Kenzo Vineyards, Phase 9
Soil Loss Analysis for New Vineyard Proposal
Explanatory Addendum to Excel Worksheet
Revised June 15, 2021

Note: The accompanying spreadsheet was submitted in response to requirements of the Napa County Engineering Division. The original submittal was completed in April 2019 in a format formally accepted by that agency, but not submitted until 2021. During that interval, the County has imposed new requirements, including segmentation of all USLE variables according to the most diverse among them, and formulaic determination of the rainfall factor. This submittal is responsive to those requirements, with no significant change in the results or conclusion of the analysis:

- A small increase in soil loss is predicted over one transect (Block 2 East). This increase is more than offset by decreases from all other transects.
- Predicted post-project soil loss from all transects is within the USDA soil loss tolerance level "T."

- Post-Project C: Non-tilled management in every other vinerow; alternate rows to be tilled, seeded, and straw-mulched as annual winterization measures: 80% cover (C=.025).
- R factor is consistent throughout the site (R = 69.72, based on 2-year/6-hour storm per NOAA Atlas 14).
- LS, K, T, and P factors segmented where appropriate, as indicated.
- P factor is the default maximum (1.00) except under post-project conditions in most of Block 2, where the proposed vinerow direction (generally NE-SW) crosses, near-perpendicular to the contours. The proposed, alternate row tillage leads to interpolated P entries (halfway between the values for "cross-slope, till" and "cross-slope, no-till) for the relevant slope range of the respective segments. Segments with slopes over 18% are assigned the default maximum P.
- Pre-project C factors:
  - Block 1 (4 Segments)
    - Segments 1 and 2: 75% Trees; 40% Cover: 20G, 80W (C=.122)
    - Segment 3 and 4: 0 Canopy; 90% Cover: 50G, 50W (C=.013)
  - Block 2 East (3 Segments)
    - Segments 1 and 2: 0 Canopy; 90% Cover: 70G, 30W (C=.011)
    - Segment 3: 0 Canopy; 90% Cover: 50G, 50W (C=.014)
  - Block 2 Mid (3 Segments)
    - Segment 1: 0 Canopy; 85% Cover: 40G, 60W (C=.023)
    - Segment 2: 0 Canopy; 70% Cover: 40G, 60W (C=.053)
    - Segment 3: 0 Canopy; 80% Cover: 70G, 30W (C=.022)
  - Block 2 West (2 Segments)
    - Segment 1: 75% Trees; 70% Cover: 50G, 50W (C=.045)
    - Segment 2: 25% Trees; 80% Cover: 40G, 60W (C=.030)

Kenzo
Pre-Project USLE
2-yr/6-hr storm, inches 1.94
June 15, 2021

Transect Identification		Kenzo Block 1, pre-project4.6				
Acres		4.6	acres			
Total Slope Length		410	feet			
Number of Segments		4	segments			
	1	2	3	4	5	
R	69.72	69.72	69.72	69.72		
Factor (F)	0.12	0.23	0.30	0.35	0.00	
Slope Length	410	410	410	410		
Slope %	36.1	28.3	7.8	3.9		
LS	14.87	11.04	1.93	0.68	0.00	
K	0.32	0.32	0.32	0.15		
C	0.122	0.122	0.013	0.013		
P	1.00	1.00	1.00	1.00		
T	2.00	2.00	2.00	5.00		3.05
(F) (LS) (K) (C)	0.069674	0.0992	0.0024	0.0005	0.0000	0.1717
A = (R) (F) (LS) (K) (C) (P	4.86	6.91	0.17	0.03	0.00	11.97 tons/acre/year
						55.07 tons/year

Kenzo
Post-Project USLE
2-yr/6-hr storm, inches 1.94
June 15, 2021

Transect Identification		Haynes Transect 1, post-project					
Acres		4.6	acres				
Total Slope Length		410	feet				
Number of Segments		4	segments				
	1	2	3	4	5		
R	69.72	69.72	69.72	69.72			
Factor (F)	0.12	0.23	0.30	0.35	0.00		
Slope Length	410	410	410	410			
Slope %	36.1	28.3	7.8	3.9			
LS	14.87	11.04	1.93	0.68	0.00		
K	0.32	0.32	0.32	0.15			
C	0.025	0.025	0.025	0.025		80 Alt till	
P	1.00	1.00	1.00	1.00			
T	2.00	2.00	2.00	5.00		3.05	
(F) (LS) (K) (C)	0.0143	0.0203	0.0046	0.0009	0.0000	0.0401	
A = (R) (F) (LS) (K) (C) (P)	1.00	1.42	0.32	0.06	0.00	2.80	tons/acre/year
						12.87	tons/year

Transect Identification		Kenzo Block 2 East, pre-project				
Acres		1.8	acres			
Total Slope Length		545	feet			
Number of Segments		3	segments			
	1	2	3	4	5	
R	69.72	69.72	69.72			
Factor (F)	0.19	0.35	0.46	0.00	0.00	
Slope Length	545	545	545			
Slope %	17.0	9.9	5.5			
LS	6.53	3.12	1.40	0.00	0.00	
K	0.32	0.32	0.32			
C	0.011	0.011	0.014			
P	1.00	1.00	1.00	1.00	1.00	
T	2.00	2.00	2.00			2.00
(F) (LS) (K) (C)	0.004369	0.0038	0.0029	0.0000	0.0000	0.0111
A = (R) (F) (LS) (K) (C) (P	0.30	0.27	0.20	0.00	0.00	0.77 tons/acre/year
						1.39 tons/year

Transect Identification		Kenzo Block 2 East, post-project					
Acres		1.8	acres				
Total Slope Length		545	feet				
Number of Segments		3	segments				
	1	2	3	4	5		
R	69.72	69.72	69.72				
Factor (F)	0.19	0.35	0.46	0.00	0.00		
Slope Length	545	545	545				
Slope %	17.0	9.9	5.5				
LS	6.53	3.12	1.40	0.00	0.00		
K	0.32	0.32	0.32				
C	0.025	0.025	0.025			80 Alt till	
P	0.75	0.63	0.56	1.00	1.00	cross, alt	
T	2.00	2.00	2.00			2.00	
(F) (LS) (K) (C)	0.0099	0.0087	0.0052	0.0000	0.0000	0.0238	
A = (R) (F) (LS) (K) (C) (P)	0.52	0.38	0.20	0.00	0.00	1.10	tons/acre/year
						1.99	tons/year

Transect Identification		Kenzo Block 2 Mid, pre-project					
Acres		5.6	acres				
Total Slope Length		430	feet				
Number of Segments		3	segments				
	1	2	3	4	5		
R	69.72	69.72	69.72				
Factor (F)	0.19	0.35	0.46	0.00	0.00		
Slope Length	430	430	430				
Slope %	23.1	13.3	7.0				
LS	8.72	4.16	1.71	0.00	0.00		
K	0.15	0.15	0.15				
C	0.023	0.053	0.022				
P	1.00	1.00	1.00	1.00	1.00		
T	5.00	5.00	5.00			5.00	
(F) (LS) (K) (C)	0.005714	0.0116	0.0026	0.0000	0.0000	0.0199	
A = (R) (F) (LS) (K) (C) (P	0.40	0.81	0.18	0.00	0.00	1.39	tons/acre/year
						7.76	tons/year

Transect Identification		Kenzo Block 2 Mid, pre-project					
Acres		5.6	acres				
Total Slope Length		430	feet				
Number of Segments		3	segments				
	1	2	3	4	5		
R	69.72	69.72	69.72				
Factor (F)	0.19	0.35	0.46	0.00	0.00		
Slope Length	430	430	430				
Slope %	23.1	13.3	7.0				
LS	8.72	4.16	1.71	0.00	0.00		
K	0.15	0.15	0.15				
C	0.025	0.025	0.025			80 Alt till	
P	1.00	0.75	0.75			cross, alt	
T	5.00	5.00	5.00			5.00	
(F) (LS) (K) (C)	0.0062	0.0055	0.0029	0.0000	0.0000	0.0146	
A = (R) (F) (LS) (K) (C) (P)	0.43	0.29	0.15	0.00	0.00	0.87	tons/acre/year
						4.89	tons/year

Transect Identification		Kenzo Block 2 West, pre-project					
Acres		0.9	acres				
Total Slope Length		235	feet				
Number of Segments		2	segments				
	1	2	3	4	5		
R	69.72	69.72					
Factor (F)	0.35	0.65	0.00	0.00	0.00		
Slope Length	235	235					
Slope %	8.5	12.8					
LS	1.65	2.92	0.00	0.00	0.00		
K	0.10	0.10					
C	0.045	0.030					
P	1.00	1.00	1.00	1.00	1.00		
T	1.00	1.00				1.00	
(F) (LS) (K) (C)	0.002574	0.0058	0.0000	0.0000	0.0000	0.0083	
A = (R) (F) (LS) (K) (C) (P	0.18	0.40	0.00	0.00	0.00	0.58	tons/acre/year
						0.52	tons/year

Transect Identification		Kenzo Block 2 West, pre-project					
Acres		0.9	acres				
Total Slope Length		235	feet				
Number of Segments		2	segments				
	1	2	3	4	5		
R	69.72	69.72					
Factor (F)	0.35	0.65	0.00	0.00	0.00		
Slope Length	235	235					
Slope %	8.5	12.8					
LS	1.65	2.92	0.00	0.00	0.00		
K	0.10	0.10					
C	0.025	0.025				80 Alt till	
P	0.57	0.75				cross, alt	
T	1.00	1.00				4.00	
(F) (LS) (K) (C)	0.0014	0.0047	0.0000	0.0000	0.0000	0.0062	
A = (R) (F) (LS) (K) (C) (P)	0.06	0.25	0.00	0.00	0.00	0.31	tons/acre/year
						0.27	tons/year

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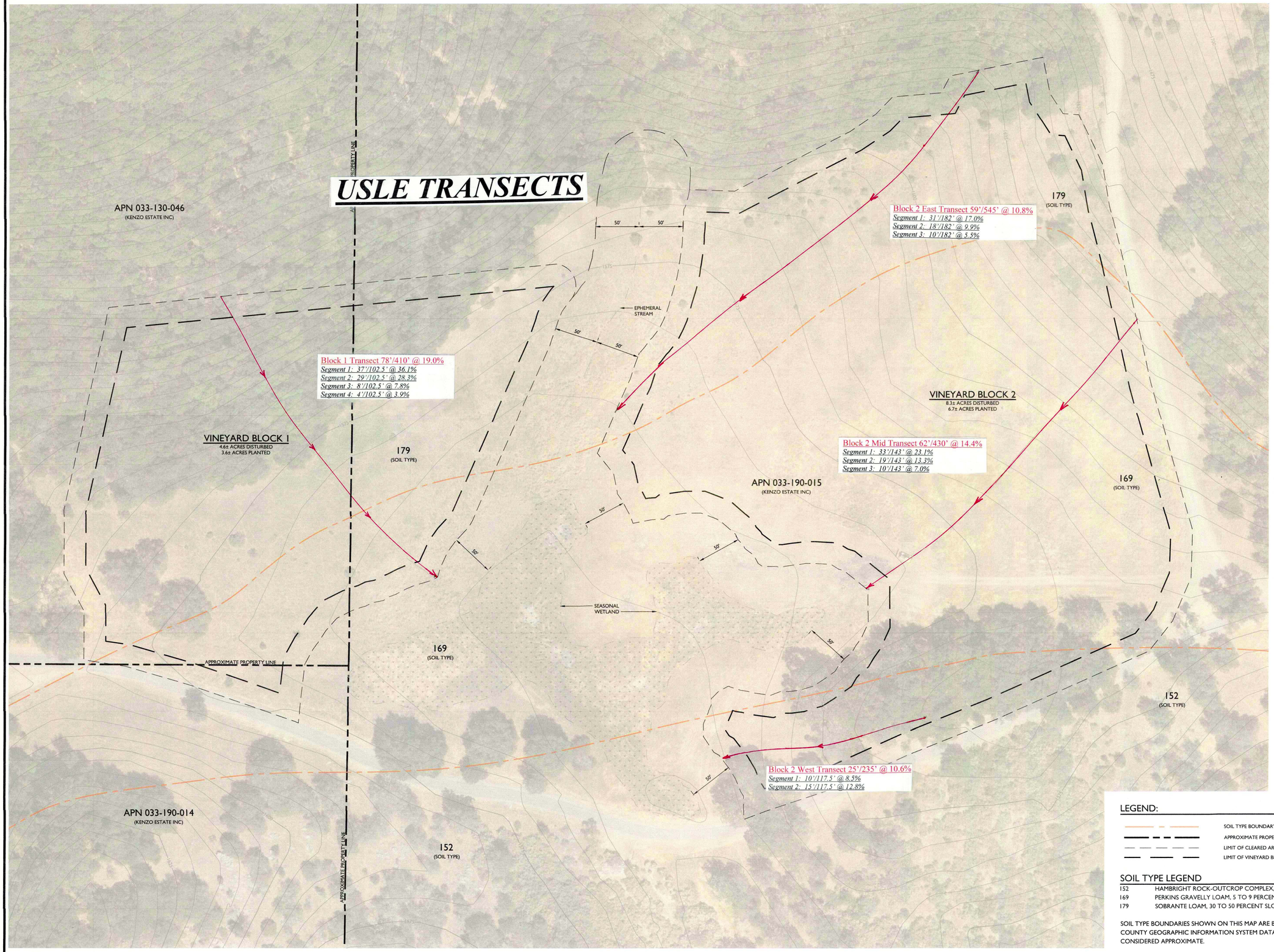
USLE TRANSECTS



USLE EXHIBIT

SCALE: 1" = 50'

SCALE: 1" = 50'

0 50' 100'

LEGEND:

- SOIL TYPE BOUNDARY
- APPROXIMATE PROPERTY LINE
- LIMIT OF CLEARED AREA / AVENUE
- LIMIT OF VINEYARD BLOCK

SOIL TYPE LEGEND

152	HAMBRIGHT ROCK-OUTCROP COMPLEX, 30 TO 75 PERCENT SLOPES
169	PERKINS GRAVELLY LOAM, 5 TO 9 PERCENT SLOPES
179	SOBRANTE LOAM, 30 TO 50 PERCENT SLOPES

SOIL TYPE BOUNDARIES SHOWN ON THIS MAP ARE BASED ON THE NAPA COUNTY GEOGRAPHIC INFORMATION SYSTEM DATA AND SHOULD BE CONSIDERED APPROXIMATE.

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KENZO ESTATE

USLE EXHIBIT

PREPARED UNDER THE DIRECTION OF:

REGISTERED PROFESSIONAL ENGINEER
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NO. 67435
Exp. 12/31/2020
CIVIL
STATE OF CALIFORNIA
PRELIMINARY NOT FOR CONSTRUCTION

DRAWN BY: BT DRAFTING

CHECKED BY: MRM

DATE: APRIL 2019

REVISIONS: BY:

JOB NUMBER: 17-147

FILE: 17-147EXH_USLE.DWG

ORIGINAL SIZE: 24" X 36"

SHEET NUMBER: 1 OF 1

SOIL LOSS ANALYSIS
KENZO ESTATE
PHASE 9 VINEYARD PROPOSAL
MAY 2019

The following analysis evaluates a proposed vineyard development on approximately 13.1 acres at 8899 Wild Horse Canyon Road, Napa, 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 Mr. Mike Muelrath, Principal Engineer of Applied Civil Engineering, Inc. 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 for the site 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 a soil type Mapping Unit boundary 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 concave slopes (flatter at the bottom) also require segmented **LS** analysis.
- **"P"** factors for the undeveloped site are at the default value of 1, and remain at that value, post project, except for the middle transect in Block 2, where the northeast-southwest vinerow layout crosses the predominant slope, allowing for application of a reduced "**P**" factor of .75.
- **Pre-project "C"** values assigned to transects and segments were chosen from Table 5 of the NRCS "Special Applications" pamphlet. These choices were determined through site visits on February 25, 2018 and April 25, 2019. A striking feature observed during these visits was the extent to which conditions were altered by the wildfire of October 2017, and the applicant's response to its ravages. (The entire proposed vineyard area and much of the surrounding watershed were burned, with varying severity.)
    - In Block 1, the upper half of the representative transect is a former oak woodland that burned very hot. All the trees are denuded and most, though still standing, appear to be dead. The understory was destroyed and very little emergent vegetation has appeared. Heavy rains generated enough soil loss to create rilling and "pedastaling" in this area. Vegetative cover has been evaluated to be 40%, predominantly non-grassy.
    - In contrast, the lower half of Block 1's transect, like the rest of the pastureland, was seeded and straw-mulched as a winterization measure to protect the land

following the wildfire. The resulting cover is estimated to be 90%, half grassy, half weedy.
    - Similarly, the lower segments of all three transects in Block 2 have 80-90% vegetative cover, in part the result of the applicant's post-fire remediation, plus the generous rainfall totals of the 2018-2019 winter.
    - Upper and middle segments of the middle and western transects, however, have more modest levels of cover, due in part to shallow top soils over rock outcrops in the Hambright and Sobrante soils.
    - Overall pre-project soil loss in the proposed vineyard area is estimated to be 2.27 tons/acre/year.
- **Post-Project "C"** value is based on the cover management specifications in the Erosion Control Plan, calling for tillage in alternate rows, with 80% cover to be achieved by annual seeding and straw mulch application, as winterization measures.

- **Conclusion**: Post-project soil loss in the proposed vineyard area is estimated to be 1.46 tons/acre/year (less than pre-project) with levels under the soil loss tolerance "**T**" in all transects modeled.

DAVID A. STEINER, CPESC, CPSWQ

USLE LAYOUT AND PRACTICE ALTERNATIVES A=(R)(K)(LS)(C)(P)

FOR: Kenzo Estate
Pre-Project
SOIL TYPE: 152, 169, 179 T= 1, 5, 2
USER: DAS 2.29 Tons/Acre Soil Loss This Sheet
DATE: 30-Apr-19

		Block 1		Block 2 East		Block 2 mid		Block 2 West			
# /ACRES:		4.70		1.8		5.6		0.9			
FACTOR:	DESCRIPTION	#1	/Describe	#2	/Describe	#3	/Describe	#4	/Describe	#5	/Describe
R	Rainfall	69		69		69		69			
K	Soil Erosiveness	0.26	Segmtd T=3.05	0.32	T=2	0.15	T=5	0.10	T=1		
	Slope length (ft)	410		545		430		235			
S	Gradient	19.0		10.8		14.4		10.6			
LS	Calculated LS	5.40	Segmented	3.09	Segmented	3.90	Segmented	2.25		0.00	
C	Cover	0.051	Segmented	0.006	Segmented	0.023	Segmented	0.035	Segmented		
P	Practice	1	vertical	1	vertical	1	vertical	1	vertical	1	vertical
A	Soil loss, tons/acre	4.96		0.41		0.93		0.54		0.00	
	Soil loss, tons	23.31		0.74		5.20		0.49		0.00	

m:	#1	#2	#3	#4	#5
	0.5	0.5	0.5	0.5	0.2

A=(R)(K)(LS)(C)(P) **29.74 Tons of Soil Loss This Sheet**

Block 1	Segmented K				
Segments	1	2	3	4	Use
Segment Length	103	103	103	103	
Segment K	0.32	0.32	0.32	0.15	
Factor	0.12	0.23	0.3	0.35	
Product	0.038	0.074	0.096	0.053	0.261

Block 1	Segmented T				
Segments	1	2	3	4	Use
Segment Length	103	103	103	103	
Segment T	2	2	2	5	
Factor	0.12	0.23	0.3	0.35	
Product	0.24	0.46	0.60	1.75	3.05

FROM TABLE 5, "Special Applications for Napa County"
____[1] 75% Trees; 40% cover: 20 G, 80 W
____[2] 0 canopy; 90% cover: 50 G, 50 W
____[3] 0 Canopy; 90% cover: 70 G, 30 W
____[4] 0 Canopy; 85% cover: 40 G, 60 W
____[5] 0 Canopy; 70% cover: 40 G, 60 W
____[6] 0 Canopy; 80% cover: 70 G, 30 W
____[7] 75% trees; 70% cover: 50 G, 50 W
____[8] 25% trees; 80% cover: 40 G, 60 W

Block 2 Mid	Segmented LS			
Segments	1	2	3	Use
Length	430	430	430	
Segmt Grade	23.1	13.3	7.0	
Segment LS	8.72	4.16	1.71	5
Factor	0.19	0.35	0.46	
Product	1.66	1.46	0.79	3.90

Block 1	Segmented C		
Segments	1	2	Use
Length	205	205	
Table 5	[1]	[2]	
Segment C	0.122	0.013	
Factor	0.35	0.65	
Product	0.043	0.008	0.051

Block 1	Segmented LS			
Segments	1	2	Use	
Length	410	410		
Segmt Grade	32.2	5.9		
Segment LS	12.97	1.33		
Factor	0.35	0.65		
Product	4.54	0.86	5.40	

Bl 2 East	Segmented C			
Segments	1	2	3	Use
Length	182	182	182	
Table 5	[3]	[3]	[2]	
Segment C	0.011	0.011	0.014	
Factor	0.19	0.35	0.46	
Product	0.002	0.004	0.006	0.006

Block 2 East	Segmented LS			
Segments	1	2	Use	
Length	545	545		
Segmt Grade	15.0	6.6		
Segment LS	5.52	1.78	5	
Factor	0.35	0.65		
Product	1.93	1.16	3.09	

Bl 2 Mid	Segmented C			
Segments	1	2	3	Use
Length	143	143	143	
Table 5	[4]	[5]	[6]	
Segment C	0.023	0.053	0.022	
Factor	0.19	0.35	0.46	
Product	0.004	0.019	0.010	0.023

Bl 2 West	Segmented C		
Segments	1	2	Use
Length	118	118	
Table 5	[7]	[8]	
Segment C	0.044	0.030	
Factor	0.35	0.65	
Product	0.015	0.020	0.035

DAVID A. STEINER, CPESC, CPSWQ

USLE LAYOUT AND PRACTICE ALTERNATIVES A=(R)(K)(LS)(C)(P)

FOR: Kenzo Estate

Post-Project

SOIL TYPE: 152, 169, 179 T= 1, 5, 2

USER: DAS 1.47 Tons/Acre Soil Loss This Sheet

DATE: 30-Apr-19

		Block 1		Block 2 East		Block 2 mid		Block 2 West			
# /ACRES:		4.70		1.8		5.6		0.9			
FACTOR:	DESCRIPTION	#1	/Describe	#2	/Describe	#3	/Describe	#4	/Describe	#5	/Describe
R	Rainfall	69		69		69		69			
K	Soil Erosiveness	0.26	Segmtd T=3.05	0.32	T=2	0.15	T=5	0.10	T=1		
	Slope length (ft)	410		545		430		235			
S	Gradient	19.0		10.8		14.4		10.6			
LS	Calculated LS	5.40	Segmented	3.09	Segmented	3.90	Segmented	2.25		0.00	
C	Cover	0.025	80% alt till	0.025	80% alt till	0.025	80% alt till	0.025	80% alt till		
P	Practice	1	vertical	1	vertical	0.75	cross, alt till	1	vertical	1	vertical
A	Soil loss, tons/acre	2.43		1.71		0.76		0.39		0.00	
	Soil loss, tons	11.43		3.07		4.24		0.35		0.00	

m:	#1	#2	#3	#4	#5
	0.5	0.5	0.5	0.5	0.2

A=(R)(K)(LS)(C)(P) **19.08 Tons of Soil Loss This Sheet**

Block 1	Segmented K				
Segments	1	2	3	4	Use
Segment Length	103	103	103	103	
Segment K	0.32	0.32	0.32	0.15	
Factor	0.12	0.23	0.3	0.35	
Product	0.038	0.074	0.096	0.053	0.261

Block 1	Segmented T				
Segments	1	2	3	4	Use
Segment Length	103	103	103	103	
Segment T	2	2	2	5	
Factor	0.12	0.23	0.3	0.35	
Product	0.24	0.46	0.60	1.75	3.05

Block 2 Mid	Segmented LS			
Segments	1	2	3	Use
Length	430	430	430	
Segmt Grade	23.1	13.3	7.0	
Segment LS	8.72	4.16	1.71	5
Factor	0.19	0.35	0.46	
Product	1.66	1.46	0.79	3.90

Block 1	Segmented LS		
Segments	1	2	Use
Length	410	410	
Segmt Grade	32.2	5.9	
Segment LS	12.97	1.33	
Factor	0.35	0.65	
Product	4.54	0.86	5.40

Block 2 East	Segmented LS		
Segments	1	2	Use
Length	545	545	
Segmt Grade	15.0	6.6	
Segment LS	5.52	1.78	5
Factor	0.35	0.65	
Product	1.93	1.16	3.09

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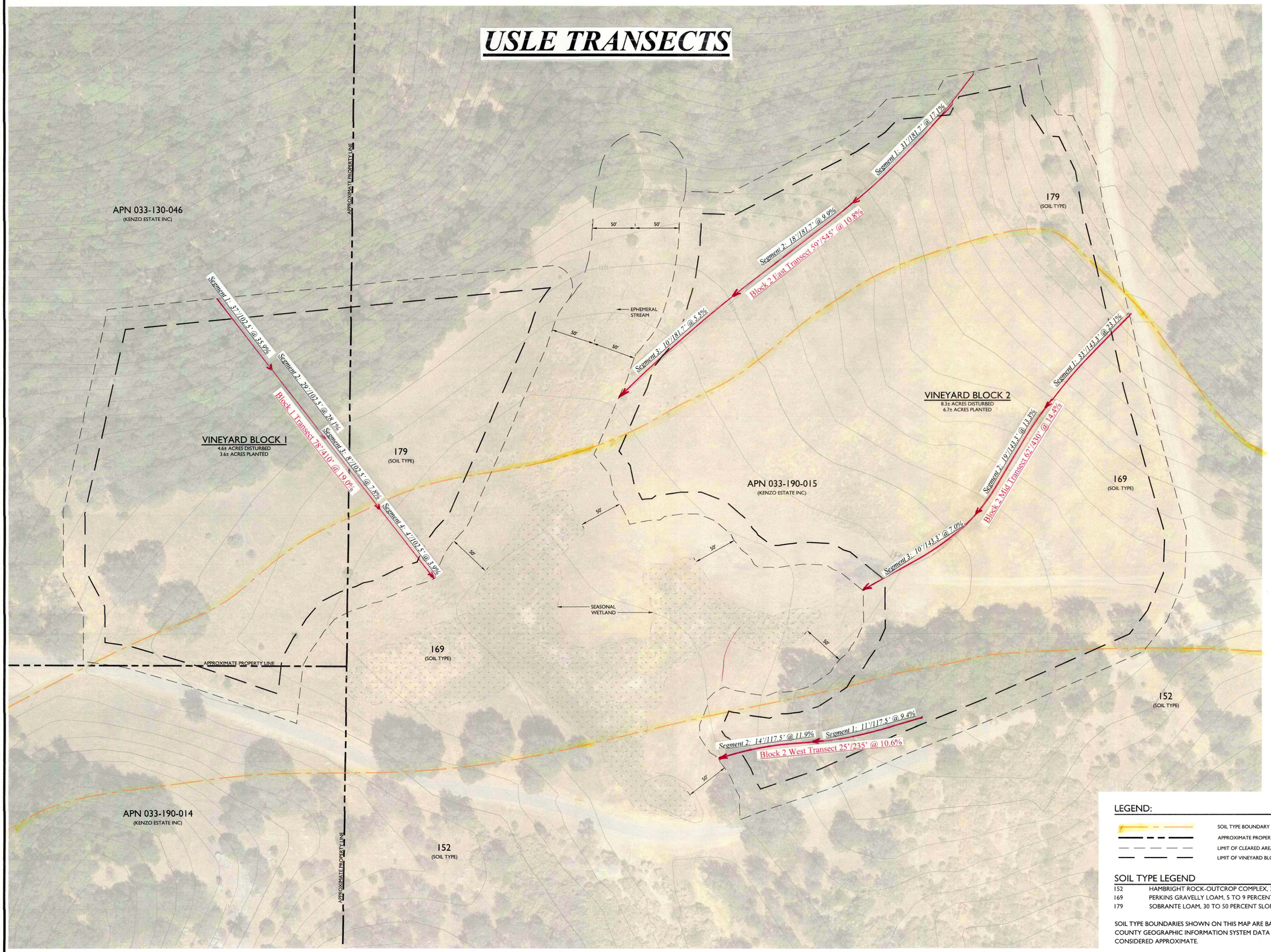
USLE TRANSECTS



SCALE: 1" = 50'

0 50' 100'

LEGEND:

- SOIL TYPE BOUNDARY
- APPROXIMATE PROPERTY LINE
- LIMIT OF CLEARED AREA / AVENUE
- LIMIT OF VINEYARD BLOCK

SOIL TYPE LEGEND

152	HAMBRIGHT ROCK-OUTCROP COMPLEX, 30 TO 75 PERCENT SLOPES
169	PERKINS GRAVELLY LOAM, 5 TO 9 PERCENT SLOPES
179	SOBRANTE LOAM, 30 TO 50 PERCENT SLOPES

SOIL TYPE BOUNDARIES SHOWN ON THIS MAP ARE BASED ON THE NAPA COUNTY GEOGRAPHIC INFORMATION SYSTEM DATA AND SHOULD BE CONSIDERED APPROXIMATE.

USLE EXHIBIT

SCALE: 1" = 50'

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KENZO ESTATE

USLE EXHIBIT

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REGISTERED PROFESSIONAL ENGINEER
MICHAEL R. MADELEY
NO. 67435
Exp. 12/31/2020
CIVIL
STATE OF CALIFORNIA
PRELIMINARY - NOT FOR CONSTRUCTION

DRAWN BY: BT DRAFTING

CHECKED BY: MRM

DATE: APRIL 2019

REVISIONS: BY:

JOB NUMBER: 17-147

FILE: 17-147EXH_USLE.DWG

ORIGINAL SIZE: 24" X 36"

SHEET NUMBER: 1 OF 1