

**FULTON RANCH VINEYARD
263 PETRIFIED FOREST ROAD
USLE - Analysis**

Prepared by Napa Valley Vineyard Engineering, Inc

INTRODUCTION

Fulton Ranch Vineyard seeks approval of approximately 3.83 net acres of proposed new vineyard. The project lies within three parcels APN 020-430-018, -019 & -027 totaling about 102.75 acres, located at 263 Petrified Forest Road, Calistoga.

This analysis is to predict the affect the proposed vineyard development project will have on local soil erosion. Modeling of existing and proposed conditions was performed using the Universal Soil Loss Equation (USLE). Following is a summary of the data used and the results of the analysis.

RAINFALL DATA

The 2 year, 6 hour rainfall depth is used to determine the "R" value in the USLE. The rainfall depth for the project site was obtained from the National Oceanic and Atmospheric Administration (NOAA) Atlas 14, Volume 6, Version 2, Precipitation Frequency Data for California, which uses the latitude and longitude of a site to interpolate rainfall depths between data points. The latitude and longitude of the Fulton Ranch Vineyard project are estimated to be, 38.5701° N, -122.6132° W, based on information obtained from the National Oceanic and Atmospheric Administration (NOAA) Atlas 14 Precipitation Frequency Data. The 2 year, 6 hour rainfall depth at the project site ranges from 1.90-inches to 2.44-inches. This analysis conservatively uses the high end of the range (2.44-inches), which equals an "R" value of 85. "R" is constant in the pre-project and post-project models.

SOIL EROSIVENESS

Each soil type listed in the United States Department of Agriculture, Soil Conservation Service (SCS), Napa County Soil Survey has an erodibility factor ("K"). The SCS soil maps indicate that soils on the project site as:

SCS# 111, Boomer-Forward felt complex - K value of 0.37

SCS# 140, Forward silt loam – K value of 0.28

"K" is constant in the pre-project and post-project models.

SLOPE LENGTH and STEEPNESS

The Napa County 2002 topographic mapping and Tetra Tech 2018 topographic mapping was used to determine slope steepness on the project site. The Slope lengths were selected to analyze the soil loss from the longest and steepest slopes in the blocks for the project area, as shown on the map included in the Appendix. The slope lengths and gradients for the blocks from the pre-project to the post-project models do not change and are identified on the map and in the USLE worksheets included in the Appendix.

VEGETATIVE COVER

Cover factors ("C") for pre-project and post-project conditions were determined using the guidelines provided in the SCS pamphlet entitled "The Universal Soil Loss Equation: Special Applications for Napa County, California (guide).

Pre Project

The existing site conditions for Blocks 19A and 27 consists of approximately 75% tree canopy with little appreciable low brush. The ground cover for this block is approximately 20% grass-like herbaceous plants (grassy) and 80% broadleaf herbaceous plants (woody), and covers approximately 85% of the area.

The existing site conditions for the for Block 19B consists of approximately 75% Brush canopy. The ground cover for this block is approximately 60% grass-like herbaceous plants (grassy) and 40% broadleaf herbaceous plants (woody), and covers approximately 85% of the area.

The existing site conditions for Blocks 19C consists of approximately 50% tree canopy with little appreciable low brush. The ground cover for this block is approximately 20% grass-like herbaceous plants (grassy) and 80% broadleaf herbaceous plants (woody), and covers approximately 85% of the area.

The existing site conditions for Blocks 18 consists of approximately 25% tree canopy with little appreciable low brush. The ground cover for this block is approximately 70% grass-like herbaceous plants (grassy) and 30% broadleaf herbaceous plants (woody), and covers approximately 60% of the area.

Post Project

The project proposes a "permanent non-till cover crop with spot spray cultivation scheme with no ripping or tillage (refer to ECP narrative). Using the table in the guide, "USLE "C" Factors for Vineyards", the post-project C factor for a no till with spot spray assuming 80% ground cover (0.022). Diversion ditches are used to help control the runoff, with no increase of soil loss.

PRACTICE FACTOR

The accepted practice factor for the existing conditions is 1.0. Using the table in the guide, "P ("Practice") Factors for USLE in Napa Valley Vineyards, the practice factor for vineyard rows running up and downhill is 1.0.

RESULTS, CONCLUSION

The pre-project and post-project modeling is presented with Appendix. A comparison of pre-project and post-project modeling shown:

<u>Blocks</u>	<u>Soil Loss (tons/ac.)</u>	
	Pre Project	Post Project
18	3.43	2.61
19A	4.32	1.83
19B	0.88	0.87
19C	2.78	2.19
27	4.29	2.26

The analysis shows, in each case, that the estimated post-project soil loss is less than the pre-project condition, and that the proposed vineyard project will not result in increased soil loss. Diversion ditches are used to help control the runoff, calculations for the diversion ditches can be found in the hydrology study report.



22ECPFultonUSLE Sheets

Napa Valley Vineyard Engineering									
Pre Project - USLE Worksheet									
Fulton Ranch									
10/27/2023									
Ranch: 268 Petrified Forest Road									
SOIL TYPE: 140 111									
T= 3 3									
S=140			S=140		S=140		S=140		S=111
S:	1.00	Block 19A	1.00	Block 19B	1.00	Block 19C	1.00	Block 18	1.00
R:	DESCRIPTION	Value /Describe	Value /Describe	Value /Describe	Value /Describe	Value /Describe	Value /Describe	Value /Describe	Value /Describe
	Rainfall	85	85	85	85	85	85	85	85
	Soil Erosiveness	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28
	Slope length (ft)	428	64	112	122	122	122	122	38
	Gradient	19.0	16.0	22.0	25.0	25.0	25.0	25.0	16.0
	Calculated LS	6.72	2.06	4.18	5.15	5.15	5.15	5.15	5.0
	Cover	0.027 (1)	0.018 (3)	0.028 (2)	0.028 (4)	0.028 (4)	0.028 (4)	0.028 (4)	0.02
	Practice	1	1	1	1	1	1	1	1
	Soil loss, tons/acre	4.32	0.88	2.78	3.43	3.43	3.43	3.43	4.2
	Soil loss, tons	4.32	0.88	2.78	3.43	3.43	3.43	3.43	4.2
(1) 75% Trees with 85% Ground Cover		(2) 50% Trees with 85% Ground Cover		(3) 75% Brush with 85% Ground Cover		(4) 25% Trees with 60% Ground Cover			
20% Grass (0.20)(.09)= 0.0018		20% Grass (0.20)(.010)= 0.002		60% Grass (0.60)(.009)= 0.0054		70% Grass (0.70)(.041)= 0.0287			
80% Broadleaf Cover (0.80)(.031)= 0.0248		80% Broadleaf Cover (0.80)(.032)= 0.0256		40% Broadleaf Cover (0.40)(.031)= 0.0124		30% Broadleaf Cover (0.30)(.089)= 0.0267			
Weighted Avg C= 0.027		Weighted Avg C= 0.028		Weighted Avg C= 0.018		Weighted Avg C= 0.055			

Napa Valley Vineyard Engineering
Post Project - USLE Worksheet

Fulton Ranch
10/27/2023

Ranch: 268 Petrified Forest Road

SOIL TYPE: 140

T= 3

S=140

	1.00 Block 19A	1.00 Block 19A	1.00 Block 19A	1.00 Block 19A	
DESCRIPTION	Value /Describe	Value /Describe	Value /Describe	Value /Describe	Value
Rainfall	85	85	85	85	
Soil Erosiveness	0.28	0.28	0.28	0.28	
Slope length (ft)	197	88	67	70	
Gradient	13.0	14.0	15.0	23.0	
Calculated LS	2.73	2.02	1.94	3.50	0.00
Cover	0.022	0.022	0.022	0.022	
Practice	1	1	1	1	
Soil loss, tons/acre	1.43	1.06	1.01	1.83	0.00
Soil loss, tons	1.43	1.06	1.01	1.83	0.00
	80% Cover	80% Cover	80% Cover	80% Cover	
	No Till, Spot Spray	No Till, Spot Spray	No Till, Spot Spray	No Till, Spot Spray	

S) (C) (P)

22ECPFultonUSLE Sheets

Napa Valley Vineyard Engineering									
Post Project - USLE Worksheet									
Fulton Ranch									
10/27/2023									
Ranch:		268 Petrified Forest Road							
SOIL TYPE:		140							
T=		3							
		S=140		S=140		S=140		S=140	
S:		1.00	Block 19B	1.00	Block 19B	1.00	Block 19C	1.00	Block 18
:	DESCRIPTION	Value	/Describe	Value	/Describe	Value	/Describe	Value	/Describe
	Rainfall	85		85		85		85	
	Soil Erosiveness	0.28		0.28		0.28		0.28	
	Slope length (ft)	33		26		112		114	
	Gradient	12.0		19.0		22.0		25.0	
	Calculated LS	1.00		1.66		4.18		4.98	0.0
	Cover	0.022		0.022		0.022		0.022	
	Practice	1		1		1		1	
	Soil loss, tons/acre	0.52		0.87		2.19		2.61	0.0
	Soil loss, tons	0.52		0.87		2.19		2.61	0.0
		80% Cover		80% Cover		80% Cover		80% Cover	
		No Till, Spot Spray		No Till, Spot Spray		No Till, Spot Spray		No Till, Spot Spray	
LS) (C) (P)									

Napa Valley Vineyard Engineering
Post Project - USLE Worksheet

Fulton Ranch
10/27/2023

Ranch: 268 Petrified Forest Road

SOIL TYPE: 111

T= 3

	1.00 Block 27	1.00 Block 27	1.00 Block 27		
DESCRIPTION	Value /Describe	Value /Describe	Value /Describe	Value /Describe	Value
Rainfall	85	85	85		
Soil Erosiveness	0.37	0.37	0.37		
Slope length (ft)	186	136	61		
Gradient	13.0	16.0	23.0		
Calculated LS	2.65	3.01	3.27	0.00	0.00
Cover	0.022	0.022	0.022		
Practice	1	1	1		
Soil loss, tons/acre	1.84	2.08	2.26	0.00	0.00
Soil loss, tons	1.84	2.08	2.26	0.00	0.00
	80% Cover	80% Cover	80% Cover		
	No Till, Spot Spray	No Till, Spot Spray	No Till, Spot Spray		

S) (C) (P)



