EXHIBIT E-1

SOIL LOSS ANALYSIS LONG RANCH VINEYARD PROPOSAL DECEMBER 2018

The following analysis evaluates a proposed vineyard development on approximately 15.9 acres at Long Ranch Road, St. Helena, California, to determine the proposed vineyard's potential to increase sediment delivery from the site, as well as compliance with the USDA "T", soil loss tolerance. This analysis was prepared by David Steiner, CPESC, CPSWQ, at the request of and in consultation with Mike Muelrath of Applied Civil Engineering. The analysis uses the Universal Soil Loss Equation (USLE) protocol developed by the Napa RCD, with guidance from the NRCS (SCS) Field Office Technical Guide, and the NRCS pamphlet "USLE: Special Applications for Napa County" during the years 1991-2015. The pre- and post-project transects modeled are drawn on the accompanying map, provided by Applied Civil Engineering. The accompanying Excel spreadsheets incorporate USLE principles and formulas, as follows:

- The "R" value is derived from the median value of the predicted range of 2-year/6-hour storms for this site, according to NOAA Atlas 14. A printout of the NOAA Atlas 14 table is included with the accompanying hydrologic analysis.
- The "K" (soil erosivity) and "T" (soil loss tolerance) values were taken from the Napa County Web Soil Survey. Where a selected transect crosses soil type Mapping Unit boundaries (Transect I) the USDA segmented analysis protocol—which assigns greater influence to downhill segments—has been employed to determine values.
- The "LS" values are calculated per algorithms based on USDA empirical data, using plotted slope lengths and gradients, over representative transects. The site's generally convex slopes (steeper at the bottom) also require segmented LS analysis, for all but the shorter Transect V, at the southeast corner of the site, below the proposed preservation area.
- Pre-project "C" values assigned to transects and segments were chosen from Table 5 of the NRCS "Special Applications" pamphlet. These choices were determined primarily through site visits on May 22, June 7, and August 20, 2018. This work was facilitated by two pathways cleared of brush, through what became Transects III and IV. Passage through the more open Transects I, II, and V was less problematic.
- "P" factors for the undeveloped site are at the default value of 1, and remain at that value for Block A's proposed up- and down-hill row orientation. Block B's cross-slope orientation dictates assignment of a lower value "P" value (.67).
- Post-project "C" values represent practices, especially cover crop management, selected to maintain soil loss (potential sediment delivery) levels at or below both pre-project conditions and the USDA "T". No-till practices are proposed for the entire development. Supplementary practices such as annual applications of seed and straw mulch may be necessary to compensate for ground disturbance related to equipment and foot traffic.

With the assumption that the specified cover levels will be maintained, the calculations predict no increase in soil loss (potential sediment delivery) from the proposed vineyard.

DAVID A. STEINER, CPESC, CPSWQ USLE LAYOUT AND PRACTICE ALTERNATIVES

A=(R)(K)(LS)(C)(P)

FOR:

Long Ranch

Pre-project SOIL TYPE: 176 (152), 178

T= 1, 1, 2

USER: DATE:

DAS

14-Dec-18

		Transect	Į.		II		111		١V		V
# /ACRES:		2.1		3.5		4.4		4.3		1.6	
FACTOR:	DESCRIPTION	#1	/Describe	#2	/Describe	#3	/Describe	#4	/Describe	#5	/Describe
R	Rainfall	69		69		69		69		69	
K	Soil Erosiveness	0.243	T=1.65 (seg)	0.10	T=1	0.10	T=1	0.10	T=1	0.10	T≔1
	Slope length (ft)	350		535		490	1	476		152	
S	Gradient	18.9		17.2		13.9		12.2		19.7	
L\$	Calculated LS	6.25	segmented	6.12	segmented	4.17	segmented	4.99	segmented	4.21	
С	Cover	0.036	segmented	0.058	segmented	0.061	segmented	0.073	segmented	0.027	4
P	Practice	1	vertical		vertical		vertical	1	vertica!	1	vertical
Α	Soil loss, tons/acre	3.77		2.45		1.76		2.51		0.78	
	Soil loss, tons	7.92		8.57		7.72		10.81		1.25	

A=(R)(K)(LS)(C)(P)

Total Soil Loss This Sheet:

35.02 Tons

Transect I	Segmented LS		
Segments	1	2	Use
Length	350	350	
Gradient	20.6	17.1	
LS	5.28	6.77	
Factor	0.35	0.65	
Product	1.848	4.401	6.249

Transect I	Segmented K		
Segments	1	2	Use
Length	175	175	
Gradient			
K	0.10	0.32	
Factor	0.35	0.65	
Product	0.035	0.208	0.243

Transect I	Segmented T		
Segments	1	2	Use
Length	175	175	
Gradient			
Т	1.00	2.00	
Factor	0.35	0.65	
Product	0.350	1.300	1,650

Transect I	Segmented C			
Segments	1	2	3	Use
Length	117	117	117	
Table 5 (footnotes)	1	2	2	
С	0.044	0.034	0.034	
Factor	0.19	0,35	0.46	
Product	800.0	0.012	0.016	0.036

Transect II	Segmented LS	Segmented LS				
Segments	1	2	Use			
Length	536	536				
Gradient	19.3	14.6				
LS	7,68	5.28				
Factor	0.35	0,65				
Product	2.688	3,432	6.120			

Transect II	Segmented C				
Segments	1	2	3	4	Use
Length	134	134	134	134	
Table 5 (above)	3	4	5	6	
С	0.028	0.027	0.056	0,090	
Factor	0,12	0.23	0,3	0.35	
Product	0.003	0.006	0.017	0.032	0.058

Transect III	Segmented La		
Segments	1	2	Use
Length	490	490	
Gradient	9.0	18.8	
L\$	2.59	5.02	
Factor	0.35	0.65	
Product	0.907	3.263	4.170

Transect IV	Segmented L		
Segments	1	Use	
Length	476	476	
Gradient	6.3	18.5	
LS	1,56	6,84	
Factor	0.35	0.65	
Product	0.546	4.446	4.992

Transect III	Segmented C					Ì
Segments	1	2	3	4	5	Use
Length	98	98	98	98	98	
Table 5	7	7	9	9	9	
С	0,053	0.053	0.078	0.059	0.059	
Factor Product	0.09	0.16	0.21	0.25	0.28	
Product	0.005	0.008	0.016	0.015	0.017	0.061

Transect IV	Segmented C				
Segments	1	2	3	4	Use
Length	119	119	119	119	
Table 5	10	8	10	11	
С	0.099	0.078	0.099	0.038	
Factor	0.12	0,23	0,3	0.35	
Product	0.012	0.018	0.030	0.013	0.073

250% Low Brush; 70% cover: 70 G, 30 W

_350% Low Brush; 70% cover: 60 G, 40 W

_450% Low Brush; 80% cover: 50 G, 50 W

__525% Low Brush; 60% cover: 60 G, 40 W _650% Low Brush; 40% cover: 50 G, 50 W

_____775% Low Brush; 70% cover: 0 G, 100 W

⁸75% High Brush; 60% cover: 0 G, 100W

975% High Brush; 70% cover: 0 G, 100W 1075% High Brush; 50% cover: 0 G, 100W

1175% Low Brush; 80% cover: 0 G. 100 W

DAVID A. STEINER, CPESC, CPSWQ USLE LAYOUT AND PRACTICE ALTERNATIVES

A=(R)(K)(LS)(C)(P)

FOR: Long Ranch
Post-project
SOIL TYPE: 176 (152), 154, 178
USER: DAS

T= 1, 1, 2

USER: DATE:

16-Dec-18

		Transect	Į		[I		111		١V		V
# /ACRES:		2.1		3.5		4.4		4.3		1.6	
FACTOR:	DESCRIPTION	#1	/Describe	#2	/Describe	#3	/Describe	#4	/Describe	#5	/Describe
R	Rainfall	69		69		69		69		69	
K	Soil Erosiveness	0.24	T=1.65 (seg)	0.10	T=1	0.10	T=1	0.10	T=1	0.10	T=1
	Slope length (ft)	350		535		490		476		152	
S	Gradient	18.9		17.2		13.9		12.2		19.7	
LS	Calculated LS	6.25	segmented	6.12	segmented	4.17	segmented	4.99	segmented	4.21	
С	Cover	0.022	80%, no-till	0.022	80%, no-till	0.022	80%, no-till	0.022	80%, no-till	0.046	70%, no-till
Р	Practice	1	vertical	1	vertical	1	vertical	1	vertical	0.67	cross, no-till
Α	Soil loss, tons/acre	2.31		0.93		0.63		0.76		0.89	
	Soil loss, tons	4.84		3.25		2.79		3.26		1.43	

A=(R)(K)(LS)(C)(P)

Total Soil Loss This Sheet:

14.13 Tons

Transect I	Segmented LS		
Segments	1	2	Use
Length	350	350	
Gradient	20.6	17.1	
LS	5.28	6.77	
Factor	0.35	0.65	
Product	1.848	4.401	6.249

Transect I	Segmented K		
Segments	1	2	Use
Length	175	175	
Gradient	1 "		
K	0.10	0.32	
Factor	0.35	0.65	
Product	0.035	0.208	0.243

Transect I	Segmented T		
Segments	1	2	Use
Length	175	175	
Gradient			
Т	1.00	2.00	
Factor	0.35	0.65	
Product	0.350	1,300	1,650

Transect II	Segmented LS		
Segments	1	2	Use
Length	536	536	
Gradient	19.3	14,6	
LS	7.68	5,28	
Factor	0.35	0.65	
Product	2.688	3.432	6.120

Transect III	Segmented LS	***************************************	
Segments	1	2	Use
Length	490	490	
Gradient	9.0	18.8	
LS	2.59	5.02	
Factor	0.35	0.65	
Product	0.907	3,263	4.170

Transect IV	Segmented LS		1
Segments	1	2	Use
Length	476	476	
Gradient	6.3	18.5	
LS	1.56	6.84	
Gradient LS Factor	0.35	0.65	
Product	0.546	4 446	4 992

NOAA's National Weather Service **Hydrometeorological Design Studies Center**



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POINT PRECIPITATION FREQUENCY (PF) ESTIMATES

WITH 90% CONFIDENCE INTERVALS AND SUPPLEMENTARY INFORMATION NOAA Atlas 14, Volume 6, Version 2

		PDS-based	precipitatio	n frequency			fidence inte	rvals (in inc	hes)1	
Duration						ce interval (years)				
	1	2	5	10	25	50	100	200	500	1000
5-min	0.139 (0.124-0.158)	0.170 (0.151-0.193)	0.211 (0.187-0.240)	0.245 (0.215-0.282)	0.292 (0.246-0.349)	0.329 (0.271-0.403)	0.368 (0.295-0.463)	0.409 (0.318-0.532)	0.466 (0.346-0.636)	0.513 (0.366-0.727
10-min	0.200 (0.178-0.227)	0.244 (0.217-0.277)	0.302 (0.268-0.344)	0.351 (0.308-0.404)	0.418 (0.353-0.500)	0.471 (0.389-0.578)	0.527 (0.423-0.664)	0.586 (0.455-0.762)	0.669 (0.495-0.911)	0.735 (0.524-1.04)
15-min	0.242 (0.215-0.274)	0.295 (0.262-0.335)	0.365 (0.324-0.417)	0.424 (0.372-0.488)	0.506 (0.427-0.605)	0.570 (0.470-0.698)	0.637 (0.511-0.803)	0.709 (0.550-0.921)	0.809 (0.599-1.10)	0.889 (0.634-1.26)
30-min	0.350 (0.312-0.397)	0.427 (0.379-0.485)	0.529 (0.469-0.603)	0.614 (0.539-0.707)	0.732 (0.619-0.876)	0.826 (0.681-1.01)	0.923 (0.740-1.16)	1.03 (0.797-1.34)	1.17 (0.868-1.60)	1.29 (0.918-1.83)
60-min	0.512 (0.456-0.581)	0.624 (0.555-0.710)	0.774 (0.686-0.882)	0.898 (0.788-1.03)	1.07 (0.905-1.28)	1.21 (0.996-1.48)	1.35 (1.08-1.70)	1.50 (1.17-1.95)	1.71 (1.27-2.34)	1.88 (1.34-2.67)
2-hr	0.777 (0.692-0.882)	0.949 (0.843-1.08)	1.17 (1.04-1.34)	1.35 (1.19-1.56)	1.60 (1.35-1.92)	1.79 (1.48-2.19)	1.98 (1.59-2.50)	2.18 (1.70-2.84)	2.45 (1.82-3.34)	2.66 (1.90-3.77)
3-hr	0.999 (0.889-1.13)	1.22 (1.08-1.39)	1.51 (1.33-1.72)	1.74 (1.52-2.00)	2.05 (1.73-2.45)	2.28 (1.88-2.79)	2.52 (2.02-3.17)	2.76 (2.14-3.59)	3.08 (2.29-4.20)	3.33 (2.37-4.72)
6-hr	1.51 (1.34-1.71)	1.84 (1.64-2.10)	2.28 (2.02-2.60)	2.62 (2.30-3.02)	3.08 (2.60-3.69)	3.43 (2.83-4.20)	3.77 (3.02-4.75)	4.11 (3.20-5.35)	4.57 (3.39-6.23)	4.91 (3.50-6.96)
12-hr	2.12 (1.89-2.41)	2.64 (2.35-3.00)	3.30 (2.92-3.76)	3.82 (3.35-4.39)	4.51 (3.81-5.39)	5.02 (4.14-6.15)	5.53 (4.43-6.96)	6.04 (4.69-7.85)	6.70 (4.97-9.14)	7.20 (5.13-10.2)
24-hr	2.95 (2.66-3.35)	3.74 (3.36-4.25)	4.74 (4.25-5.40)	5.53 (4.93-6.34)	6.57 (5.70-7.74)	7.35 (6.26-8.81)	8.12 (6.78-9.93)	8.89 (7.25-11.1)	9.90 (7.80-12.8)	10.7 (8.16-14.2)
2-day	3.87 (3.48-4.39)	4.94 (4.44-5.61)	6.31 (5.66-7.18)	7.39 (6.58-8.47)	8.82 (7.64-10.4)	9.89 (8.42-11.9)	10.9 (9.14-13.4)	12.0 (9.79-15.0)	13.4 (10.6-17.4)	14.5 (11.1-19.3)
3-day	4.50 (4.05-5.11)	5.77 (5.18-6.55)	7.39 (6.63-8.41)	8.68 (7.73-9.94)	10.4 (8.99-12.2)	11.6 (9.92-14.0)	12.9 (10.8-15.8)	14.2 (11.6-17.7)	15.9 (12.5-20.5)	17.1 (13.1-22.8)
4-day	5.00 (4.49-5.67)	6.42 (5.77-7.29)	8.23 (7.38-9.37)	9.67 (8.61-11.1)	11.6 (10.0-13.6)	13.0 (11.1-15.5)	14.4 (12.0-17.6)	15.8 (12.9-19.8)	17.6 (13.9-22.9)	19.0 (14.6-25.4)
7-day	6.17 (5.55-7.00)	7.92 (7.11-8.99)	10.1 (9.09-11.5)	11.9 (10.6-13.6)	14.2 (12.3-16.7)	15.9 (13.5-19.0)	17.5 (14.6-21.5)	19.2 (15.7-24.0)	21.4 (16.8-27.7)	23.0 (17.6-30.7)
10-day	6.97 (6.27-7.91)	8.95 (8.04-10.2)	11.4 (10.3-13.0)	13.4 (11.9-15.4)	15.9 (13.8-18.8)	17.8 (15.2-21.3)	19.6 (16.4-24.0)	21.5 (17.5-26.9)	23.8 (18.8-30.9)	25.6 (19.6-34.1)
20-day	9.12 (8.21-10.4)	11.7 (10.5-13.3)	15.0 (13.4-17.0)	17.5 (15.6-20.0)	20.7 (17.9-24.3)	23.0 (19.6-27.5)	25.2 (21.1-30.8)	27.4 (22.4-34.3)	30.2 (23.8-39.1)	32.2 (24.7-43.0)
30-day	11.0 (9.89-12.5)	14.1 (12.7-16.0)	17.9 (16.1-20.4)	20.9 (18.6-23.9)	24.6 (21.3-28.9)	27.2 (23.2-32.6)	29.8 (24.8-36.4)	32.2 (26.3-40.3)	35.3 (27.8-45.8)	37.5 (28.7-50.1)
45-day	13.4 (12.1-15.2)	17.1 (15.4-19.4)	21.6 (19.3-24.6)	25.0 (22.2-28.6)	29.2 (25.3-34.4)	32.3 (27.5-38.7)	35.1 (29.3-43.0)	37.9 (30.9-47.4)	41.3 (32.5-53.5)	43.7 (33.5-58.3)
60-day	16.0 (14.4-18.1)	20.2 (18.2-23.0)	25.3 (22.7-28.8)	29.2 (26.0-33.4)	34.0 (29.4-40.0)	37.3 (31.8-44.7)	40.5 (33.8-49.5)	43.5 (35.5-54.5)	47.2 (37.2-61.2)	49.9 (38.1-66.5)
Numbers recurrence estimates	in parenthesis are be interval) will be	greater than the up er than currently va	ower and upper bo oper bound (or less alid PMP values.	ounds of the 90% o	onfidence interval.	The probability the			for a given duration maximum precipita	

Main Link Categories: Home | OWP

US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
Office of Water Prediction (OWP)
1325 East West Highway
Silver Spring, MD 20910
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