Exhibit G

HYDROLOGIC ANALYSIS
RED DIRT GRAPES, LLC
PROPOSED NEW VINEYARD
LONG RANCH ROAD
ST. HELENA, CA 95476
APN 032-030-071; 032-560-038
JANUARY 17, 2022

The following analysis evaluates a proposed, approximately 28.1-acre new vineyard on two parcels totaling approximately 54.7 acres, located in Napa County, northeast of St. Helena, to determine the project's potential to increase runoff or peak flow. This analysis was prepared by David Steiner, CPESC, CPSWQ, at the request of, and in consultation with, Mr. Mike Muelrath, PE, of Applied Civil Engineering. The analysis employs the basic methodology of USDA Technical Release 55, as modeled in Version 1.00.10 of WinTR55 "Small Watershed Hydrology", a Windows-based application. The reader's attention is drawn to accompanying printouts of the analysis—both pre-project and post-project—including storm data, runoff curve number analyses, times of concentration, stream reach data, and summaries of hydrograph peaks and peak times. The accompanying maps were drawn on aerial/topographic base maps provided by Applied Civil Engineering.

The precipitation data for the modeled **24-hour storms** of 2, 5, 10, 25, 50, and 100-year return intervals were taken from the median of each event's range of likely depths, as per NOAA Atlas 14. A printout of the NOAA website's database page also accompanies this analysis. Peak flow calculations for this location were derived from these values, using the appropriate "CA-1" distribution curve, implicit in the 2013 updates of the Atlas.

The project encompasses straddles the dividing ridge between the drainage basins of Lake Hennessey and Rector Reservoir, modeled and analyzed here as three discrete watersheds, designated Hennessey Northeast (59.1 acres), Hennessey Southwest (44 acres) and Rector South (67.6 acres). Please note that, to avoid buffering or masking the proposal's potential hydrologic impacts, a relatively large area of the Northeast Watershed's eastern headwaters area has been deliberately excluded from the analysis. While this approach compromises the validity of the model's outputs for in-stream hydraulics and *total* flow, it takes into account any potential effects (possible flow increases) from the project area—the objective of the analysis.

Land uses in these watersheds include riparian areas, mixed woodland, chaparral or brushland, grassland, existing and developing vineyards, and small areas of rock outcrop with little or no topsoil or vegetation. Residences with landscaping and outbuildings, accessed via asphalt and gravel driveways, complete the area's land use picture. Pre- and post-project runoff curve numbers (**CN**) are assigned based on hydrologic soil group (**HSG**), land use, and hydrologic condition. Estimates of land use, cover, and hydrologic condition were based on review of Google Earth imagery and evaluations made during field visits on November 9 and December 2, 2021.

Approximately 5.8 acres of the proposed vineyard (parts of which are in all three watersheds) was surveyed and determined to be on slopes less than 5%, i.e., not subject to the requirement for an Erosion Control Plan. This area was cleared and seeded in the fall of 2021; however, as straw mulch winterization was interrupted by heavy rains in October, this part of the site had very little protective cover at the time of the referenced site visits, when it was certainly in "poor" hydrologic condition. However, for modeling purposes this area's pre-project

hydrologic condition was assumed to be "fair", with the expectation of proper winterization, with 70% cover.

Neither vineyards nor chaparral are included among WinTR-55's land use alternatives, the application's other options (including the "Custom Curve Number" field) are adapted for use in the analysis. These two specific options were selected from a California-specific table found in the NRCS Engineering Field Handbook.[1] This table's guidance calls for vineyard Curve Numbers equivalent to those of "annual grass."

The Hydrologic Soil Group designation (all "D", in all three watersheds) was derived from the USDA Web Soil Survey.

Times of Concentration (Tc) for each of the three watersheds were determined by plotting flowpaths from the hydrologically most remote points to designated outlets, or points of interest. The flowpaths include sheet flow, shallow concentrated flow and channel flow. Each component's data is entered into the model as slope length, gradient, Manning's "N" (roughness) factor, with additional characteristics—cross-sectional area and wetted perimeter, or a known velocity— required for channel flow.

Summary of the Results of Initial Analysis: (Please see accompanying WinTR-55 printouts and electronic files for complete reports.)

- Hennessey Northeast Watershed:

Pre-project 100-year peak flow:	53.51 cfs
Post-project 100-year peak flow:	54.46 cfs
Increase	.95 cfs
Pre-Project 2-year peak flow:	17.15 cfs
Post-Project 2-year flow:	17.89 cfs
Increase:	.74 cfs

- Hennessey Southwest Watershed:

Pre-project 100-year peak flow:	41.46 cfs
Post-project 100-year peak flow:	41.46 cfs
Increase:	0
Pre-Project 2-year peak flow:	13.29 cfs
Post-Project 2-year peak flow:	13.29 cfs
Increase	0

- Rector South Watershed:

Pre-project 100-year peak flow:	61.20 cfs
Post-project 100-year peak flow:	61.20 cfs
Increase:	0
Pre-Project 2-year peak flow:	19.59 cfs
Post-Project 2-year peak flow:	19.59 cfs
Increase	0

_____[2]Engineering Field Handbook, Part 650, Chapter 2, Supplement 1, USDA/NRCS, Oct 2008.

As the above summary indicates, a small peak flow increase will be generated in the Hennessey northeast Watershed, under the development initially proposed. The strategy for offsetting this modeled peak flow increase involves construction of a storage structure designed with sufficient capacity to increase the Time of Concentration, thereby commensurately reducing the post-project peak flow to the pre-project level. As peak flows of larger, less frequent storms are many times those of smaller, more frequent storms, retention structures providing Tc extensions that achieve pre- and post-project peak flow parity for 100-year/24-hour storms are more than adequate for smaller storms. To demonstrate this trend, the analysis includes calculations for reducing the 2-year peak flow, as well as the determinative 100-year year peak. The following Addendum provides design criteria for a structure providing the required Tc extension and peak flow reduction: (Please refer to accompanying WinTR-55 printouts.)

Calculations for Northeast Watershed Retention Requirements

- A manually-entered Tc increase of .029 hours brings the post-project, 100-year peak of the Hennessey Northeast WS (54.46 cfs) to parity with the pre-project peak (53.51 cfs).
- Sub-WS A will generate a 100-year peak of 5.41 cfs.
- .029 hours x 3600 seconds/hour = 104.4 seconds
- 104.4 seconds x 5.41 cfs = 564.8 cubic feet of required storage volume
- 564.8 cf / .33 void ratio = **1711.5 cf of rock in structure**

- A manually-entered Tc increase of .072 hours brings the post-project, 2-year peak of the Hennessey Northeast WS (17.89 cfs) to parity with the pre-project peak (17.15 cfs).
- Sub-WS A will generate a 2-year peak of 1.83 cfs.
- .072 hours x 3600 seconds/hour = 259.2 seconds
- 259.2 seconds x 1.83 cfs = 474.3 cubic feet of required storage volume
- 474.3 cf < 564.8 cf (determinative retention requirement for 100-year peak)

Conclusion:

With installation and maintenance of a retention structure meeting this criterion at the outlet of Sub-WS A, as specified in the Erosion Control Plan, the proposed project will result in no increase in peak flow or runoff, compared to pre-project conditions.

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Red Dirt Grapes
Hennessey Northeast, Pre-Project
Napa County, California

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period					
	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
	(hr)	(hr)	(hr)	(hr)	(hr)	(hr)
SUBAREAS						
Main	17.15	25.19	31.71	40.50	47.05	53.51
	12.20	12.20	12.20	12.20	12.21	12.21
REACHES						
OUTLET	17.15	25.19	31.71	40.50	47.05	53.51

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Red Dirt Grapes
Hennessey Northeast, Pre-Project
Napa County, California

Storm Data

Rainfall Depth by Rainfall Return Period

2-Yr (in)	5-Yr (in)	10-Yr (in)	25-Yr (in)	50-Yr (in)	100-Yr (in)	-Yr (in)
3.89	4.93	5.75	6.84	7.65	8.45	.0

Storm Data Source: User-provided custom storm data
Rainfall Distribution Type: Type CA-1
Dimensionless Unit Hydrograph: <standard>

DAS

Red Dirt Grapes
Hennessey Northeast, Pre-Project
Napa County, California

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
Main							
SHEET	100	0.0300	0.240				0.183
SHALLOW	1519	0.1400	0.050				0.070
CHANNEL	250	0.2430	0.050	4.00	6.00	11.574	0.006
CHANNEL	423	0.1200	0.045	6.00	10.00	8.393	0.014
					Time of Concentration		.273

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Red Dirt Grapes
Hennessey Northeast, Pre-Project
Napa County, California

Sub-Area Land Use and Curve Number Details

Sub-Area Identifier	Land Use		Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
Main	Open space; grass cover 50% to 75%	(fair)	D	1.8	84
	User defined urban (Click button or		D	11.8	81
	Legume/Rot. Meadow Straight row	(good)	C	5.2	81
	Legume/Rot. Meadow Contoured	(good)	C	28.8	78
	Woods	(good)	D	9.8	77
	Farmsteads		D	1.7	86
	Total Area / Weighted Curve Number			59.1	79

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Red Dirt Grapes
Hennessey Northeast, Pre-Project
Napa County, California

Sub-Area Land Use and Curve Number Details

Sub-Area Identifier	Land Use		Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
Main	Annual grass	(fair)	D	1.8	84
	Vineyard (annual grass)	(good)	D	11.8	81
	Broadleaf Chaparral	(fair)	D	5.2	81
	Broadleaf Chaparral	(good)	D	28.8	78
	Woods	(good)	D	9.8	77
	Farmsteads		D	1.7	86
	Total Area / Weighted Curve Number			59.1	79

DAS

Red Dirt Grapes
Hennessey Southwest, Pre-Project
Napa County, California

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period 2-Yr (cfs)	(hr)	5-Yr (cfs)	(hr)	10-Yr (cfs)	(hr)	25-Yr (cfs)	(hr)	50-Yr (cfs)	(hr)	100-Yr (cfs)	(hr)
SUBAREAS												
Main	13.29	12.18	19.51	12.17	24.55	12.17	31.33	12.17	36.43	12.17	41.46	12.17
REACHES												
OUTLET	13.29		19.51		24.55		31.33		36.43		41.46	

DAS

Red Dirt Grapes
Hennessey Southwest, Pre-Project
Napa County, California

Storm Data

Rainfall Depth by Rainfall Return Period

2-Yr (in)	5-Yr (in)	10-Yr (in)	25-Yr (in)	50-Yr (in)	100-Yr (in)	-Yr (in)
3.89	4.93	5.75	6.84	7.65	8.45	.0

Storm Data Source: User-provided custom storm data
Rainfall Distribution Type: Type CA-1
Dimensionless Unit Hydrograph: <standard>

DAS

Red Dirt Grapes
Hennessey Southwest, Pre-Project
Napa County, California

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
Main							
SHEET	100	0.0360	0.150				0.117
SHALLOW	622	0.1310	0.050				0.030
CHANNEL	1485	0.0670	0.045	6.00	10.00	6.066	0.068
					Time of Concentration		.215

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Red Dirt Grapes
Hennessey Southwest, Pre-Project
Napa County, California

Sub-Area Land Use and Curve Number Details

Sub-Area Identifier	Land Use		Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
Main	Open space; grass cover 50% to 75%	(fair)	D	1.5	84
	Legume/Rot. Meadow Straight row	(good)	C	9.7	81
	Legume/Rot. Meadow Contoured	(good)	C	21	78
	Woods - grass combination	(fair)	D	3.9	82
	Woods	(good)	D	7.9	77
	Total Area / Weighted Curve Number			44	79
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Red Dirt Grapes
Hennessey Southwest, Pre-Project
Napa County, California

Sub-Area Land Use and Curve Number Details

Sub-Area Identifier	Land Use		Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
Main	Annual grass	(fair)	D	1.5	84
	Broadleaf Chaparral	(fair)	D	9.7	81
	Broadleaf Chapparral	(good)	D	21	78
	Woods - grass combination	(fair)	D	3.9	82
	Woods	(good)	D	7.9	77
	Total Area / Weighted Curve Number			44	79
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DAS

Red Dirt Grapes
Rector South, Pre-Project
Napa County, California

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period					
	2-Yr (cfs)	5-Yr (cfs)	10-Yr (cfs)	25-Yr (cfs)	50-Yr (cfs)	100-Yr (cfs)
	(hr)	(hr)	(hr)	(hr)	(hr)	(hr)
SUBAREAS						
Main	19.59	28.79	36.26	46.31	55.66	61.20
	12.22	12.20	12.20	12.20	12.21	12.20
REACHES						
OUTLET	19.59	28.79	36.26	46.31	55.66	61.20

DAS

Red Dirt Grapes
Rector South, Pre-Project
Napa County, California

Storm Data

Rainfall Depth by Rainfall Return Period

2-Yr (in)	5-Yr (in)	10-Yr (in)	25-Yr (in)	50-Yr (in)	100-Yr (in)	-Yr (in)
3.89	4.93	5.75	6.84	7.85	8.45	.0

Storm Data Source: User-provided custom storm data
Rainfall Distribution Type: Type CA-1
Dimensionless Unit Hydrograph: <standard>

DAS

Red Dirt Grapes
Rector South, Pre-Project
Napa County, California

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
Main							
SHEET	100	0.0120	0.150				0.182
SHALLOW	490	0.0730	0.050				0.031
SHALLOW	275	0.1080	0.050				0.014
CHANNEL	1101	0.0910	0.050	5.00	8.00	6.507	0.047
					Time of Concentration		.274

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Red Dirt Grapes
Rector South, Pre-Project
Napa County, California

Sub-Area Land Use and Curve Number Details

Sub-Area Identifier	Land Use	Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
Main	Open space; grass cover 50% to 75% (fair)	D	2.5	84
	Gravel (w/ right-of-way)	D	.6	91
	User defined urban (Click button or	D	9.8	81
	Legume/Rot. Meadow Contoured (good)	C	52.2	78
	Farmsteads	D	2.5	86
	Total Area / Weighted Curve Number		67.6	79

DAS

Red Dirt Grapes
Rector South, Pre-Project
Napa County, California

Sub-Area Land Use and Curve Number Details

Sub-Area Identifier	Land Use		Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
Main	Annual grass	(fair)	D	2.5	84
	Gravel (w/ right-of-way)		D	.6	91
	Vineyard (Annual grass)	(good)	D	9.8	81
	Broadleaf Chaparral	(good)	D	52.2	78
	Farmsteads		D	2.5	86
	Total Area / Weighted Curve Number			67.6	79

DAS

Red Dirt Grapes
Hennessey Northeast, Post-Project
Napa County, California

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period 2-Yr (cfs)	(hr)	5-Yr (cfs)	(hr)	10-Yr (cfs)	(hr)	25-Yr (cfs)	(hr)	50-Yr (cfs)	(hr)	100-Yr (cfs)	(hr)
SUBAREAS												
Main	17.89	12.20	26.00	12.20	32.56	12.21	41.37	12.20	47.97	12.20	54.46	12.20
REACHES												
OUTLET	17.89		26.00		32.56		41.37		47.97		54.46	

DAS

Red Dirt Grapes
Hennessey Northeast, Post-Project
Napa County, California

Storm Data

Rainfall Depth by Rainfall Return Period

2-Yr (in)	5-Yr (in)	10-Yr (in)	25-Yr (in)	50-Yr (in)	100-Yr (in)	-Yr (in)
3.89	4.93	5.75	6.84	7.65	8.45	.0

Storm Data Source: User-provided custom storm data
Rainfall Distribution Type: Type CA-1
Dimensionless Unit Hydrograph: <standard>

DAS

Red Dirt Grapes
Hennessey Northeast, Post-Project
Napa County, California

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
Main							
SHEET	100	0.0300	0.240				0.183
SHALLOW	1519	0.1400	0.050				0.070
CHANNEL	250	0.2430	0.050	4.00	6.00	11.574	0.006
CHANNEL	423	0.1200	0.045	6.00	10.00	8.393	0.014
					Time of Concentration		.273

DAS

Red Dirt Grapes
Hennessey Northeast, Post-Project
Napa County, California

Sub-Area Land Use and Curve Number Details

Sub-Area Identifier	Land Use		Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
Main	User defined urban (Click button or		D	25.6	81
	Legume/Rot. Meadow Straight row	(good)	C	5.2	81
	Legume/Rot. Meadow Contoured	(good)	C	16.8	78
	Woods	(good)	D	9.8	77
	Farmsteads		D	1.7	86
	Total Area / Weighted Curve Number			59.1	80

DAS

Red Dirt Grapes
Hennessey Northeast, Post-Project
Napa County, California

Sub-Area Land Use and Curve Number Details

Sub-Area Identifier	Land Use		Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
Main	Vineyard (Annual grass)	(good)	D	25.6	81
	Broadleaf Chaparral	(fair)	D	5.2	81
	Broadleaf Chaparral	(good)	D	16.8	78
	Woods	(good)	D	9.8	77
	Farmsteads		D	1.7	86
	Total Area / Weighted Curve Number			59.1	80

DAS

Red Dirt Grapes
Hennessey Northeast, Post-ProjectTc inc 2-yr
Napa County, California

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period 2-Yr (cfs)	(hr)	5-Yr (cfs)	(hr)	10-Yr (cfs)	(hr)	25-Yr (cfs)	(hr)	50-Yr (cfs)	(hr)	100-Yr (cfs)	(hr)
SUBAREAS												
Main	17.15	12.26	24.95	12.25	31.25	12.25	39.68	12.24	46.01	12.24	52.27	12.24
REACHES												
OUTLET	17.15		24.95		31.25		39.68		46.01		52.27	

DAS

Red Dirt Grapes
Hennessey Northeast, Post-ProjectTc inc 2-yr
Napa County, California

Storm Data

Rainfall Depth by Rainfall Return Period

2-Yr (in)	5-Yr (in)	10-Yr (in)	25-Yr (in)	50-Yr (in)	100-Yr (in)	-Yr (in)
3.89	4.93	5.75	6.84	7.65	8.45	.0

Storm Data Source: User-provided custom storm data
Rainfall Distribution Type: Type CA-1
Dimensionless Unit Hydrograph: <standard>

DAS

Red Dirt Grapes
Hennessey Northeast, Post-ProjectTc inc 2-yr
Napa County, California

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
Main							
SHEET	100	0.0300	0.240				0.183
SHALLOW	1519	0.1400	0.050				0.070
SHALLOW	930	0.0500	0.050				0.072
CHANNEL	250	0.2430	0.050	4.00	6.00	11.574	0.006
CHANNEL	423	0.1200	0.045	6.00	10.00	8.393	0.014
					Time of Concentration		.345

DAS

Red Dirt Grapes
Hennessey Northeast, Post-ProjectTc inc 2-yr
Napa County, California

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
Main							
SHEET	100	0.0300	0.240				0.183
SHALLOW	1519	0.1400	0.050				0.070
SHALLOW	930	0.0500	0.050	MANUAL ENTRY			0.072
CHANNEL	250	0.2430	0.050	4.00	6.00	11.574	0.006
CHANNEL	423	0.1200	0.045	6.00	10.00	8.393	0.014
					Time of Concentration		.345

DAS

Red Dirt Grapes
Hennessey Northeast, Post-ProjectTc inc 2-yr
Napa County, California

Sub-Area Land Use and Curve Number Details

Sub-Area Identifier	Land Use		Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
Main	User defined urban (Click button or		D	25.6	81
	Legume/Rot. Meadow Straight row	(good)	C	5.2	81
	Legume/Rot. Meadow Contoured	(good)	C	16.8	78
	Woods - grass combination	(good)	D	9.8	79
	Farmsteads		D	1.7	86
	Total Area / Weighted Curve Number			59.1	80

DAS

Red Dirt Grapes
Hennessey Northeast, Post-ProjectTc inc 2-yr
Napa County, California

Sub-Area Land Use and Curve Number Details

Sub-Area Identifier	Land Use		Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
Main	Vineyard (annual grass)	(good)	D	25.6	81
	Broadleaf Chaparral	(fair)	D	5.2	81
	Broadleaf Chaparral	(good)	D	16.8	78
	Woods - grass combination	(good)	D	9.8	79
	Farmsteads		D	1.7	86
	Total Area / Weighted Curve Number			59.1	80

DAS

Red Dirt Grapes
Hennessey Northeast, Post-Project, Tc inc 100
Napa County, California

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period					
	2-Yr (cfs)	5-Yr (cfs)	10-Yr (cfs)	25-Yr (cfs)	50-Yr (cfs)	100-Yr (cfs)
	(hr)	(hr)	(hr)	(hr)	(hr)	(hr)
SUBAREAS						
Main	17.57	25.55	32.00	40.67	47.10	53.49
	12.22	12.23	12.22	12.22	12.23	12.23
REACHES						
OUTLET	17.57	25.55	32.00	40.67	47.10	53.49

DAS

Red Dirt Grapes
Hennessey Northeast, Post-Project, Tc inc 100
Napa County, California

Storm Data

Rainfall Depth by Rainfall Return Period

2-Yr (in)	5-Yr (in)	10-Yr (in)	25-Yr (in)	50-Yr (in)	100-Yr (in)	-Yr (in)
3.89	4.93	5.75	6.84	7.65	8.45	.0

Storm Data Source: User-provided custom storm data
Rainfall Distribution Type: Type CA-1
Dimensionless Unit Hydrograph: <standard>

DAS

Red Dirt Grapes
Hennessey Northeast, Post-Project, Tc inc 100
Napa County, California

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
Main							
SHEET	100	0.0300	0.240				0.183
SHALLOW	1519	0.1400	0.050				0.070
SHALLOW	375	0.0510	0.050				0.029
CHANNEL	250	0.2430	0.050	4.00	6.00	11.574	0.006
CHANNEL	423	0.1200	0.045	6.00	10.00	8.393	0.014
					Time of Concentration		0.302

DAS

Red Dirt Grapes
Hennessey Northeast, Post-Project, Tc inc 100
Napa County, California

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
Main							
SHEET	100	0.0300	0.240				0.183
SHALLOW	1519	0.1400	0.050				0.070
SHALLOW	375	0.0510	0.050	MANUAL ENTRY			0.029
CHANNEL	250	0.2430	0.050	4.00	6.00	11.574	0.006
CHANNEL	423	0.1200	0.045	6.00	10.00	8.393	0.014
					Time of Concentration		0.302

DAS

Red Dirt Grapes
Hennessey Northeast, Post-Project, Tc inc 100
Napa County, California

Sub-Area Land Use and Curve Number Details

Sub-Area Identifier	Land Use		Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
Main	User defined urban (Click button or		D	25.6	81
	Legume/Rot. Meadow Straight row	(good)	C	5.2	81
	Legume/Rot. Meadow Contoured	(good)	C	16.8	78
	Woods - grass combination	(good)	D	9.8	79
	Farmsteads		D	1.7	86
	Total Area / Weighted Curve Number			59.1	80

DAS

Red Dirt Grapes
Hennessey Northeast, Post-Project, Tc inc 100
Napa County, California

Sub-Area Land Use and Curve Number Details

Sub-Area Identifier	Land Use		Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
Main	Vineyard (annual grass)	(good)	D	25.6	81
	Broadleaf Chaparral	(fair)	D	5.2	81
	Broadleaf Chaparral	(good)	D	16.8	78
	Woods - grass combination	(good)	D	9.8	79
	Farmsteads		D	1.7	86
	Total Area / Weighted Curve Number			59.1	80

DAS

Red Dirt Grapes
Hennessey NE Sub WS A, Post-Project
Napa County, California

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period 2-Yr (cfs)	(hr)	5-Yr (cfs)	(hr)	10-Yr (cfs)	(hr)	25-Yr (cfs)	(hr)	50-Yr (cfs)	(hr)	100-Yr (cfs)	(hr)
SUBAREAS												
Main	1.83	12.12	2.63	12.11	3.27	12.12	4.14	12.12	4.78	12.12	5.41	12.12
REACHES												
OUTLET	1.83		2.63		3.27		4.14		4.78		5.41	

DAS

Red Dirt Grapes
Hennessey NE Sub WS A, Post-Project
Napa County, California

Storm Data

Rainfall Depth by Rainfall Return Period

2-Yr (in)	5-Yr (in)	10-Yr (in)	25-Yr (in)	50-Yr (in)	100-Yr (in)	-Yr (in)
3.89	4.93	5.75	6.84	7.65	8.45	.0

Storm Data Source: User-provided custom storm data
Rainfall Distribution Type: Type CA-1
Dimensionless Unit Hydrograph: <standard>

Red Dirt Grapes
Hennessey NE Sub WS A, Post-Project
Napa County, California

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
Main							
SHEET	100	0.1400	0.150				0.068
SHALLOW	720	0.1580	0.050				0.031
					Time of Concentration		0.1

DAS

Red Dirt Grapes
Hennessey NE Sub WS A, Post-Project
Napa County, California

Sub-Area Land Use and Curve Number Details

Sub-Area Identifier	Land Use	Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
Main	User defined urban (Click button or	D	4.53	81
	Legume/Rot. Meadow Contoured (good)	C	.53	78
	Total Area / Weighted Curve Number		5.06	81

DAS

Red Dirt Grapes
Hennessey NE Sub WS A, Post-Project
Napa County, California

Sub-Area Land Use and Curve Number Details

Sub-Area Identifier	Land Use		Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
Main	Vineyard (annual grass)	(good)	D	4.53	81
	Broadleaf Chaparral	(good)	D	.53	78
	Total Area / Weighted Curve Number			5.06	81

DAS

Red Dirt Grapes
Hennessey Southwest, Post-Project
Napa County, California

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period					
	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
	(cfs) (hr)	(cfs) (hr)	(cfs) (hr)	(cfs) (hr)	(cfs) (hr)	(cfs) (hr)
SUBAREAS						
Main	13.29 12.18	19.51 12.17	24.55 12.17	31.33 12.17	36.43 12.17	41.46 12.17
REACHES						
OUTLET	13.29	19.51	24.55	31.33	36.43	41.46

DAS

Red Dirt Grapes
Hennessey Southwest, Post-Project
Napa County, California

Storm Data

Rainfall Depth by Rainfall Return Period

2-Yr (in)	5-Yr (in)	10-Yr (in)	25-Yr (in)	50-Yr (in)	100-Yr (in)	-Yr (in)
3.89	4.93	5.75	6.84	7.65	8.45	.0

Storm Data Source: User-provided custom storm data
Rainfall Distribution Type: Type CA-1
Dimensionless Unit Hydrograph: <standard>

DAS

Red Dirt Grapes
Hennessey Southwest, Post-Project
Napa County, California

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
Main							
SHEET	100	0.0360	0.150				0.117
SHALLOW	622	0.1310	0.050				0.030
CHANNEL	1485	0.0670	0.045	6.00	10.00	6.066	0.068
					Time of Concentration		.215

DAS

Red Dirt Grapes
Hennessey Southwest, Post-Project
Napa County, California

Sub-Area Land Use and Curve Number Details

Sub-Area Identifier	Land Use		Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
Main	User defined urban (Click button or		D	9.1	81
	Legume/Rot. Meadow Straight row	(good)	C	5.6	81
	Legume/Rot. Meadow Contoured	(good)	C	17.5	78
	Woods - grass combination	(fair)	D	3.9	82
	Woods	(good)	D	7.9	77
	Total Area / Weighted Curve Number			44	79
				==	==

DAS

Red Dirt Grapes
Hennessey Southwest, Post-Project
Napa County, California

Sub-Area Land Use and Curve Number Details

Sub-Area Identifier	Land Use		Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
Main	Vineyard (annual grass)	(good)	D	9.1	81
	Broadleaf Chaparral	(fair)	D	5.6	81
	Broadleaf Chaparral	(good)	D	17.5	78
	Woods - grass combination	(fair)	D	3.9	82
	Woods	(good)	D	7.9	77
	Total Area / Weighted Curve Number			44	79
				==	==

DAS

Red Dirt Grapes
Rector South, Post-Project
Napa County, California

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period					
	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
	(hr)	(hr)	(hr)	(hr)	(hr)	(hr)
SUBAREAS						
Main	19.59	28.79	36.26	46.31	55.66	61.20
	12.22	12.20	12.20	12.20	12.21	12.20
REACHES						
OUTLET	19.59	28.79	36.26	46.31	55.66	61.20

DAS

Red Dirt Grapes
Rector South, Post-Project
Napa County, California

Storm Data

Rainfall Depth by Rainfall Return Period

2-Yr (in)	5-Yr (in)	10-Yr (in)	25-Yr (in)	50-Yr (in)	100-Yr (in)	-Yr (in)
3.89	4.93	5.75	6.84	7.85	8.45	.0

Storm Data Source: User-provided custom storm data
Rainfall Distribution Type: Type CA-1
Dimensionless Unit Hydrograph: <standard>

DAS

Red Dirt Grapes
Rector South, Post-Project
Napa County, California

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
Main							
SHEET	100	0.0120	0.150				0.182
SHALLOW	490	0.0730	0.050				0.031
SHALLOW	275	0.1080	0.050				0.014
CHANNEL	1101	0.0910	0.050	5.00	8.00	6.507	0.047
					Time of Concentration		.274

DAS

Red Dirt Grapes
Rector South, Post-Project
Napa County, California

Sub-Area Land Use and Curve Number Details

Sub-Area Identifier	Land Use	Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
Main	Gravel (w/ right-of-way)	D	.6	91
	User defined urban (Click button or	D	15	81
	Legume/Rot. Meadow Contoured (good)	C	49.5	78
	Farmsteads	D	2.5	86
	Total Area / Weighted Curve Number		67.6	79

DAS

Red Dirt Grapes
Rector South, Post-Project
Napa County, California

Sub-Area Land Use and Curve Number Details

Sub-Area Identifier	Land Use		Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
Main	Gravel (w/ right-of-way)		D	.6	91
	Vineyard (Annual grass)	(good)	D	15	81
	Broadleaf Chaparral	(good)	D	49.5	78
	Farmsteads		D	2.5	86
	Total Area / Weighted Curve Number			67.6	79

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NOAA ATLAS 14 POINT PRECIPITATION FREQUENCY ESTIMATES: CA

Data description

Data type: Precipitation depth **Units:** English **Time series type:** Partial duration

Select location

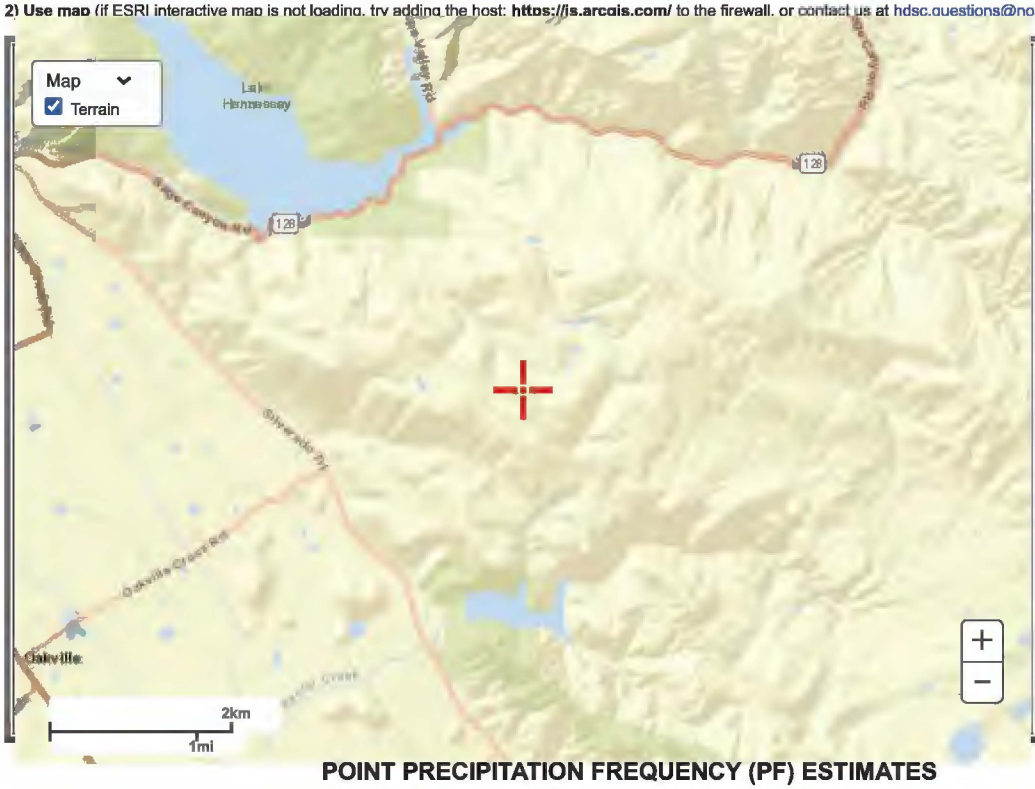
1) Manually:

a) By location (decimal degrees, use "-" for S and W): Latitude: 38.464 Longitude: -122.338 Submit

b) By station (list of CA stations): Select station

c) By address Search

2) Use map (if ESRI interactive map is not loading, try adding the host: **https://js.arcgis.com/** to the firewall, or contact us at hdsc.questions@noaa.gov):



a) Select location
Move crosshair or double click

b) Click on station icon
Show stations on map

Location information:
Name: Napa, California, USA*
Latitude: 38.4640°
Longitude: -122.3380°
Elevation: 1371.75 ft **

* Source: ESRI Maps
** Source: USGS

POINT PRECIPITATION FREQUENCY (PF) ESTIMATES

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

PF tabular | PF graphical | Supplementary information | Print page

PDS-based precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.142** (0.126-0.161)	**0.173** (0.154-0.197)	**0.215** (0.190-0.245)	**0.249** (0.219-0.287)	**0.297** (0.251-0.356)	**0.336** (0.277-0.411)	**0.375** (0.301-0.473)	**0.417** (0.324-0.543)	**0.477** (0.353-0.650)	**0.525** (0.374-0.744)
10-min	**0.203** (0.181-0.231)	**0.248** (0.221-0.282)	**0.308** (0.273-0.351)	**0.357** (0.314-0.411)	**0.426** (0.360-0.510)	**0.481** (0.397-0.589)	**0.538** (0.431-0.678)	**0.598** (0.465-0.778)	**0.684** (0.507-0.932)	**0.752** (0.536-1.07)
15-min	**0.246** (0.219-0.279)	**0.300** (0.267-0.341)	**0.372** (0.330-0.424)	**0.432** (0.379-0.497)	**0.516** (0.436-0.617)	**0.582** (0.480-0.712)	**0.651** (0.522-0.819)	**0.724** (0.562-0.941)	**0.827** (0.613-1.13)	**0.910** (0.649-1.29)
30-min	**0.356** (0.317-0.404)	**0.434** (0.386-0.494)	**0.539** (0.477-0.614)	**0.626** (0.549-0.720)	**0.746** (0.630-0.893)	**0.842** (0.694-1.03)	**0.942** (0.755-1.19)	**1.05** (0.814-1.36)	**1.20** (0.887-1.63)	**1.32** (0.939-1.87)
60-min	**0.522** (0.464-0.592)	**0.637** (0.566-0.724)	**0.790** (0.700-0.900)	**0.917** (0.805-1.06)	**1.09** (0.924-1.31)	**1.23** (1.02-1.51)	**1.38** (1.11-1.74)	**1.54** (1.19-2.00)	**1.75** (1.30-2.39)	**1.93** (1.38-2.74)
2-hr	**0.793** (0.706-0.900)	**0.968** (0.861-1.10)	**1.20** (1.06-1.37)	**1.39** (1.22-1.59)	**1.64** (1.39-1.96)	**1.84** (1.51-2.25)	**2.03** (1.63-2.56)	**2.24** (1.74-2.91)	**2.52** (1.87-3.43)	**2.74** (1.95-3.88)
3-hr	**1.02** (0.907-1.16)	**1.25** (1.11-1.42)	**1.54** (1.36-1.76)	**1.78** (1.56-2.04)	**2.10** (1.77-2.51)	**2.34** (1.93-2.87)	**2.59** (2.07-3.26)	**2.84** (2.20-3.69)	**3.17** (2.35-4.33)	**3.43** (2.45-4.86)
6-hr	**1.54** (1.37-1.75)	**1.89** (1.68-2.15)	**2.34** (2.07-2.67)	**2.70** (2.37-3.10)	**3.17** (2.68-3.79)	**3.53** (2.91-4.32)	**3.89** (3.12-4.89)	**4.25** (3.30-5.52)	**4.72** (3.50-6.44)	**5.08** (3.62-7.20)
12-hr	**2.19**	**2.72**	**3.41**	**3.95**	**4.66**	**5.19**	**5.72**	**6.25**	**6.95**	**7.47**

	(1.95-2.48)	(2.42-3.10)	(3.02-3.88)	(3.46-4.54)	(3.94-5.57)	(4.28-6.36)	(4.59-7.20)	(4.85-8.13)	(5.15-9.47)	(5.32-10.6)
24-hr	**3.07** (2.76-3.48)	**3.89** (3.49-4.41)	**4.93** (4.42-5.61)	**5.75** (5.12-6.59)	**6.84** (5.93-8.05)	**7.65** (6.51-9.16)	**8.45** (7.05-10.3)	**9.25** (7.54-11.6)	**10.3** (8.12-13.3)	**11.1** (8.49-14.8)
2-day	**4.03** (3.62-4.57)	**5.14** (4.62-5.84)	**6.57** (5.89-7.47)	**7.70** (6.85-8.82)	**9.19** (7.96-10.8)	**10.3** (8.77-12.3)	**11.4** (9.52-13.9)	**12.5** (10.2-15.7)	**14.0** (11.0-18.1)	**15.1** (11.5-20.1)
3-day	**4.69** (4.22-5.33)	**6.02** (5.41-6.83)	**7.70** (6.90-8.77)	**9.04** (8.05-10.4)	**10.8** (9.37-12.7)	**12.1** (10.3-14.5)	**13.5** (11.2-16.5)	**14.8** (12.1-18.5)	**16.6** (13.0-21.5)	**17.9** (13.7-23.9)
4-day	**5.22** (4.69-5.92)	**6.70** (6.02-7.60)	**8.58** (7.69-9.77)	**10.1** (8.98-11.5)	**12.1** (10.4-14.2)	**13.5** (11.5-16.2)	**15.0** (12.5-18.3)	**16.5** (13.4-20.6)	**18.4** (14.5-23.9)	**19.9** (15.2-26.6)
7-day	**6.43** (5.79-7.30)	**8.26** (7.42-9.38)	**10.6** (9.48-12.0)	**12.4** (11.0-14.2)	**14.8** (12.8-17.4)	**16.5** (14.1-19.8)	**18.3** (15.3-22.4)	**20.0** (16.3-25.1)	**22.3** (17.6-28.9)	**24.0** (18.4-32.0)
10-day	**7.26** (6.53-8.24)	**9.32** (8.38-10.6)	**11.9** (10.7-13.6)	**13.9** (12.4-16.0)	**16.6** (14.4-19.5)	**18.5** (15.8-22.2)	**20.4** (17.0-25.0)	**22.3** (18.2-27.9)	**24.8** (19.5-32.1)	**26.6** (20.3-35.4)
20-day	**9.50** (8.55-10.8)	**12.2** (11.0-13.9)	**15.6** (14.0-17.7)	**18.2** (16.2-20.8)	**21.5** (18.6-25.3)	**23.9** (20.3-28.6)	**26.2** (21.8-32.0)	**28.4** (23.2-35.5)	**31.3** (24.6-40.5)	**33.4** (25.5-44.5)
30-day	**11.5** (10.3-13.0)	**14.8** (13.3-16.8)	**18.7** (16.8-21.3)	**21.8** (19.4-24.9)	**25.6** (22.2-30.1)	**28.3** (24.1-33.9)	**30.9** (25.8-37.8)	**33.5** (27.3-41.9)	**36.7** (28.9-47.5)	**39.0** (29.8-52.0)
45-day	**14.0** (12.6-15.9)	**17.8** (16.0-20.3)	**22.5** (20.2-25.6)	**26.0** (23.1-29.8)	**30.4** (26.3-35.8)	**33.5** (28.5-40.1)	**36.4** (30.4-44.5)	**39.2** (32.0-49.1)	**42.7** (33.6-55.3)	**45.2** (34.6-60.3)
60-day	**16.7** (15.0-18.9)	**21.1** (19.0-24.0)	**26.4** (23.7-30.0)	**30.4** (27.0-34.8)	**35.3** (30.6-41.5)	**38.7** (33.0-46.4)	**41.9** (35.0-51.3)	**45.0** (36.7-56.3)	**48.8** (38.5-63.3)	**51.5** (39.4-68.7)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

Estimates from the table in CSV format: Precipitation frequency estimates Submit

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  - AASHTO Group Index
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  - Depth to Any Soil Restrictive Layer
  - Drainage Class
  - Frost Action
  - Frost-Free Days
  - Hydrologic Soil Group

View Description | View Rating

View Options

Map ☑

Table ☑

Description of Rating ☑

Rating Options

☐ Detailed Description

Advanced Options

Aggregation Method: Dominant Condition

Component Percent Cutoff

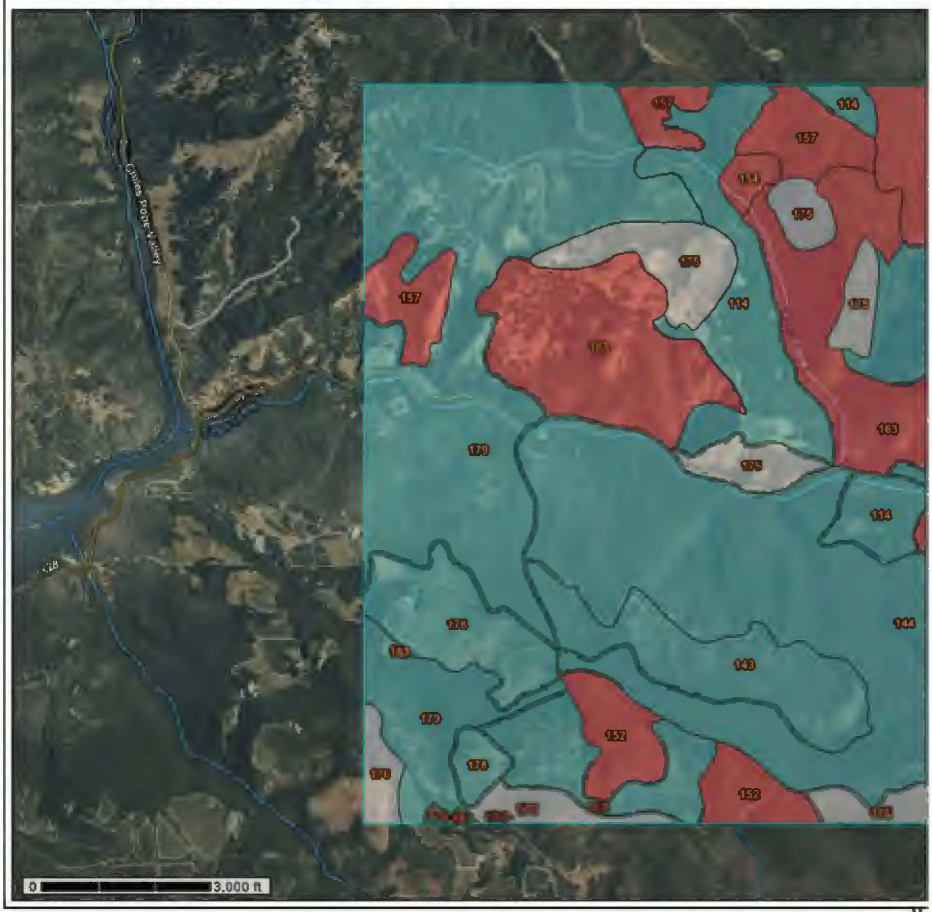
Tie-break Rule: Lower / Higher

View Description | View Rating

- Map Unit Name
- Parent Material Name
- Representative Slope
- Soil Slippage Potential
- Subsidence, Initial
- Subsidence, Total
- Unified Soil Classification (Surface)
- Water Features

Map — Hydrologic Soil Group

Scale (not to scale)



Tables — Hydrologic Soil Group — Summary By Map Unit

Summary by Map Unit — Napa County, California (CA055)

Summary by Map Unit — Napa County, California (CA055)

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
114	Bressa-Dibble complex, 30 to 50 percent slopes	C	245.7	6.4%
143	Guenoc-Rock outcrop complex, 5 to 30 percent slopes	C	254.5	6.6%
144	Guenoc-Rock outcrop complex, 30 to 75 percent slopes	C	780.0	20.2%
152	Hambright rock-Outcrop complex, 30 to 75 percent slopes	D	100.2	2.6%
154	Henneke gravelly loam, 30 to 75 percent slopes	D	251.4	6.5%
157	Lodo-Maymen-Felton association, 30 to 75 percent slopes	D	133.3	3.5%
158	Los Gatos loam, 5 to 30 percent slopes	C	11.9	0.3%
160	Los Gatos loam, 50 to 75 percent slopes	C	213.5	5.5%
161	Maxwell clay, 2 to 9 percent slopes	D	5.4	0.1%
Totals for Area of Interest			**3,861.8**	**100.0%**

Summary by Map Unit — Napa County, California (CA055)

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
163	Maymen-Millsholm-Lodo association, 30-75 percent slopes	D	704.3	18.2%
166	Montara clay loam, 5 to 30 percent slopes	D	5.0	0.1%
171	Pleasanton loam, 2 to 5 percent slopes, MLRA 14	C	20.4	0.5%
175	Rock outcrop		162.1	4.2%
176	Rock outcrop-Hambright complex, 50 to 75 percent slopes		90.8	2.4%
178	Sobrante loam, 5 to 30 percent slopes	C	136.1	3.5%
179	Sobrante loam, 30 to 50 percent slopes	C	738.4	19.1%
180	Tehama silt loam, 0 to 5 percent slopes	C	4.3	0.1%
183	Water		4.3	0.1%
Totals for Area of Interest			**3,861.8**	**100.0%**

Description — Hydrologic Soil Group

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options — Hydrologic Soil Group

Aggregation Method: Dominant Condition

Component Percent Cutoff: *None Specified*

Tie-break Rule: Higher

Land Use	Cover Treatment or Practice	Hydrologic 1/ Condition	Hydrologic Soil Group A	B	C	D
Orchards, deciduous		(See accompanying land-use description)				
Orchards, Evergreen		Poor	55	72	81	86
		Fair	42	64	76	82
		Good	33	58	72	79
Vineyards		(See accompanying land-use description)				
NON-CULTIVATED AGRICULTURAL LAND (Grassland, Woodland, Brushland)						
Annual grass		Poor	65	78	86	89
		Fair	49	69	79	84
		Good	38	61	75	81
Broadleaf chaparral		Poor	53	70	80	85
		Fair	40	63	75	81
		Good	31	57	71	78
Meadow		Poor	63	77	84	90
		Fair	58	70	78	84
		Good	30	58	72	78
Narrowleaf chaparral		Poor	70	82	88	90
		Fair	55	72	81	86
Open brush		Poor	61	76	84	88
		Fair	46	66	77	83
		Good	41	63	75	81

Exhibit 2.1-3

Close-seeded legumes or rotation meadow, contour - Close-seeded legumes or rotation meadow planted on the contour or in straight rows on land with 2 percent slopes or less.

Irrigated pasture - Irrigated land that is planted to perennial grasses and legumes for production of forage and which is cultivated only to establish or renew the stand of plants. For hydrologic purposes, dryland pasture is considered as annual grass.

Orchards, Deciduous - Land planted to such deciduous trees as apples, apricots, pears, walnuts, and almonds. Soil protection during the rainy season is dependent on ground cover. This ground cover may be annual grass or perennial grass cover crops with or without legumes, occasionally legumes alone.

Use curve numbers that apply to the land use or the kind and condition of cover during storm periods; for example, Annual grass curve numbers for annual grass or grass-legume cover. Where orchards are kept bare by disking or the use of herbicides, use Fallow curve numbers.

Because of management practices, ground cover in orchards is seldom continous. Only orchards untilled with more than 75 percent of the ground surface continuously protected by cover are in Good Hydrologic Condition, others are Fair or Poor.

Orchards, Evergreen - Land planted to evergreen trees which include citrus, avocado, and Christmas tree plantations. Soil protection is dependent on ground cover or litter. This ground cover may be annual grass or perennial grass cover crops with or without legumes alone; or the ground protection may be litter where tree canopy is sufficiently dense to produce an effective amount of fallen leaves.

Because of management practices, ground cover in orchards is seldom continous. Only untilled orchards with more than 75 percent of the ground surface continuously protected by litter or plant cover are in Good Hydrologic Condition, others are Fair or Poor.

Vineyards - Land planted to grapes. Soil protection during the rainy season is dependent on ground cover. This ground cover may be annual grass or perennial grass cover crops with or without legumes, occasionally legumes alone.

Use curve numbers that apply to the land use or the kind and condition of cover during the storm periods; for example, Annual grass curve numbers for annual grass or grass legume cover. Where vineyards are kept bare by disking or the use of herbicides, use Fallow curve numbers.

chaparral

chaparral, vegetation composed of broad-leaved evergreen shrubs, bushes, and small trees usually less than 2.5 m (about 8 feet) tall; together they often form dense thickets. Chaparral is found in regions with a climate similar to that of the Mediterranean area, characterized by hot, dry summers and mild, wet winters. The name chaparral is applied primarily to the coastal and inland mountain vegetation of southwestern North America; sometimes it takes the place of a more general term, Mediterranean vegetation, which denotes areas of similar vegetation around the Mediterranean Sea, at the southern tip of Africa, in southwestern Australia, and in central South America.

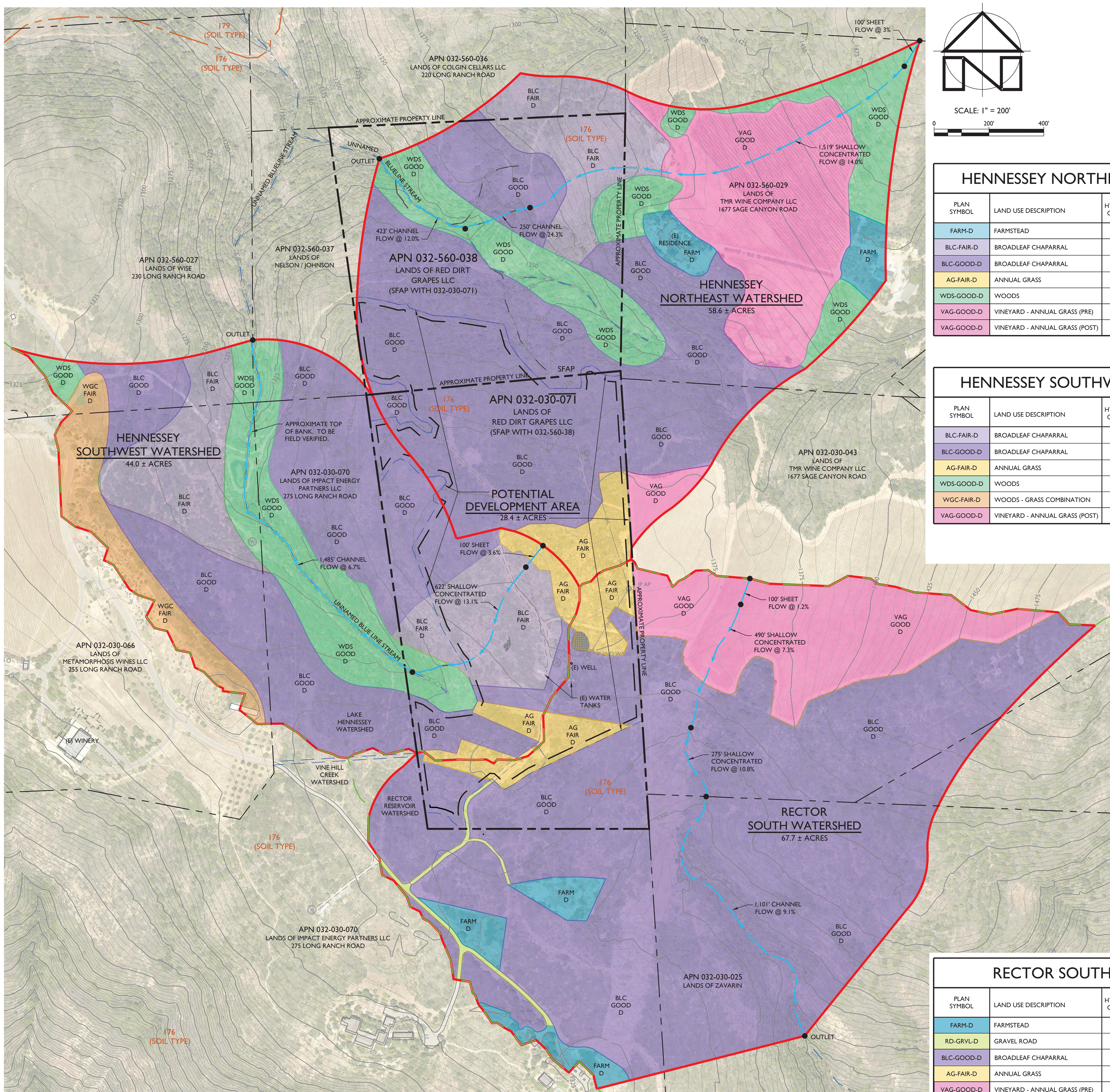
Sages and evergreen oaks are the dominant plants in North American chaparral areas that have an average yearly rainfall of about 500 to 750 mm (20 to 30 inches). Areas with less rainfall or poorer soil have fewer, more drought-resistant shrubs such as chamise and manzanita. Chaparral vegetation becomes extremely dry by late summer. The fires that commonly occur during this period are necessary for the germination of many shrub seeds and also serve to clear away dense ground cover, thus maintaining the shrubby growth form of the vegetation by preventing the spread of trees. Chaparral returns to its prefire density within about 10 years but may become grassland by too frequent burning.

Deer and birds usually inhabit chaparral only during the wet season (the growth period for most chaparral plants), and move northward or to a higher altitude as food becomes scarce during the dry season. Small, dull-coloured animals such as lizards, rabbits, chipmunks, and quail are year-round residents. New chaparral growth provides good grazing for domestic livestock, and chaparral vegetation also is valuable for watershed protection in areas with steep, easily eroded slopes.

Citation Information
Article Title: chaparral
Website Name: Encyclopaedia Britannica
Publisher: Encyclopaedia Britannica, Inc.
Date Published: 18 December 2019
URL: https://www.britannica.com/plant/chaparral
Access Date: December 27, 2021

RED DIRT GRAPES LLC

WATERSHED EXHIBITS



WATERSHED AREAS - EXISTING CONDITIONS

SCALE: 1" = 200'

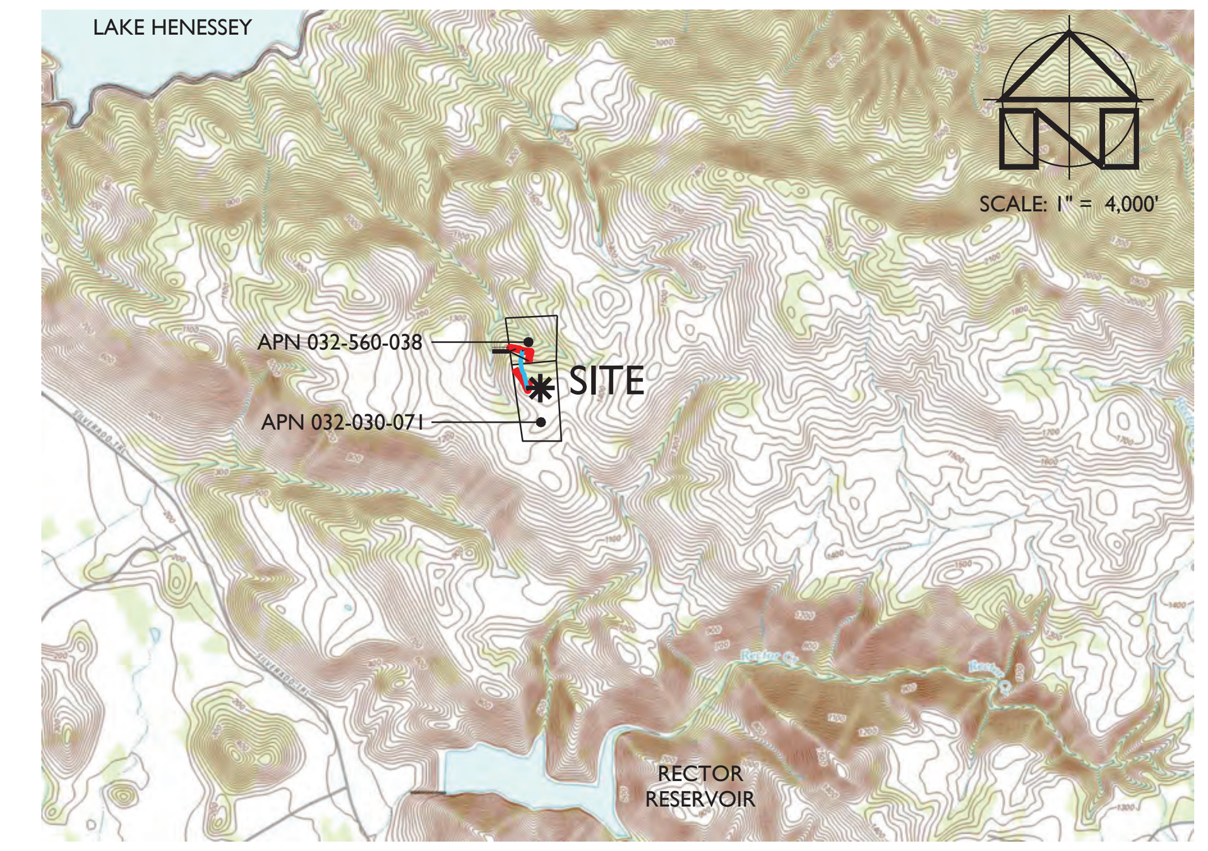
SCALE: 1" = 200'

0 200' 400'

HENNESSEY NORTHEAST WATERSHED AREA SUMMARY							
PLAN SYMBOL	LAND USE DESCRIPTION	HYDROLOGIC CONDITION	HYDROLOGIC SOIL GROUP	CURVE NUMBER (CN)	PRE-PROJECT (ACRES)	REMOVED (ACRES)	POST-PROJECT
FARM-D	FARMSTEAD	N/A	D	86	1.7 ± AC	0	1.7 ± AC
BLC-FAIR-D	BROADLEAF CHAPARRAL	FAIR	D	81	5.2 ± AC	0	5.2 ± AC
BLC-GOOD-D	BROADLEAF CHAPARRAL	GOOD	D	78	28.8 ± AC	12.0 ± AC	16.8 ± AC
AG-FAIR-D	ANNUAL GRASS	FAIR	D	84	1.8 ± AC	1.8 ± AC	0 ± AC
WDS-GOOD-D	WOODS	GOOD	D	77	9.8 ± AC	0	9.8 ± AC
VAG-GOOD-D	VINEYARD - ANNUAL GRASS (PRE)	GOOD	D	81	11.8 ± AC	0	11.8 ± AC
VAG-GOOD-D	VINEYARD - ANNUAL GRASS (POST)	GOOD	D	81	-	-	13.8 ± AC
				TOTALS	59.1 ± AC	13.8 ± AC	59.1 ± AC

HENNESSEY SOUTHWEST WATERSHED AREA SUMMARY							
PLAN SYMBOL	LAND USE DESCRIPTION	HYDROLOGIC CONDITION	HYDROLOGIC SOIL GROUP	CURVE NUMBER (CN)	PRE-PROJECT (ACRES)	REMOVED (ACRES)	POST-PROJECT
BLC-FAIR-D	BROADLEAF CHAPARRAL	FAIR	D	81	9.7 ± AC	4.1 ± AC	5.6 ± AC
BLC-GOOD-D	BROADLEAF CHAPARRAL	GOOD	D	78	21.0 ± AC	3.5 ± AC	17.5 ± AC
AG-FAIR-D	ANNUAL GRASS	FAIR	D	84	1.5 ± AC	1.5 ± AC	0 ± AC
WDS-GOOD-D	WOODS	GOOD	D	77	7.9 ± AC	0	7.9 ± AC
WGC-FAIR-D	WOODS - GRASS COMBINATION	FAIR	D	82	3.9 ± AC	0	3.9 ± AC
VAG-GOOD-D	VINEYARD - ANNUAL GRASS (POST)	GOOD	D	81	-	-	9.1 ± AC
				TOTALS	44.0 ± AC	9.1 ± AC	44.0 ± AC

RECTOR SOUTH WATERSHED AREA SUMMARY							
PLAN SYMBOL	LAND USE DESCRIPTION	HYDROLOGIC CONDITION	HYDROLOGIC SOIL GROUP	CURVE NUMBER (CN)	PRE-PROJECT (ACRES)	REMOVED (ACRES)	POST-PROJECT
FARM-D	FARMSTEAD	N/A	D	86	2.5 ± AC	0	2.5 ± AC
RD-GRVL-D	GRAVEL ROAD	N/A	D	91	0.6 ± AC	0	0.6 ± AC
BLC-GOOD-D	BROADLEAF CHAPARRAL	GOOD	D	78	52.2 ± AC	2.7 ± AC	49.5 ± AC
AG-FAIR-D	ANNUAL GRASS	FAIR	D	84	2.5 ± AC	2.5 ± AC	0
VAG-GOOD-D	VINEYARD - ANNUAL GRASS (PRE)	GOOD	D	81	9.8 ± AC	0	9.8 ± AC
VAG-GOOD-D	VINEYARD - ANNUAL GRASS (POST)	GOOD	D	81	-	-	5.2 ± AC
				TOTALS	67.6 ± AC	5.2 ± AC	67.6 ± AC



LOCATION MAP

SCALE: 1" = 4,000'

PROJECT INFORMATION:

PROPERTY OWNER & APPLICANT:
RED DIRT GRAPES LLC
9000 CAMERON PARKWAY
OAKLAHOMA CITY, OK 73114

SITE ADDRESS:
LONG RANCH ROAD

ASSESSOR'S PARCEL NUMBERS:
032-030-071 & 032-560-038 (SFAP)

PARCEL SIZES:
32.2 ± ACRES & 22.5 ± ACRES, RESPECTIVELY

ZONING:
AGRICULTURAL WATERSHED (AW)

SHEET INDEX:

NOTES:

1. FADED BACKGROUND REPRESENTS EXISTING TOPOGRAPHIC FEATURES. TOPOGRAPHIC INFORMATION WAS TAKEN FROM THE NAPA COUNTY GEOGRAPHIC INFORMATION SYSTEM DATABASE. APPLIED CIVIL ENGINEERING INCORPORATED ASSUMES NO LIABILITY REGARDING THE ACCURACY OR COMPLETENESS OF THE TOPOGRAPHIC INFORMATION.
2. AERIAL PHOTOGRAPHS WERE OBTAINED FROM THE NAPA COUNTY GEOGRAPHIC INFORMATION SYSTEM (GIS) DATABASE, TAKEN APRIL TO JUNE 2018 AND MAY NOT REPRESENT CURRENT CONDITIONS.
3. CONTOUR INTERVAL: FIVE (5) FEET, HIGHLIGHTED EVERY TWENTY FIVE (25) FEET.
4. BENCHMARK: NAVD 88
5. THE PROPERTY LINES SHOWN ON THESE PLANS DO NOT REPRESENT A BOUNDARY SURVEY. THEY ARE APPROXIMATE AND ARE PROVIDED FOR GENERAL INFORMATIONAL PURPOSES ONLY.

SOIL TYPE LEGEND:

176 ROCK OUTCROP - HAMBRIGHT COMPLEX, 50% TO 75% SLOPES.

179 SOBRANTE LOAM, 30% TO 50% SLOPES.

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

LEGEND:

- APPROXIMATE PROPERTY LINE
- SOIL TYPE BOUNDARY
- BLUELINE STREAM
- WATERS OF THE US / EPHEMERAL STREAM (AS LOCATED BY PROJECT BIOLOGIST)
- POTENTIAL DEVELOPMENT AREA OUTLINE
- WATERSHED BOUNDARY
- WATERSHED AREAS

APPLIED CIVIL ENGINEERING INCORPORATED
2074 West Lincoln Avenue
Napa, CA 94558
(707) 320-4968 (707) 320-2395 Fax
www.appliedcivil.com

RED DIRT GRAPES LLC

WATERSHED EXHIBITS

WATERSHED AREAS - EXISTING CONDITIONS

PREPARED UNDER THE DIRECTION OF:

PRELIMINARY NOT FOR CONSTRUCTION

DRAWN BY: PowerCAD

CHECKED BY: MRM

DATE: JANUARY 2022

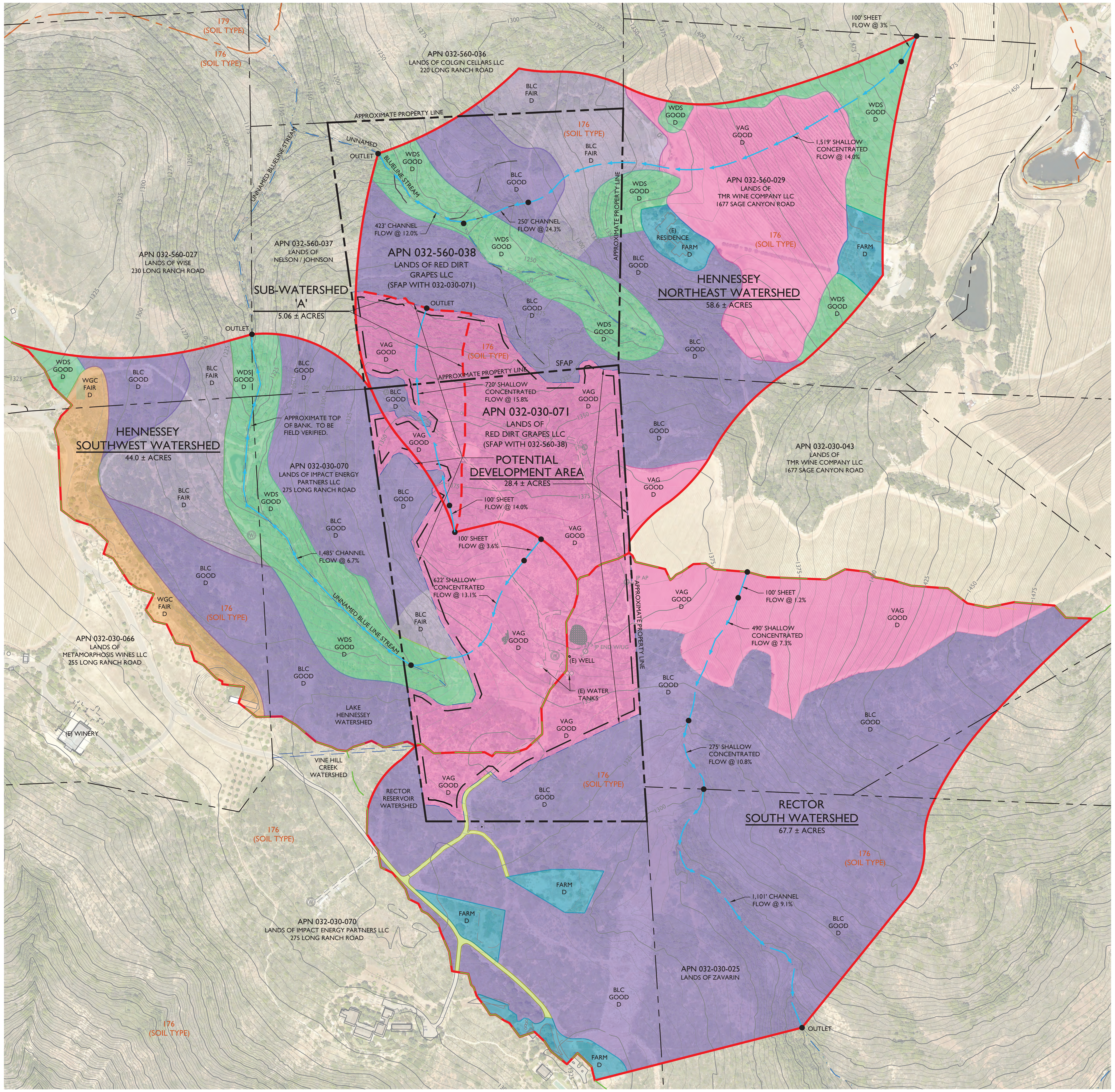
REVISIONS: BY:

JOB NUMBER: 21-113

FILE: 21-113EXH_WTRSHD.DWG

ORIGINAL SIZE: 24" X 36"

SHEET NUMBER: 1 OF 2



WATERSHED AREAS - PROPOSED CONDITIONS

SCALE: 1" = 200'

SCALE: 1" = 200'
0 200' 400'

HENNESSEY NORTHEAST WATERSHED AREA SUMMARY

PLAN SYMBOL	LAND USE DESCRIPTION	HYDROLOGIC CONDITION	HYDROLOGIC SOIL GROUP	CURVE NUMBER (CN)	PRE-PROJECT (ACRES)	REMOVED (ACRES)	POST-PROJECT
FARM-D	FARMSTEAD	N/A	D	86	1.7 ± AC	0	1.7 ± AC
BLC-FAIR-D	BROADLEAF CHAPARRAL	FAIR	D	81	5.2 ± AC	0	5.2 ± AC
BLC-GOOD-D	BROADLEAF CHAPARRAL	GOOD	D	78	28.8 ± AC	12.0 ± AC	16.8 ± AC
AG-FAIR-D	ANNUAL GRASS	FAIR	D	84	1.8 ± AC	1.8 ± AC	0 ± AC
WDS-GOOD-D	WOODS	GOOD	D	77	9.8 ± AC	0	9.8 ± AC
VAG-GOOD-D	VINEYARD - ANNUAL GRASS (PRE)	GOOD	D	81	11.8 ± AC	0	11.8 ± AC
VAG-GOOD-D	VINEYARD - ANNUAL GRASS (POST)	GOOD	D	81	-	-	13.8 ± AC
				TOTALS	59.1 ± AC	13.8 ± AC	59.1 ± AC

HENNESSEY SOUTHWEST WATERSHED AREA SUMMARY

PLAN SYMBOL	LAND USE DESCRIPTION	HYDROLOGIC CONDITION	HYDROLOGIC SOIL GROUP	CURVE NUMBER (CN)	PRE-PROJECT (ACRES)	REMOVED (ACRES)	POST-PROJECT
BLC-FAIR-D	BROADLEAF CHAPARRAL	FAIR	D	81	9.7 ± AC	4.1 ± AC	5.6 ± AC
BLC-GOOD-D	BROADLEAF CHAPARRAL	GOOD	D	78	21.0 ± AC	3.5 ± AC	17.5 ± AC
AG-FAIR-D	ANNUAL GRASS	FAIR	D	84	1.5 ± AC	1.5 ± AC	0 ± AC
WDS-GOOD-D	WOODS	GOOD	D	77	7.9 ± AC	0	7.9 ± AC
WGC-FAIR-D	WOODS - GRASS COMBINATION	FAIR	D	82	3.9 ± AC	0	3.9 ± AC
VAG-GOOD-D	VINEYARD - ANNUAL GRASS (POST)	GOOD	D	81	-	-	9.1 ± AC
				TOTALS	44.0 ± AC	9.1 ± AC	44.0 ± AC

RECTOR SOUTH WATERSHED AREA SUMMARY

PLAN SYMBOL	LAND USE DESCRIPTION	HYDROLOGIC CONDITION	HYDROLOGIC SOIL GROUP	CURVE NUMBER (CN)	PRE-PROJECT (ACRES)	REMOVED (ACRES)	POST-PROJECT
FARM-D	FARMSTEAD	N/A	D	86	2.5 ± AC	0	2.5 ± AC
RD-GRVL-D	GRAVEL ROAD	N/A	D	91	0.6 ± AC	0	0.6 ± AC
BLC-GOOD-D	BROADLEAF CHAPARRAL	GOOD	D	78	52.2 ± AC	2.7 ± AC	49.5 ± AC
AG-FAIR-D	ANNUAL GRASS	FAIR	D	84	2.5 ± AC	2.5 ± AC	0
VAG-GOOD-D	VINEYARD - ANNUAL GRASS (PRE)	GOOD	D	81	9.8 ± AC	0	9.8 ± AC
VAG-GOOD-D	VINEYARD - ANNUAL GRASS (POST)	GOOD	D	81	-	-	5.2 ± AC
				TOTALS	67.6 ± AC	5.2 ± AC	67.6 ± AC

SUB-WATERSHED 'A' AREA SUMMARY

PLAN SYMBOL	LAND USE DESCRIPTION	HYDROLOGIC CONDITION	HYDROLOGIC SOIL GROUP	CURVE NUMBER (CN)	POST-PROJECT
BLC-GOOD-D	BROADLEAF CHAPARRAL	GOOD	D	78	0.53 ± AC
VAG-GOOD-D	VINEYARD - ANNUAL GRASS	GOOD	D	81	4.53 ± AC
				TOTALS	5.06 ± AC

SOIL TYPE LEGEND:

176 ROCK OUTCROP - HAMBRIGHT COMPLEX, 50% TO 75% SLOPES.

179 SOBRANTE LOAM, 30% TO 50% SLOPES.

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

LEGEND:

- APPROXIMATE PROPERTY LINE
- SOIL TYPE BOUNDARY
- BLUELINE STREAM
- WATERS OF THE US / EPHEMERAL STREAM (AS LOCATED BY PROJECT BIOLOGIST)
- POTENTIAL DEVELOPMENT AREA OUTLINE
- WATERSHED BOUNDARY
- WATERSHED AREAS
- SUB-WATERSHED AREA

APPLIED CIVIL ENGINEERING INCORPORATED
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Napa, CA 94558
(707) 320-4968 (707) 320-2395 Fax
www.appliedcivil.com

RED DIRT GRAPES LLC

WATERSHED EXHIBITS

WATERSHED AREAS - PROPOSED CONDITIONS

PREPARED UNDER THE DIRECTION OF:

REGISTERED PROFESSIONAL ENGINEER
MICHAEL R. MUELRATH
NO. 67435
Exp. 12/31/2022
CIVIL
STATE OF CALIFORNIA
PRELIMINARY NOT FOR CONSTRUCTION

DRAWN BY: PowerCAD

CHECKED BY: MRM

DATE: JANUARY 2022

REVISIONS: BY:

JOB NUMBER: 21-113

FILE: 21-113EXH_WTRSHD.DWG

ORIGINAL SIZE: 24" X 36"

SHEET NUMBER: 2 OF 2

HYDROLOGIC ANALYSIS
RED DIRT GRAPES, LLC
PROPOSED NEW VINEYARD
LONG RANCH ROAD
ST. HELENA, CA 95476
APN 032-030-071; 032-560-038
JULY 1, 2022

REFER TO ORINAL ANALYSIS DATD JANUARY 17, 2022 FOR FULL BACKGROUND

THIS ANALYSIS SUPPLEMENTS THE ORIGINAL AND RESPONDS TO COMMENTS FROM NAPA COUNTY ENGINEERING TO BREAK THE HENNESEY NORTHEAST WATERSHED INTO TWO SMALLER SUB-WATERSHEDS AND ALSO REVISE THE FLOW PATH IN THE RECTOR SOUTH WATERSHED. PLEASE SEE ATTACHED TR-55 ANALYSIS AND COMMENTS BELOW.

Calculations for Hennessey East Northeast Watershed Retention Requirements

- A manually-entered Tc increase of .022 hours brings the post-project, 100-year peak of the Hennessey East Northeast WS (17.09 cfs) to parity with the pre-project peak (16.81 cfs).
- Sub-WS B will generate a 100-year peak of 4.85 cfs.
- .022 hours x 3600 seconds/hour = 79.2 seconds
- 79.2 seconds x 4.85 cfs = 384.1 cubic feet of required storage volume
- 384.1 cf / .33 void ratio = **1164 cf of rock in structure**

- A manually-entered Tc increase of .056 hours brings the post-project, 2-year peak of the Hennessey East Northeast WS (5.62 cfs) to parity with the pre-project peak (5.39 cfs).
- Sub-WS B will generate a 2-year peak of 1.83 cfs.
- .056 hours x 3600 seconds/hour = 201.6 seconds
- 201.6 seconds x 1.83 cfs = 368.9 cubic feet of required storage volume
- 368.9 < 384.1 cf (determinative retention requirement based on 100-year peak)

Calculations for Hennessey West Northeast Watershed Retention Requirements

- A manually-entered Tc increase of .021 hours brings the post-project, 100-year peak of the Hennessey West Northeast WS (9.27 cfs) to parity with the pre-project peak (9.11
- cfs).
- Sub-WS A will generate a 100-year peak of 5.41 cfs.
- .021 hours x 3600 seconds/hour = 75.6 seconds
- 75.6 seconds x 5.41 cfs = 409 cubic feet of required storage volume
- 409 cf / .33 void ratio = **1239.4 cf of rock in structure**

- A manually-entered Tc increase of .050 hours brings the post-project, 2-year peak of the Hennessey West Northeast WS (2.98 cfs) to parity with the pre-project peak (2.85 cfs).

Tc Flowpath for Rector South Watershed

- Sheet flow: 100’ @ 2%
- Shallow Concentrated: 290’ @ 6.2%
- Shallow Concentrated: 620’ @ 10%
- Channel flow: 1101’ @ 9.1%

Tc Flowpath for ENE Watershed

- Sheet flow: 100’ @ 3%
- Shallow Concentrated: 240’ @ 4.6%
- Shallow Concentrated: 508’ @ 14.4%
- Channel Flow: 480’ @ 14.3%

Tc Flowpath for WNE Watershed

- Sheet flow: 100’ @ 14%
- Shallow Concentrated: 720’ @ 15.8%
- Shallow Concentrated: 420’ @ 30.5%

Tc Flowpath for Sub-Watershed A

- Sheet flow: 100’ @ 14%
- Shallow Concentrated: 720’ @ 15.8%

Tc Flowpath for Sub-Watershed B

- Sheet flow: 100’ @ 3%
- Shallow Concentrated: 240’ @ 4.6%
- Shallow Concentrated: 418’ @ 11.7%

Reach Data

- Reach 1: 250’ @ 7.2%
- Reach 2: 160’ @ 18.1%

- Sub-WS A will generate a 2-year peak of 1.64 cfs.
- .050 hours x 3600 seconds/hour = 180 seconds
- 180 seconds x 1.64 cfs = 295.2 cubic feet of required storage volume
- 295.2 < 409 cf (determinative retention requirement based on 100-year peak)

DAS

Red Dirt Grapes
Rector South, Tc rev, Pre-Project
Napa County, California

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period 2-Yr (cfs)	(hr)	5-Yr (cfs)	(hr)	10-Yr (cfs)	(hr)	25-Yr (cfs)	(hr)	50-Yr (cfs)	(hr)	100-Yr (cfs)	(hr)
SUBAREAS												
Main	19.93	12.19	29.25	12.20	36.82	12.19	47.05	12.19	56.53	12.19	62.23	12.19
REACHES												
OUTLET	19.93		29.25		36.82		47.05		56.53		62.23	

DAS

Red Dirt Grapes
Rector South, Tc rev, Pre-Project
Napa County, California

Storm Data

Rainfall Depth by Rainfall Return Period

2-Yr (in)	5-Yr (in)	10-Yr (in)	25-Yr (in)	50-Yr (in)	100-Yr (in)	-Yr (in)
3.89	4.93	5.75	6.84	7.85	8.45	.0

Storm Data Source: User-provided custom storm data
Rainfall Distribution Type: Type CA-1
Dimensionless Unit Hydrograph: <standard>

DAS

Red Dirt Grapes
Rector South, Tc rev, Pre-Project
Napa County, California

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
Main							
SHEET	100	0.0200	0.150				0.148
SHALLOW	290	0.0620	0.050				0.020
SHALLOW	620	0.1000	0.050				0.034
CHANNEL	1101	0.0910	0.050	5.00	8.00	6.507	0.047
					Time of Concentration		.249

DAS

Red Dirt Grapes
Rector South, Tc rev, Pre-Project
Napa County, California

Sub-Area Land Use and Curve Number Details

Sub-Area Identifier	Land Use	Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
Main	Open space; grass cover 50% to 75% (fair)	D	2.5	84
	Gravel (w/ right-of-way)	D	.6	91
	User defined urban (Click button or	D	9.8	81
	Legume/Rot. Meadow Contoured (good)	C	52.2	78
	Farmsteads	D	2.5	86
	Total Area / Weighted Curve Number		67.6	79

DAS

Red Dirt Grapes
Rector South, Tc rev, Pre-Project
Napa County, California

Sub-Area Land Use and Curve Number Details

Sub-Area Identifier	Land Use		Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
Main	Annual grass	(fair)	D	2.5	84
	Gravel (w/ right-of-way)		D	.6	91
	Vineyard (annual grass)	(good)	D	9.8	81
	Broadleaf Chaparral	(good)	D	52.2	78
	Farmsteads		D	2.5	86
	Total Area / Weighted Curve Number			67.6	79

DAS

Red Dirt Grapes
Rector South, Tc rev, Post-Project
Napa County, California

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period 2-Yr (cfs)	(hr)	5-Yr (cfs)	(hr)	10-Yr (cfs)	(hr)	25-Yr (cfs)	(hr)	50-Yr (cfs)	(hr)	100-Yr (cfs)	(hr)
SUBAREAS												
Main	19.93	12.19	29.25	12.20	36.82	12.19	47.05	12.19	56.53	12.19	62.23	12.19
REACHES												
OUTLET	19.93		29.25		36.82		47.05		56.53		62.23	

DAS

Red Dirt Grapes
Rector South, Tc rev, Post-Project
Napa County, California

Storm Data

Rainfall Depth by Rainfall Return Period

2-Yr (in)	5-Yr (in)	10-Yr (in)	25-Yr (in)	50-Yr (in)	100-Yr (in)	-Yr (in)
3.89	4.93	5.75	6.84	7.85	8.45	.0

Storm Data Source: User-provided custom storm data
Rainfall Distribution Type: Type CA-1
Dimensionless Unit Hydrograph: <standard>

DAS

Red Dirt Grapes
Rector South, Tc rev, Post-Project
Napa County, California

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
Main							
SHEET	100	0.0200	0.150				0.148
SHALLOW	290	0.0620	0.050				0.020
SHALLOW	620	0.1000	0.050				0.034
CHANNEL	1101	0.0910	0.050	5.00	8.00	6.507	0.047
					Time of Concentration		.249

DAS

Red Dirt Grapes
Rector South, Tc rev, Post-Project
Napa County, California

Sub-Area Land Use and Curve Number Details

Sub-Area Identifier	Land Use	Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
Main	Gravel (w/ right-of-way)	D	.6	91
	User defined urban (Click button or	D	15	81
	Legume/Rot. Meadow Contoured (good)	C	49.5	78
	Farmsteads	D	2.5	86
	Total Area / Weighted Curve Number		67.6	79

DAS

Red Dirt Grapes
Rector South, Tc rev, Post-Project
Napa County, California

Sub-Area Land Use and Curve Number Details

Sub-Area Identifier	Land Use		Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
Main	Gravel (w/ right-of-way)		D	.6	91
	Vineyard (annual grass)	(good)	D	15	81
	Legume/Rot. Meadow Contoured	(good)	C	49.5	78
	Farmsteads		D	2.5	86
	Total Area / Weighted Curve Number			67.6	79

DAS

Red Dirt Grapes
New Hennessey Northeast, Pre-Project
Napa County, California

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period 2-Yr (cfs)	(hr)	5-Yr (cfs)	(hr)	10-Yr (cfs)	(hr)	25-Yr (cfs)	(hr)	50-Yr (cfs)	(hr)	100-Yr (cfs)	(hr)
SUBAREAS												
ENE	5.39	12.16	7.91	12.15	9.96	12.16	12.72	12.16	14.78	12.16	16.81	12.16
WNE	2.85	12.12	4.23	12.12	5.35	12.12	6.86	12.12	7.99	12.12	9.11	12.12
REACHES												
Reach 1	5.39	12.16	7.91	12.16	9.96	12.16	12.72	12.16	14.78	12.16	16.81	12.16
Down	5.39	12.16	7.91	12.16	9.96	12.17	12.71	12.17	14.77	12.17	16.80	12.16
Reach 2	8.11	12.14	11.95	12.14	15.06	12.14	19.28	12.14	22.43	12.14	25.55	12.14
Down	8.11	12.15	11.95	12.14	15.06	12.15	19.28	12.15	22.43	12.15	25.55	12.14
OUTLET	8.11		11.95		15.06		19.28		22.43		25.55	

DAS

Red Dirt Grapes
New Hennessey Northeast, Pre-Project
Napa County, California

Storm Data

Rainfall Depth by Rainfall Return Period

2-Yr (in)	5-Yr (in)	10-Yr (in)	25-Yr (in)	50-Yr (in)	100-Yr (in)	-Yr (in)
3.89	4.93	5.75	6.84	7.65	8.45	.0

Storm Data Source: User-provided custom storm data
Rainfall Distribution Type: Type CA-1
Dimensionless Unit Hydrograph: <standard>

DAS

Red Dirt Grapes
New Hennessey Northeast, Pre-Project
Napa County, California

Reach Summary Table

Reach Identifier	Receiving Reach Identifier	Reach Length (ft)	Routing Method
Reach 1	Reach 2	250	CHANNEL
Reach 2	Outlet	160	CHANNEL

DAS

Red Dirt Grapes
New Hennessey Northeast, Pre-Project
Napa County, California

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
ENE							
SHEET	100	0.0300	0.150				0.126
SHALLOW	240	0.0460	0.050				0.019
SHALLOW	508	0.1440	0.050				0.023
CHANNEL	480	0.1430	0.045	4.00	6.00	9.524	0.014
					Time of Concentration		.182
WNE							
SHEET	100	0.1400	0.150				0.068
SHALLOW	720	0.1580	0.050				0.031
SHALLOW	410	0.3050	0.050				0.013
					Time of Concentration		.112

DAS

Red Dirt Grapes
New Hennessey Northeast, Pre-Project
Napa County, California

Sub-Area Land Use and Curve Number Details

Sub-Area Identifier	Land Use		Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
ENE	Open space; grass cover 50% to 75%	(fair)	D	1.8	84
	User defined urban (Click button or		D	.83	81
	Legume/Rot. Meadow Contoured	(good)	C	13.13	78
	Woods	(good)	D	1.64	77
	Total Area / Weighted Curve Number			17.4	79
				====	==
WNE	Legume/Rot. Meadow Contoured	(good)	C	8.39	78
	Woods	(good)	D	.65	77
	Total Area / Weighted Curve Number			9.04	78
				====	==

DAS

Red Dirt Grapes
New Hennessey Northeast, Pre-Project
Napa County, California

Sub-Area Land Use and Curve Number Details

Sub-Area Identifier	Land Use		Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
ENE	Annual grass	(fair)	D	1.8	84
	Vineyard (annual grass)	(good)	D	.83	81
	Broadleaf Chaparral	(good)	D	13.13	78
	Woods	(good)	D	1.64	77
	Total Area / Weighted Curve Number			17.4	79
WNE	Broadleaf Chaparral	(good)	C	8.39	78
	Woods	(good)	D	.65	77
	Total Area / Weighted Curve Number			9.04	78

DAS

Red Dirt Grapes
New Hennessey Northeast, Post-Project
Napa County, California

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period 2-Yr (cfs)	(hr)	5-Yr (cfs)	(hr)	10-Yr (cfs)	(hr)	25-Yr (cfs)	(hr)	50-Yr (cfs)	(hr)	100-Yr (cfs)	(hr)
SUBAREAS												
ENE	5.62	12.16	8.17	12.15	10.22	12.15	12.99	12.15	15.06	12.16	17.09	12.16
WNE	2.98	12.12	4.37	12.12	5.49	12.13	7.01	12.12	8.15	12.12	9.27	12.12
REACHES												
Reach 1	5.62	12.16	8.17	12.15	10.22	12.15	12.99	12.15	15.06	12.16	17.09	12.16
Down	5.62	12.16	8.17	12.17	10.22	12.16	12.99	12.16	15.05	12.17	17.09	12.16
Reach 2	8.46	12.14	12.34	12.14	15.48	12.14	19.71	12.14	22.87	12.14	25.99	12.14
Down	8.46	12.15	12.34	12.14	15.47	12.15	19.70	12.14	22.87	12.14	25.99	12.15
OUTLET	8.46		12.34		15.47		19.70		22.87		25.99	

DAS

Red Dirt Grapes
New Hennessey Northeast, Post-Project
Napa County, California

Storm Data

Rainfall Depth by Rainfall Return Period

2-Yr (in)	5-Yr (in)	10-Yr (in)	25-Yr (in)	50-Yr (in)	100-Yr (in)	-Yr (in)
3.89	4.93	5.75	6.84	7.65	8.45	.0

Storm Data Source: User-provided custom storm data
Rainfall Distribution Type: Type CA-1
Dimensionless Unit Hydrograph: <standard>

DAS

Red Dirt Grapes
New Hennessey Northeast, Post-Project
Napa County, California

Reach Summary Table

Reach Identifier	Receiving Reach Identifier	Reach Length (ft)	Routing Method
Reach 1	Reach 2	250	CHANNEL
Reach 2	Outlet	160	CHANNEL

DAS

Red Dirt Grapes
New Hennessey Northeast, Post-Project
Napa County, California

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
ENE							
SHEET	100	0.0300	0.150				0.126
SHALLOW	240	0.0460	0.050				0.019
SHALLOW	508	0.1440	0.050				0.023
CHANNEL	480	0.1430	0.045	4.00	6.00	9.524	0.014
					Time of Concentration		.182
WNE							
SHEET	100	0.1400	0.150				0.068
SHALLOW	720	0.1580	0.050				0.031
SHALLOW	410	0.3050	0.050				0.013
					Time of Concentration		0.112

DAS

Red Dirt Grapes
New Hennessey Northeast, Post-Project
Napa County, California

Sub-Area Land Use and Curve Number Details

Sub-Area Identifier	Land Use		Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
ENE	User defined urban (Click button or		D	9.46	81
	Legume/Rot. Meadow Contoured	(good)	C	6.3	78
	Woods	(good)	D	1.64	77
	Total Area / Weighted Curve Number			17.4	80
				====	==
WNE	User defined urban (Click button or		D	4.53	81
	Legume/Rot. Meadow Contoured	(good)	C	3.86	78
	Woods	(good)	D	.65	77
	Total Area / Weighted Curve Number			9.04	79
				====	==

DAS

Red Dirt Grapes
New Hennessey Northeast, Post-Project
Napa County, California

Sub-Area Land Use and Curve Number Details

Sub-Area Identifier	Land Use		Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
ENE	Vineyard (annual grass)	(good)	D	9.46	81
	Broadleaf Chaparral	(good)	D	6.3	78
	Woods	(good)	D	1.64	77
	Total Area / Weighted Curve Number			17.4	80
				====	==
WNE	Vineyard (annual grass)	(good)	D	4.53	81
	Broadleaf Chaparral	(good)	D	3.86	78
	Woods	(good)	D	.65	77
	Total Area / Weighted Curve Number			9.04	79
				====	==

DAS

Red Dirt Grapes
Hennessey WNE Sub WS A, Post-Project
Napa County, California

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period					
	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
	(cfs) (hr)	(cfs) (hr)	(cfs) (hr)	(cfs) (hr)	(cfs) (hr)	(cfs) (hr)
SUBAREAS						
Main	1.83 12.12	2.63 12.11	3.27 12.12	4.14 12.12	4.78 12.12	5.41 12.12
REACHES						
OUTLET	1.83	2.63	3.27	4.14	4.78	5.41

DAS

Red Dirt Grapes
Hennessey WNE Sub WS A, Post-Project
Napa County, California

Storm Data

Rainfall Depth by Rainfall Return Period

2-Yr (in)	5-Yr (in)	10-Yr (in)	25-Yr (in)	50-Yr (in)	100-Yr (in)	-Yr (in)
3.89	4.93	5.75	6.84	7.65	8.45	.0

Storm Data Source: User-provided custom storm data
Rainfall Distribution Type: Type CA-1
Dimensionless Unit Hydrograph: <standard>

Red Dirt Grapes
Hennessey WNE Sub WS A, Post-Project
Napa County, California

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
Main							
SHEET	100	0.1400	0.150				0.068
SHALLOW	720	0.1580	0.050				0.031
					Time of Concentration		0.1

DAS

Red Dirt Grapes
Hennessey WNE Sub WS A, Post-Project
Napa County, California

Sub-Area Land Use and Curve Number Details

Sub-Area Identifier	Land Use	Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
Main	User defined urban (Click button or	D	4.53	81
	Legume/Rot. Meadow Contoured (good)	C	.53	78
	Total Area / Weighted Curve Number		5.06	81

DAS

Red Dirt Grapes
Hennessey WNE Sub WS A, Post-Project
Napa County, California

Sub-Area Land Use and Curve Number Details

Sub-Area Identifier	Land Use		Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
Main	Vineyard (annual grass)	(good)	D	4.53	81
	Broadleaf Chaparral	(good)	D	.53	78
	Total Area / Weighted Curve Number			5.06	81

DAS

Red Dirt Grapes
Hennessey ENE Sub WS B, Post-Project
Napa County, California

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period 2-Yr (cfs)	(hr)	5-Yr (cfs)	(hr)	10-Yr (cfs)	(hr)	25-Yr (cfs)	(hr)	50-Yr (cfs)	(hr)	100-Yr (cfs)	(hr)
SUBAREAS												
Main	1.64	12.15	2.36	12.15	2.93	12.14	3.71	12.14	4.28	12.15	4.85	12.15
REACHES												
OUTLET	1.64		2.36		2.93		3.71		4.28		4.85	

DAS

Red Dirt Grapes
Hennessey ENE Sub WS B, Post-Project
Napa County, California

Storm Data

Rainfall Depth by Rainfall Return Period

2-Yr (in)	5-Yr (in)	10-Yr (in)	25-Yr (in)	50-Yr (in)	100-Yr (in)	-Yr (in)
3.89	4.93	5.75	6.84	7.65	8.45	.0

Storm Data Source: User-provided custom storm data
Rainfall Distribution Type: Type CA-1
Dimensionless Unit Hydrograph: <standard>

DAS

Red Dirt Grapes
Hennessey ENE Sub WS B, Post-Project
Napa County, California

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
Main							
SHEET	100	0.0300	0.150				0.126
SHALLOW	240	0.0460	0.050				0.019
SHALLOW	418	0.1170	0.050				0.021
						Time of Concentration	.166

DAS

Red Dirt Grapes
Hennessey ENE Sub WS B, Post-Project
Napa County, California

Sub-Area Land Use and Curve Number Details

Sub-Area Identifier	Land Use	Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
Main	User defined urban (Click button or	D	4.8	81
	Total Area / Weighted Curve Number		4.8	81

DAS

Red Dirt Grapes
Hennessey ENE Sub WS B, Post-Project
Napa County, California

Sub-Area Land Use and Curve Number Details

Sub-Area Identifier	Land Use	Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
Main	Vineyard (annual grass) (good)	D	4.8	81
	Total Area / Weighted Curve Number		4.8	81

DAS

Red Dirt Grapes
New Hennessey Northeast, Post-Project, Tc inc 2
Napa County, California

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period 2-Yr (cfs)	(hr)	5-Yr (cfs)	(hr)	10-Yr (cfs)	(hr)	25-Yr (cfs)	(hr)	50-Yr (cfs)	(hr)	100-Yr (cfs)	(hr)
SUBAREAS												
ENE	5.39	12.19	7.83	12.18	9.81	12.18	12.46	12.18	14.44	12.18	16.40	12.18
WNE	2.85	12.15	4.18	12.15	5.26	12.14	6.72	12.14	7.81	12.15	8.88	12.15
REACHES												
Reach 1	5.39	12.19	7.83	12.18	9.81	12.18	12.46	12.18	14.44	12.18	16.40	12.18
Down	5.39	12.20	7.83	12.20	9.81	12.20	12.46	12.19	14.44	12.19	16.40	12.20
Reach 2	8.13	12.17	11.86	12.17	14.88	12.17	18.95	12.17	21.99	12.17	25.00	12.17
Down	8.13	12.18	11.86	12.18	14.88	12.17	18.95	12.17	21.98	12.18	24.99	12.17
OUTLET	8.13		11.86		14.88		18.95		21.98		24.99	

DAS

Red Dirt Grapes
New Hennessey Northeast, Post-Project, Tc inc 2
Napa County, California

Storm Data

Rainfall Depth by Rainfall Return Period

2-Yr (in)	5-Yr (in)	10-Yr (in)	25-Yr (in)	50-Yr (in)	100-Yr (in)	-Yr (in)
3.89	4.93	5.75	6.84	7.65	8.45	.0

Storm Data Source: User-provided custom storm data
Rainfall Distribution Type: Type CA-1
Dimensionless Unit Hydrograph: <standard>

DAS

Red Dirt Grapes
New Hennessey Northeast, Post-Project, Tc inc 2
Napa County, California

Reach Summary Table

Reach Identifier	Receiving Reach Identifier	Reach Length (ft)	Routing Method
Reach 1	Reach 2	250	CHANNEL
Reach 2	Outlet	160	CHANNEL

DAS

Red Dirt Grapes
New Hennessey Northeast, Post-Project, Tc inc 2
Napa County, California

Sub-Area Land Use and Curve Number Details

Sub-Area Identifier	Land Use		Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
ENE	User defined urban (Click button or		D	9.46	81
	Legume/Rot. Meadow Contoured	(good)	C	6.3	78
	Woods	(good)	D	1.64	77
	Total Area / Weighted Curve Number			17.4	80
WNE	User defined urban (Click button or		D	4.53	81
	Legume/Rot. Meadow Contoured	(good)	C	3.86	78
	Woods	(good)	D	.65	77
	Total Area / Weighted Curve Number			9.04	79

DAS

Red Dirt Grapes
New Hennessey Northeast, Post-Project, Tc inc 2
Napa County, California

Sub-Area Land Use and Curve Number Details

Sub-Area Identifier	Land Use		Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
ENE	Vineyard (annual grass)	(good)	D	9.46	81
	Broadleaf Chaparral	(good)	D	6.3	78
	Woods	(good)	D	1.64	77
	Total Area / Weighted Curve Number			17.4	80
WNE	Vineyard (annual grass)	(good)	D	4.53	81
	Broadleaf Chaparral	(good)	D	3.86	78
	Woods	(good)	D	.65	77
	Total Area / Weighted Curve Number			9.04	79

DAS

Red Dirt Grapes
New Hennessey Northeast, Post-Project, Tc inc 2
Napa County, California

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
ENE							
SHEET	100	0.0300	0.150				0.126
SHALLOW	240	0.0460	0.050				0.019
SHALLOW	508	0.1440	0.050				0.023
CHANNEL	480	0.1430	0.045	4.00	6.00	9.524	0.014
CHANNEL	510	0.0100	0.045	4.00	6.00	2.530	0.056
					Time of Concentration		.238
WNE							
SHEET	100	0.1400	0.150				0.068
SHALLOW	720	0.1580	0.050				0.031
SHALLOW	410	0.3050	0.050				0.013
CHANNEL	775	0.0100	0.045	6.00	4.00	4.306	0.050
					Time of Concentration		.162

DAS

Red Dirt Grapes
New Hennessey Northeast, Post-Project, Tc inc 2
Napa County, California

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
ENE							
SHEET	100	0.0300	0.150				0.126
SHALLOW	240	0.0460	0.050				0.019
SHALLOW	508	0.1440	0.050				0.023
CHANNEL	480	0.1430	0.045	4.00	6.00	9.524	0.014
MANUAL ENTRY							0.056
						Time of Concentration	.238
WNE							
SHEET	100	0.1400	0.150				0.068
SHALLOW	720	0.1580	0.050				0.031
SHALLOW	410	0.3050	0.050				0.013
MANUAL ENTRY							0.050
						Time of Concentration	.162

DAS

Red Dirt Grapes
New Hennessey Northeast, Post-Project, Tc inc 100
Napa County, California

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period 2-Yr (cfs)	(hr)	5-Yr (cfs)	(hr)	10-Yr (cfs)	(hr)	25-Yr (cfs)	(hr)	50-Yr (cfs)	(hr)	100-Yr (cfs)	(hr)
SUBAREAS												
ENE	5.52	12.17	8.03	12.17	10.05	12.17	12.77	12.17	14.81	12.16	16.81	12.17
WNE	2.93	12.13	4.29	12.13	5.40	12.13	6.88	12.13	8.00	12.13	9.10	12.13
REACHES												
Reach 1	5.52	12.17	8.03	12.17	10.05	12.17	12.77	12.17	14.81	12.16	16.81	12.17
Down	5.52	12.17	8.02	12.18	10.05	12.18	12.76	12.17	14.80	12.18	16.80	12.18
Reach 2	8.33	12.16	12.14	12.15	15.23	12.15	19.39	12.15	22.51	12.15	25.59	12.15
Down	8.33	12.16	12.14	12.15	15.23	12.16	19.39	12.15	22.50	12.15	25.58	12.15
OUTLET	8.33		12.14		15.23		19.39		22.50		25.58	

DAS

Red Dirt Grapes
New Hennessey Northeast, Post-Project, Tc inc 100
Napa County, California

Storm Data

Rainfall Depth by Rainfall Return Period

2-Yr (in)	5-Yr (in)	10-Yr (in)	25-Yr (in)	50-Yr (in)	100-Yr (in)	-Yr (in)
3.89	4.93	5.75	6.84	7.65	8.45	.0

Storm Data Source: User-provided custom storm data
Rainfall Distribution Type: Type CA-1
Dimensionless Unit Hydrograph: <standard>

DAS

Red Dirt Grapes
New Hennessey Northeast, Post-Project, Tc inc 100
Napa County, California

Reach Summary Table

Reach Identifier	Receiving Reach Identifier	Reach Length (ft)	Routing Method
Reach 1	Reach 2	250	CHANNEL
Reach 2	Outlet	160	CHANNEL

DAS

Red Dirt Grapes
New Hennessey Northeast, Post-Project, Tc inc 100
Napa County, California

Sub-Area Land Use and Curve Number Details

Sub-Area Identifier	Land Use		Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
ENE	User defined urban (Click button or		D	9.46	81
	Legume/Rot. Meadow Contoured	(good)	C	6.3	78
	Woods	(good)	D	1.64	77
	Total Area / Weighted Curve Number			17.4	80
				====	==
WNE	User defined urban (Click button or		D	4.53	81
	Legume/Rot. Meadow Contoured	(good)	C	3.86	78
	Woods	(good)	D	.65	77
	Total Area / Weighted Curve Number			9.04	79
				====	==

DAS

Red Dirt Grapes
New Hennessey Northeast, Post-Project, Tc inc 100
Napa County, California

Sub-Area Land Use and Curve Number Details

Sub-Area Identifier	Land Use		Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
ENE	Vineyard (annual grass)	(good)	D	9.46	81
	Broadleaf Chaparral	(good)	D	6.3	78
	Woods	(good)	D	1.64	77
	Total Area / Weighted Curve Number			17.4	80
WNE	Vineyard (annual grass)	(good)	D	4.53	81
	Broadleaf Chaparral	(good)	D	3.86	78
	Woods	(good)	D	.65	77
	Total Area / Weighted Curve Number			9.04	79

DAS

Red Dirt Grapes
New Hennessey Northeast, Post-Project, Tc inc 100
Napa County, California

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
ENE							
SHEET	100	0.0300	0.150				0.126
SHALLOW	240	0.0460	0.050				0.019
SHALLOW	508	0.1440	0.050				0.023
CHANNEL	480	0.1430	0.045	4.00	6.00	9.524	0.014
CHANNEL	200	0.0100	0.045	4.00	6.00	2.525	0.022
					Time of Concentration		.204
WNE							
SHEET	100	0.1400	0.150				0.068
SHALLOW	720	0.1580	0.050				0.031
SHALLOW	410	0.3050	0.050				0.013
CHANNEL	325	0.0100	0.045	6.00	4.00	4.299	0.021
					Time of Concentration		.133

DAS

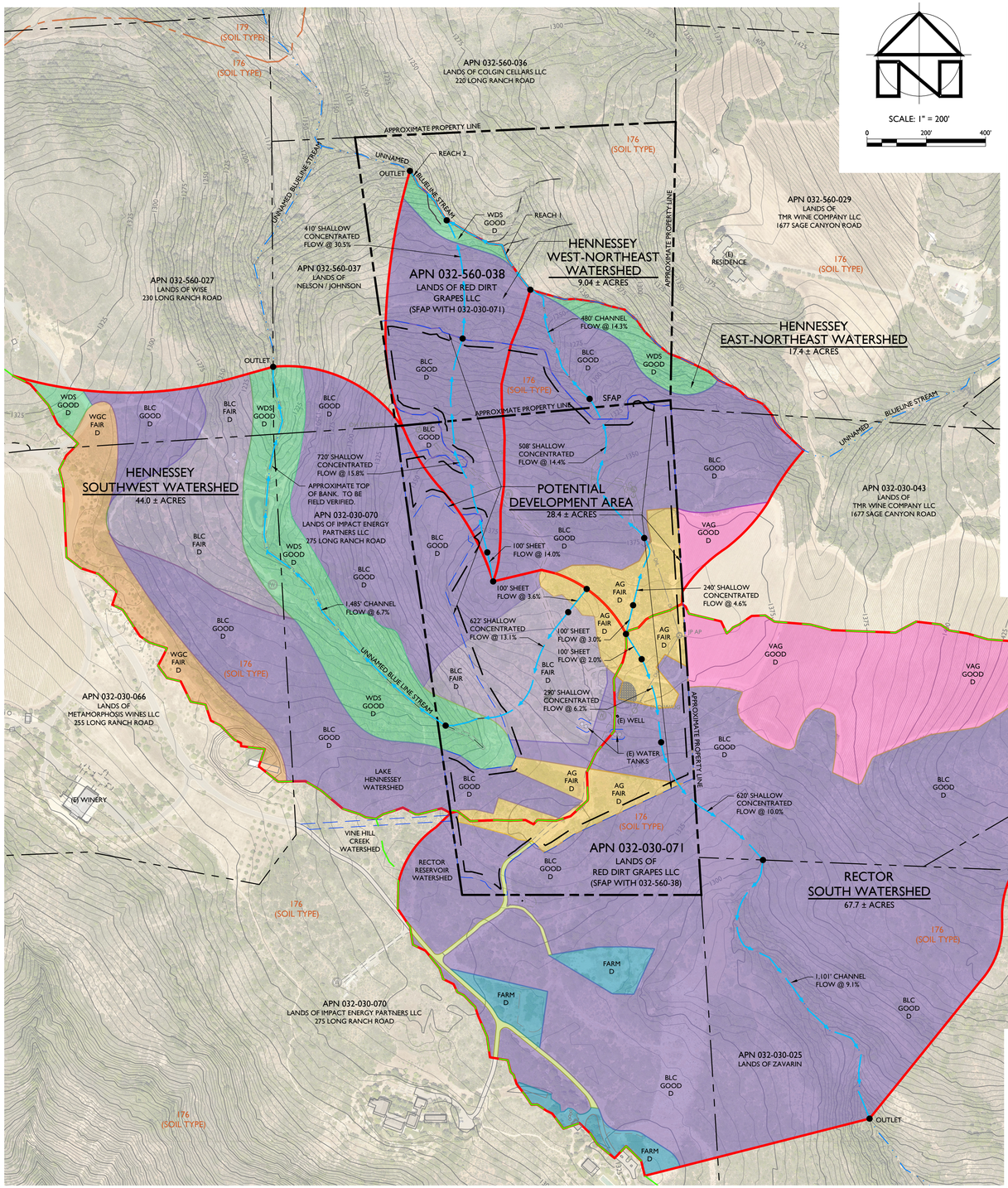
Red Dirt Grapes
New Hennessey Northeast, Post-Project, Tc inc 100
Napa County, California

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
ENE							
SHEET	100	0.0300	0.150				0.126
SHALLOW	240	0.0460	0.050				0.019
SHALLOW	508	0.1440	0.050				0.023
CHANNEL	480	0.1430	0.045	4.00	6.00	9.524	0.014
MANUAL ENTRY							0.022
						Time of Concentration	.204
WNE							
SHEET	100	0.1400	0.150				0.068
SHALLOW	720	0.1580	0.050				0.031
SHALLOW	410	0.3050	0.050				0.013
MANUAL ENTRY							0.021
						Time of Concentration	.133

RED DIRT GRAPES LLC

WATERSHED EXHIBITS



WATERSHED AREAS - EXISTING CONDITIONS

SCALE: 1" = 200'

HENNESSEY WEST-NORTHEAST WATERSHED AREA SUMMARY

PLAN SYMBOL	LAND USE DESCRIPTION	HYDROLOGIC CONDITION	HYDROLOGIC SOIL GROUP	CURVE NUMBER (CN)	PRE-PROJECT (ACRES)	REMOVED (ACRES)	POST-PROJECT
BLC-GOOD-D	BROADLEAF CHAPARRAL	GOOD	D	78	8.39 ± AC	4.53 ± AC	3.86 ± AC
WDS-GOOD-D	WOODS	GOOD	D	77	0.65 ± AC	0	0.65 ± AC
VAG-GOOD-D	VINEYARD - ANNUAL GRASS (POST)	GOOD	D	81	-	-	4.53 ± AC
				TOTALS	9.04 ± AC	4.53 ± AC	9.04 ± AC

HENNESSEY EAST-NORTHEAST WATERSHED AREA SUMMARY

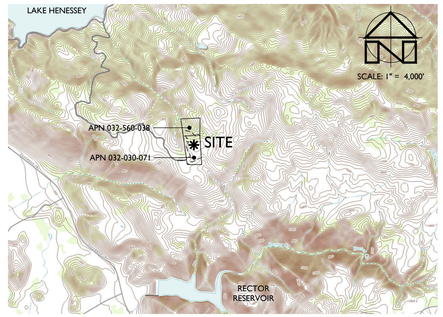
PLAN SYMBOL	LAND USE DESCRIPTION	HYDROLOGIC CONDITION	HYDROLOGIC SOIL GROUP	CURVE NUMBER (CN)	PRE-PROJECT (ACRES)	REMOVED (ACRES)	POST-PROJECT
BLC-GOOD-D	BROADLEAF CHAPARRAL	GOOD	D	78	13.13 ± AC	6.83 ± AC	6.3 ± AC
AG-FAIR-D	ANNUAL GRASS	FAIR	D	84	1.8 ± AC	1.8 ± AC	0 ± AC
WDS-GOOD-D	WOODS	GOOD	D	77	1.64 ± AC	0	1.64 ± AC
VAG-GOOD-D	VINEYARD - ANNUAL GRASS (PRE)	GOOD	D	81	0.83 ± AC	0	0.83 ± AC
VAG-GOOD-D	VINEYARD - ANNUAL GRASS (POST)	GOOD	D	81	-	-	8.63 ± AC
				TOTALS	17.4 ± AC	8.63 ± AC	17.4 ± AC

HENNESSEY SOUTHWEST WATERSHED AREA SUMMARY

PLAN SYMBOL	LAND USE DESCRIPTION	HYDROLOGIC CONDITION	HYDROLOGIC SOIL GROUP	CURVE NUMBER (CN)	PRE-PROJECT (ACRES)	REMOVED (ACRES)	POST-PROJECT
BLC-FAIR-D	BROADLEAF CHAPARRAL	FAIR	D	81	9.7 ± AC	4.1 ± AC	5.6 ± AC
BLC-GOOD-D	BROADLEAF CHAPARRAL	GOOD	D	78	21.0 ± AC	3.5 ± AC	17.5 ± AC
AG-FAIR-D	ANNUAL GRASS	FAIR	D	84	1.5 ± AC	1.5 ± AC	0 ± AC
WDS-GOOD-D	WOODS	GOOD	D	77	7.9 ± AC	0	7.9 ± AC
WGC-FAIR-D	WOODS - GRASS COMBINATION	FAIR	D	82	3.9 ± AC	0	3.9 ± AC
VAG-GOOD-D	VINEYARD - ANNUAL GRASS (POST)	GOOD	D	81	-	-	9.1 ± AC
				TOTALS	44.0 ± AC	9.1 ± AC	44.0 ± AC

RECTOR SOUTH WATERSHED AREA SUMMARY

PLAN SYMBOL	LAND USE DESCRIPTION	HYDROLOGIC CONDITION	HYDROLOGIC SOIL GROUP	CURVE NUMBER (CN)	PRE-PROJECT (ACRES)	REMOVED (ACRES)	POST-PROJECT
FARM-D	FARMSTEAD	N/A	D	86	2.5 ± AC	0	2.5 ± AC
RD-GRVL-D	GRAVEL ROAD	N/A	D	91	0.6 ± AC	0	0.6 ± AC
BLC-GOOD-D	BROADLEAF CHAPARRAL	GOOD	D	78	52.2 ± AC	2.7 ± AC	49.5 ± AC
AG-FAIR-D	ANNUAL GRASS	FAIR	D	84	2.5 ± AC	2.5 ± AC	0
VAG-GOOD-D	VINEYARD - ANNUAL GRASS (PRE)	GOOD	D	81	9.8 ± AC	0	9.8 ± AC
VAG-GOOD-D	VINEYARD - ANNUAL GRASS (POST)	GOOD	D	81	-	-	5.2 ± AC
				TOTALS	67.6 ± AC	5.2 ± AC	67.6 ± AC



LOCATION MAP

SCALE: 1" = 4,000'

PROJECT INFORMATION:

PROPERTY OWNER & APPLICANT:
RED DIRT GRAPES LLC
9000 CAMERON PARKWAY
OAKLAHOMA CITY, OK 73114
SITE ADDRESS:
LONG RANCH ROAD
ASSESSOR'S PARCEL NUMBERS:
032-030-071 & 032-560-038 (SFAP)
PARCEL SIZES:
32.2 ± ACRES & 22.5 ± ACRES, RESPECTIVELY
ZONING:
AGRICULTURAL WATERSHED (AW)

SHEET INDEX:

NOTES:

1. FADED BACKGROUND REPRESENTS EXISTING TOPOGRAPHIC FEATURES. TOPOGRAPHIC INFORMATION WAS TAKEN FROM THE NAPA COUNTY GEOGRAPHIC INFORMATION SYSTEM DATABASE. APPLIED CIVIL ENGINEERING INCORPORATED ASSUMES NO LIABILITY REGARDING THE ACCURACY OR COMPLETENESS OF THE TOPOGRAPHIC INFORMATION.
2. AERIAL PHOTOGRAPHS WERE OBTAINED FROM THE NAPA COUNTY GEOGRAPHIC INFORMATION SYSTEM (GIS) DATABASE, TAKEN APRIL TO JUNE 2018 AND MAY NOT REPRESENT CURRENT CONDITIONS.
3. CONTOUR INTERVAL: FIVE (5) FEET, HIGHLIGHTED EVERY TWENTY FIVE (25) FEET.
4. BENCHMARK: NAVD 88
5. THE PROPERTY LINES SHOWN ON THESE PLANS DO NOT REPRESENT A BOUNDARY SURVEY. THEY ARE APPROXIMATE AND ARE PROVIDED FOR GENERAL INFORMATIONAL PURPOSES ONLY.

SOIL TYPE LEGEND:

176 ROCK OUTCROP - HAMBRIGHT COMPLEX, 50% TO 75% SLOPES.

179 SOBRANTE LOAM, 30% TO 50% SLOPES.

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

LEGEND:

- APPROXIMATE PROPERTY LINE
- SOIL TYPE BOUNDARY
- BLUELINE STREAM
- WATERS OF THE US / EPHEMERAL STREAM (AS LOCATED BY PROJECT BIOLOGIST)
- POTENTIAL DEVELOPMENT AREA OUTLINE
- WATERSHED BOUNDARY
- WATERSHED AREAS

APPLIED CIVIL ENGINEERING INCORPORATED
2160 Jefferson Street, Suite 230
Napa, CA 94559
(707) 320-4988 | www.appliedcivil.com

RED DIRT GRAPES LLC

WATERSHED EXHIBITS

WATERSHED AREAS - EXISTING CONDITIONS

PREPARED UNDER THE DIRECTION OF:

REGISTERED PROFESSIONAL ENGINEER
MICHAEL R. MUELRATH
MRM
NO. 67435
Exp. 12/31/2022
7/1/2022
CIVIL
STATE OF CALIFORNIA

DRAWN BY: PowerCAD

CHECKED BY: MRM

DATE: JULY 1, 2022

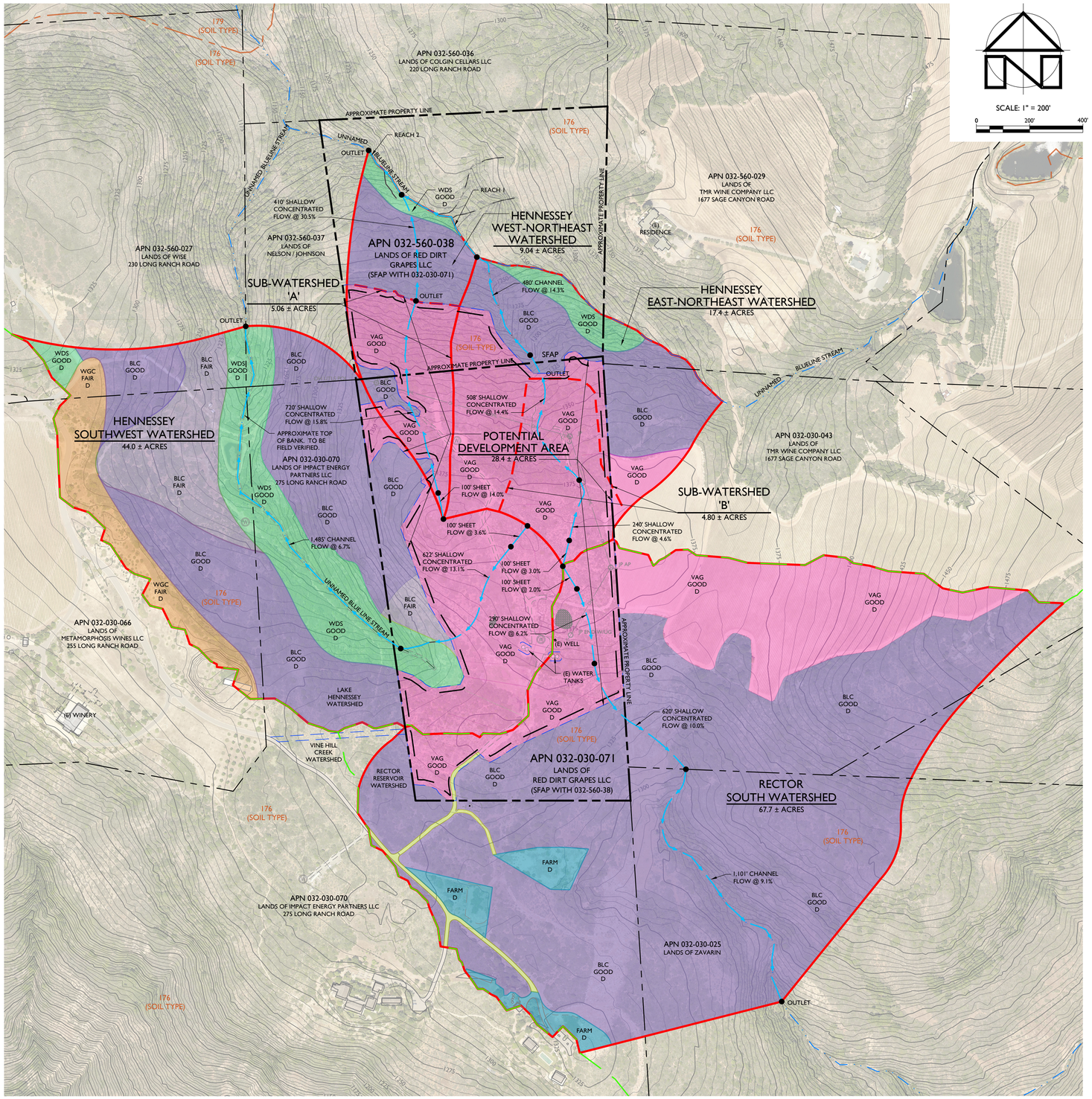
REVISIONS: BY:

JOB NUMBER: 21-113

FILE: 21-113EXH_WTRSHD.DWG

ORIGINAL SIZE: 24" X 36"

SHEET NUMBER: 1 OF 2



SCALE: 1" = 200'

0 200' 400'

WATERSHED AREAS - PROPOSED CONDITIONS

SCALE: 1" = 200'

HENNESSEY WEST-NORTHEAST WATERSHED AREA SUMMARY

PLAN SYMBOL	LAND USE DESCRIPTION	HYDROLOGIC CONDITION	HYDROLOGIC SOIL GROUP	CURVE NUMBER (CN)	PRE-PROJECT (ACRES)	REMOVED (ACRES)	POST-PROJECT
BLC-GOOD-D	BROADLEAF CHAPARRAL	GOOD	D	78	8.39 ± AC	4.53 ± AC	3.86 ± AC
WDS-GOOD-D	WOODS	GOOD	D	77	0.65 ± AC	0	0.65 ± AC
VAG-GOOD-D	VINEYARD - ANNUAL GRASS (POST)	GOOD	D	81	-	-	4.53 ± AC
				TOTALS	9.04 ± AC	4.53 ± AC	9.04 ± AC

HENNESSEY EAST-NORTHEAST WATERSHED AREA SUMMARY

PLAN SYMBOL	LAND USE DESCRIPTION	HYDROLOGIC CONDITION	HYDROLOGIC SOIL GROUP	CURVE NUMBER (CN)	PRE-PROJECT (ACRES)	REMOVED (ACRES)	POST-PROJECT
BLC-GOOD-D	BROADLEAF CHAPARRAL	GOOD	D	78	13.13 ± AC	6.83 ± AC	6.3 ± AC
AG-FAIR-D	ANNUAL GRASS	FAIR	D	84	1.8 ± AC	1.8 ± AC	0 ± AC
WDS-GOOD-D	WOODS	GOOD	D	77	1.64 ± AC	0	1.64 ± AC
VAG-GOOD-D	VINEYARD - ANNUAL GRASS (PRE)	GOOD	D	81	0.83 ± AC	0	0.83 ± AC
VAG-GOOD-D	VINEYARD - ANNUAL GRASS (POST)	GOOD	D	81	-	-	8.63 ± AC
				TOTALS	17.4 ± AC	8.63 ± AC	17.4 ± AC

HENNESSEY SOUTHWEST WATERSHED AREA SUMMARY

PLAN SYMBOL	LAND USE DESCRIPTION	HYDROLOGIC CONDITION	HYDROLOGIC SOIL GROUP	CURVE NUMBER (CN)	PRE-PROJECT (ACRES)	REMOVED (ACRES)	POST-PROJECT
BLC-FAIR-D	BROADLEAF CHAPARRAL	FAIR	D	81	9.7 ± AC	4.1 ± AC	5.6 ± AC
BLC-GOOD-D	BROADLEAF CHAPARRAL	GOOD	D	78	21.0 ± AC	3.5 ± AC	17.5 ± AC
AG-FAIR-D	ANNUAL GRASS	FAIR	D	84	1.5 ± AC	1.5 ± AC	0 ± AC
WDS-GOOD-D	WOODS	GOOD	D	77	7.9 ± AC	0	7.9 ± AC
WGC-FAIR-D	WOODS - GRASS COMBINATION	FAIR	D	82	3.9 ± AC	0	3.9 ± AC
VAG-GOOD-D	VINEYARD - ANNUAL GRASS (POST)	GOOD	D	81	-	-	9.1 ± AC
				TOTALS	44.0 ± AC	9.1 ± AC	44.0 ± AC

RECTOR SOUTH WATERSHED AREA SUMMARY

PLAN SYMBOL	LAND USE DESCRIPTION	HYDROLOGIC CONDITION	HYDROLOGIC SOIL GROUP	CURVE NUMBER (CN)	PRE-PROJECT (ACRES)	REMOVED (ACRES)	POST-PROJECT
FARM-D	FARMSTEAD	N/A	D	86	2.5 ± AC	0	2.5 ± AC
RD-GRVL-D	GRAVEL ROAD	N/A	D	91	0.6 ± AC	0	0.6 ± AC
BLC-GOOD-D	BROADLEAF CHAPARRAL	GOOD	D	78	52.2 ± AC	2.7 ± AC	49.5 ± AC
AG-FAIR-D	ANNUAL GRASS	FAIR	D	84	2.5 ± AC	2.5 ± AC	0
VAG-GOOD-D	VINEYARD - ANNUAL GRASS (PRE)	GOOD	D	81	9.8 ± AC	0	9.8 ± AC
VAG-GOOD-D	VINEYARD - ANNUAL GRASS (POST)	GOOD	D	81	-	-	5.2 ± AC
				TOTALS	67.6 ± AC	5.2 ± AC	67.6 ± AC

SUB-WATERSHED 'A' AREA SUMMARY

PLAN SYMBOL	LAND USE DESCRIPTION	HYDROLOGIC CONDITION	HYDROLOGIC SOIL GROUP	CURVE NUMBER (CN)	POST-PROJECT
BLC-GOOD-D	BROADLEAF CHAPARRAL	GOOD	D	78	0.53 ± AC
VAG-GOOD-D	VINEYARD - ANNUAL GRASS	GOOD	D	81	4.53 ± AC
				TOTALS	5.06 ± AC

SUB-WATERSHED 'B' AREA SUMMARY

PLAN SYMBOL	LAND USE DESCRIPTION	HYDROLOGIC CONDITION	HYDROLOGIC SOIL GROUP	CURVE NUMBER (CN)	POST-PROJECT
VAG-GOOD-D	VINEYARD - ANNUAL GRASS	GOOD	D	81	4.80 ± AC
				TOTALS	4.80 ± AC

SOIL TYPE LEGEND:

176 ROCK OUTCROP - HAMBRIGHT COMPLEX, 50% TO 75% SLOPES.

179 SOBRANTE LOAM, 30% TO 50% SLOPES.

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

LEGEND:

- APPROXIMATE PROPERTY LINE
- SOIL TYPE BOUNDARY
- BLUELINE STREAM
- WATERS OF THE US / EPHEMERAL STREAM (AS LOCATED BY PROJECT BIOLOGIST)
- POTENTIAL DEVELOPMENT AREA OUTLINE
- WATERSHED BOUNDARY
- WATERSHED AREAS
- SUB-WATERSHED AREA

APPLIED CIVIL ENGINEERING INCORPORATED
2160 Jefferson Street, Suite 230
Napa, CA 94559
(707) 320-4988 | www.appliedcivil.com

RED DIRT GRAPES LLC

WATERSHED EXHIBITS

WATERSHED AREAS - PROPOSED CONDITIONS

PREPARED UNDER THE DIRECTION OF:

REGISTERED PROFESSIONAL ENGINEER
MICHAEL R. MUELRATH
MRM
NO. 67435
Exp. 12/31/2022
7/1/2022
CIVIL
STATE OF CALIFORNIA

DRAWN BY: PowerCAD

CHECKED BY: MRM

DATE: JULY 1, 2022

REVISIONS: BY:

JOB NUMBER: 21-113

FILE: 21-113EXH_WTRSHD.DWG

ORIGINAL SIZE: 24" X 36"

SHEET NUMBER: 2 OF 2

ADDENDUM, HYDROLOGIC ANALYSIS
RED DIRT GRAPES, LLC
PROPOSED NEW VINEYARD
LONG RANCH ROAD
ST. HELENA, CA 95476
APN 032-030-071; 032-560-038
DECEMBER 11, 2022

This Addendum to the Hydrologic Analysis addresses two points raised by Napa County Engineering and Planning Staff, in response to their review of the Revised Analysis of July l, 2022:

- Staff now requires that specifications for runoff control structures include calculations showing adequacy for, not only the design storm--in this submittal the 100-year/24-hour storm--but also for storms of 2-, 10-, and 50-year return intervals. Calculations for the two Sub-Areas (ENE and WNE) of the original Hennessey Northeast Watershed demonstrate the adequacy of the specified structures proposed for installation at the respective outlets of further hydrologic subdivisions (Sub-watersheds A and B) to reduce predicted post-project runoff to the level of pre-project flows.
- Staff pointed out that, in the July 1 submittal, post-project flows at the outlet of the larger Hennessey Northeast Watershed failed to achieve the pre-project parity objective of the design, notwithstanding that predicted flows from the individual Sub-Areas did meet that standard. Slight adjustments in the retention requirements of the respective Sub-Area structures, with reference to their collective effect on the overall peak flows at the outlet, have taken care of that apparent rounding anomaly.

Calculations for Hennessey East Northeast Sub-Area Retention Requirements

- A manually-entered Tc increase of .024 hours brings the post-project, 100-year peak of the Hennessey East Northeast Sub-Area (17.09 cfs) to parity with the pre-project peak (16.81 cfs).
- Sub-WS B will generate a 100-year peak of 4.85 cfs.
- .024 hours x 3600 seconds/hour = 86.4 seconds
- 86.4 seconds x 4.85 cfs = **419.04 cubic feet of required storage volume**
- 419.04 cf / .33 void ratio = **1270 cf of rock in structure**

- A manually-entered Tc increase of .026 hours brings the post-project, 50-year peak of the Hennessey East Northeast Sub-Area (15.06 cfs) to parity with the pre-project peak (14.78 cfs).
- Sub-WS B will generate a 50-year peak of 4.28 cfs.
- .026 hours x 3600 seconds/hour = 93.6 seconds
- 93.6 seconds x 4.28 cfs = 400.61 cubic feet of required storage volume
- 400.61 cf < 419.04 cf (determinative retention requirement based on 100-year peak)

- A manually-entered Tc increase of .038 hours brings the post-project, 10-year peak of the Hennessey East Northeast Sub-Area (10.22 cfs) to parity with the pre-project peak (9.96 cfs).
- Sub-WS B will generate a 10-year peak of 2.93 cfs.
- .038 hours x 3600 seconds/hour = 136.8 seconds
- 136.8 seconds x 2.93 cfs = 400.82 cubic feet of required storage volume
- 400.82 cf < 419.04 cf (determinative retention requirement based on 100-year peak)

- A manually-entered Tc increase of .060 hours brings the post-project, 2-year peak of the Hennessey East Northeast Sub-Area (5.62 cfs) to parity with the pre-project peak (5.39 cfs).
- Sub-WS B will generate a 2-year peak of 1.64 cfs.
- .060 hours x 3600 seconds/hour = 216 seconds
- 216 seconds x 1.64 cfs = 354.24 cubic feet of required storage volume
- 354.24 cf < 419.04 cf (determinative retention requirement based on 100-year peak)

Calculations for Hennessey West Northeast Sub-Area Retention Requirements

- A manually-entered Tc increase of .022 hours brings the post-project, 100-year peak of the Hennessey West Northeast Sub-Area (9.27 cfs) to parity with the pre-project peak (9.11 cfs).
- Sub-WS A will generate a 100-year peak of 5.41 cfs.
- .022 hours x 3600 seconds/hour = 79.2 seconds
- 79.2 seconds x 5.41 cfs = 428.5 cubic feet of required storage volume
- 428.5 < 494.4 cf (determinative retention requirement based on 10-**year peak)**

- A manually-entered Tc increase of .026 hours brings the post-project, 50-year peak of the Hennessey West Northeast Sub-Area (8.15 cfs) to parity with the pre-project peak (7.99 cfs).
- Sub-WS A will generate a 50-year peak of 4.78 cfs.
- .026 hours x 3600 seconds/hour = 93.6 seconds
- 93.6 seconds x 4.78 cfs = 447.41 cubic feet of required storage volume
- 447.41 < 494.4 cf (determinative retention requirement based on 10-**year peak)**

- A manually-entered Tc increase of .042 hours brings the post-project, 10-year peak of the Hennessey West Northeast Sub-Area (5.49 cfs) to parity with the pre-project peak (5.35 cfs).
- Sub-WS A will generate a 10-year peak of 3.27 cfs.
- .042 hours x 3600 seconds/hour = 151.2 seconds
- 151.2 seconds x 3.27 cfs = 494.4 cubic feet of required storage volume
- 494.4 cubic is the determinative retention requirement based, on 10-year peak.
- 494.4 cubic feet / .33 void ratio of crushed rock = **1498.3 cubic feet rock in structure**

- A manually-entered Tc increase of .050 hours brings the post-project, 2-year peak of the Hennessey West Northeast WS (2.98 cfs) to parity with the pre-project peak (2.85 cfs).
- Sub-WS A will generate a 2-year peak of 1.83 cfs.
- .050 hours x 3600 seconds/hour = 180 seconds
- 180 seconds x 1.83 cfs = 329.4 cubic feet of required storage volume
- 329.4 < 494.4 cf (determinative retention requirement based on 10-**year peak)**

Conclusion: The above calculations demonstrate the adequacy of the specified retention structures to retain post-project flows from the respective Sub-Areas to eliminate post-project peak flow increases; the combined, net effect of those retentions on the entire Northeast Watershed, as shown in the accompanying spreadsheet and WinTR-55 printouts, is to bring post-project flows for the entire watershed to parity with pre-project conditions.

	Runoff (cfs)			
	2-year	10-year	50-year	100-year
Main Watershed - Peak Flow				
Pre-project conditions	8.11	15.06	22.43	25.55
Post-project conditions	8.46	15.47	22.87	25.99
Change (cfs)	0.35	0.41	0.44	0.44
Change (%)	4.32%	2.72%	1.96%	1.72%
Main Watershed-Peak Flow – Tc Extended				
Post-project conditions: Retention Bench Designed for 100 year storm	8.11	15.06	22.43	25.54
Change (cfs)	0	0	0	-0.01
Change (%)	0.00%	0.00%	0.00%	-0.04%

DAS Red Dirt Grapes
Red Dirt Revised Hennessey Northeast, Post-Project, Tc inc 2
Napa County, California

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period 2-Yr (cfs) (hr)
SUBAREAS	
ENE	5.37 12.19
WNE	2.85 12.15
REACHES	
Reach 1	5.37 12.19
Down	5.37 12.20
Reach 2	8.11 12.17
Down	8.11 12.18
OUTLET	8.11

DAS Red Dirt Grapes
Red Dirt Revised Hennessey Northeast, Post-Project, Tc inc 2
Napa County, California

Storm Data

Rainfall Depth by Rainfall Return Period

2-Yr (in)	5-Yr (in)	10-Yr (in)	25-Yr (in)	50-Yr (in)	100-Yr (in)	-Yr (in)
3.89	4.93	5.75	6.84	7.65	8.45	.0

Storm Data Source: User-provided custom storm data
Rainfall Distribution Type: Type CA-1
Dimensionless Unit Hydrograph: <standard>

DAS

Red Dirt Grapes
Red Dirt Revised Hennessey Northeast, Post-Project, Tc inc 2
Napa County, California

Reach Summary Table

Reach Identifier	Receiving Reach Identifier	Reach Length (ft)	Routing Method
Reach 1	Reach 2	250	CHANNEL
Reach 2	Outlet	160	CHANNEL

DAS

Red Dirt Grapes
Red Dirt Revised Hennessey Northeast, Post-Project, Tc inc 2
Napa County, California

Sub-Area Land Use and Curve Number Details

Sub-Area Identifier	Land Use		Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
ENE	User defined urban (Click button or		D	9.46	81
	Legume/Rot. Meadow Contoured	(good)	C	6.3	78
	Woods	(good)	D	1.64	77
	Total Area / Weighted Curve Number			17.4	80
WNE	User defined urban (Click button or		D	4.53	81
	Legume/Rot. Meadow Contoured	(good)	C	3.86	78
	Woods	(good)	D	.65	77
	Total Area / Weighted Curve Number			9.04	79

DAS

Red Dirt Grapes
Red Dirt Revised Hennessey Northeast, Post-Project, Tc inc 2
Napa County, California

Sub-Area Land Use and Curve Number Details

Sub-Area Identifier	Land Use		Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
ENE	Vineyard (annual grass)	(good)	D	9.46	81
	Broadleaf Chaparral	(good)	D	6.3	78
	Woods	(good)	D	1.64	77
	Total Area / Weighted Curve Number			17.4	80
				====	==
WNE	Vineyard (annual grass)	(good)	D	4.53	81
	Broadleaf Chaparral `	(good)	D	3.86	78
	Woods	(good)	D	.65	77
	Total Area / Weighted Curve Number			9.04	79
				====	==

DAS

Red Dirt Grapes
Red Dirt Revised Hennessey Northeast, Post-Project, Tc inc 2
Napa County, California

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
ENE							
SHEET	100	0.0300	0.150				0.126
SHALLOW	240	0.0460	0.050				0.019
SHALLOW	508	0.1440	0.050				0.023
CHANNEL	480	0.1430	0.045	4.00	6.00	9.524	0.014
CHANNEL	550	0.0100	0.045	4.00	6.00	2.546	0.060
					Time of Concentration		.242
WNE							
SHEET	100	0.1400	0.150				0.068
SHALLOW	720	0.1580	0.050				0.031
SHALLOW	410	0.3050	0.050				0.013
CHANNEL	775	0.0100	0.045	6.00	4.00	4.306	0.050
					Time of Concentration		.162

DAS

Red Dirt Grapes
Red Dirt Revised Hennessey Northeast, Post-Project, Tc inc 2
Napa County, California

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
ENE							
SHEET	100	0.0300	0.150				0.126
SHALLOW	240	0.0460	0.050				0.019
SHALLOW	508	0.1440	0.050				0.023
CHANNEL	480	0.1430	0.045	4.00	6.00	9.524	0.014
CHANNEL			MANUAL ENTRY				0.060
					Time of Concentration		.242
WNE							
SHEET	100	0.1400	0.150				0.068
SHALLOW	720	0.1580	0.050				0.031
SHALLOW	410	0.3050	0.050				0.013
CHANNEL			MANUAL ENTRY				0.050
					Time of Concentration		.162

DAS

Red Dirt Grapes
Revised Hennessey Northeast, Post-Project, Tc inc 10
Napa County, California

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period 10-Yr (cfs) (hr)
SUBAREAS	
ENE	9.93 12.17
WNE	5.30 12.14
REACHES	
Reach 1	9.93 12.17
Down	9.93 12.19
Reach 2	15.06 12.16
Down	15.06 12.17
OUTLET	15.06

DAS

Red Dirt Grapes
Revised Hennessey Northeast, Post-Project, Tc inc 10
Napa County, California

Storm Data

Rainfall Depth by Rainfall Return Period

2-Yr (in)	5-Yr (in)	10-Yr (in)	25-Yr (in)	50-Yr (in)	100-Yr (in)	-Yr (in)
3.89	4.93	5.75	6.84	7.65	8.45	.0

Storm Data Source: User-provided custom storm data
Rainfall Distribution Type: Type CA-1
Dimensionless Unit Hydrograph: <standard>

DAS

Red Dirt Grapes
Revised Hennessey Northeast, Post-Project, Tc inc 10
Napa County, California

Reach Summary Table

Reach Identifier	Receiving Reach Identifier	Reach Length (ft)	Routing Method
Reach 1	Reach 2	250	CHANNEL
Reach 2	Outlet	160	CHANNEL

DAS

Red Dirt Grapes
Revised Hennessey Northeast, Post-Project, Tc inc 10
Napa County, California

Sub-Area Land Use and Curve Number Details

Sub-Area Identifier	Land Use		Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
ENE	User defined urban (Click button or		D	9.46	81
	Legume/Rot. Meadow Contoured	(good)	C	6.3	78
	Woods	(good)	D	1.64	77
	Total Area / Weighted Curve Number			17.4	80
				====	==
WNE	User defined urban (Click button or		D	4.53	81
	Legume/Rot. Meadow Contoured	(good)	C	3.86	78
	Woods	(good)	D	.65	77
	Total Area / Weighted Curve Number			9.04	79
				====	==

DAS

Red Dirt Grapes
Revised Hennessey Northeast, Post-Project, Tc inc 10
Napa County, California

Sub-Area Land Use and Curve Number Details

Sub-Area Identifier	Land Use		Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
ENE	Vineyard (annual grass)	(good)	D	9.46	81
	Broadleaf Chaparral	(good)	D	6.3	78
	Woods	(good)	D	1.64	77
	Total Area / Weighted Curve Number			17.4	80
WNE	Vineyard (annual grass)	(good)	D	4.53	81
	Broadleaf Chaparral	(good)	D	3.86	78
	Woods	(good)	D	.65	77
	Total Area / Weighted Curve Number			9.04	79

DAS

Red Dirt Grapes
Revised Hennessey Northeast, Post-Project, Tc inc 10
Napa County, California

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
ENE							
SHEET	100	0.0300	0.150				0.126
SHALLOW	240	0.0460	0.050				0.019
SHALLOW	508	0.1440	0.050				0.023
CHANNEL	480	0.1430	0.045	4.00	6.00	9.524	0.014
CHANNEL	350	0.0100	0.045	4.00	6.00	2.558	0.038
					Time of Concentration		.22
WNE							
SHEET	100	0.1400	0.150				0.068
SHALLOW	720	0.1580	0.050				0.031
SHALLOW	410	0.3050	0.050				0.013
CHANNEL	650	0.0100	0.045	6.00	4.00	4.299	0.042
					Time of Concentration		.154

DAS

Red Dirt Grapes
Revised Hennessey Northeast, Post-Project, Tc inc 10
Napa County, California

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
ENE							
SHEET	100	0.0300	0.150				0.126
SHALLOW	240	0.0460	0.050				0.019
SHALLOW	508	0.1440	0.050				0.023
CHANNEL	480	0.1430	0.045	4.00	6.00	9.524	0.014
CHANNEL			MANUAL ENTRY				0.038
					Time of Concentration		.22
WNE							
SHEET	100	0.1400	0.150				0.068
SHALLOW	720	0.1580	0.050				0.031
SHALLOW	410	0.3050	0.050				0.013
CHANNEL			MANUAL ENTRY				0.042
					Time of Concentration		.154

DAS Red Dirt Grapes
Red Dirt Revised Hennessey Northeast Post-Project, Tc inc 50
Napa County, California

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period 50-Yr (cfs) (hr)
SUBAREAS	
ENE	14.76 12.17
WNE	7.97 12.14
REACHES	
Reach 1	14.76 12.17
Down	14.76 12.18
Reach 2	22.45 12.15
Down	22.45 12.16
OUTLET	22.45

DAS

Red Dirt Grapes
Red Dirt Revised Hennessey Northeast Post-Project, Tc inc 50
Napa County, California

Storm Data

Rainfall Depth by Rainfall Return Period

2-Yr (in)	5-Yr (in)	10-Yr (in)	25-Yr (in)	50-Yr (in)	100-Yr (in)	-Yr (in)
3.89	4.93	5.75	6.84	7.65	8.45	.0

Storm Data Source: User-provided custom storm data
Rainfall Distribution Type: Type CA-1
Dimensionless Unit Hydrograph: <standard>

DAS

Red Dirt Grapes
Red Dirt Revised Hennessey Northeast Post-Project, Tc inc 50
Napa County, California

Reach Summary Table

Reach Identifier	Receiving Reach Identifier	Reach Length (ft)	Routing Method
Reach 1	Reach 2	250	CHANNEL
Reach 2	Outlet	160	CHANNEL

DAS

Red Dirt Grapes
Red Dirt Revised Hennessey Northeast Post-Project, Tc inc 50
Napa County, California

Sub-Area Land Use and Curve Number Details

Sub-Area Identifier	Land Use		Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
ENE	User defined urban (Click button or		D	9.46	81
	Legume/Rot. Meadow Contoured	(good)	C	6.3	78
	Woods	(good)	D	1.64	77
	Total Area / Weighted Curve Number			17.4	80
				====	==
WNE	User defined urban (Click button or		D	4.53	81
	Legume/Rot. Meadow Contoured	(good)	C	3.86	78
	Woods	(good)	D	.65	77
	Total Area / Weighted Curve Number			9.04	79
				====	==

DAS

Red Dirt Grapes
Red Dirt Revised Hennessey Northeast Post-Project, Tc inc 50
Napa County, California

Sub-Area Land Use and Curve Number Details

Sub-Area Identifier	Land Use		Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
ENE	Vineyard (annual grass)	(good)	D	9.46	81
	Broadleaf Chaparral	(good)	D	6.3	78
	Woods	(good)	D	1.64	77
	Total Area / Weighted Curve Number			17.4	80
WNE	Vineyard (annual grass)	(good)	D	4.53	81
	Legume/Rot. Meadow Contoured	(good)	D	3.86	78
	Woods	(good)	D	.65	77
	Total Area / Weighted Curve Number			9.04	79

DAS

Red Dirt Grapes
Red Dirt Revised Hennessey Northeast Post-Project, Tc inc 50
Napa County, California

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
ENE							
SHEET	100	0.0300	0.150				0.126
SHALLOW	240	0.0460	0.050				0.019
SHALLOW	508	0.1440	0.050				0.023
CHANNEL	480	0.1430	0.045	4.00	6.00	9.524	0.014
CHANNEL	240	0.0100	0.045	4.00	6.00	2.564	0.026
					Time of Concentration		.208
WNE							
SHEET	100	0.1400	0.150				0.068
SHALLOW	720	0.1580	0.050				0.031
SHALLOW	410	0.3050	0.050				0.013
CHANNEL	400	0.0100	0.045	6.00	4.00	4.274	0.026
					Time of Concentration		.138

DAS

Red Dirt Grapes
Red Dirt Revised Hennessey Northeast Post-Project, Tc inc 50
Napa County, California

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
ENE							
SHEET	100	0.0300	0.150				0.126
SHALLOW	240	0.0460	0.050				0.019
SHALLOW	508	0.1440	0.050				0.023
CHANNEL	480	0.1430	0.045	4.00	6.00	9.524	0.014
			MANUAL ENTRY				0.026
					Time of Concentration		.208
WNE							
SHEET	100	0.1400	0.150				0.068
SHALLOW	720	0.1580	0.050				0.031
SHALLOW	410	0.3050	0.050				0.013
			MANUAL ENTRY				0.026
					Time of Concentration		.138

DAS

Red Dirt Grapes
Revised Hennessey Northeast, Post-Project, Tc inc 100
Napa County, California

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period 100-Yr (cfs) (hr)
SUBAREAS	
ENE	16.78 12.16
WNE	9.10 12.13
REACHES	
Reach 1	16.78 12.16
Down	16.78 12.18
Reach 2	25.55 12.15
Down	25.54 12.16
OUTLET	25.54

DAS

Red Dirt Grapes
Revised Hennessey Northeast, Post-Project, Tc inc 100
Napa County, California

Storm Data

Rainfall Depth by Rainfall Return Period

2-Yr (in)	5-Yr (in)	10-Yr (in)	25-Yr (in)	50-Yr (in)	100-Yr (in)	-Yr (in)
3.89	4.93	5.75	6.84	7.65	8.45	.0

Storm Data Source: User-provided custom storm data
Rainfall Distribution Type: Type CA-1
Dimensionless Unit Hydrograph: <standard>

DAS

Red Dirt Grapes
Revised Hennessey Northeast, Post-Project, Tc inc 100
Napa County, California

Reach Summary Table

Reach Identifier	Receiving Reach Identifier	Reach Length (ft)	Routing Method
Reach 1	Reach 2	250	CHANNEL
Reach 2	Outlet	160	CHANNEL

DAS

Red Dirt Grapes
Revised Hennessey Northeast, Post-Project, Tc inc 100
Napa County, California

Sub-Area Land Use and Curve Number Details

Sub-Area Identifier	Land Use		Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
ENE	User defined urban (Click button or		D	9.46	81
	Legume/Rot. Meadow Contoured	(good)	C	6.3	78
	Woods	(good)	D	1.64	77
	Total Area / Weighted Curve Number			17.4	80
				====	==
WNE	User defined urban (Click button or		D	4.53	81
	Legume/Rot. Meadow Contoured	(good)	C	3.86	78
	Woods	(good)	D	.65	77
	Total Area / Weighted Curve Number			9.04	79
				====	==

DAS

Red Dirt Grapes
Revised Hennessey Northeast, Post-Project, Tc inc 100
Napa County, California

Sub-Area Land Use and Curve Number Details

Sub-Area Identifier	Land Use		Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
ENE	Vineyard (annual grass)	(good)	D	9.46	81
	Broadleaf Chaparral	(good)	D	6.3	78
	Woods	(good)	D	1.64	77
	Total Area / Weighted Curve Number			17.4	80
				====	==
WNE	Vineyard (annual grass)	(good)	D	4.53	81
	Broadleaf Chaparral ` `	(good)	D	3.86	78
	Woods	(good)	D	.65	77
	Total Area / Weighted Curve Number			9.04	79
				====	==

DAS

Red Dirt Grapes
Revised Hennessey Northeast, Post-Project, Tc inc 100
Napa County, California

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
ENE							
SHEET	100	0.0300	0.150				0.126
SHALLOW	240	0.0460	0.050				0.019
SHALLOW	508	0.1440	0.050				0.023
CHANNEL	480	0.1430	0.045	4.00	6.00	9.524	0.014
CHANNEL	220	0.0100	0.045	4.00	6.00	2.546	0.024
					Time of Concentration		.206
WNE							
SHEET	100	0.1400	0.150				0.068
SHALLOW	720	0.1580	0.050				0.031
SHALLOW	410	0.3050	0.050				0.013
CHANNEL	340	0.0100	0.045	6.00	4.00	4.293	0.022
					Time of Concentration		.134

DAS

Red Dirt Grapes
Revised Hennessey Northeast, Post-Project, Tc inc 100
Napa County, California

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
ENE							
SHEET	100	0.0300	0.150				0.126
SHALLOW	240	0.0460	0.050				0.019
SHALLOW	508	0.1440	0.050				0.023
CHANNEL	480	0.1430	0.045	4.00	6.00	9.524	0.014
CHANNEL		MANUAL ENTRY					0.024
					Time of Concentration		.206
WNE							
SHEET	100	0.1400	0.150				0.068
SHALLOW	720	0.1580	0.050				0.031
SHALLOW	410	0.3050	0.050				0.013
CHANNEL		MANUAL ENTRY					0.022
					Time of Concentration		.134