hrs, Volume= 22.207 af, Depth= 5.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-28.00 hrs, dt= 0.01 hrs  
Type IA 24-hr 100-Year Rainfall=8.85"

Area (ac)	CN	Description
* 0.000	0	, HSG C
3.295	79	Annual Grass, Fair, HSG C
0.045	75	Annual Grass, Good, HSG C
0.547	87	Dirt roads, HSG C
0.571	82	Farmsteads, HSG C
0.299	96	Gravel surface, HSG C
0.736	98	Paved roads w/curbs & sewers, HSG C
8.481	75	Vineyard, Good, HSG C
34.943	70	Woods, Good, HSG C
48.917	72	Weighted Average
48.182		98.50% Pervious Area
0.736		1.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	100	0.2300	0.34		<b>Sheet Flow, Sheet</b> Grass: Dense n= 0.240 P2= 3.92"
2.5	457	0.3700	3.04		<b>Shallow Concentrated Flow, Shallow - Woodland</b> Woodland Kv= 5.0 fps
1.2	149	0.0900	2.10		<b>Shallow Concentrated Flow, Shallow - Pasture</b> Short Grass Pasture Kv= 7.0 fps
0.2	47	0.0200	3.51	7.02	<b>Trap/Vee/Rect Channel Flow, Ditch</b> Bot.W=0.00' D=1.00' Z= 2.0 '/' Top.W=4.00' n= 0.035
0.3	202	0.1300	10.14	3.54	<b>Pipe Channel, 8" SWCPP</b> 8.0" Round Area= 0.3 sf Perim= 2.1' r= 0.17' n= 0.016
5.2	885	0.3200	2.83		<b>Shallow Concentrated Flow, Shallow - Woodland</b> Woodland Kv= 5.0 fps
2.5	682	0.0100	4.47	89.47	<b>Trap/Vee/Rect Channel Flow, Stream</b> Bot.W=2.00' D=2.00' Z= 4.0 '/' Top.W=18.00' n= 0.035
16.8	2,522	Total			

**Subcatchment WS-1: Subcat WS-1**

