



VINEYARD DESIGN
EROSION CONTROL
WATER DEVELOPMENT
DRAINAGE
PERMITTING
GPS/GIS


Exhibit C

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

MEMORANDUM

Date: December 13th, 2018

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

From: James R. Bushey, P.E.
Rachel L. Rosasco, E.I.T. 

Cc: Brian Bordona, Napa County Planning, Building and Environmental Services

Re: Darioush Estate Track I ECP – Hydrologic Analysis
2100 Curry Lane, Napa, CA 94558; APN 045-380-010

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

Two (2) watersheds were delineated for the hydrologic modeling using 2-foot contours from American Aerial, Inc. and 5-foot contours from Napa County. Watershed 1 encompasses approximately 31 acres and drains directly into Kreuse Creek, which runs through the property. Watershed 2 is located south of Watershed 1 and contains approximately 12 acres that contribute flow to an unnamed blue-line stream that eventually drains to Kreuse Creek. Watersheds 1 and 2 converge and exit the property to the west where they flow into a neighboring unnamed reservoir. Please see the attached figures for the location of each watershed.

Soils within the watersheds were obtained from the NRCS Web Soil Survey and are classified as Haire loam 2-9% slopes, Hambright Rock – outcrop complex 30-75% slopes, and Sobrante loam 5-30% slopes. The Hambright Rock – outcrop complex soil group is classified as Hydrologic Soil Group (HSG) C. The remaining soils are classified as HSG D. Please see the attached figures for soil type delineations within the vicinity of each watershed.

Land use areas were initially delineated based on Napa County orthophotos. A site visit was then conducted on October 5, 2018 by Matt Bueno to ground truth the orthophotos and determine the existing land use conditions. The land use hydrologic conditions were classified based on the respective covers as poor (less than 50% cover), fair (50%-75% cover), or good (greater than or equal to 75% cover). The area has been historically grazed and is currently intermittently grazed for fire protection and fuel-load reduction purposes. The HydroCAD software analyzes the land use data along with the corresponding soil HSGs to determine a weighted Curve Number for

runoff calculations. Please see the attached figures for existing and proposed land use delineations.

The Time of Concentration (Tc) flow path within each watershed was determined using both American Aerial, Inc. and Napa County contours. The Tc did not change from pre- to post-project conditions for either watershed. Please see the attached figures for both the pre- and post-project Tc flow paths by watershed.

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

Table 1. Hydrologic Analysis Summary

	Runoff (cfs)					
	Watershed 1			Watershed 2		
	Pre- Project	Post- Project	Increase/ Decrease	Pre- Project	Post- Project	Increase/ Decrease
2-Year Storm	5.98	5.98	0.00	2.77	2.77	0.00
10-Year Storm	17.25	17.25	0.00	7.41	7.41	0.00
50-Year Storm	30.16	30.16	0.00	12.60	12.60	0.00
100-Year Storm	35.61	35.61	0.00	14.81	14.81	0.00

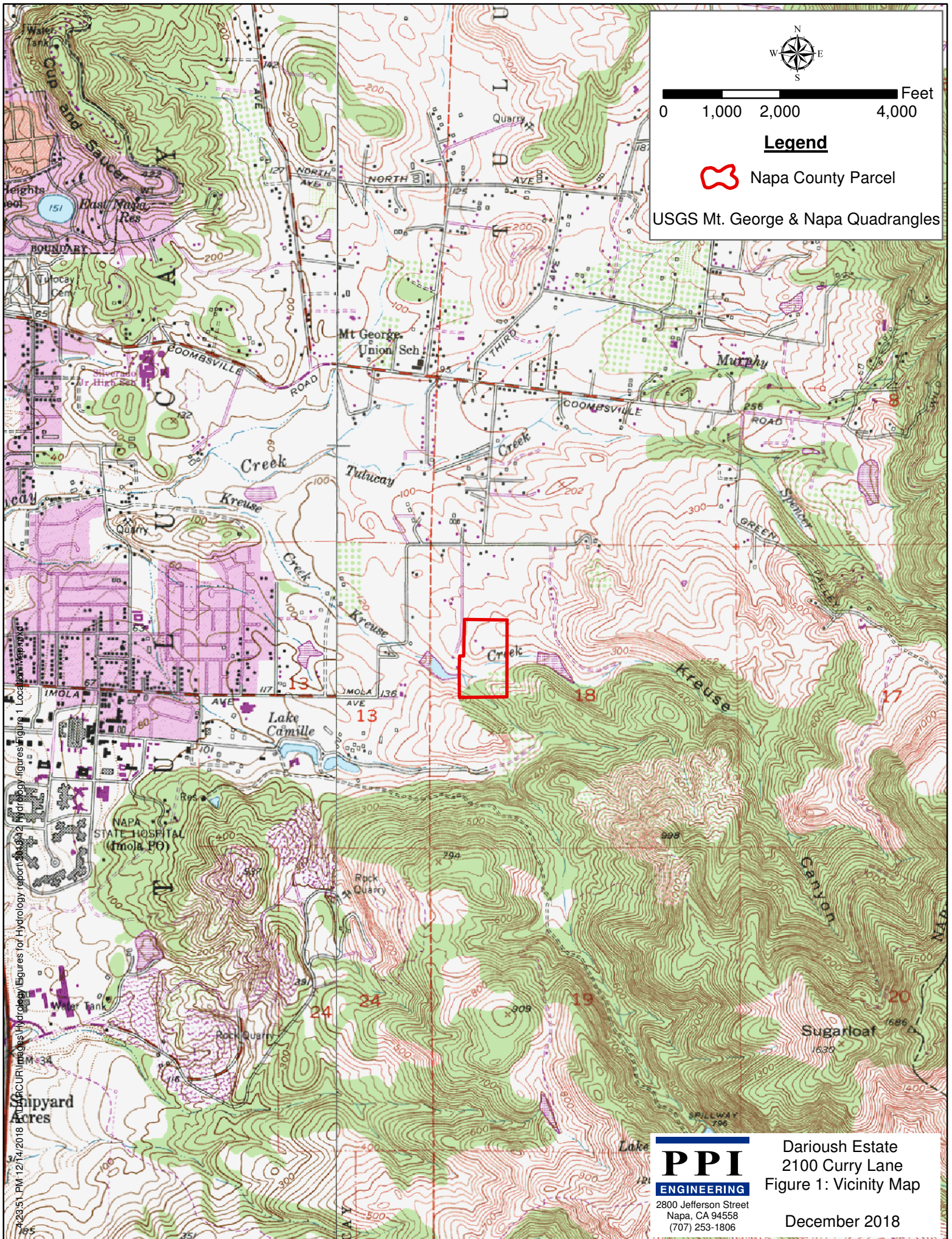
The HydroCAD models for Watersheds 1 and 2 show no net change in runoff from pre- to post-project conditions for all storm events. This is due to the fact that neither the Curve Number nor the Time of Concentration changed for the post-project conditions in these watersheds.

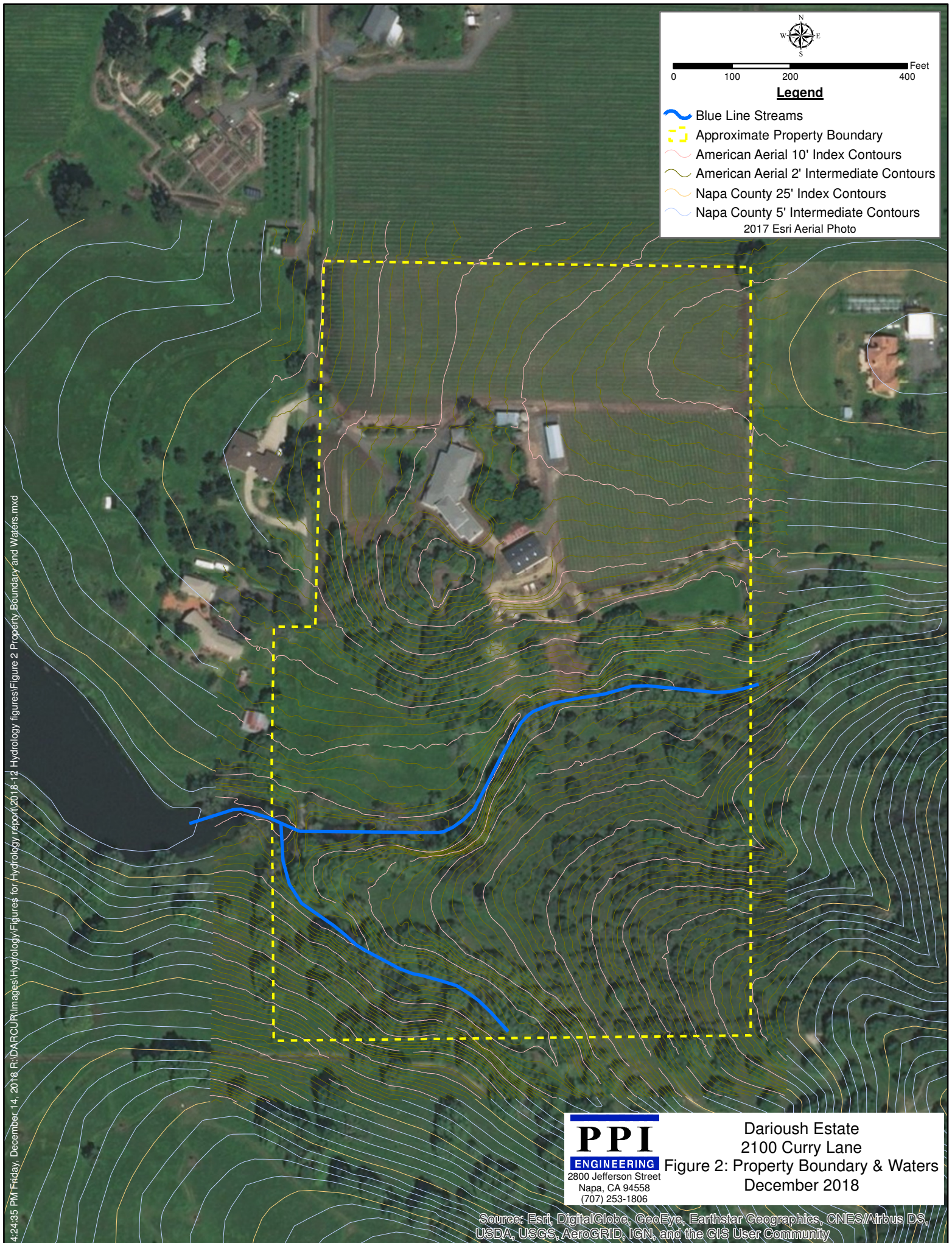
Please see the attached HydroCAD analyses for inputs, details, and summaries of the hydrologic modeling. Based on our analysis, there are no predicted runoff increases, and no negative hydrologic impacts are expected as a result of this project. The project as proposed is in compliance with Napa County's General Plan policy requiring no-net-increase in runoff.



ATTACHMENT A

SUPPORTING FIGURES





4:24:35 PM Friday, December 14, 2018 R:\DARCUR\Images\Hydrology\Figures for Hydrology report\2018-12 Hydrology figures\Figure 2 Property Boundary and Waters.mxd

0 100 200 400 Feet

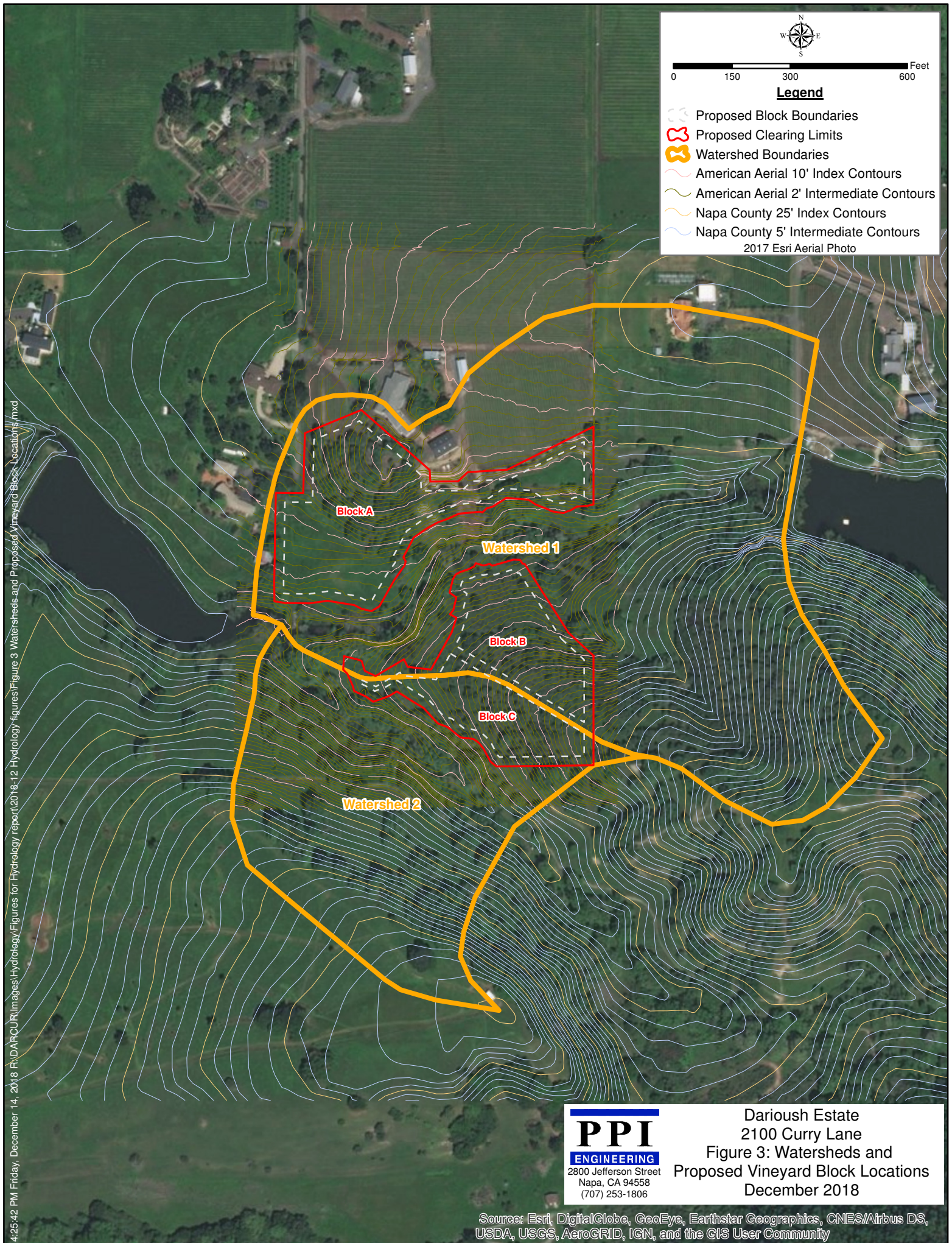
Legend

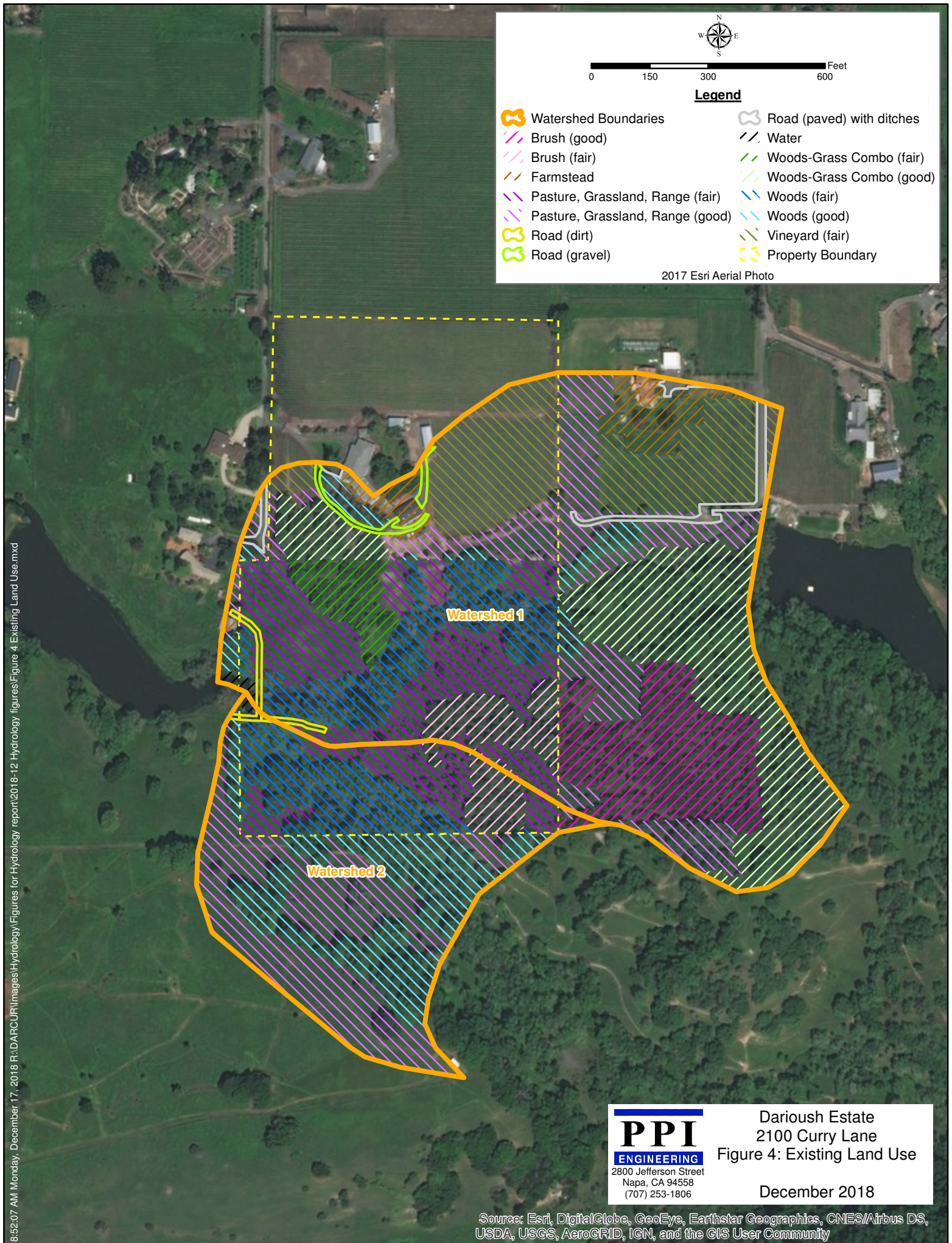
- Blue Line Streams
- Approximate Property Boundary
- American Aerial 10' Index Contours
- American Aerial 2' Intermediate Contours
- Napa County 25' Index Contours
- Napa County 5' Intermediate Contours
- 2017 Esri Aerial Photo

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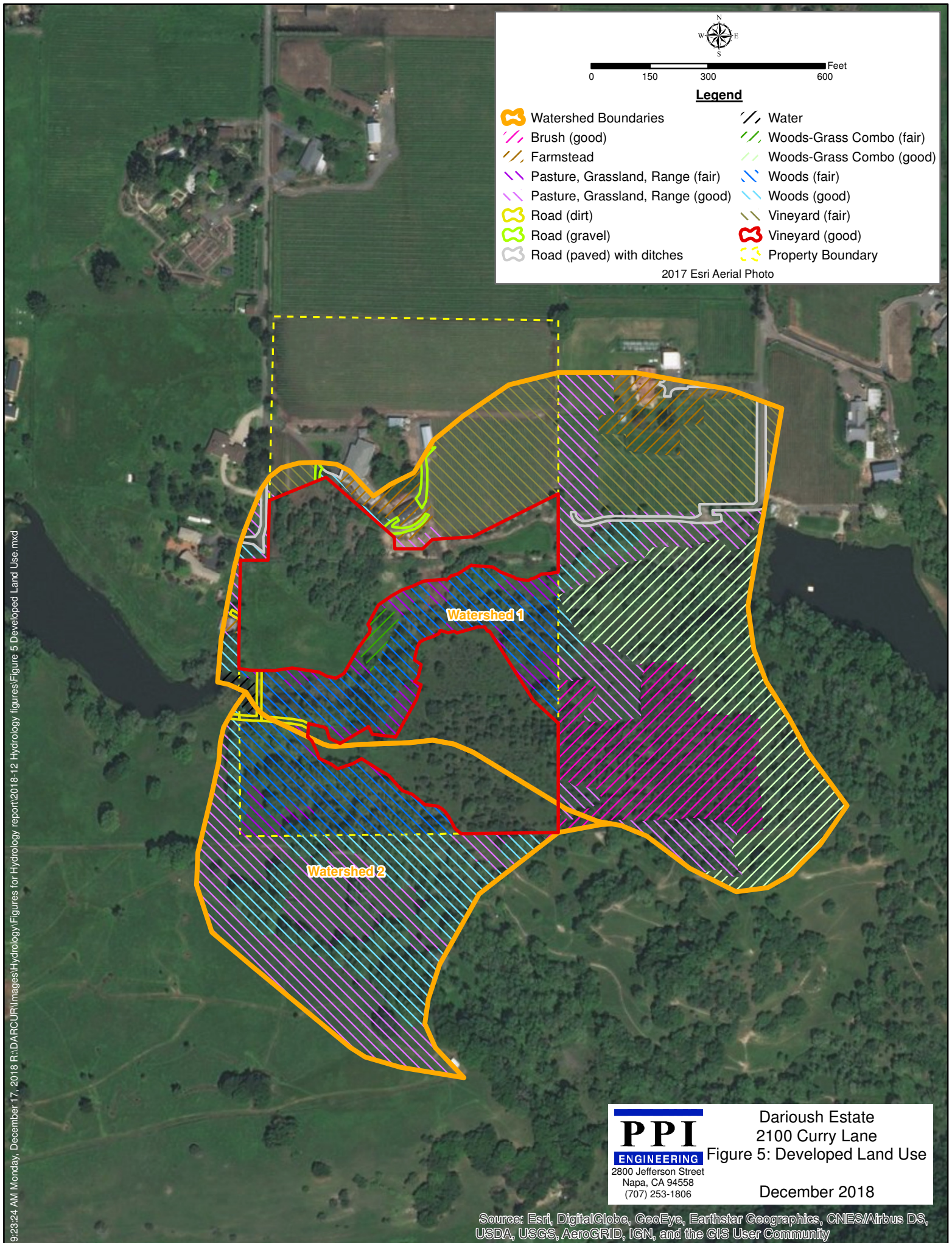
Darioush Estate
2100 Curry Lane
Figure 2: Property Boundary & Waters
December 2018

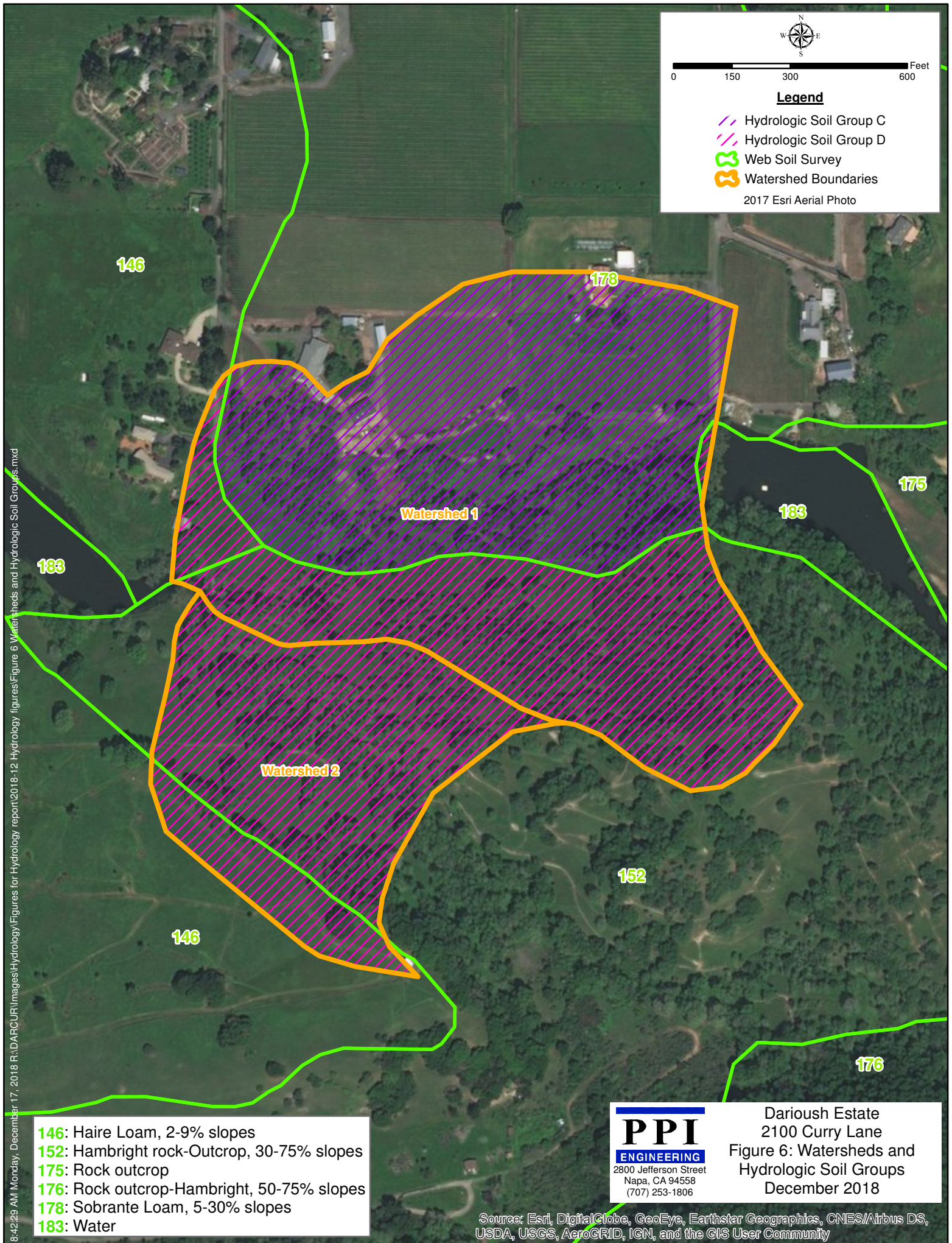
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

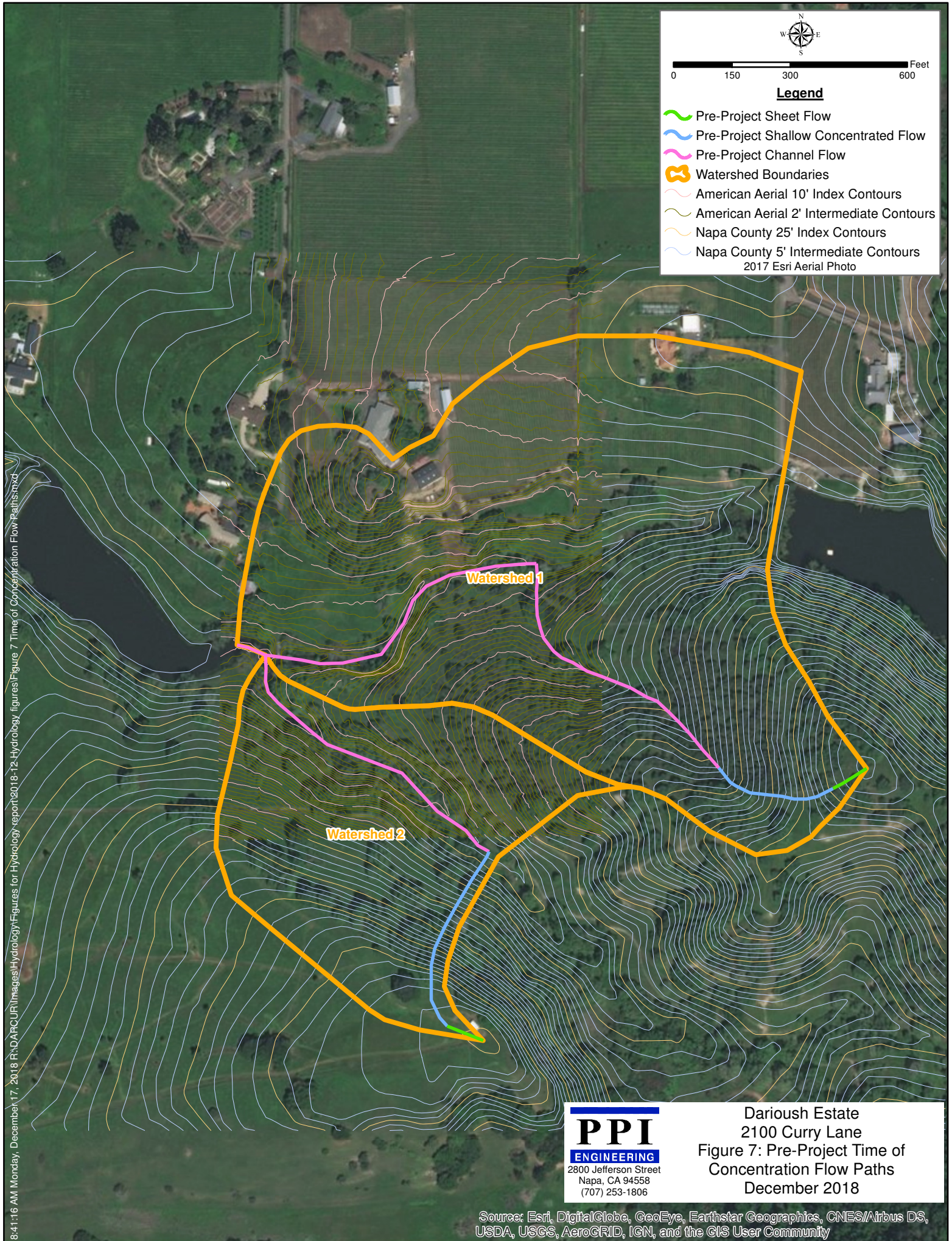


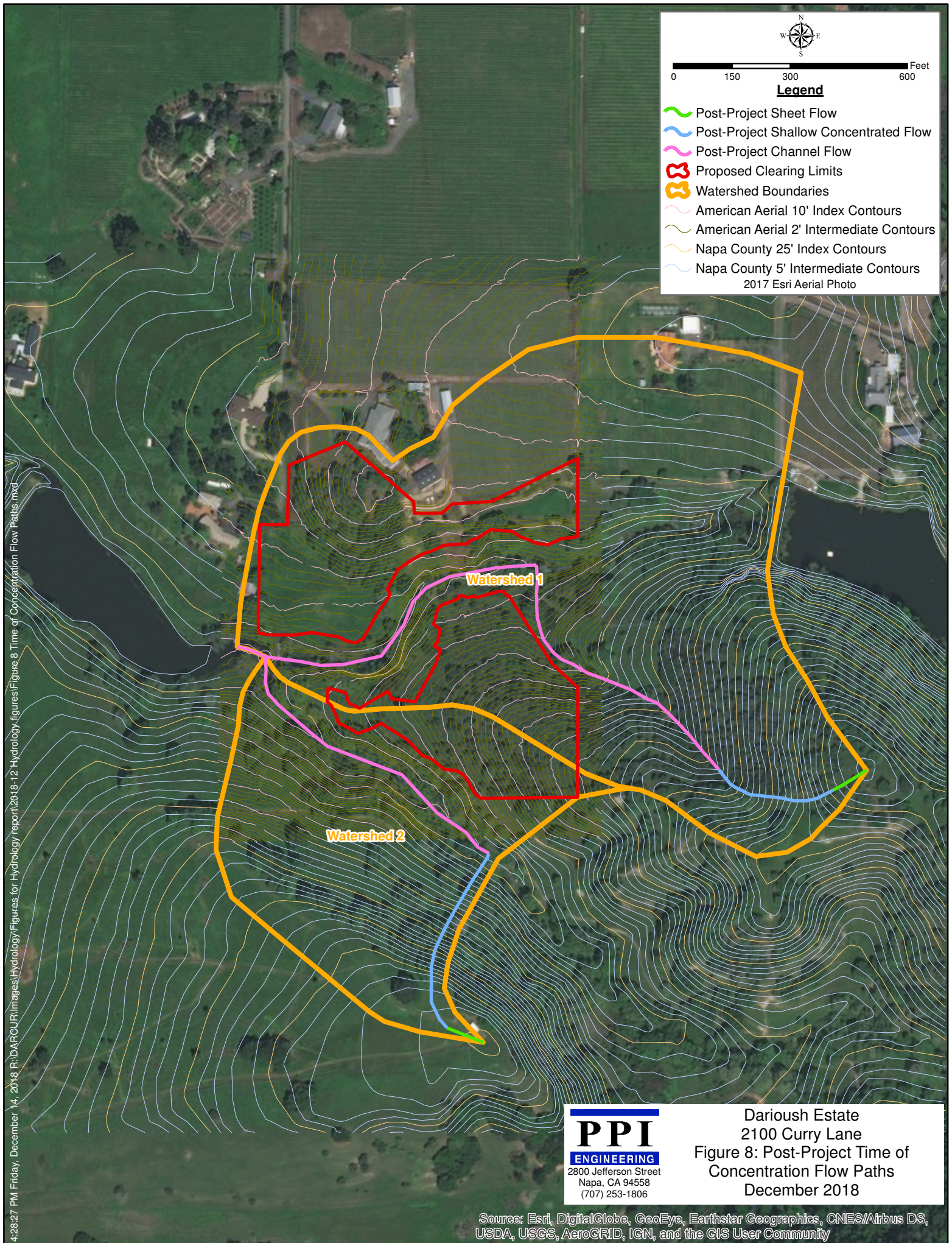


8:52:07 AM Monday, December 17, 2018 R:\DARCUR\Images\Hydrology\Figures for Hydrology report\2018-12 Hydrology figures\Figure 4 Existing Land Use.mxd









ATTACHMENT B

HYDROCAD ANALYSES

Darioush Curry Lane Pre-Project

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Type IA 24-hr 2 Year Rainfall=2.92"

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Page 1

Summary for Subcatchment WS 1: Subcat WS 1

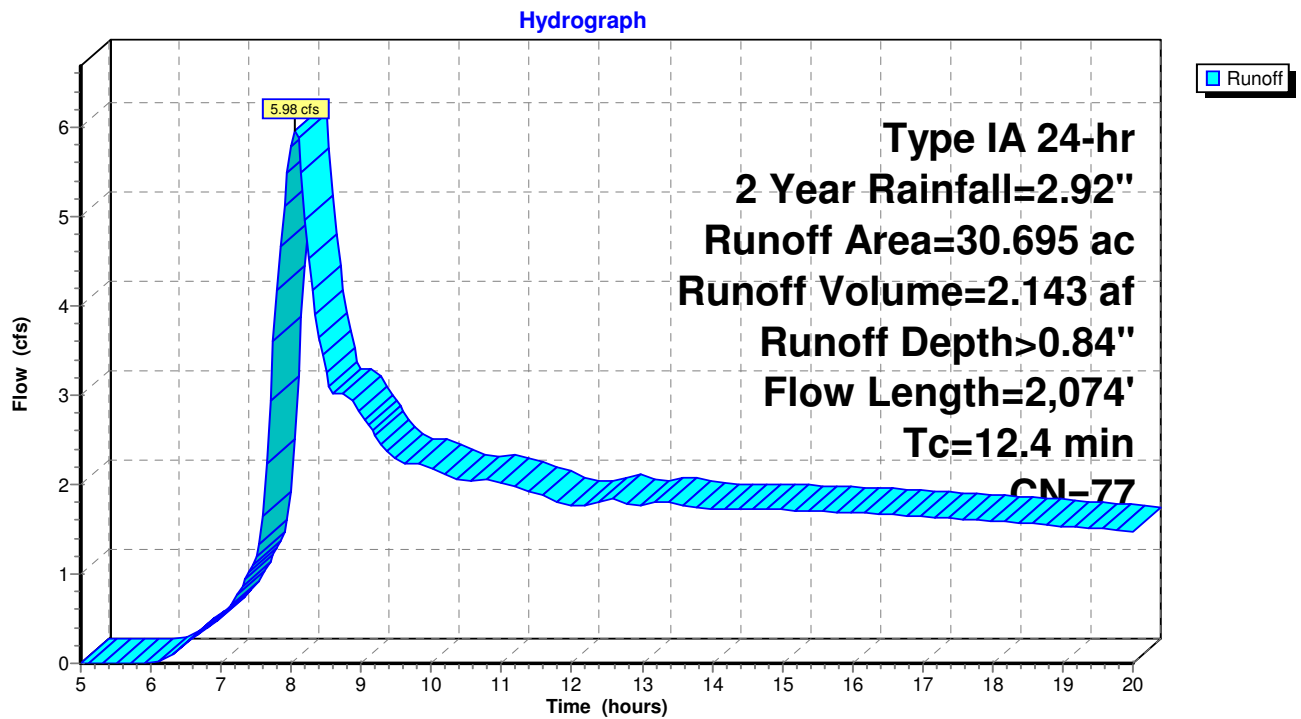
Runoff = 5.98 cfs @ 8.06 hrs, Volume= 2.143 af, Depth> 0.84"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type IA 24-hr 2 Year Rainfall=2.92"

Area (ac)	CN	Description
* 0.000	0	, HSG C
1.045	77	Brush, Fair, HSG D
0.050	65	Brush, Good, HSG C
3.580	73	Brush, Good, HSG D
0.119	89	Dirt roads, HSG D
1.418	82	Farmsteads, HSG C
0.030	86	Farmsteads, HSG D
0.163	89	Gravel roads, HSG C
1.668	79	Pasture/grassland/range, Fair, HSG C
2.441	84	Pasture/grassland/range, Fair, HSG D
3.089	74	Pasture/grassland/range, Good, HSG C
1.397	80	Pasture/grassland/range, Good, HSG D
0.418	92	Paved roads w/open ditches, 50% imp, HSG C
0.068	93	Paved roads w/open ditches, 50% imp, HSG D
4.613	79	Vineyard, Fair, HSG C
0.012	84	Vineyard, Fair, HSG D
0.090	98	Water Surface, HSG D
1.661	73	Woods, Fair, HSG C
1.083	79	Woods, Fair, HSG D
0.765	70	Woods, Good, HSG C
0.155	77	Woods, Good, HSG D
0.952	76	Woods/grass comb., Fair, HSG C
0.001	82	Woods/grass comb., Fair, HSG D
3.222	72	Woods/grass comb., Good, HSG C
2.656	79	Woods/grass comb., Good, HSG D
30.695	77	Weighted Average
30.362		98.91% Pervious Area
0.333		1.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.7	100	0.1500	0.25		Sheet Flow, Sheet Grass: Dense n= 0.240 P2= 2.92"
0.6	325	0.3000	8.82		Shallow Concentrated Flow, Shallow Unpaved Kv= 16.1 fps
1.4	766	0.1200	9.38	65.67	Trap/Vee/Rect Channel Flow, Swale Bot.W=3.00' D=1.00' Z= 4.0 '/' Top.W=11.00' n= 0.040 Mountain streams
3.7	883	0.0200	4.02	20.10	Trap/Vee/Rect Channel Flow, Stream Bot.W=3.00' D=1.00' Z= 2.0 '/' Top.W=7.00' n= 0.040 Mountain streams
12.4	2,074	Total			

Subcatchment WS 1: Subcat WS 1



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Type IA 24-hr 10 Year Rainfall=4.75"

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Summary for Subcatchment WS 1: Subcat WS 1

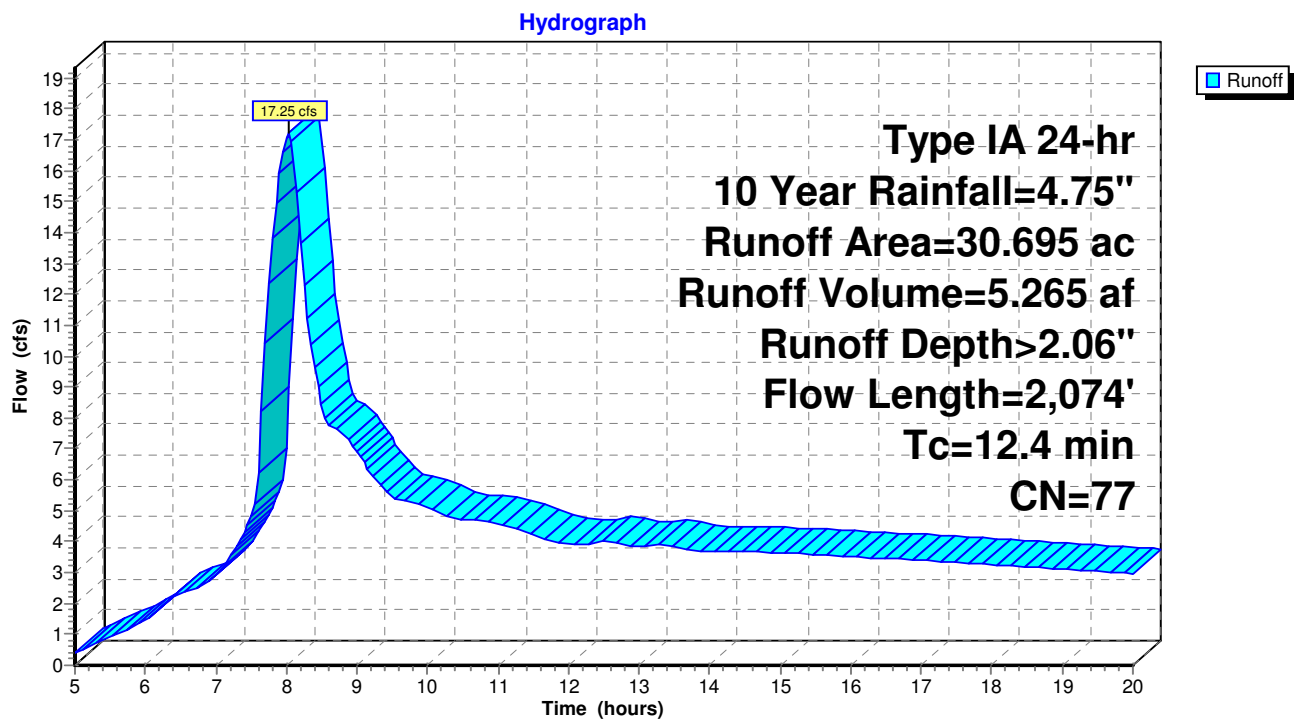
Runoff = 17.25 cfs @ 8.04 hrs, Volume= 5.265 af, Depth> 2.06"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type IA 24-hr 10 Year Rainfall=4.75"

Area (ac)	CN	Description
* 0.000	0	, HSG C
1.045	77	Brush, Fair, HSG D
0.050	65	Brush, Good, HSG C
3.580	73	Brush, Good, HSG D
0.119	89	Dirt roads, HSG D
1.418	82	Farmsteads, HSG C
0.030	86	Farmsteads, HSG D
0.163	89	Gravel roads, HSG C
1.668	79	Pasture/grassland/range, Fair, HSG C
2.441	84	Pasture/grassland/range, Fair, HSG D
3.089	74	Pasture/grassland/range, Good, HSG C
1.397	80	Pasture/grassland/range, Good, HSG D
0.418	92	Paved roads w/open ditches, 50% imp, HSG C
0.068	93	Paved roads w/open ditches, 50% imp, HSG D
4.613	79	Vineyard, Fair, HSG C
0.012	84	Vineyard, Fair, HSG D
0.090	98	Water Surface, HSG D
1.661	73	Woods, Fair, HSG C
1.083	79	Woods, Fair, HSG D
0.765	70	Woods, Good, HSG C
0.155	77	Woods, Good, HSG D
0.952	76	Woods/grass comb., Fair, HSG C
0.001	82	Woods/grass comb., Fair, HSG D
3.222	72	Woods/grass comb., Good, HSG C
2.656	79	Woods/grass comb., Good, HSG D
30.695	77	Weighted Average
30.362		98.91% Pervious Area
0.333		1.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.7	100	0.1500	0.25		Sheet Flow, Sheet Grass: Dense n= 0.240 P2= 2.92"
0.6	325	0.3000	8.82		Shallow Concentrated Flow, Shallow Unpaved Kv= 16.1 fps
1.4	766	0.1200	9.38	65.67	Trap/Vee/Rect Channel Flow, Swale Bot.W=3.00' D=1.00' Z= 4.0 '/' Top.W=11.00' n= 0.040 Mountain streams
3.7	883	0.0200	4.02	20.10	Trap/Vee/Rect Channel Flow, Stream Bot.W=3.00' D=1.00' Z= 2.0 '/' Top.W=7.00' n= 0.040 Mountain streams
12.4	2,074	Total			

Subcatchment WS 1: Subcat WS 1



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Type IA 24-hr 50 Year Rainfall=6.57"

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Summary for Subcatchment WS 1: Subcat WS 1

Runoff = 30.16 cfs @ 8.03 hrs, Volume= 8.727 af, Depth> 3.41"

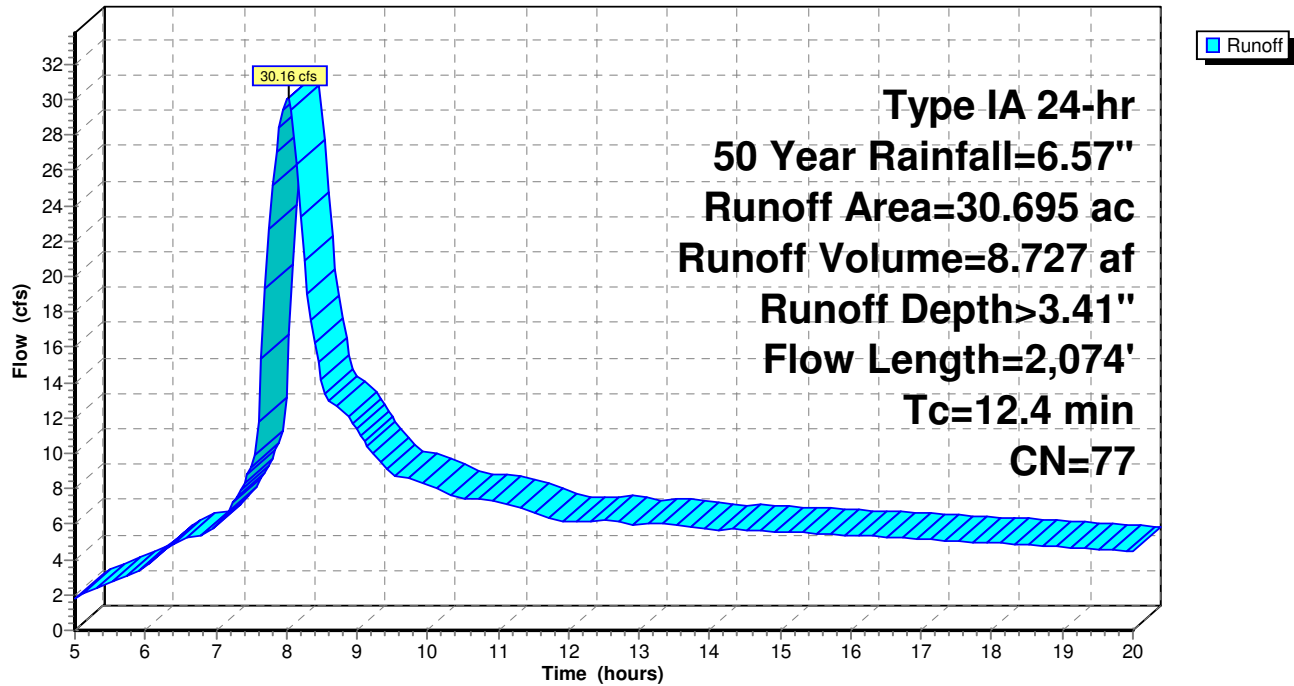
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type IA 24-hr 50 Year Rainfall=6.57"

Area (ac)	CN	Description
* 0.000	0	, HSG C
1.045	77	Brush, Fair, HSG D
0.050	65	Brush, Good, HSG C
3.580	73	Brush, Good, HSG D
0.119	89	Dirt roads, HSG D
1.418	82	Farmsteads, HSG C
0.030	86	Farmsteads, HSG D
0.163	89	Gravel roads, HSG C
1.668	79	Pasture/grassland/range, Fair, HSG C
2.441	84	Pasture/grassland/range, Fair, HSG D
3.089	74	Pasture/grassland/range, Good, HSG C
1.397	80	Pasture/grassland/range, Good, HSG D
0.418	92	Paved roads w/open ditches, 50% imp, HSG C
0.068	93	Paved roads w/open ditches, 50% imp, HSG D
4.613	79	Vineyard, Fair, HSG C
0.012	84	Vineyard, Fair, HSG D
0.090	98	Water Surface, HSG D
1.661	73	Woods, Fair, HSG C
1.083	79	Woods, Fair, HSG D
0.765	70	Woods, Good, HSG C
0.155	77	Woods, Good, HSG D
0.952	76	Woods/grass comb., Fair, HSG C
0.001	82	Woods/grass comb., Fair, HSG D
3.222	72	Woods/grass comb., Good, HSG C
2.656	79	Woods/grass comb., Good, HSG D
30.695	77	Weighted Average
30.362		98.91% Pervious Area
0.333		1.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.7	100	0.1500	0.25		Sheet Flow, Sheet Grass: Dense n= 0.240 P2= 2.92"
0.6	325	0.3000	8.82		Shallow Concentrated Flow, Shallow Unpaved Kv= 16.1 fps
1.4	766	0.1200	9.38	65.67	Trap/Vee/Rect Channel Flow, Swale Bot.W=3.00' D=1.00' Z= 4.0 '/' Top.W=11.00' n= 0.040 Mountain streams
3.7	883	0.0200	4.02	20.10	Trap/Vee/Rect Channel Flow, Stream Bot.W=3.00' D=1.00' Z= 2.0 '/' Top.W=7.00' n= 0.040 Mountain streams
12.4	2,074	Total			

Subcatchment WS 1: Subcat WS 1

Hydrograph



Darioush Curry Lane Pre-Project

Type IA 24-hr 100 Year Rainfall=7.32"

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Printed 12/17/2018

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Summary for Subcatchment WS 1: Subcat WS 1

Runoff = 35.61 cfs @ 8.02 hrs, Volume= 10.199 af, Depth> 3.99"

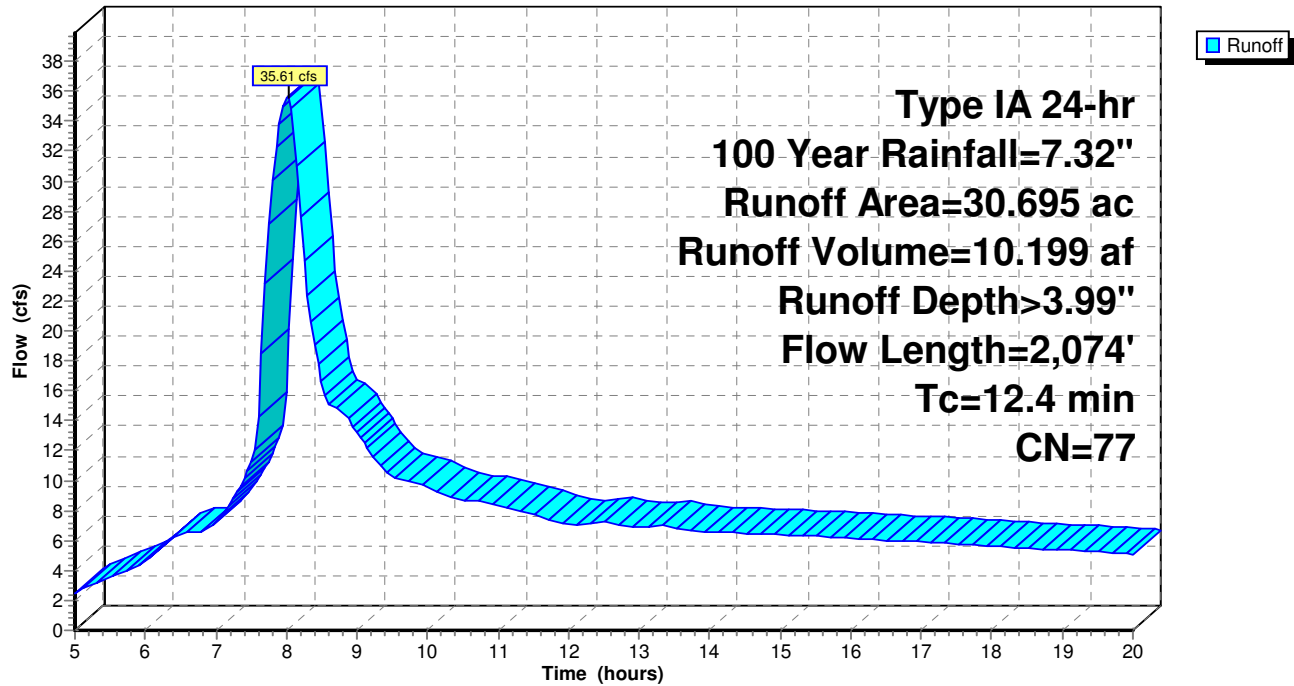
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type IA 24-hr 100 Year Rainfall=7.32"

Area (ac)	CN	Description
* 0.000	0	, HSG C
1.045	77	Brush, Fair, HSG D
0.050	65	Brush, Good, HSG C
3.580	73	Brush, Good, HSG D
0.119	89	Dirt roads, HSG D
1.418	82	Farmsteads, HSG C
0.030	86	Farmsteads, HSG D
0.163	89	Gravel roads, HSG C
1.668	79	Pasture/grassland/range, Fair, HSG C
2.441	84	Pasture/grassland/range, Fair, HSG D
3.089	74	Pasture/grassland/range, Good, HSG C
1.397	80	Pasture/grassland/range, Good, HSG D
0.418	92	Paved roads w/open ditches, 50% imp, HSG C
0.068	93	Paved roads w/open ditches, 50% imp, HSG D
4.613	79	Vineyard, Fair, HSG C
0.012	84	Vineyard, Fair, HSG D
0.090	98	Water Surface, HSG D
1.661	73	Woods, Fair, HSG C
1.083	79	Woods, Fair, HSG D
0.765	70	Woods, Good, HSG C
0.155	77	Woods, Good, HSG D
0.952	76	Woods/grass comb., Fair, HSG C
0.001	82	Woods/grass comb., Fair, HSG D
3.222	72	Woods/grass comb., Good, HSG C
2.656	79	Woods/grass comb., Good, HSG D
30.695	77	Weighted Average
30.362		98.91% Pervious Area
0.333		1.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.7	100	0.1500	0.25		Sheet Flow, Sheet Grass: Dense n= 0.240 P2= 2.92"
0.6	325	0.3000	8.82		Shallow Concentrated Flow, Shallow Unpaved Kv= 16.1 fps
1.4	766	0.1200	9.38	65.67	Trap/Vee/Rect Channel Flow, Swale Bot.W=3.00' D=1.00' Z= 4.0 '/' Top.W=11.00' n= 0.040 Mountain streams
3.7	883	0.0200	4.02	20.10	Trap/Vee/Rect Channel Flow, Stream Bot.W=3.00' D=1.00' Z= 2.0 '/' Top.W=7.00' n= 0.040 Mountain streams
12.4	2,074	Total			

Subcatchment WS 1: Subcat WS 1

Hydrograph



Darioush Curry Lane Post-Project

Type IA 24-hr 2 Year Rainfall=2.92"

Prepared by Microsoft

Printed 12/17/2018

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Summary for Subcatchment WS 1: Subcat WS 1

Runoff = 5.98 cfs @ 8.06 hrs, Volume= 2.143 af, Depth> 0.84"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type IA 24-hr 2 Year Rainfall=2.92"

Area (ac)	CN	Description
* 0.000	0	, HSG C
* 0.000	0	, HSG D
0.050	65	Brush, Good, HSG C
3.580	73	Brush, Good, HSG D
0.062	89	Dirt roads, HSG D
1.415	82	Farmsteads, HSG C
0.030	86	Farmsteads, HSG D
0.106	89	Gravel roads, HSG C
0.431	79	Pasture/grassland/range, Fair, HSG C
0.536	84	Pasture/grassland/range, Fair, HSG D
2.228	74	Pasture/grassland/range, Good, HSG C
1.397	80	Pasture/grassland/range, Good, HSG D
0.418	92	Paved roads w/open ditches, 50% imp, HSG C
0.068	93	Paved roads w/open ditches, 50% imp, HSG D
4.592	79	Vineyard, Fair, HSG C
0.012	84	Vineyard, Fair, HSG D
4.163	75	Vineyard, Good, HSG C
2.969	81	Vineyard, Good, HSG D
0.090	98	Water Surface, HSG D
1.439	73	Woods, Fair, HSG C
1.121	79	Woods, Fair, HSG D
0.524	70	Woods, Good, HSG C
0.155	77	Woods, Good, HSG D
0.196	76	Woods/grass comb., Fair, HSG C
0.001	82	Woods/grass comb., Fair, HSG D
2.456	72	Woods/grass comb., Good, HSG C
2.656	79	Woods/grass comb., Good, HSG D
30.695	77	Weighted Average
30.362		98.91% Pervious Area
0.333		1.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.7	100	0.1500	0.25		Sheet Flow, Sheet Grass: Dense n= 0.240 P2= 2.92"
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1.4	766	0.1200	9.38	65.67	Trap/Vee/Rect Channel Flow, Swale Bot.W=3.00' D=1.00' Z= 4.0 '/' Top.W=11.00' n= 0.040 Mountain streams
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Darioush Curry Lane Post-Project

Prepared by Microsoft

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Type IA 24-hr 2 Year Rainfall=2.92"

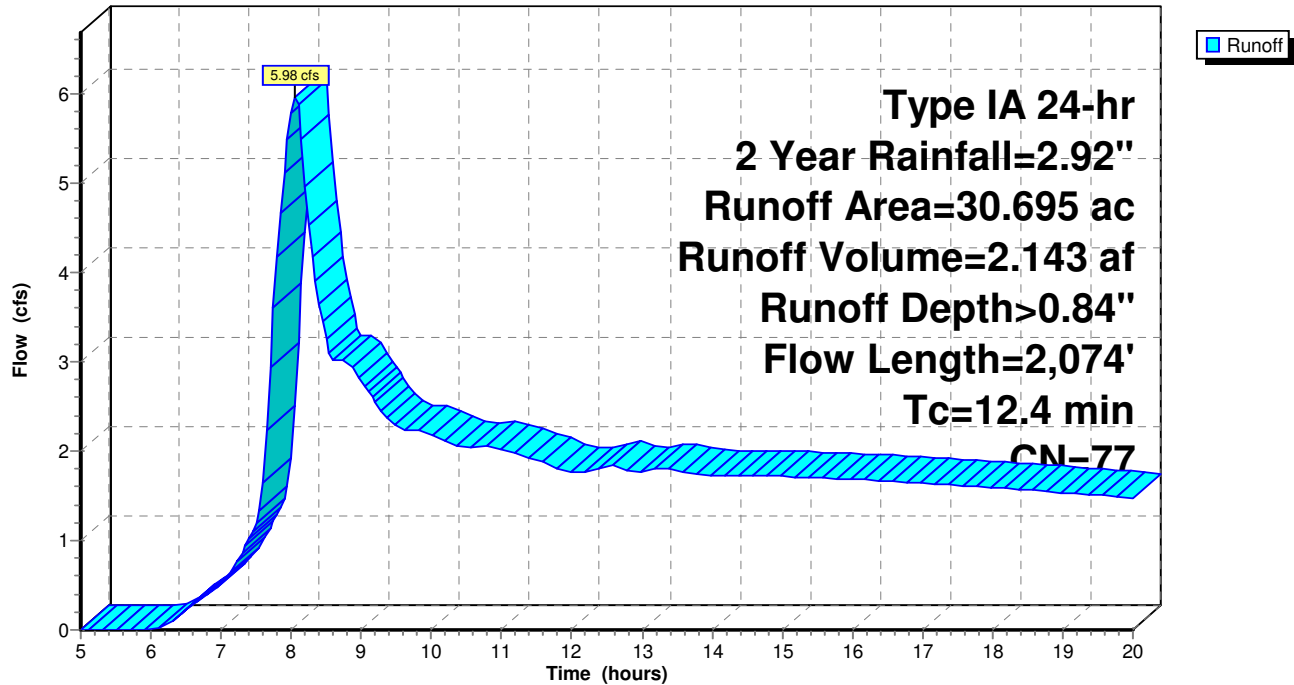
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Page 10

12.4 2,074 Total

Subcatchment WS 1: Subcat WS 1

Hydrograph



Darioush Curry Lane Post-Project

Prepared by Microsoft

HydroCAD® 10.00-17 s/n 09429 © 2016 HydroCAD Software Solutions LLC

Type IA 24-hr 10 Year Rainfall=4.75"

Printed 12/17/2018

Page 11

Summary for Subcatchment WS 1: Subcat WS 1

Runoff = 17.25 cfs @ 8.04 hrs, Volume= 5.265 af, Depth> 2.06"

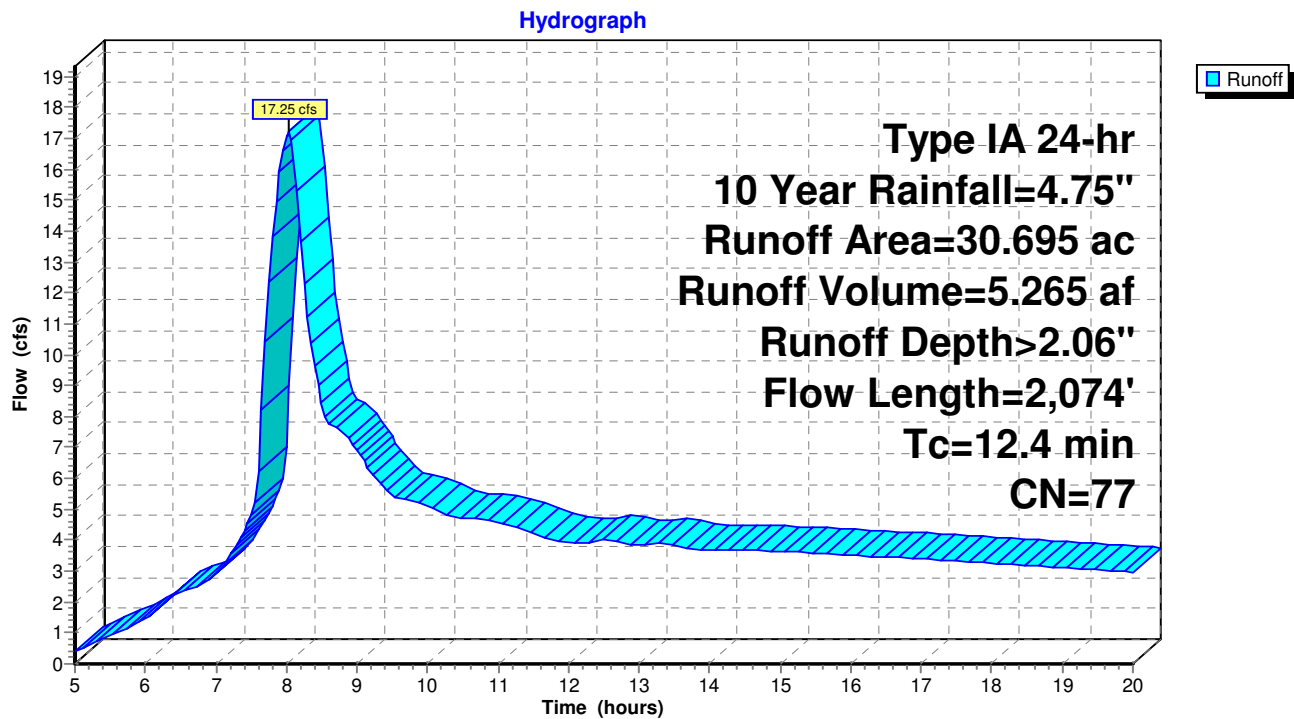
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type IA 24-hr 10 Year Rainfall=4.75"

Area (ac)	CN	Description
* 0.000	0	, HSG C
* 0.000	0	, HSG D
0.050	65	Brush, Good, HSG C
3.580	73	Brush, Good, HSG D
0.062	89	Dirt roads, HSG D
1.415	82	Farmsteads, HSG C
0.030	86	Farmsteads, HSG D
0.106	89	Gravel roads, HSG C
0.431	79	Pasture/grassland/range, Fair, HSG C
0.536	84	Pasture/grassland/range, Fair, HSG D
2.228	74	Pasture/grassland/range, Good, HSG C
1.397	80	Pasture/grassland/range, Good, HSG D
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0.068	93	Paved roads w/open ditches, 50% imp, HSG D
4.592	79	Vineyard, Fair, HSG C
0.012	84	Vineyard, Fair, HSG D
4.163	75	Vineyard, Good, HSG C
2.969	81	Vineyard, Good, HSG D
0.090	98	Water Surface, HSG D
1.439	73	Woods, Fair, HSG C
1.121	79	Woods, Fair, HSG D
0.524	70	Woods, Good, HSG C
0.155	77	Woods, Good, HSG D
0.196	76	Woods/grass comb., Fair, HSG C
0.001	82	Woods/grass comb., Fair, HSG D
2.456	72	Woods/grass comb., Good, HSG C
2.656	79	Woods/grass comb., Good, HSG D
30.695	77	Weighted Average
30.362		98.91% Pervious Area
0.333		1.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.7	100	0.1500	0.25		Sheet Flow, Sheet Grass: Dense n= 0.240 P2= 2.92"
0.6	325	0.3000	8.82		Shallow Concentrated Flow, Shallow Unpaved Kv= 16.1 fps
1.4	766	0.1200	9.38	65.67	Trap/Vee/Rect Channel Flow, Swale Bot.W=3.00' D=1.00' Z= 4.0 '/' Top.W=11.00' n= 0.040 Mountain streams
3.7	883	0.0200	4.02	20.10	Trap/Vee/Rect Channel Flow, Stream Bot.W=3.00' D=1.00' Z= 2.0 '/' Top.W=7.00' n= 0.040 Mountain streams

12.4 2,074 Total

Subcatchment WS 1: Subcat WS 1



Darioush Curry Lane Post-Project

Type IA 24-hr 50 Year Rainfall=6.57"

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Summary for Subcatchment WS 1: Subcat WS 1

Runoff = 30.16 cfs @ 8.03 hrs, Volume= 8.727 af, Depth> 3.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type IA 24-hr 50 Year Rainfall=6.57"

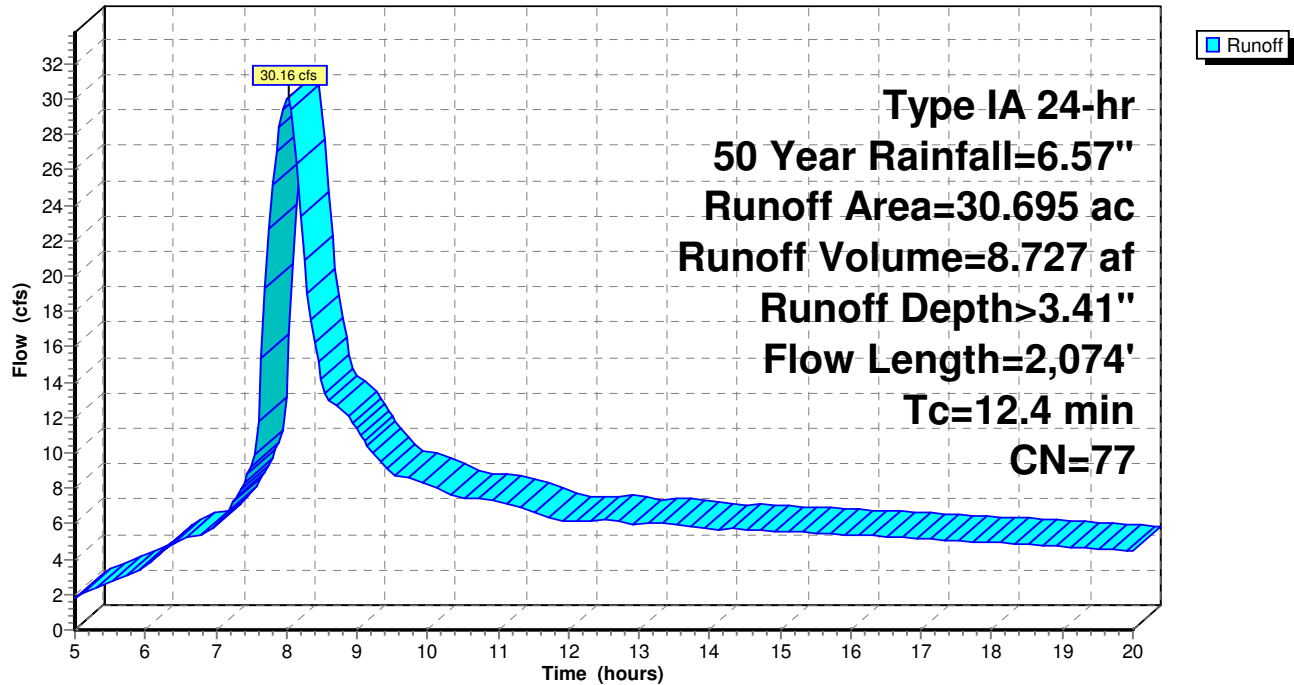
Area (ac)	CN	Description
* 0.000	0	, HSG C
* 0.000	0	, HSG D
0.050	65	Brush, Good, HSG C
3.580	73	Brush, Good, HSG D
0.062	89	Dirt roads, HSG D
1.415	82	Farmsteads, HSG C
0.030	86	Farmsteads, HSG D
0.106	89	Gravel roads, HSG C
0.431	79	Pasture/grassland/range, Fair, HSG C
0.536	84	Pasture/grassland/range, Fair, HSG D
2.228	74	Pasture/grassland/range, Good, HSG C
1.397	80	Pasture/grassland/range, Good, HSG D
0.418	92	Paved roads w/open ditches, 50% imp, HSG C
0.068	93	Paved roads w/open ditches, 50% imp, HSG D
4.592	79	Vineyard, Fair, HSG C
0.012	84	Vineyard, Fair, HSG D
4.163	75	Vineyard, Good, HSG C
2.969	81	Vineyard, Good, HSG D
0.090	98	Water Surface, HSG D
1.439	73	Woods, Fair, HSG C
1.121	79	Woods, Fair, HSG D
0.524	70	Woods, Good, HSG C
0.155	77	Woods, Good, HSG D
0.196	76	Woods/grass comb., Fair, HSG C
0.001	82	Woods/grass comb., Fair, HSG D
2.456	72	Woods/grass comb., Good, HSG C
2.656	79	Woods/grass comb., Good, HSG D
30.695	77	Weighted Average
30.362		98.91% Pervious Area
0.333		1.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.7	100	0.1500	0.25		Sheet Flow, Sheet Grass: Dense n= 0.240 P2= 2.92"
0.6	325	0.3000	8.82		Shallow Concentrated Flow, Shallow Unpaved Kv= 16.1 fps
1.4	766	0.1200	9.38	65.67	Trap/Vee/Rect Channel Flow, Swale Bot.W=3.00' D=1.00' Z= 4.0 '/' Top.W=11.00' n= 0.040 Mountain streams
3.7	883	0.0200	4.02	20.10	Trap/Vee/Rect Channel Flow, Stream Bot.W=3.00' D=1.00' Z= 2.0 '/' Top.W=7.00' n= 0.040 Mountain streams

12.4 2,074 Total

Subcatchment WS 1: Subcat WS 1

Hydrograph



Darioush Curry Lane Post-Project

Type IA 24-hr 100 Year Rainfall=7.32"

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Summary for Subcatchment WS 1: Subcat WS 1

Runoff = 35.61 cfs @ 8.02 hrs, Volume= 10.199 af, Depth> 3.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type IA 24-hr 100 Year Rainfall=7.32"

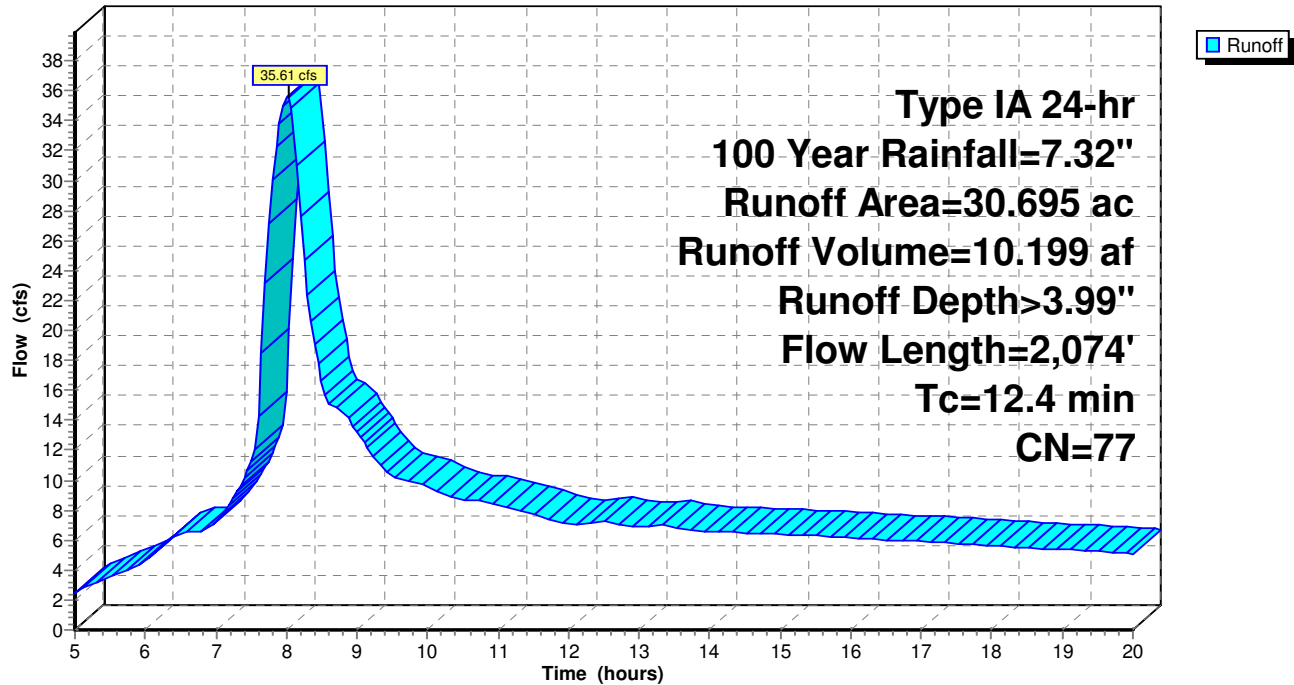
Area (ac)	CN	Description
* 0.000	0	, HSG C
* 0.000	0	, HSG D
0.050	65	Brush, Good, HSG C
3.580	73	Brush, Good, HSG D
0.062	89	Dirt roads, HSG D
1.415	82	Farmsteads, HSG C
0.030	86	Farmsteads, HSG D
0.106	89	Gravel roads, HSG C
0.431	79	Pasture/grassland/range, Fair, HSG C
0.536	84	Pasture/grassland/range, Fair, HSG D
2.228	74	Pasture/grassland/range, Good, HSG C
1.397	80	Pasture/grassland/range, Good, HSG D
0.418	92	Paved roads w/open ditches, 50% imp, HSG C
0.068	93	Paved roads w/open ditches, 50% imp, HSG D
4.592	79	Vineyard, Fair, HSG C
0.012	84	Vineyard, Fair, HSG D
4.163	75	Vineyard, Good, HSG C
2.969	81	Vineyard, Good, HSG D
0.090	98	Water Surface, HSG D
1.439	73	Woods, Fair, HSG C
1.121	79	Woods, Fair, HSG D
0.524	70	Woods, Good, HSG C
0.155	77	Woods, Good, HSG D
0.196	76	Woods/grass comb., Fair, HSG C
0.001	82	Woods/grass comb., Fair, HSG D
2.456	72	Woods/grass comb., Good, HSG C
2.656	79	Woods/grass comb., Good, HSG D
30.695	77	Weighted Average
30.362		98.91% Pervious Area
0.333		1.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.7	100	0.1500	0.25		Sheet Flow, Sheet Grass: Dense n= 0.240 P2= 2.92"
0.6	325	0.3000	8.82		Shallow Concentrated Flow, Shallow Unpaved Kv= 16.1 fps
1.4	766	0.1200	9.38	65.67	Trap/Vee/Rect Channel Flow, Swale Bot.W=3.00' D=1.00' Z= 4.0 '/' Top.W=11.00' n= 0.040 Mountain streams
3.7	883	0.0200	4.02	20.10	Trap/Vee/Rect Channel Flow, Stream Bot.W=3.00' D=1.00' Z= 2.0 '/' Top.W=7.00' n= 0.040 Mountain streams

12.4 2,074 Total

Subcatchment WS 1: Subcat WS 1

Hydrograph



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Type IA 24-hr 2 Year Rainfall=2.92"

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Summary for Subcatchment WS 2: Subcat WS 2

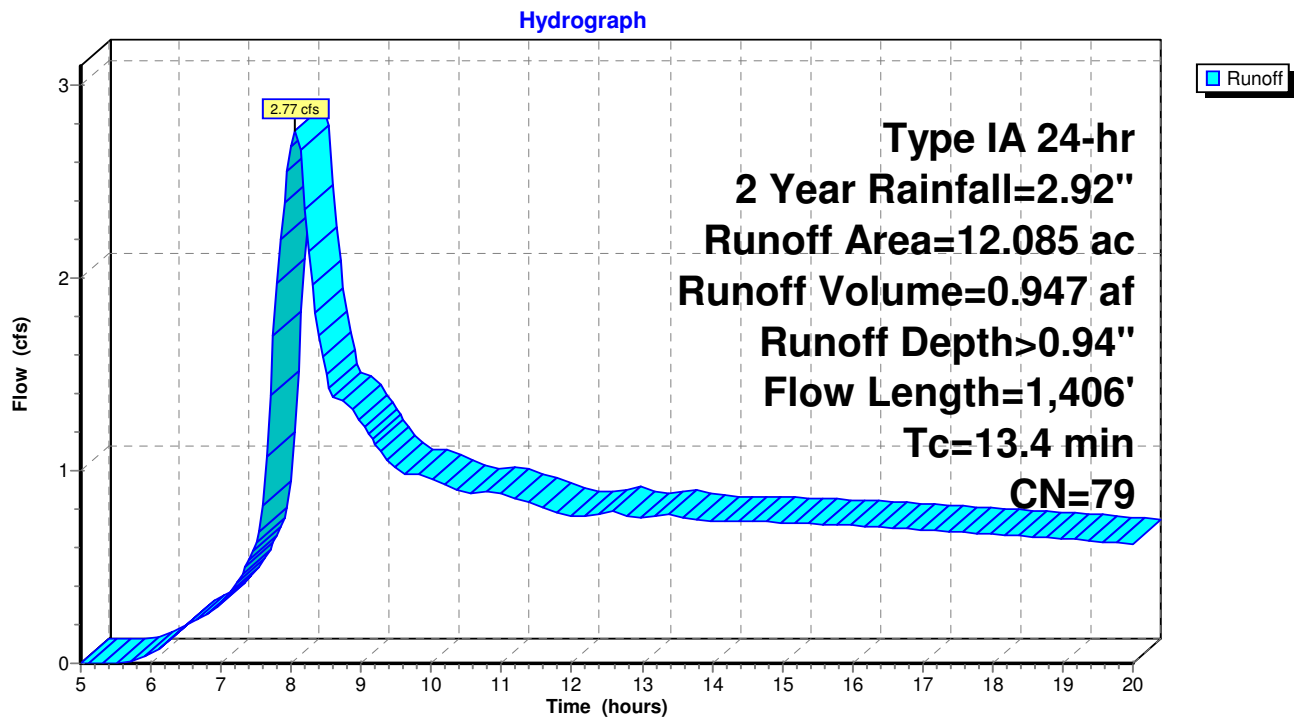
Runoff = 2.77 cfs @ 8.06 hrs, Volume= 0.947 af, Depth> 0.94"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type IA 24-hr 2 Year Rainfall=2.92"

Area (ac)	CN	Description
0.618	77	Brush, Fair, HSG D
0.072	73	Brush, Good, HSG D
0.033	89	Dirt roads, HSG D
1.368	84	Pasture/grassland/range, Fair, HSG D
4.504	80	Pasture/grassland/range, Good, HSG D
0.033	98	Water Surface, HSG D
2.149	79	Woods, Fair, HSG D
3.308	77	Woods, Good, HSG D
12.085	79	Weighted Average
12.052		99.72% Pervious Area
0.033		0.28% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	93	0.0500	0.16		Sheet Flow, Sheet
					Grass: Dense n= 0.240 P2= 2.92"
0.9	505	0.3100	8.96		Shallow Concentrated Flow, Shallow
					Unpaved Kv= 16.1 fps
2.7	808	0.0300	4.92	24.61	Trap/Vee/Rect Channel Flow, Stream
					Bot.W=3.00' D=1.00' Z= 2.0 '/' Top.W=7.00'
					n= 0.040
13.4	1,406	Total			

Subcatchment WS 2: Subcat WS 2



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Type IA 24-hr 10 Year Rainfall=4.75"

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Summary for Subcatchment WS 2: Subcat WS 2

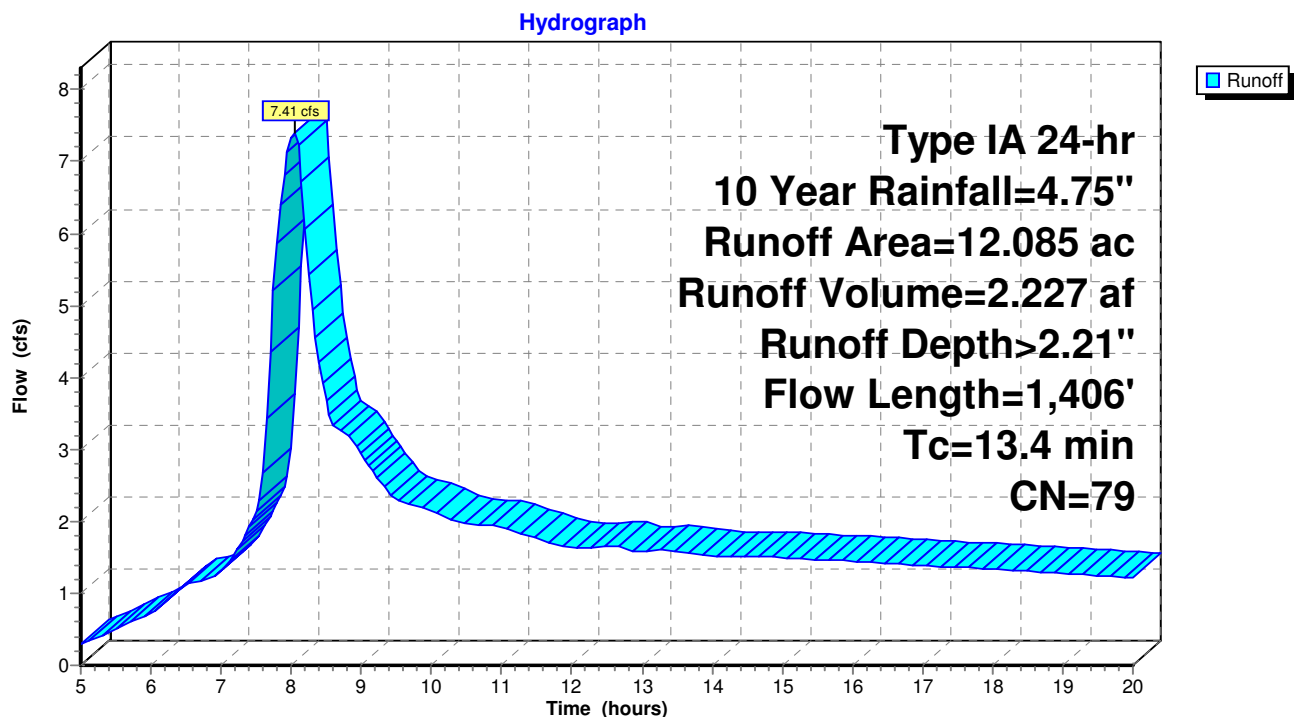
Runoff = 7.41 cfs @ 8.04 hrs, Volume= 2.227 af, Depth> 2.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type IA 24-hr 10 Year Rainfall=4.75"

Area (ac)	CN	Description
0.618	77	Brush, Fair, HSG D
0.072	73	Brush, Good, HSG D
0.033	89	Dirt roads, HSG D
1.368	84	Pasture/grassland/range, Fair, HSG D
4.504	80	Pasture/grassland/range, Good, HSG D
0.033	98	Water Surface, HSG D
2.149	79	Woods, Fair, HSG D
3.308	77	Woods, Good, HSG D
12.085	79	Weighted Average
12.052		99.72% Pervious Area
0.033		0.28% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	93	0.0500	0.16		Sheet Flow, Sheet
					Grass: Dense n= 0.240 P2= 2.92"
0.9	505	0.3100	8.96		Shallow Concentrated Flow, Shallow
					Unpaved Kv= 16.1 fps
2.7	808	0.0300	4.92	24.61	Trap/Vee/Rect Channel Flow, Stream
					Bot.W=3.00' D=1.00' Z= 2.0 '/' Top.W=7.00'
					n= 0.040
13.4	1,406	Total			

Subcatchment WS 2: Subcat WS 2



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Type IA 24-hr 50 Year Rainfall=6.57"

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Summary for Subcatchment WS 2: Subcat WS 2

Runoff = 12.60 cfs @ 8.03 hrs, Volume= 3.615 af, Depth> 3.59"

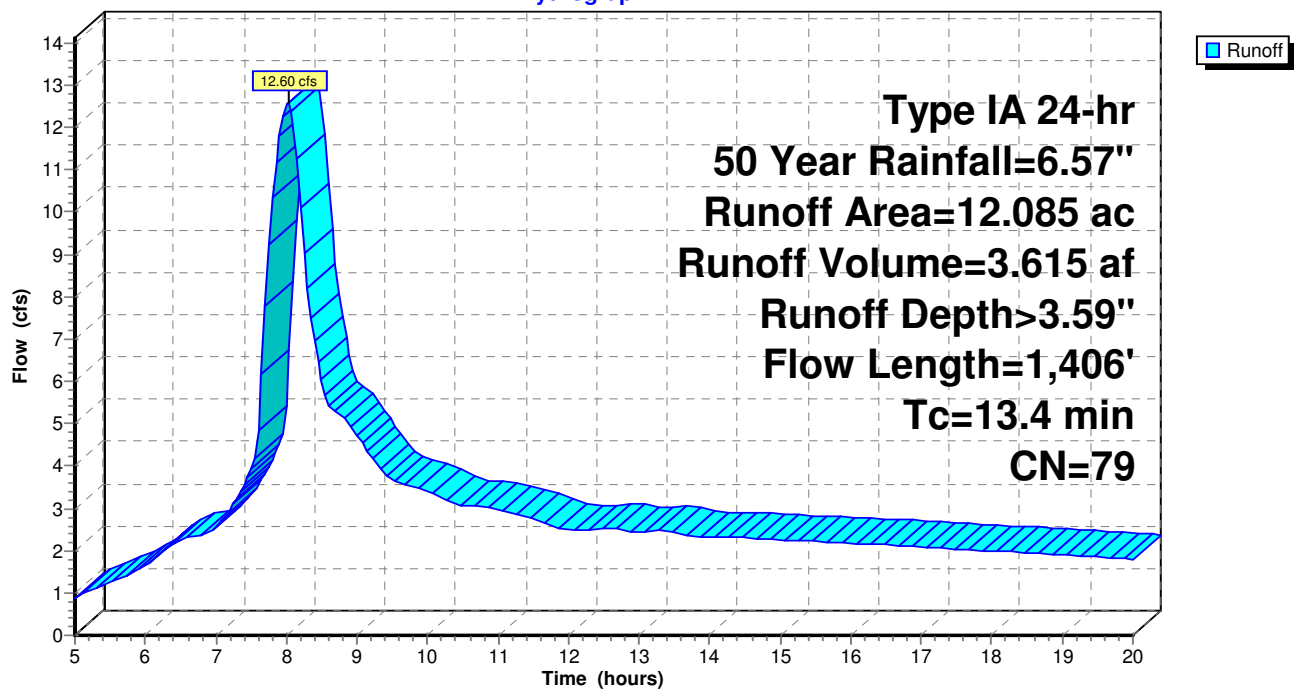
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type IA 24-hr 50 Year Rainfall=6.57"

Area (ac)	CN	Description
0.618	77	Brush, Fair, HSG D
0.072	73	Brush, Good, HSG D
0.033	89	Dirt roads, HSG D
1.368	84	Pasture/grassland/range, Fair, HSG D
4.504	80	Pasture/grassland/range, Good, HSG D
0.033	98	Water Surface, HSG D
2.149	79	Woods, Fair, HSG D
3.308	77	Woods, Good, HSG D
12.085	79	Weighted Average
12.052		99.72% Pervious Area
0.033		0.28% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	93	0.0500	0.16		Sheet Flow, Sheet
					Grass: Dense n= 0.240 P2= 2.92"
0.9	505	0.3100	8.96		Shallow Concentrated Flow, Shallow
					Unpaved Kv= 16.1 fps
2.7	808	0.0300	4.92	24.61	Trap/Vee/Rect Channel Flow, Stream
					Bot.W=3.00' D=1.00' Z= 2.0 '/' Top.W=7.00'
					n= 0.040
13.4	1,406	Total			

Subcatchment WS 2: Subcat WS 2

Hydrograph



Darioush Curry Lane Pre-Project

Type IA 24-hr 100 Year Rainfall=7.32"

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Summary for Subcatchment WS 2: Subcat WS 2

Runoff = 14.81 cfs @ 8.03 hrs, Volume= 4.202 af, Depth> 4.17"

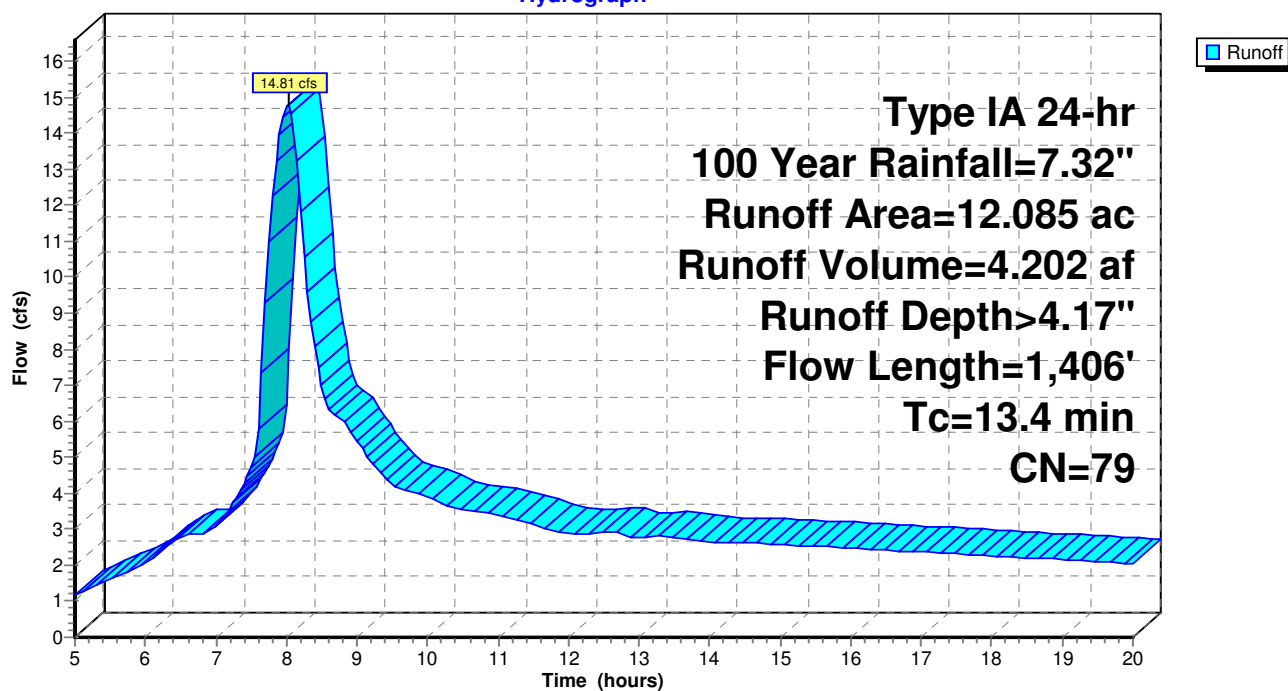
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type IA 24-hr 100 Year Rainfall=7.32"

Area (ac)	CN	Description
0.618	77	Brush, Fair, HSG D
0.072	73	Brush, Good, HSG D
0.033	89	Dirt roads, HSG D
1.368	84	Pasture/grassland/range, Fair, HSG D
4.504	80	Pasture/grassland/range, Good, HSG D
0.033	98	Water Surface, HSG D
2.149	79	Woods, Fair, HSG D
3.308	77	Woods, Good, HSG D
12.085	79	Weighted Average
12.052		99.72% Pervious Area
0.033		0.28% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	93	0.0500	0.16		Sheet Flow, Sheet
					Grass: Dense n= 0.240 P2= 2.92"
0.9	505	0.3100	8.96		Shallow Concentrated Flow, Shallow
					Unpaved Kv= 16.1 fps
2.7	808	0.0300	4.92	24.61	Trap/Vee/Rect Channel Flow, Stream
					Bot.W=3.00' D=1.00' Z= 2.0 '/' Top.W=7.00'
					n= 0.040
13.4	1,406	Total			

Subcatchment WS 2: Subcat WS 2

Hydrograph



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Type IA 24-hr 2 Year Rainfall=2.92"

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Summary for Subcatchment WS 2: Subcat WS 2

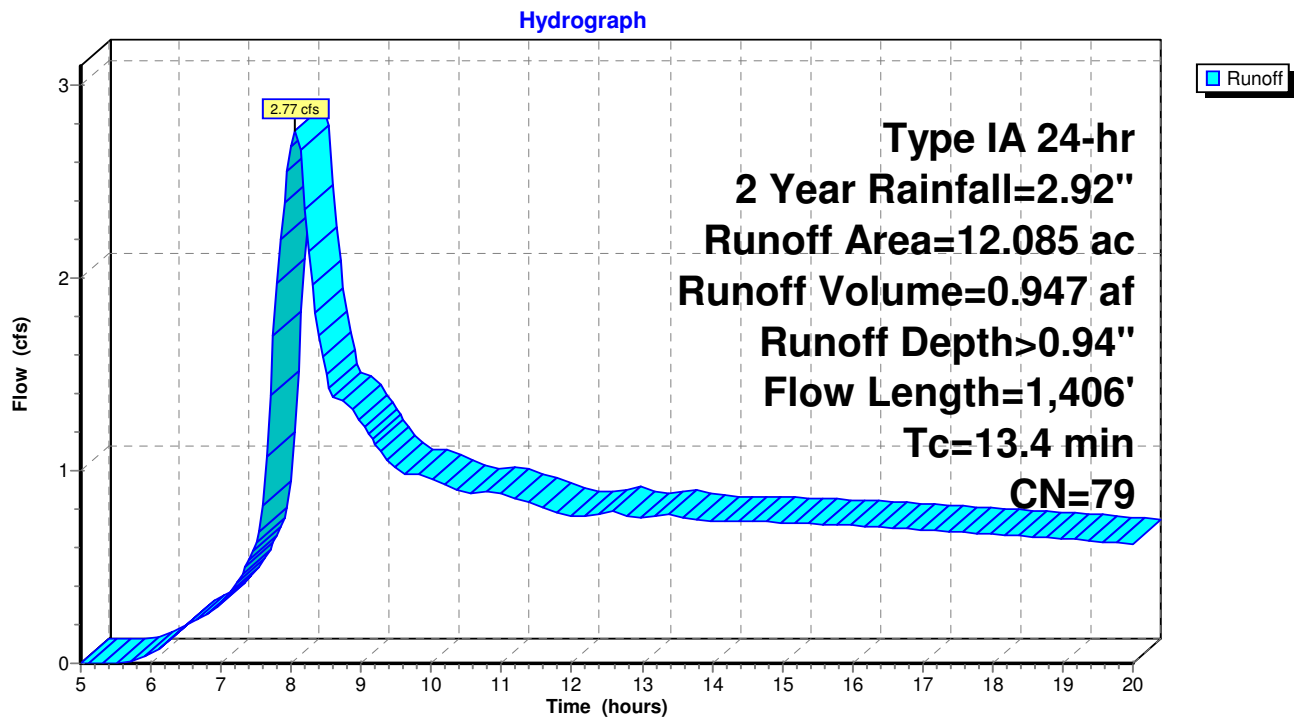
Runoff = 2.77 cfs @ 8.06 hrs, Volume= 0.947 af, Depth> 0.94"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type IA 24-hr 2 Year Rainfall=2.92"

Area (ac)	CN	Description
0.084	73	Brush, Good, HSG D
0.033	89	Dirt roads, HSG D
0.331	84	Pasture/grassland/range, Fair, HSG D
4.504	80	Pasture/grassland/range, Good, HSG D
1.746	81	Vineyard, Good, HSG D
0.033	98	Water Surface, HSG D
2.047	79	Woods, Fair, HSG D
3.306	77	Woods, Good, HSG D
12.085	79	Weighted Average
12.052		99.72% Pervious Area
0.033		0.28% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	93	0.0500	0.16		Sheet Flow, Sheet
					Grass: Dense n= 0.240 P2= 2.92"
0.9	505	0.3100	8.96		Shallow Concentrated Flow, Shallow
					Unpaved Kv= 16.1 fps
2.7	808	0.0300	4.92	24.61	Trap/Vee/Rect Channel Flow, Stream
					Bot.W=3.00' D=1.00' Z= 2.0 '/' Top.W=7.00'
					n= 0.040
13.4	1,406	Total			

Subcatchment WS 2: Subcat WS 2



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Type IA 24-hr 10 Year Rainfall=4.75"

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Summary for Subcatchment WS 2: Subcat WS 2

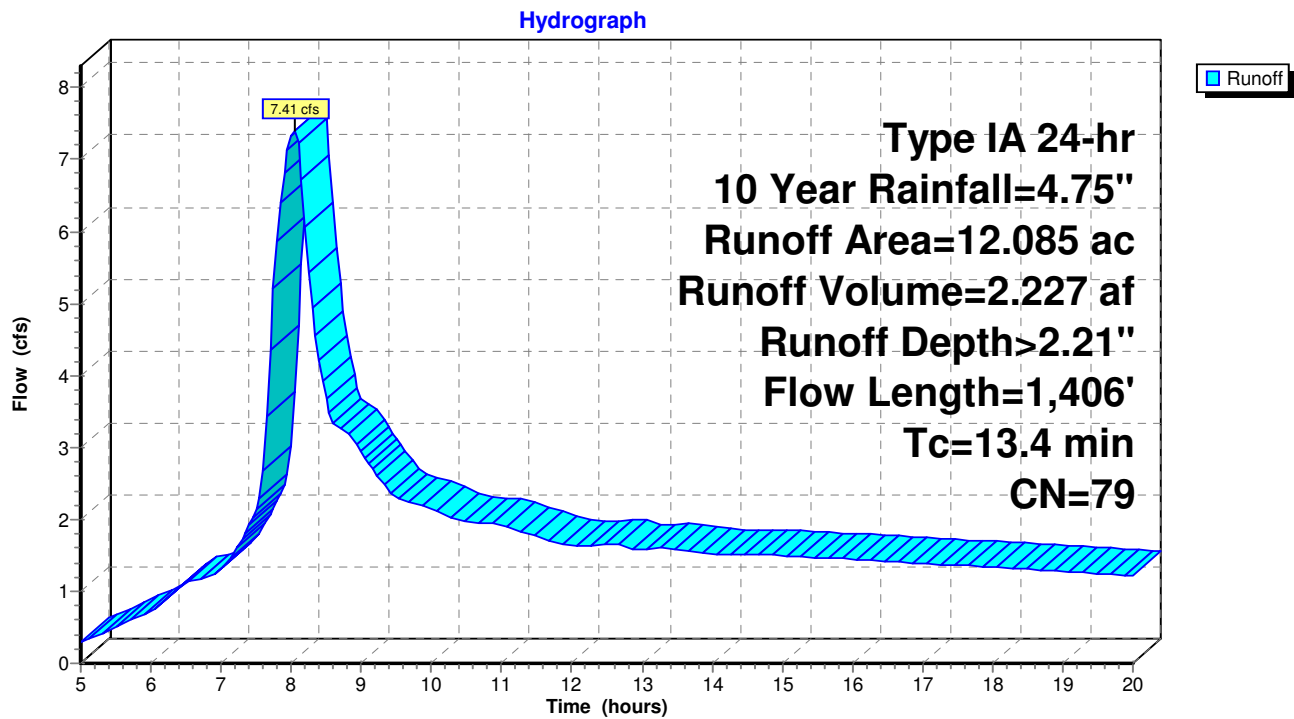
Runoff = 7.41 cfs @ 8.04 hrs, Volume= 2.227 af, Depth> 2.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type IA 24-hr 10 Year Rainfall=4.75"

Area (ac)	CN	Description
0.084	73	Brush, Good, HSG D
0.033	89	Dirt roads, HSG D
0.331	84	Pasture/grassland/range, Fair, HSG D
4.504	80	Pasture/grassland/range, Good, HSG D
1.746	81	Vineyard, Good, HSG D
0.033	98	Water Surface, HSG D
2.047	79	Woods, Fair, HSG D
3.306	77	Woods, Good, HSG D
12.085	79	Weighted Average
12.052		99.72% Pervious Area
0.033		0.28% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	93	0.0500	0.16		Sheet Flow, Sheet Grass: Dense n= 0.240 P2= 2.92"
0.9	505	0.3100	8.96		Shallow Concentrated Flow, Shallow Unpaved Kv= 16.1 fps
2.7	808	0.0300	4.92	24.61	Trap/Vee/Rect Channel Flow, Stream Bot.W=3.00' D=1.00' Z= 2.0 '/' Top.W=7.00' n= 0.040
13.4	1,406	Total			

Subcatchment WS 2: Subcat WS 2



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Type IA 24-hr 50 Year Rainfall=6.57"

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Summary for Subcatchment WS 2: Subcat WS 2

Runoff = 12.60 cfs @ 8.03 hrs, Volume= 3.615 af, Depth> 3.59"

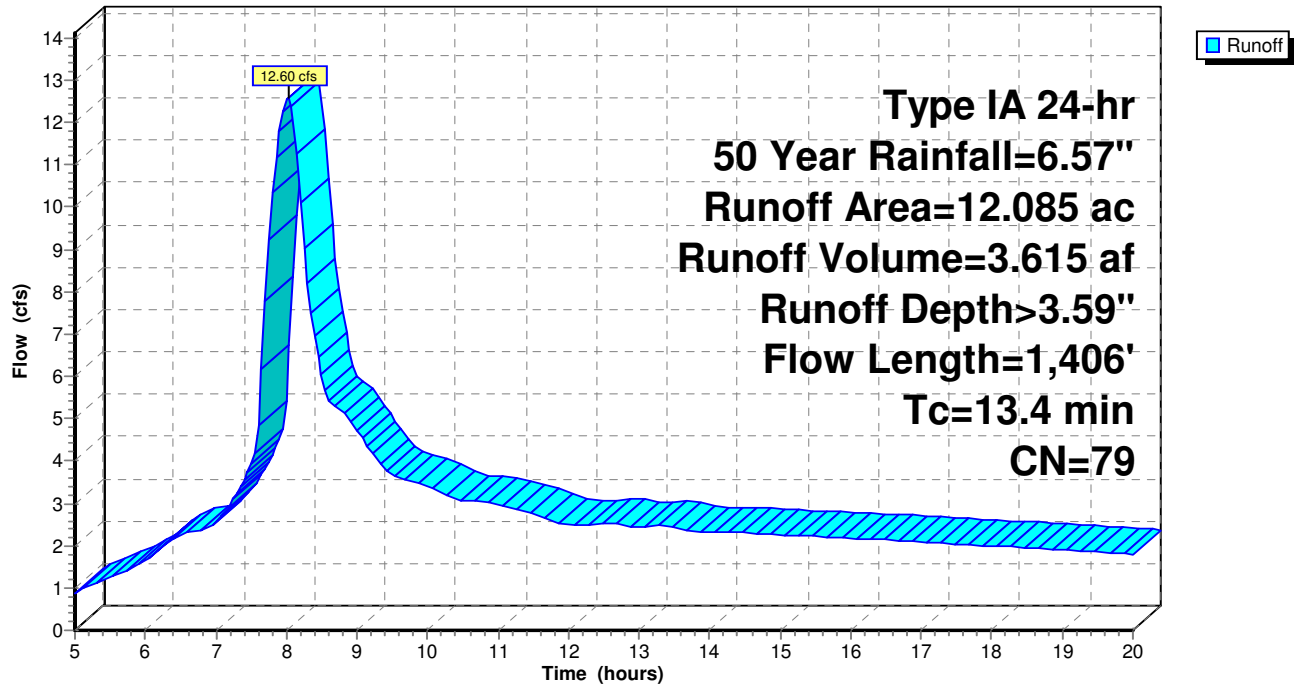
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type IA 24-hr 50 Year Rainfall=6.57"

Area (ac)	CN	Description
0.084	73	Brush, Good, HSG D
0.033	89	Dirt roads, HSG D
0.331	84	Pasture/grassland/range, Fair, HSG D
4.504	80	Pasture/grassland/range, Good, HSG D
1.746	81	Vineyard, Good, HSG D
0.033	98	Water Surface, HSG D
2.047	79	Woods, Fair, HSG D
3.306	77	Woods, Good, HSG D
12.085	79	Weighted Average
12.052		99.72% Pervious Area
0.033		0.28% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	93	0.0500	0.16		Sheet Flow, Sheet
					Grass: Dense n= 0.240 P2= 2.92"
0.9	505	0.3100	8.96		Shallow Concentrated Flow, Shallow
					Unpaved Kv= 16.1 fps
2.7	808	0.0300	4.92	24.61	Trap/Vee/Rect Channel Flow, Stream
					Bot.W=3.00' D=1.00' Z= 2.0 '/' Top.W=7.00'
					n= 0.040
13.4	1,406	Total			

Subcatchment WS 2: Subcat WS 2

Hydrograph



Darioush Curry Lane Post-Project

Type IA 24-hr 100 Year Rainfall=7.32"

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Summary for Subcatchment WS 2: Subcat WS 2

Runoff = 14.81 cfs @ 8.03 hrs, Volume= 4.202 af, Depth> 4.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type IA 24-hr 100 Year Rainfall=7.32"

Area (ac)	CN	Description
0.084	73	Brush, Good, HSG D
0.033	89	Dirt roads, HSG D
0.331	84	Pasture/grassland/range, Fair, HSG D
4.504	80	Pasture/grassland/range, Good, HSG D
1.746	81	Vineyard, Good, HSG D
0.033	98	Water Surface, HSG D
2.047	79	Woods, Fair, HSG D
3.306	77	Woods, Good, HSG D
12.085	79	Weighted Average
12.052		99.72% Pervious Area
0.033		0.28% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	93	0.0500	0.16		Sheet Flow, Sheet
					Grass: Dense n= 0.240 P2= 2.92"
0.9	505	0.3100	8.96		Shallow Concentrated Flow, Shallow
					Unpaved Kv= 16.1 fps
2.7	808	0.0300	4.92	24.61	Trap/Vee/Rect Channel Flow, Stream
					Bot.W=3.00' D=1.00' Z= 2.0 '/' Top.W=7.00'
					n= 0.040
13.4	1,406	Total			

Subcatchment WS 2: Subcat WS 2

Hydrograph

