

# T.D.G.

**CONSULTING CIVIL ENGINEERS INC.**

CALISTOGA COTTAGES

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## CALISTOGA COTTAGES HYDROLOGY ANALYSIS

### **CALISTOGA COTTAGES**

408 Calistoga Road  
A.P.N: 153-430-032  
PROJECT #13104  
October 20, 2023

**ANALYSIS PREPARED BY**  
**TDG CONSULTING CIVIL ENGINEERS, INC.**  
CIVIL ENGINEERING – LAND SURVEYING  
883 3rd Street, Santa Rosa, CA 95404  
(707) 577-0425 Office      (707) 573-1418 FAX  
[tdg@sonic.net](mailto:tdg@sonic.net)

**OWNER**  
WRI 408 Calistoga LLC.  
7710 Bell Road  
Winsor, CA 95492



Charlie Traboulsi RPE No.34079



# T.D.G.

**CONSULTING CIVIL ENGINEERS INC.**

CALISTOGA COTTAGES

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Mr. Phillip E. Wadsworth  
Sonoma County Water Agency  
Flood and Drainage Review  
2227 Capricorn Way, Building E, Suit 108  
Santa Rosa CA 95407

Dear Phil:

Enclosed for your initial plan check are the following items for CALISTOGA COTTAGES subdivision 408 Calistoga Road Santa Rosa CA.95409:

Page(s)	Item
1	Transmittal Letter
3-6	Explanation of Analysis approach
2	Submittal Information sheet
Attached	Tentative Map
Attached	Final Map or Parcel Map (if applicable)
Attachment 1	Hydrology Map
TableC-1 (7-9)	Establish Factors used in Analysis
10-17	Hydrology Calculation (*) 10-year Storm and (*) 100-year Storm
10-17	Hydraulic Calculations
Attachment 3	Establish Starting HGL (from Calistoga Road at Monte Verde Dr. file #78-29 )
Attachment 2	Overland Release Map
28	Inlet Capacity calculations
29	Assessor Parcel Map with Site Outlined

Please contact me if you have any questions or comments regarding this submittal.

Thanks.

TDG Consulting Civil Engineers, Inc

Charlie Traboulsi

## FLOOD AND DRAINAGE REVIEW PLAN SUBMITTAL CHECKLIST

PROJECT NAME: CALISTOGA COTTAGES

DATE:

SCWA FILE# \_\_\_\_\_

- ✓ TRANSMITTAL LETTER
- ✓ EXPLANATION OF ANALYSIS
- ✓ SUBMITTAL INFORMATION SHEET
- ✓ PLAN CHECK FEE
- ✓ IMPROVEMENTS PLANS
- ✓ FINAL MAP OR PARCEL MAP
- ✓ HYDROLOGY MAP
- ✓ ESTABLISH FACTORS USED IN ANALYSIS
- ✓ HYDROLOGY CALCULATIONS
- ✓ 10-YEAR STORM
- ✓ 100-YEAR STORM
- ✓ HYDRAULIC CALCULATIONS
- ✓ ESTABLISH STARTING HGL
- ✓ EGL AND HGL PLOTS
- ✓ 100-YEAR STORM ROUTING
- ✓ 100-YEAR STORM ELEVATION VS FINISH FLOOR ELEVATIONS
- ✓ INLET CAPACITY CALCULATIONS
- ✓ CURB WATER DEPTH CALCULATIONS
- ✓ ASSESSOR PARCEL MAP WITH SITE OUTLINED
- ✓ COPY OF THE CONDITIONS OF APPROVAL OF THE PROJECT

## **INTRODUCTION**

This submittal package contains the hydrology maps and hydraulic calculations for CALISTOGA COTTAGES project.

The references used for this report are:

- Flood Control Design Criteria Manual 2020 (FMDM), Sonoma County Water Agency

This drainage report analyzes the flow capacity of the underground storm drain system for the 10-year storm event.

All documentation used in supporting our analysis is included in the various sections or the exhibits section of this package.

## **PROJECT DESCRIPTION**

CALISTOGA COTTAGES project is proposed by the developers WRI 408 CALISTOGA LLC. This project calls for the development of 4 lots; lot one will keep the exiting residence on it. The project is located at 408 Calistoga Road in the northeast quadrant of City of Santa Rosa. The Parcel is approximately  $\pm 0.96$  acres in size. A proposed private driveway running east from Calistoga Road will serve as access for all lots.

## **EXISTING SITE CONDITION**

The site A.P.N is 153-430-032 with address 408 Calistoga Road; the Parcel is small lot (R-1-6) density designate; there is an existing residence & garage within the subject site; an existing driveway connects the main residence from Calistoga Road; existing vegetation is a combination of grass, trees. Project site slope northwesterly at 0% to 9%  $\pm$ . There is an existing 18" RCP (Reinforced Concrete Pipe) base on the City of Santa Rosa Storm Drain Master Plan conveys the drainage from east of Calistoga Road & Some area of Austin Estates Subdivisions.

## HYDROLOGY

The following hydrology calculations were performed using variables of the modified Rational Method. The variables used in the analysis were obtained from the latest SCWA Flood Control Design Criteria Manual 2020. Runoff coefficients were calculated for each tributary area based on “table C-1” shown on Hydrology Soil Group C with medium-Low Density and average slope >2%-6% of 0.63;  $C_v$  and a value of 0.90 used for  $C_p$  tributary areas within the proposed subdivision. Additionally, the initial time of concentrations are per the SCWA Flood Control Design Criteria Manual plate 3-3 and were set at 7 minutes for this project. This variable reflect the current land use of the property.

The intensity of the rainfall the information was obtained from the NOAA Atlas 14 at the site project location see attached table.

The hydrology calculations were performed using the Hydraflow Storm Sewers Extension for Civil 3D software developed and marketed by Autodesk. This software suite calculates the peak flow of a catchment by simultaneously calculating a basin’s hydrologic characteristics and hydraulic capacity. This differs from the traditional approach of calculating the hydrology independent of any hydraulic or backwater effects. In some situations, this sort of analysis appears to lengthen the time of concentration of a basin due to the velocity in the pipes of the system being calculated under backwater conditions rather than under full-flow/ gravity depth velocities. Such an approach is slightly less conservative, but is probably more realistic. Further explanation of the implications of this approach is discussed in the Hydraulic Section of this submittal.

The enclosed CALISTOGA COTTAGES project Map define the limits of the local catchments and have been used as the basis for determining the runoff quantities that the project’s storm drain systems must convey. The limits of these areas were determined by the proposed project improvements.

## HYDRAULICS

### Basis

As was mentioned in the preceding section, the hydraulics for this project was analyzed simultaneously with the hydrology of the project. Therefore, the hydraulics and hydrology are more interdependent than had they been analyzed separately.

## Starting HGL

The starting 10-year HGL was assigned preliminary as the crown elevation of the 18" RCP at the proposed SDMH-1 point of connection as a conservative assumption. The storm drain network will connect about 175' south of Monte Verde Dr. & Calistoga Road intersection on the east side of Calistoga Road. The HGL elevation of the crown of the existing 18" RCP was calculated as 288.61 per Calistoga Road at Monte Verde Dr. File # 78-29.

## Project Datum

BENCHMARK: CITY OF SANTA ROSA B128: Calistoga Rd., 370 ft. S/o Monte Verde Dr.; City disk in well monument, 17 ft. W/o CL Calistoga Rd. (Coordinate monument G-97)  
Elevation – 291.156 (NGVD 1929)

## System Analysis

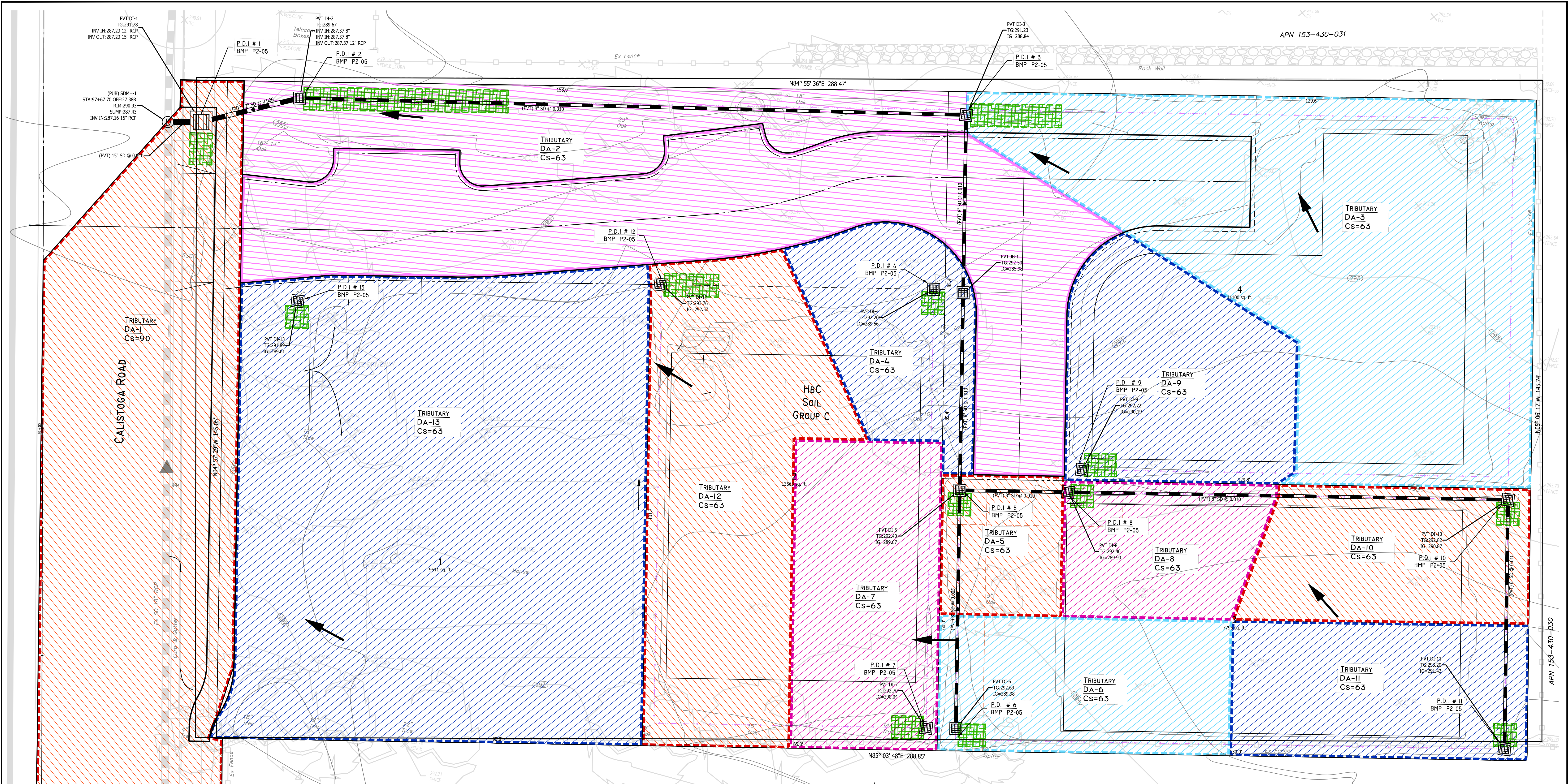
The Autodesk software automatically computes losses at junctions and inlets of a system based on data adapted from FHWA HEC No. 22. The hydrology/backwater analysis of this submittal is based on this method. The following Storm Sewer Tabulations show the HGLs for the piped storm drain system networks within the project. The attached CALISTOGA COTTAGES Hydrology Map show the project tributary areas and storm drain system in relation to the calculations.

## Inlet Capacity Analysis

The capacity of inlet structures within the model has been calculated by the software. The software calculates the capacity of all inlet structures within the model and reports the capture efficiency. The proposed Catch Basin (CB) within the project's tributary boundaries have been analyzed. Had the capacity of any of CB's been exceeded, the capture efficiency would have been reported to be less than 100%. During the 10-year storm event, the proposed CB's structures within the study area have an efficiency level of 100%. The worst-case gutter depth for catch basins and depth of water are included in the hydraulic pages.

## 100-Year Overland Release

The proposed storm drain improvements for CALISTOGA COTTAGES project were designed for the 10-year storm event. During the 100-year storm event, the project will route drainage over land. CALISTOGA COTTAGES Hydrology Map included a map showing the flood routing course and areas of anticipated inundation, and flood routing during a 100-year event. The route was determined by calculating the HGL at each proposed inlets of the project, in addition to analyzing the degree of ponding that must occur in order for the flow

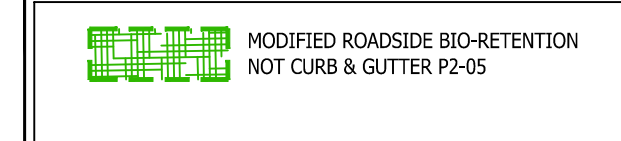


**LOT DI'S TRIBUTARIES**

DA-1 0.17 AC (7,618 SF)	DA-8 0.03 AC (1,287 SF)
DA-2 0.18 AC (7,712 SF)	DA-9 0.05 AC (2,282 SF)
DA-3 0.16 AC (6,772 SF)	DA-10 0.04 AC (1,810 SF)
DA-4 0.04 AC (1,559 SF)	DA-11 0.04 AC (1,959 SF)
DA-5 0.02 AC (837 SF)	DA-12 0.09 AC (3,779 SF)
DA-6 0.04 AC (1,930 SF)	DA-13 0.21 AC (9,338 SF)
DA-7 0.05 AC (2,213 SF)	

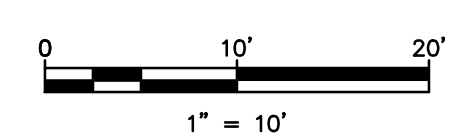
APN 153-051-002

**BIO-RETENTION LEGEND**



**DRAINAGE AREA LEGEND**

← FLOW DIRECTION



Tributary	Area sf	Area acres	C-value
Tributary P.D.I.(1)	7618	0.17	0.90
Tributary P.D.I.(2)	7713	0.18	0.63
Tributary P.D.I.(3)	6772	0.16	0.63
Tributary P.D.I.(4)	1559	0.04	0.63
Tributary P.D.I.(5)	837	0.02	0.63
Tributary P.D.I.(6)	1930	0.04	0.63
Tributary P.D.I.(7)	2213	0.05	0.63
Tributary P.D.I.(8)	1287	0.03	0.63
Tributary P.D.I.(9)	2282	0.05	0.63
Tributary P.D.I.(10)	1810	0.04	0.63
Tributary P.D.I.(11)	1959	0.04	0.63
Tributary P.D.I.(12)	3779	0.09	0.63
Tributary P.D.I.(13)	9338	0.21	0.63

JOB NO. 13104  
DATE: October 14, 2023  
DRAWN: 3 ORCZ

DESIGN FOR:  
**CALISTOGA ROAD**  
HYDROLOGY MAP

ADDRESS: 408 CALISTOGA ROAD  
APN: 153-430-032  
**T.D.G. CONSULTING CIVIL ENGINEERS, INC.**  
803 8TH STREET  
SANTA ROSA, CALIF. 95404  
(707) 577-0425

to pass obstacles, such as curbs and high points. The finish floor elevations, accumulation escape elevations, and local break point escape elevations can all be seen on this map.

## **CONCLUSION**

The hydraulic calculations contained in this report demonstrate that that during the 10-year storm event the HGL is below the inlet elevation of all drainage structures. All building structures will remain flood free during the 100-year storm event.

There will be no additional negative impacts to the adjacent properties with respect to pre-project and post-project flooding.



# CALISTOGA COTTAGES

9/25/2023

## 408 Calistoga Road

C-values for Drainage Areas

**Table C-1.** Runoff Coefficients (Cs) (Incremental Rational Method)

Land Use	Lot Size (acres)	Impervious Fraction	Average Slope (%)			
			0-2	>2-6	>6-12	>12
<b>Soil Type C</b>						
Residential <sup>1</sup>						
Rural		0.03	0.33	0.38	0.43	0.47
Very low density	2	0.11	0.38	0.42	0.47	0.51
	1	0.24	0.45	0.49	0.53	0.57
Low density	1/2	0.32	0.50	0.53	0.57	0.60
	1/3	0.41	0.56	0.59	0.62	0.64
Medium-low density	1/4	0.49	0.60	0.63	0.65	0.68
Medium density	1/8	0.70	0.73	0.74	0.76	0.77
Medium-high density	1/18	1	0.90	0.90	0.90	0.90

Tributary	Area sf <sup>2</sup>	Area acres	C-value
<b>Tributary P.D.I-(1)</b>	7876	0.18	0.63
<b>Tributary P.D.I-(2)</b>	6772	0.16	0.63
<b>Tributary P.D.I-(3)</b>	1559	0.04	0.63
<b>Tributary P.D.I-(4)</b>	837	0.02	0.63
<b>Tributary P.D.I-(5)</b>	1930	0.04	0.63
<b>Tributary P.D.I-(6)</b>	2213	0.05	0.63
<b>Tributary P.D.I-(7)</b>	1282	0.03	0.63
<b>Tributary P.D.I-(8)</b>	1810	0.04	0.63
<b>Tributary P.D.I-(9)</b>	1975	0.05	0.63
<b>Tributary P.D.I-(11)</b>	3779	0.09	0.63
<b>Tributary P.D.I-(12)</b>	9672	0.22	0.63

**Table C-1. Runoff Coefficients (Cs) (Incremental Rational Method)**

Land Use	Lot Size (acres)	Impervious Fraction	Average Slope (%)			
			0-2	>2-6	>6-12	>12
<b>Soil Type A</b>						
Residential <sup>1</sup>						
Rural		0.03	0.24	0.28	0.34	0.38
Very low density	2	0.11	0.29	0.34	0.38	0.42
	1	0.24	0.38	0.42	0.46	0.49
Low density	1/2	0.32	0.43	0.47	0.50	0.53
	1/3	0.41	0.50	0.53	0.56	0.58
Medium-low density	1/4	0.49	0.55	0.58	0.60	0.62
Medium density	1/8	0.70	0.70	0.71	0.73	0.74
Medium-high density	1/18	1	0.90	0.90	0.90	0.90
Business, commercial, etc.		1	0.90	0.90	0.90	0.90
General industrial		1	0.90	0.90	0.90	0.90
Parks and recreation		0.05	0.25	0.25	0.30	0.35
Ag and open space		0.02	0.23	0.23	0.28	0.33
<b>Soil Type B</b>						
Residential <sup>1</sup>						
Rural		0.03	0.28	0.33	0.39	0.43
Very low density	2	0.11	0.34	0.38	0.43	0.47
	1	0.24	0.42	0.45	0.50	0.53
Low density	1/2	0.32	0.47	0.50	0.54	0.57
	1/3	0.41	0.53	0.56	0.59	0.61
Medium-low density	1/4	0.49	0.58	0.60	0.63	0.65
Medium density	1/8	0.70	0.71	0.73	0.74	0.76
Medium-high density	1/18	1	0.90	0.90	0.90	0.90
Business, commercial, etc.		1	0.90	0.90	0.90	0.90
General industrial		1	0.90	0.90	0.90	0.90
Parks and recreation		0.05	0.25	0.30	0.34	0.40
Ag and open space		0.02	0.23	0.28	0.33	0.38
<b>Soil Type C</b>						
Residential <sup>1</sup>						
Rural		0.03	0.33	0.38	0.43	0.47
Very low density	2	0.11	0.38	0.42	0.47	0.51
	1	0.24	0.45	0.49	0.53	0.57
Low density	1/2	0.32	0.50	0.53	0.57	0.60

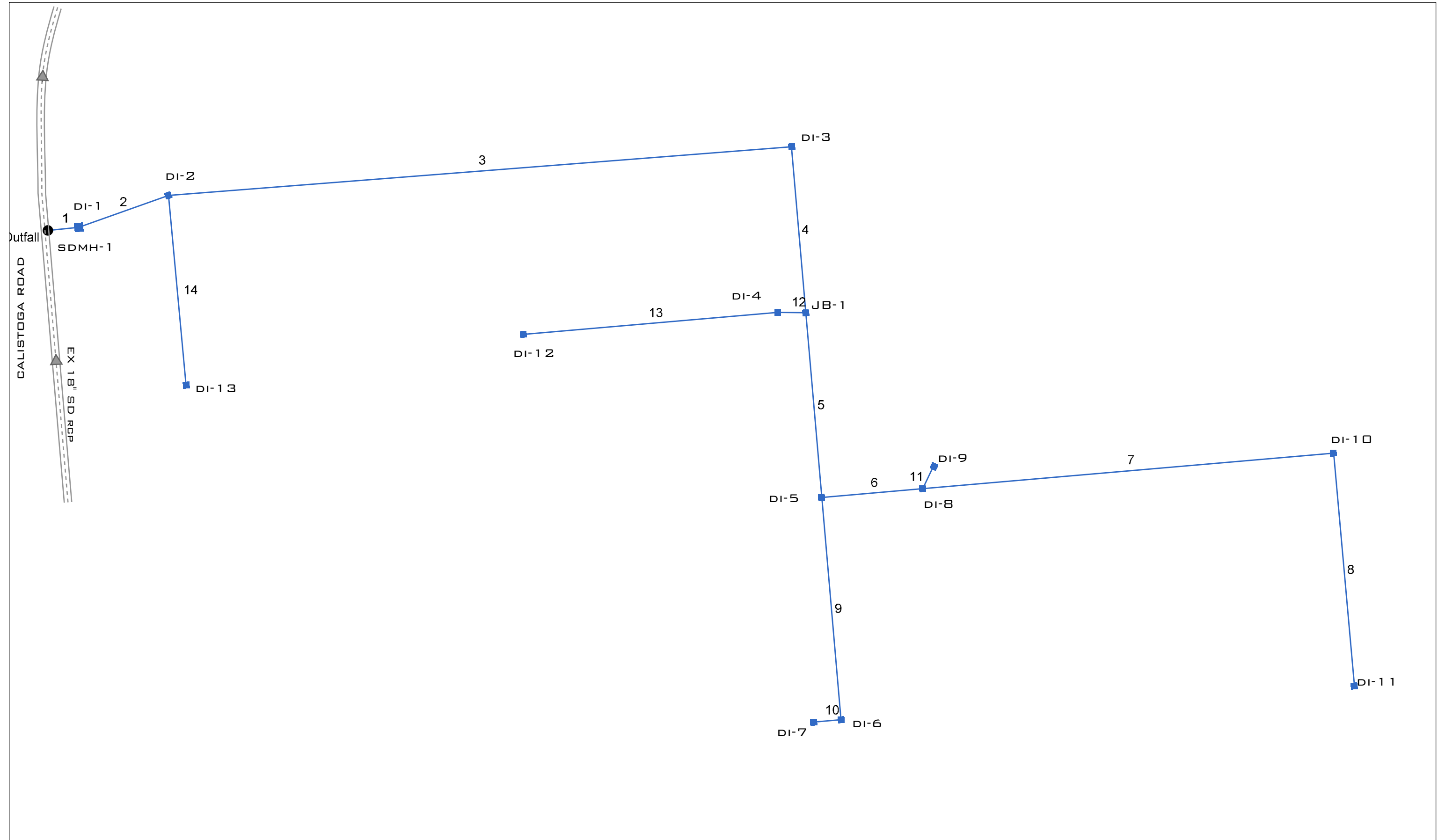
Land Use	Lot Size (acres)	Impervious Fraction	Average Slope (%)			
			0-2	>2-6	>6-12	>12
	1/3	0.41	0.56	0.59	0.62	0.64
Medium-low density	1/4	0.49	0.60	0.63	0.65	0.68
Medium density	1/8	0.70	0.73	0.74	0.76	0.77
Medium-high density	1/18	1	0.90	0.90	0.90	0.90
Business, commercial, etc.		1	0.90	0.90	0.90	0.90
General industrial		1	0.90	0.90	0.90	0.90
Parks and recreation		0.05	0.34	0.39	0.44	0.48
Ag and open space		0.02	0.33	0.38	0.43	0.47
<b>Soil Type D</b>						
Residential <sup>1</sup>						
Rural		0.03	0.38	0.43	0.48	0.52
Very low density	2	0.11	0.42	0.47	0.52	0.55
	1	0.24	0.49	0.53	0.57	0.60
Low density	1/2	0.32	0.54	0.57	0.61	0.63
	1/3	0.41	0.59	0.62	0.65	0.67
Medium-low density	1/4	0.49	0.63	0.65	0.68	0.70
Medium density	1/8	0.70	0.74	0.76	0.77	0.78
Medium-high density	1/18	1	0.90	0.90	0.90	0.90
Business, commercial		1	0.90	0.90	0.90	0.90
General industrial		1	0.90	0.90	0.90	0.90
Parks and recreation		0.05	0.39	0.44	0.49	0.53
Ag and open space		0.02	0.38	0.42	0.48	0.52

<sup>1</sup> Percent impervious values are based on analysis conducted by ESA for Sonoma County Water Agency (Sonoma Water) in 2014, using a sample of existing developed areas.

<sup>2</sup> For residential areas, composite C values were developed as follows: C values for soil type from Los Angeles County Hydrology Manual (1991) were modified for slope using the vegetated areas curve from Plate B-1 of SCWA (1983) for pervious areas within a given slope range and a C of 0.90 for all impervious areas.

Source: Approach adapted from McCuen 1989

# Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan



10 YEAR CALCULATIONS

# Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
1	SD-1	1.47	15	Cir	7.309	287.16	287.23	0.958	288.61*	288.61*	0.01	288.62	End	DropGrate
2	SD-2	1.18	12	Cir	22.330	287.23	287.37	0.627	288.62*	288.65*	0.05	288.70	1	DropGrate
3	SD-3	0.72	8	Cir	146.949	287.37	288.84	1.000	288.70	289.26	0.22	289.48	2	DropGrate
4	SD-4	0.52	8	Cir	39.195	288.84	289.23	0.995	289.48	289.57	n/a	289.57 j	3	DropGrate
5	SD-5	0.35	8	Cir	43.578	289.23	289.67	1.010	289.57	289.94	n/a	289.94 j	4	DropGrate
6	SD-6	0.21	8	Cir	23.902	289.67	289.90	0.962	289.94	290.11	n/a	290.11 j	5	DropGrate
7	SD-7	0.12	8	Cir	96.935	289.90	290.87	1.001	290.11	291.03	n/a	291.03 j	6	DropGrate
8	SD-8	0.08	8	Cir	55.001	290.87	291.42	1.000	291.03	291.55	n/a	291.55 j	7	DropGrate
9	SD-9	0.18	8	Cir	52.500	289.71	289.98	0.514	289.94	290.18	n/a	290.28 j	5	DropGrate
10	SD-10	0.10	8	Cir	6.532	289.98	290.04	0.918	290.28	290.19	n/a	290.19	9	DropGrate
11	SD-11	0.10	8	Cir	5.816	289.90	290.19	4.986	290.11	290.34	n/a	290.34 j	6	DropGrate
12	SD-12	0.23	8	Cir	6.531	289.23	289.56	5.053	289.57	289.78	n/a	289.78 j	4	DropGrate
13	SD-13	0.18	8	Cir	60.203	289.56	292.57	5.000	289.78	292.77	n/a	292.77 j	12	DropGrate
14	SD-14	0.43	8	Cir	44.775	287.37	289.61	5.003	288.70	289.92	n/a	289.92 j	2	DropGrate

Project File: 13104-SD 10 YRS.stm

Number of lines: 14

Run Date: 10/14/2023

NOTES: Return period = 10 Yrs. ; \*Surcharged (HGL above crown). ; j - Line contains hyd. jump.

# Storm Sewer Tabulation

Station		Len (ft)	Drng Area (ac)		Rnoff coeff (C)	Area x C		Tc		Rain (l) (in/hr)	Total flow (cfs)	Cap full (cfs)	Vel (ft/s)	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr	Total		Incr	Total	Inlet (min)	Syst (min)					Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	7.309	0.17	1.13	0.90	0.15	0.76	5.0	14.7	1.9	1.47	6.85	1.20	15	0.96	287.16	287.23	288.61	288.61	290.93	291.78	SD-1
2	1	22.330	0.18	0.96	0.63	0.11	0.60	5.0	14.5	1.9	1.18	3.05	1.50	12	0.63	287.23	287.37	288.62	288.65	291.78	289.67	SD-2
3	2	146.949	0.16	0.57	0.63	0.10	0.36	5.0	13.7	2.0	0.72	1.31	2.58	8	1.00	287.37	288.84	288.70	289.26	289.67	291.23	SD-3
4	3	39.195	0.01	0.41	0.63	0.01	0.26	5.0	13.4	2.0	0.52	1.31	2.23	8	1.00	288.84	289.23	289.48	289.57	291.23	292.50	SD-4
5	4	43.578	0.02	0.27	0.63	0.01	0.17	5.0	12.9	2.1	0.35	1.31	2.28	8	1.01	289.23	289.67	289.57	289.94	292.50	292.40	SD-5
6	5	23.902	0.03	0.16	0.63	0.02	0.10	5.0	12.4	2.1	0.21	1.28	1.89	8	0.96	289.67	289.90	289.94	290.11	292.40	292.40	SD-6
7	6	96.935	0.04	0.08	0.63	0.03	0.05	5.0	8.9	2.5	0.12	1.31	1.61	8	1.00	289.90	290.87	290.11	291.03	292.40	292.82	SD-7
8	7	55.001	0.04	0.04	0.63	0.03	0.03	5.0	5.0	3.3	0.08	1.31	1.49	8	1.00	290.87	291.42	291.03	291.55	292.82	293.20	SD-8
9	5	52.500	0.04	0.09	0.63	0.03	0.06	5.0	5.4	3.1	0.18	0.94	1.86	8	0.51	289.71	289.98	289.94	290.18	292.40	292.69	SD-9
10	9	6.532	0.05	0.05	0.63	0.03	0.03	5.0	5.0	3.3	0.10	1.25	1.25	8	0.92	289.98	290.04	290.28	290.19	292.69	292.70	SD-10
11	6	5.816	0.05	0.05	0.63	0.03	0.03	5.0	5.0	3.3	0.10	2.92	1.45	8	4.99	289.90	290.19	290.11	290.34	292.40	292.72	SD-11
12	4	6.531	0.04	0.13	0.63	0.03	0.08	5.0	6.9	2.8	0.23	2.94	1.78	8	5.05	289.23	289.56	289.57	289.78	292.50	292.20	SD-12
13	12	60.203	0.09	0.09	0.63	0.06	0.06	5.0	5.0	3.3	0.18	2.93	1.99	8	5.00	289.56	292.57	289.78	292.77	292.20	293.76	SD-13
14	2	44.775	0.21	0.21	0.63	0.13	0.13	5.0	5.0	3.3	0.43	2.93	1.99	8	5.00	287.37	289.61	288.70	289.92	289.67	291.89	SD-14

Project File: 13104-SD 10 YRS.stm Number of lines: 14 Run Date: 10/14/2023

NOTES: Intensity = 7.20 / (Inlet time + 0.10) ^ 0.49; Return period = Yrs. 10 ; c = cir e = ellip b = box

# Hydraulic Grade Line Computations

Line	Size (in)	Q (cfs)	Downstream								Len (ft)	Upstream								Check		JL coeff (K)	Minor loss (ft)
			Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)		Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)	Ave Sf (%)	Enrgy loss (ft)		
1	15	1.47	287.16	288.61	1.25	1.23	1.20	0.02	288.63	0.044	7.309	287.23	288.61	1.25	1.23	1.20	0.02	288.64	0.044	0.044	0.003	0.50	0.01
2	12	1.18	287.23	288.62	1.00	0.79	1.50	0.03	288.66	0.093	22.330	287.37	288.65	1.00	0.79	1.50	0.03	288.68	0.093	0.093	0.021	1.50	0.05
3	8	0.72	287.37	288.70	0.67	0.35	2.06	0.07	288.76	0.303	146.949	288.84	289.26	0.42	0.23	3.10	0.15	289.41	0.574	0.438	0.644	1.50	0.22
4	8	0.52	288.84	289.48	0.64	0.18	1.51	0.13	289.62	0.000	39.195	289.23	289.57 j	0.34**	0.18	2.94	0.13	289.70	0.000	0.000	n/a	1.50	n/a
5	8	0.35	289.23	289.57	0.34	0.14	1.97	0.10	289.67	0.000	43.578	289.67	289.94 j	0.27**	0.14	2.59	0.10	290.05	0.000	0.000	n/a	1.50	0.16
6	8	0.21	289.67	289.94	0.27	0.10	1.56	0.08	290.02	0.000	23.902	289.90	290.11 j	0.21**	0.10	2.22	0.08	290.19	0.000	0.000	n/a	1.33	n/a
7	8	0.12	289.90	290.11	0.21	0.06	1.31	0.06	290.17	0.000	96.935	290.87	291.03 j	0.16**	0.06	1.92	0.06	291.09	0.000	0.000	n/a	1.50	0.09
8	8	0.08	290.87	291.03	0.16	0.05	1.26	0.05	291.08	0.000	55.001	291.42	291.55 j	0.13**	0.05	1.71	0.05	291.60	0.000	0.000	n/a	1.00	n/a
9	8	0.18	289.71	289.94	0.23	0.08	1.62	0.04	289.99	0.262	52.500	289.98	290.18 j	0.20**	0.09	2.10	0.07	290.24	0.534	0.398	0.209	1.50	0.10
10	8	0.10	289.98	290.28	0.30	0.06	0.68	0.05	290.33	0.000	6.532	290.04	290.19	0.15**	0.06	1.82	0.05	290.24	0.000	0.000	n/a	1.00	n/a
11	8	0.10	289.90	290.11	0.21	0.06	1.08	0.05	290.16	0.000	5.816	290.19	290.34 j	0.15**	0.06	1.82	0.05	290.39	0.000	0.000	n/a	1.00	n/a
12	8	0.23	289.23	289.57	0.34	0.10	1.28	0.08	289.65	0.000	6.531	289.56	289.78 j	0.22**	0.10	2.27	0.08	289.86	0.000	0.000	n/a	0.50	n/a
13	8	0.18	289.56	289.78	0.22	0.09	1.84	0.07	289.85	0.000	60.203	292.57	292.77 j	0.20**	0.09	2.14	0.07	292.84	0.000	0.000	n/a	1.00	0.07
14	8	0.43	287.37	288.70	0.67	0.16	1.23	0.02	288.72	0.108	44.775	289.61	289.92 j	0.31**	0.16	2.76	0.12	290.03	0.583	0.346	n/a	1.00	0.12

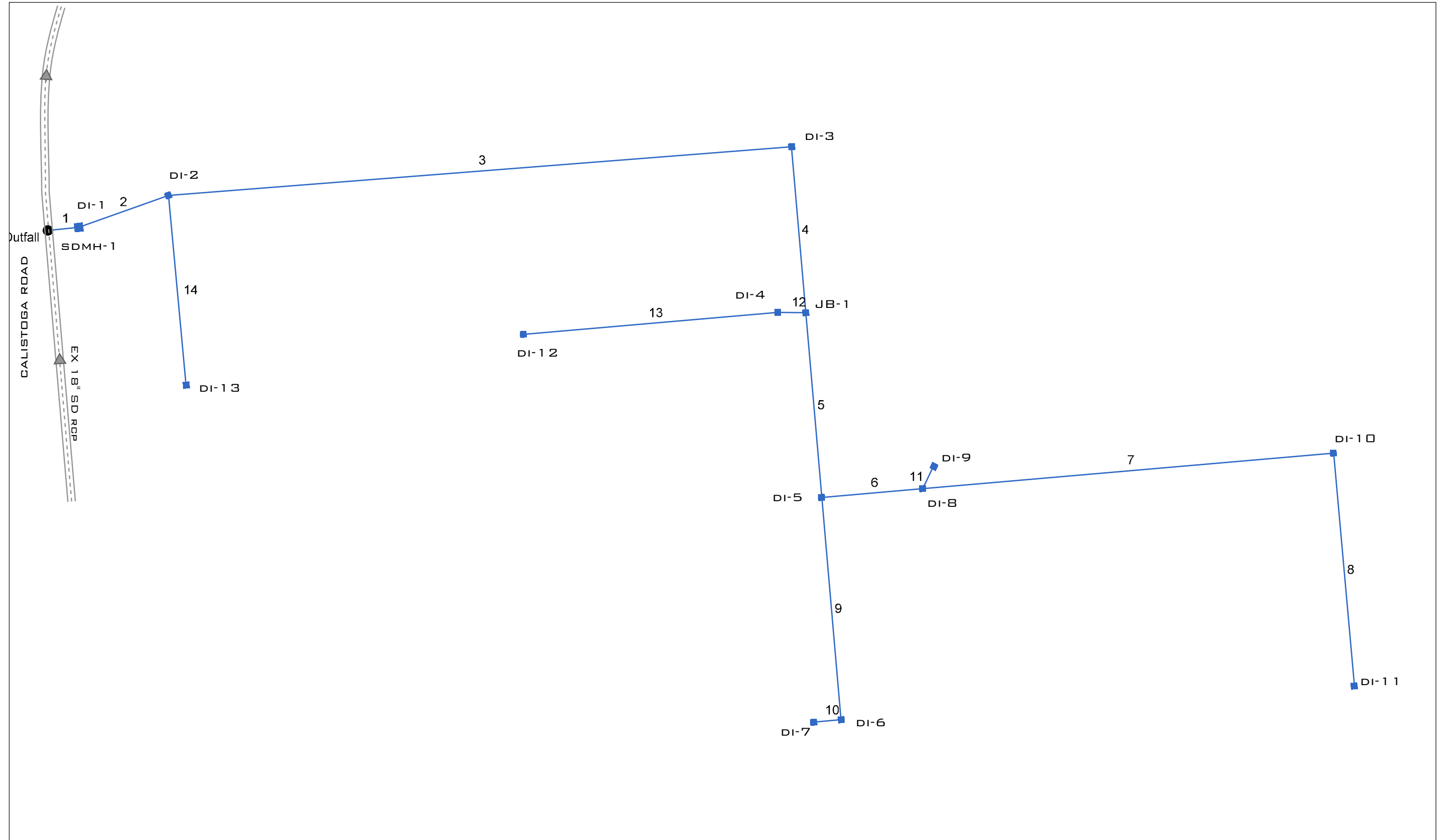
Project File: 13104-SD 10 YRS.stm

Number of lines: 14

Run Date: 10/14/2023

Notes: ; \*\* Critical depth.; j-Line contains hyd. jump ; c = cir e = ellip b = box

# Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan



**100 YEAR CALCULATIONS**

Number of lines: 14

Date: 10/14/2023



# Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
1	SD-1	2.40	15	Cir	7.309	287.16	287.23	0.958	289.61*	289.62*	0.03	289.65	End	DropGrate
2	SD-2	1.93	12	Cir	22.330	287.23	287.37	0.627	289.65*	289.70*	0.14	289.84	1	DropGrate
3	SD-3	1.17	8	Cir	146.949	287.37	288.84	1.000	289.84*	291.02*	0.26	291.29	2	DropGrate
4	SD-4	0.85	8	Cir	39.195	288.84	289.23	0.995	291.29*	291.45*	0.14	291.59	3	DropGrate
5	SD-5	0.57	8	Cir	43.578	289.23	289.67	1.010	291.59*	291.67*	0.06	291.73	4	DropGrate
6	SD-6	0.34	8	Cir	23.902	289.67	289.90	0.962	291.73*	291.75*	0.02	291.77	5	DropGrate
7	SD-7	0.19	8	Cir	96.935	289.90	290.87	1.001	291.77*	291.79*	0.01	291.80	6	DropGrate
8	SD-8	0.12	8	Cir	55.001	290.87	291.42	1.000	291.80	291.80	0.01	291.81	7	DropGrate
9	SD-9	0.26	8	Cir	52.500	289.71	289.98	0.514	291.73*	291.75*	0.01	291.77	5	DropGrate
10	SD-10	0.15	8	Cir	6.532	289.98	290.04	0.918	291.77*	291.77*	0.00	291.77	9	DropGrate
11	SD-11	0.15	8	Cir	5.816	289.90	290.19	4.986	291.77*	291.77*	0.00	291.77	6	DropGrate
12	SD-12	0.35	8	Cir	6.531	289.23	289.56	5.053	291.59*	291.59*	0.01	291.60	4	DropGrate
13	SD-13	0.27	8	Cir	60.203	289.56	292.57	5.000	291.60	292.81	n/a	292.81 j	12	DropGrate
14	SD-14	0.63	8	Cir	44.775	287.37	289.61	5.003	289.84	289.98	n/a	290.13 j	2	DropGrate

Project File: 13104-SD 100 YRS.stm

Number of lines: 14

Run Date: 10/14/2023

NOTES: Return period = 100 Yrs. ; \*Surcharged (HGL above crown). ; j - Line contains hyd. jump.

# Storm Sewer Tabulation

Station		Len (ft)	Drng Area (ac)		Rnoff coeff (C)	Area x C		Tc		Rain (l) (in/hr)	Total flow (cfs)	Cap full (cfs)	Vel (ft/s)	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr	Total		Incr	Total	Inlet (min)	Syst (min)					Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	7.309	0.17	1.13	0.90	0.15	0.76	5.0	11.7	3.2	2.40	6.85	1.96	15	0.96	287.16	287.23	289.61	289.62	290.93	291.78	SD-1
2	1	22.330	0.18	0.96	0.63	0.11	0.60	5.0	11.5	3.2	1.93	3.05	2.45	12	0.63	287.23	287.37	289.65	289.70	291.78	289.67	SD-2
3	2	146.949	0.16	0.57	0.63	0.10	0.36	5.0	11.0	3.3	1.17	1.31	3.36	8	1.00	287.37	288.84	289.84	291.02	289.67	291.23	SD-3
4	3	39.195	0.01	0.41	0.63	0.01	0.26	5.0	10.8	3.3	0.85	1.31	2.44	8	1.00	288.84	289.23	291.29	291.45	291.23	292.50	SD-4
5	4	43.578	0.02	0.27	0.63	0.01	0.17	5.0	10.4	3.3	0.57	1.31	1.63	8	1.01	289.23	289.67	291.59	291.67	292.50	292.40	SD-5
6	5	23.902	0.03	0.16	0.63	0.02	0.10	5.0	10.1	3.4	0.34	1.28	0.98	8	0.96	289.67	289.90	291.73	291.75	292.40	292.40	SD-6
7	6	96.935	0.04	0.08	0.63	0.03	0.05	5.0	7.7	3.9	0.19	1.31	0.56	8	1.00	289.90	290.87	291.77	291.79	292.40	292.82	SD-7
8	7	55.001	0.04	0.04	0.63	0.03	0.03	5.0	5.0	4.7	0.12	1.31	0.46	8	1.00	290.87	291.42	291.80	291.80	292.82	293.20	SD-8
9	5	52.500	0.04	0.09	0.63	0.03	0.06	5.0	5.3	4.6	0.26	0.94	0.75	8	0.51	289.71	289.98	291.73	291.75	292.40	292.69	SD-9
10	9	6.532	0.05	0.05	0.63	0.03	0.03	5.0	5.0	4.7	0.15	1.25	0.43	8	0.92	289.98	290.04	291.77	291.77	292.69	292.70	SD-10
11	6	5.816	0.05	0.05	0.63	0.03	0.03	5.0	5.0	4.7	0.15	2.92	0.43	8	4.99	289.90	290.19	291.77	291.77	292.40	292.72	SD-11
12	4	6.531	0.04	0.13	0.63	0.03	0.08	5.0	6.3	4.2	0.35	2.94	1.00	8	5.05	289.23	289.56	291.59	291.59	292.50	292.20	SD-12
13	12	60.203	0.09	0.09	0.63	0.06	0.06	5.0	5.0	4.7	0.27	2.93	1.58	8	5.00	289.56	292.57	291.60	292.81	292.20	293.76	SD-13
14	2	44.775	0.21	0.21	0.63	0.13	0.13	5.0	5.0	4.7	0.63	2.93	2.45	8	5.00	287.37	289.61	289.84	289.98	289.67	291.89	SD-14

Project File: 13104-SD 100 YRS.stm

Number of lines: 14

Run Date: 10/14/2023

NOTES: Intensity = 10.33 / (Inlet time + 0.10) ^ 0.48; Return period = Yrs. 100 ; c = cir e = ellip b = box

# Hydraulic Grade Line Computations

Line	Size (in)	Q (cfs)	Downstream								Len (ft)	Upstream								Check		JL coeff (K)	Minor loss (ft)
			Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)		Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)	Ave Sf (%)	Enrgy loss (ft)		
1	15	2.40	287.16	289.61	1.25	1.23	1.96	0.06	289.67	0.118	7.309	287.23	289.62	1.25	1.23	1.96	0.06	289.68	0.118	0.118	0.009	0.50	0.03
2	12	1.93	287.23	289.65	1.00	0.79	2.45	0.09	289.74	0.249	22.330	287.37	289.70	1.00	0.79	2.45	0.09	289.80	0.249	0.249	0.056	1.50	0.14
3	8	1.17	287.37	289.84	0.67	0.35	3.36	0.18	290.02	0.802	146.949	288.84	291.02	0.67	0.35	3.36	0.18	291.20	0.802	0.802	1.178	1.50	0.26
4	8	0.85	288.84	291.29	0.67	0.35	2.44	0.09	291.38	0.422	39.195	289.23	291.45	0.67	0.35	2.44	0.09	291.54	0.422	0.422	0.166	1.50	0.14
5	8	0.57	289.23	291.59	0.67	0.35	1.63	0.04	291.63	0.189	43.578	289.67	291.67	0.67	0.35	1.63	0.04	291.71	0.189	0.189	0.082	1.50	0.06
6	8	0.34	289.67	291.73	0.67	0.35	0.98	0.01	291.75	0.068	23.902	289.90	291.75	0.67	0.35	0.98	0.01	291.76	0.068	0.068	0.016	1.33	0.02
7	8	0.19	289.90	291.77	0.67	0.35	0.56	0.00	291.77	0.022	96.935	290.87	291.79	0.67	0.35	0.56	0.00	291.80	0.022	0.022	0.021	1.50	0.01
8	8	0.12	290.87	291.80	0.67	0.35	0.34	0.00	291.80	0.008	55.001	291.42	291.80	0.38	0.21	0.57	0.01	291.81	0.021	0.015	0.008	1.00	0.01
9	8	0.26	289.71	291.73	0.67	0.35	0.75	0.01	291.74	0.040	52.500	289.98	291.75	0.67	0.35	0.75	0.01	291.76	0.040	0.040	0.021	1.50	0.01
10	8	0.15	289.98	291.77	0.67	0.35	0.43	0.00	291.77	0.013	6.532	290.04	291.77	0.67	0.35	0.43	0.00	291.77	0.013	0.013	0.001	1.00	0.00
11	8	0.15	289.90	291.77	0.67	0.35	0.43	0.00	291.77	0.013	5.816	290.19	291.77	0.67	0.35	0.43	0.00	291.77	0.013	0.013	0.001	1.00	0.00
12	8	0.35	289.23	291.59	0.67	0.35	1.00	0.02	291.60	0.071	6.531	289.56	291.59	0.67	0.35	1.00	0.02	291.61	0.071	0.071	0.005	0.50	0.01
13	8	0.27	289.56	291.60	0.67	0.11	0.77	0.01	291.61	0.042	60.203	292.57	292.81 j	0.24**	0.11	2.38	0.09	292.90	0.555	0.299	n/a	1.00	0.09
14	8	0.63	287.37	289.84	0.67	0.20	1.79	0.05	289.89	0.229	44.775	289.61	289.98 j	0.37**	0.20	3.11	0.15	290.13	0.627	0.428	0.192	1.00	0.15

Project File: 13104-SD 100 YRS.stm

Number of lines: 14

Run Date: 10/14/2023

Notes: ; \*\* Critical depth.; j-Line contains hyd. jump ; c = cir e = ellip b = box



**POINT PRECIPITATION FREQUENCY ESTIMATES**

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

[PF\\_tabular](#) | [PF\\_graphical](#) | [Maps\\_&\\_aerials](#)

**PF tabular**

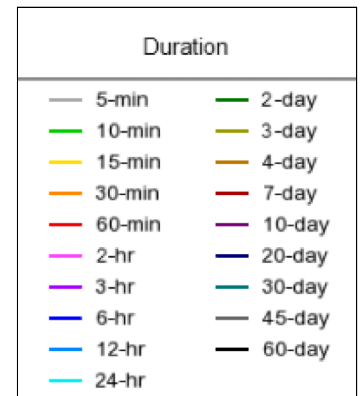
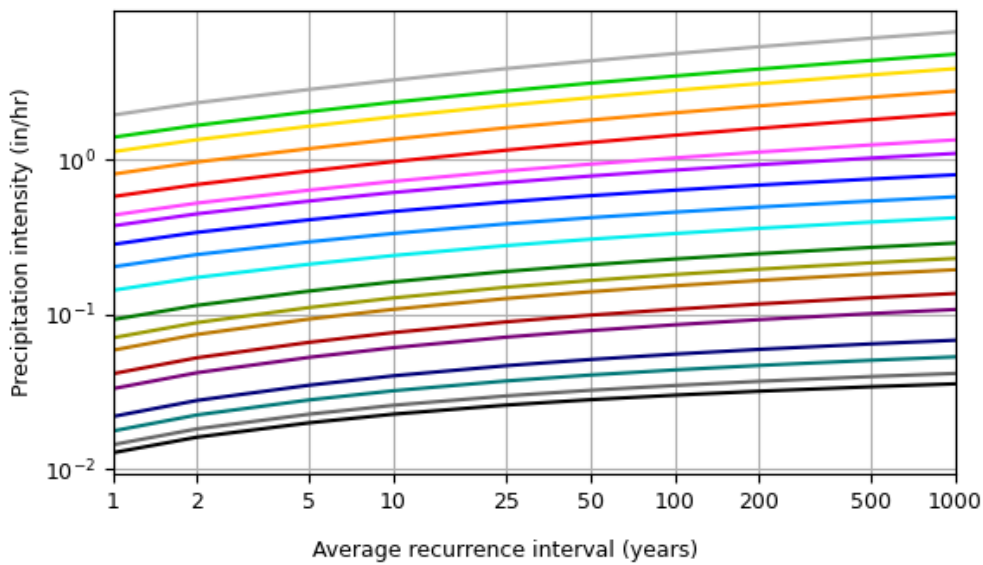
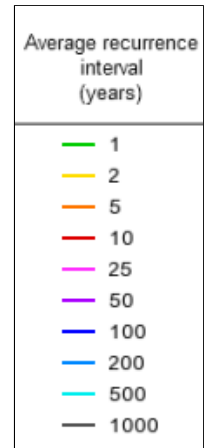
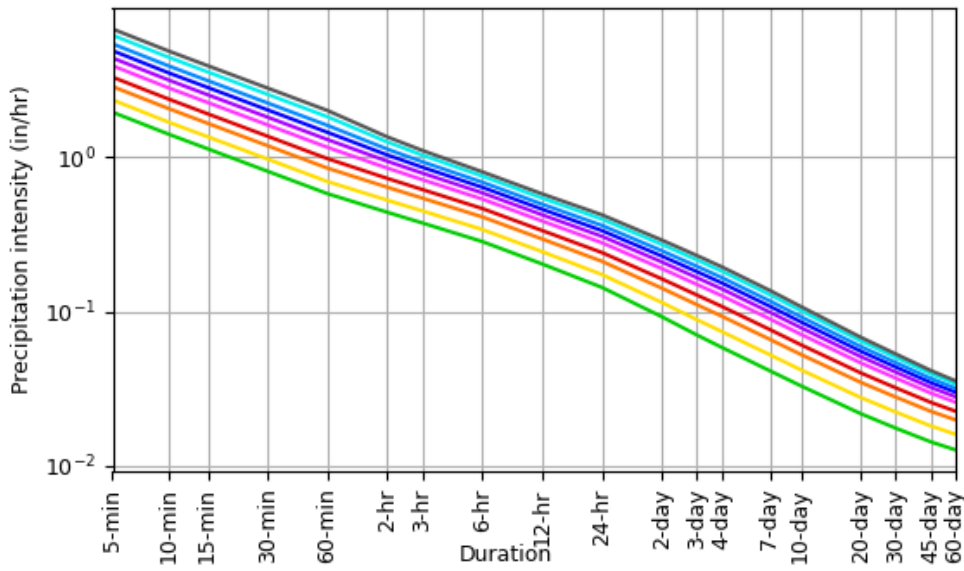
<b>PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour)<sup>1</sup></b>										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	1.96 (1.74-2.22)	2.35 (2.09-2.68)	2.87 (2.54-3.28)	3.30 (2.89-3.80)	3.91 (3.30-4.68)	4.39 (3.61-5.39)	4.90 (3.91-6.18)	5.42 (4.20-7.07)	6.17 (4.56-8.44)	6.77 (4.81-9.64)
10-min	1.40 (1.25-1.60)	1.68 (1.49-1.91)	2.06 (1.82-2.35)	2.37 (2.08-2.73)	2.80 (2.36-3.36)	3.15 (2.59-3.86)	3.50 (2.80-4.43)	3.89 (3.01-5.07)	4.42 (3.26-6.05)	4.85 (3.44-6.91)
15-min	1.13 (1.01-1.28)	1.36 (1.20-1.54)	1.66 (1.47-1.89)	1.91 (1.68-2.20)	2.26 (1.90-2.71)	2.54 (2.09-3.12)	2.83 (2.26-3.57)	3.13 (2.43-4.09)	3.56 (2.63-4.88)	3.91 (2.78-5.57)
30-min	0.810 (0.720-0.920)	0.972 (0.862-1.10)	1.19 (1.05-1.35)	1.37 (1.20-1.57)	1.62 (1.36-1.94)	1.82 (1.49-2.23)	2.02 (1.62-2.55)	2.24 (1.74-2.93)	2.55 (1.88-3.49)	2.80 (1.99-3.99)
60-min	0.580 (0.516-0.659)	0.695 (0.617-0.791)	0.849 (0.752-0.969)	0.978 (0.858-1.13)	1.16 (0.976-1.39)	1.30 (1.07-1.60)	1.45 (1.16-1.83)	1.61 (1.24-2.09)	1.83 (1.35-2.50)	2.00 (1.42-2.85)
2-hr	0.439 (0.390-0.499)	0.526 (0.467-0.598)	0.638 (0.565-0.728)	0.728 (0.639-0.839)	0.849 (0.716-1.02)	0.941 (0.774-1.16)	1.03 (0.826-1.30)	1.13 (0.873-1.47)	1.25 (0.926-1.72)	1.35 (0.960-1.92)
3-hr	0.374 (0.333-0.425)	0.448 (0.398-0.510)	0.542 (0.480-0.619)	0.617 (0.541-0.710)	0.714 (0.603-0.856)	0.788 (0.648-0.967)	0.860 (0.688-1.09)	0.933 (0.723-1.22)	1.03 (0.761-1.41)	1.10 (0.784-1.57)
6-hr	0.284 (0.252-0.322)	0.340 (0.302-0.386)	0.410 (0.363-0.468)	0.464 (0.407-0.535)	0.535 (0.451-0.641)	0.587 (0.483-0.721)	0.638 (0.510-0.805)	0.688 (0.533-0.898)	0.754 (0.556-1.03)	0.803 (0.570-1.14)
12-hr	0.203 (0.180-0.230)	0.244 (0.216-0.277)	0.295 (0.261-0.336)	0.334 (0.293-0.385)	0.385 (0.325-0.462)	0.423 (0.348-0.519)	0.459 (0.367-0.580)	0.496 (0.384-0.646)	0.543 (0.401-0.743)	0.578 (0.410-0.822)
24-hr	0.143 (0.128-0.162)	0.173 (0.155-0.197)	0.211 (0.189-0.240)	0.240 (0.214-0.276)	0.279 (0.241-0.329)	0.306 (0.260-0.368)	0.334 (0.278-0.410)	0.361 (0.293-0.454)	0.396 (0.310-0.516)	0.423 (0.321-0.567)
2-day	0.092 (0.083-0.105)	0.114 (0.102-0.130)	0.141 (0.126-0.161)	0.162 (0.144-0.186)	0.189 (0.164-0.223)	0.209 (0.177-0.251)	0.228 (0.190-0.280)	0.247 (0.201-0.311)	0.272 (0.213-0.354)	0.290 (0.220-0.389)
3-day	0.070 (0.063-0.080)	0.088 (0.079-0.100)	0.110 (0.099-0.126)	0.127 (0.113-0.146)	0.149 (0.129-0.176)	0.165 (0.140-0.199)	0.181 (0.150-0.222)	0.196 (0.159-0.246)	0.216 (0.169-0.281)	0.230 (0.175-0.309)
4-day	0.058 (0.052-0.066)	0.074 (0.066-0.084)	0.093 (0.083-0.106)	0.107 (0.096-0.123)	0.126 (0.109-0.149)	0.140 (0.119-0.168)	0.153 (0.127-0.188)	0.166 (0.134-0.208)	0.182 (0.143-0.237)	0.194 (0.148-0.261)
7-day	0.041 (0.037-0.046)	0.052 (0.047-0.059)	0.065 (0.059-0.075)	0.076 (0.067-0.087)	0.089 (0.077-0.105)	0.098 (0.084-0.118)	0.108 (0.089-0.132)	0.116 (0.094-0.146)	0.128 (0.100-0.167)	0.136 (0.103-0.183)
10-day	0.033 (0.029-0.037)	0.041 (0.037-0.047)	0.052 (0.047-0.060)	0.060 (0.054-0.069)	0.071 (0.061-0.084)	0.078 (0.066-0.094)	0.085 (0.071-0.105)	0.092 (0.075-0.116)	0.101 (0.079-0.131)	0.107 (0.081-0.144)
20-day	0.021 (0.019-0.024)	0.027 (0.024-0.031)	0.034 (0.031-0.039)	0.040 (0.035-0.045)	0.046 (0.040-0.054)	0.051 (0.043-0.061)	0.055 (0.046-0.067)	0.059 (0.048-0.074)	0.064 (0.050-0.083)	0.068 (0.051-0.091)
30-day	0.017 (0.015-0.019)	0.022 (0.020-0.025)	0.027 (0.025-0.031)	0.032 (0.028-0.036)	0.037 (0.032-0.043)	0.040 (0.034-0.048)	0.043 (0.036-0.053)	0.046 (0.037-0.058)	0.050 (0.039-0.065)	0.053 (0.040-0.071)
45-day	0.014 (0.012-0.016)	0.018 (0.016-0.020)	0.022 (0.020-0.025)	0.025 (0.022-0.029)	0.029 (0.025-0.034)	0.032 (0.027-0.038)	0.034 (0.028-0.042)	0.036 (0.029-0.046)	0.039 (0.031-0.051)	0.041 (0.031-0.055)
60-day	0.012 (0.011-0.014)	0.016 (0.014-0.018)	0.019 (0.017-0.022)	0.022 (0.020-0.025)	0.025 (0.022-0.030)	0.028 (0.023-0.033)	0.029 (0.024-0.036)	0.031 (0.025-0.039)	0.034 (0.026-0.044)	0.035 (0.027-0.047)

<sup>1</sup> 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.

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**PF graphical**

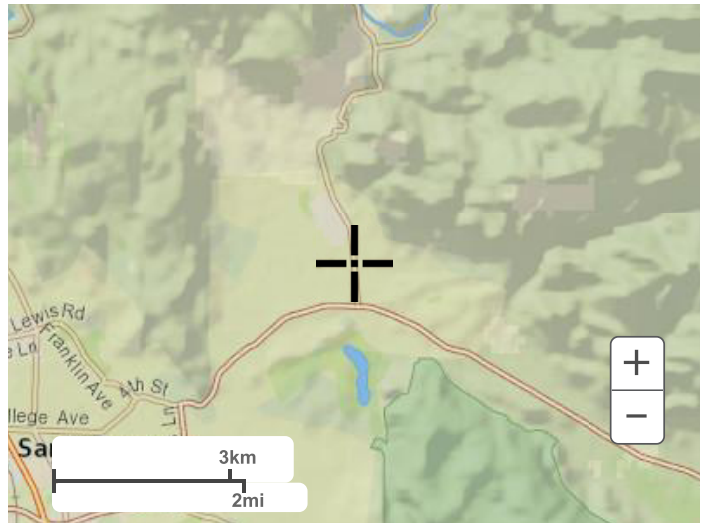
PDS-based intensity-duration-frequency (IDF) curves  
 Latitude: 38.4714°, Longitude: -122.6538°



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**Maps & aerials**

**Small scale terrain**



Large scale terrain



Large scale map



Large scale aerial



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[National Oceanic and Atmospheric Administration](#)  
[National Weather Service](#)  
[National Water Center](#)  
1325 East West Highway  
Silver Spring, MD 20910  
Questions?: [HDSC.Questions@noaa.gov](mailto:HDSC.Questions@noaa.gov)

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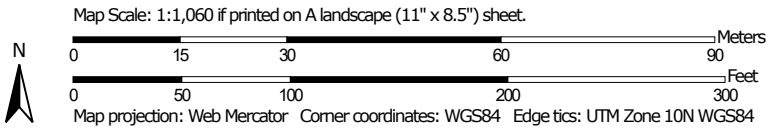
**Intensity = B / (Tc + D)^E**

Return Period (Yrs)	Intensity Values (in/hr)											
	5 min	10	15	20	25	30	35	40	45	50	55	60
1	1.91	1.37	1.13	0.98	0.88	0.81	0.75	0.71	0.67	0.63	0.60	0.58
2	2.30	1.65	1.36	1.18	1.06	0.97	0.90	0.85	0.80	0.76	0.72	0.70
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	2.83	2.03	1.67	1.45	1.30	1.19	1.10	1.03	0.98	0.93	0.89	0.85
10	3.25	2.33	1.92	1.67	1.50	1.37	1.27	1.19	1.12	1.07	1.02	0.98
25	3.82	2.75	2.26	1.97	1.77	1.62	1.50	1.41	1.33	1.27	1.21	1.16
50	4.32	3.10	2.55	2.22	1.99	1.82	1.69	1.58	1.49	1.42	1.36	1.30
100	4.73	3.41	2.81	2.45	2.20	2.02	1.88	1.76	1.66	1.58	1.51	1.45

Tc = time in minutes. Min Tc = 5




Soil Map—Sonoma County, California




## MAP LEGEND

### Area of Interest (AOI)

 Area of Interest (AOI)

### Soils

 Soil Map Unit Polygons

 Soil Map Unit Lines

 Soil Map Unit Points

### Special Point Features



Blowout



Borrow Pit



Clay Spot



Closed Depression



Gravel Pit



Gravelly Spot



Landfill



Lava Flow



Marsh or swamp



Mine or Quarry



Miscellaneous Water



Perennial Water



Rock Outcrop



Saline Spot



Sandy Spot



Severely Eroded Spot



Sinkhole



Slide or Slip



Sodic Spot



Spoil Area



Stony Spot



Very Stony Spot



Wet Spot



Other



Special Line Features

### Water Features



Streams and Canals

### Transportation



Rails



Interstate Highways



US Routes



Major Roads



Local Roads

### Background



Aerial Photography

## MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

**Warning:** Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL:

Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Sonoma County, California

Survey Area Data: Version 16, Sep 14, 2022

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Mar 26, 2022—Apr 25, 2022

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

## Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
HbC	Haire gravelly loam, 0 to 9 percent slopes	2.3	100.0%
HcC	Haire clay loam, 0 to 9 percent slopes	0.0	0.0%
<b>Totals for Area of Interest</b>		<b>2.3</b>	<b>100.0%</b>

## Sonoma County, California

### HbC—Haire gravelly loam, 0 to 9 percent slopes

#### Map Unit Setting

*National map unit symbol:* hfdn

*Elevation:* 20 to 2,400 feet

*Mean annual precipitation:* 20 to 45 inches

*Mean annual air temperature:* 54 to 57 degrees F

*Frost-free period:* 200 to 300 days

*Farmland classification:* Farmland of statewide importance

#### Map Unit Composition

*Haire and similar soils:* 85 percent

*Minor components:* 15 percent

*Estimates are based on observations, descriptions, and transects of the mapunit.*

#### Description of Haire

##### Setting

*Landform:* Terraces

*Landform position (two-dimensional):* Footslope

*Landform position (three-dimensional):* Base slope

*Down-slope shape:* Linear

*Across-slope shape:* Linear

*Parent material:* Alluvium derived from sedimentary rock

##### Typical profile

*H1 - 0 to 24 inches:* gravelly loam

*H2 - 24 to 36 inches:* clay

*H3 - 36 to 60 inches:* very gravelly clay loam

##### Properties and qualities

*Slope:* 0 to 9 percent

*Depth to restrictive feature:* More than 80 inches

*Drainage class:* Moderately well drained

*Runoff class:* High

*Capacity of the most limiting layer to transmit water*

*(Ksat):* Moderately low to moderately high (0.06 to 0.20 in/hr)

*Depth to water table:* More than 80 inches

*Frequency of flooding:* None

*Frequency of ponding:* None

*Available water supply, 0 to 60 inches:* Moderate (about 6.3 inches)

##### Interpretive groups

*Land capability classification (irrigated):* 2e

*Land capability classification (nonirrigated):* 3e

*Hydrologic Soil Group:* C

*Ecological site:* R014XC010CA - CLAYPAN

*Hydric soil rating:* No

### **Minor Components**

#### **Diablo**

*Percent of map unit: 7 percent*

*Hydric soil rating: No*

#### **Arbuckle**

*Percent of map unit: 6 percent*

*Hydric soil rating: No*

#### **Clear lake**

*Percent of map unit: 2 percent*

*Landform: Depressions*

*Hydric soil rating: Yes*

## **Data Source Information**

Soil Survey Area: Sonoma County, California

Survey Area Data: Version 16, Sep 14, 2022

# DESIGN CRITERIA

1. GATE IS IN SUMP AREA (LOW POINT)

2.  $Q = 1/2$  PERIMETER IN FEET (ASSUME 35 40 PERCENT OF THE PEREMETER IS  
BLOCKED WITH DEBRIS AND 10 15 PERCENT IS TAKEN UP BY THE GRATE BEARING

3.  $A = CI$  = AREA IN ACRES

WHERE

$Q$  = WEIR DISCHARGE IN C.F.S

$C$  = 0.9 FOR PAVED AREAS

$I$  = 2.48 INCHES PER HOUR FOR FOR  $T = 10$

S.R.C.P MODEL	INSIDE GRATE DIMENSION a" x b"	P=a+b IN FEET	H=0.1'		H=0.2'		H=0.3'		H=0.4'	
			Q cfs	Acres	Q cfs	Acres	Q cfs	Acres	Q cfs	Acres
EK	12X12	2.00	0.19	0.10	0.54	0.28	0.99	0.52	1.52	0.80
BK	16X16	2.67	0.25	0.13	0.72	0.38	1.32	0.70	2.03	1.07
IK	16X24	3.33	0.32	0.17	0.89	0.47	1.64	0.87	2.53	1.34
2K	24X24	4.00	0.38	0.20	1.00	0.57	1.97	1.04	3.04	1.61
3K	24X30	4.50	0.43	0.23	1.21	0.64	2.22	1.17	3.42	1.81
5K	30X30	5.00	0.47	0.25	1.34	0.71	2.46	1.30	3.79	2.01
IL	24X36	5.00	0.47	0.25	1.34	0.71	2.46	1.30	3.79	2.01
IM	36X36	6.00	0.57	0.30	1.61	0.85	2.96	1.56	4.55	2.41
3L	24X48	6.00	0.57	0.30	1.61	0.85	2.96	1.56	4.55	2.41
3M	36X48	7.00	0.66	0.35	1.88	0.99	3.45	1.83	5.31	2.81
IR	48X48	8.00	0.76	0.40	2.15	1.14	3.94	2.09	6.07	3.21

DI TYPE

P.D.I-(1) 2K

P.D.I-(2) BK

P.D.I-(3) EK

P.D.I-(4) EK

P.D.I-(5) EK

P.D.I-(6) EK

P.D.I-(7) EK

P.D.I-(8) EK

P.D.I-(9) EK

P.D.I-(11) EK

P.D.I-(12) EK

# COUNTY ASSESSOR'S PARCEL MAP

TAX RATE AREA  
4-093

153-43

Pcl. Map No. 379  
REC. 07-28-83 IN BK. 347, MAPS, PGS. 31-32

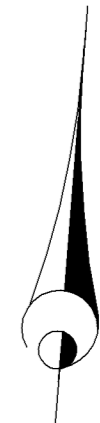
Pcl. Map No. 637  
REC. 04-30-04 IN BK. 661, MAPS, PGS. 01-04

Pcl. Map No. 558  
REC. 10-04-95 IN BK. 543, MAPS, PGS. 01-03

Pcl. Map No. 641  
REC. 08-01-06 IN BK. 698, MAPS, PGS. 36-39

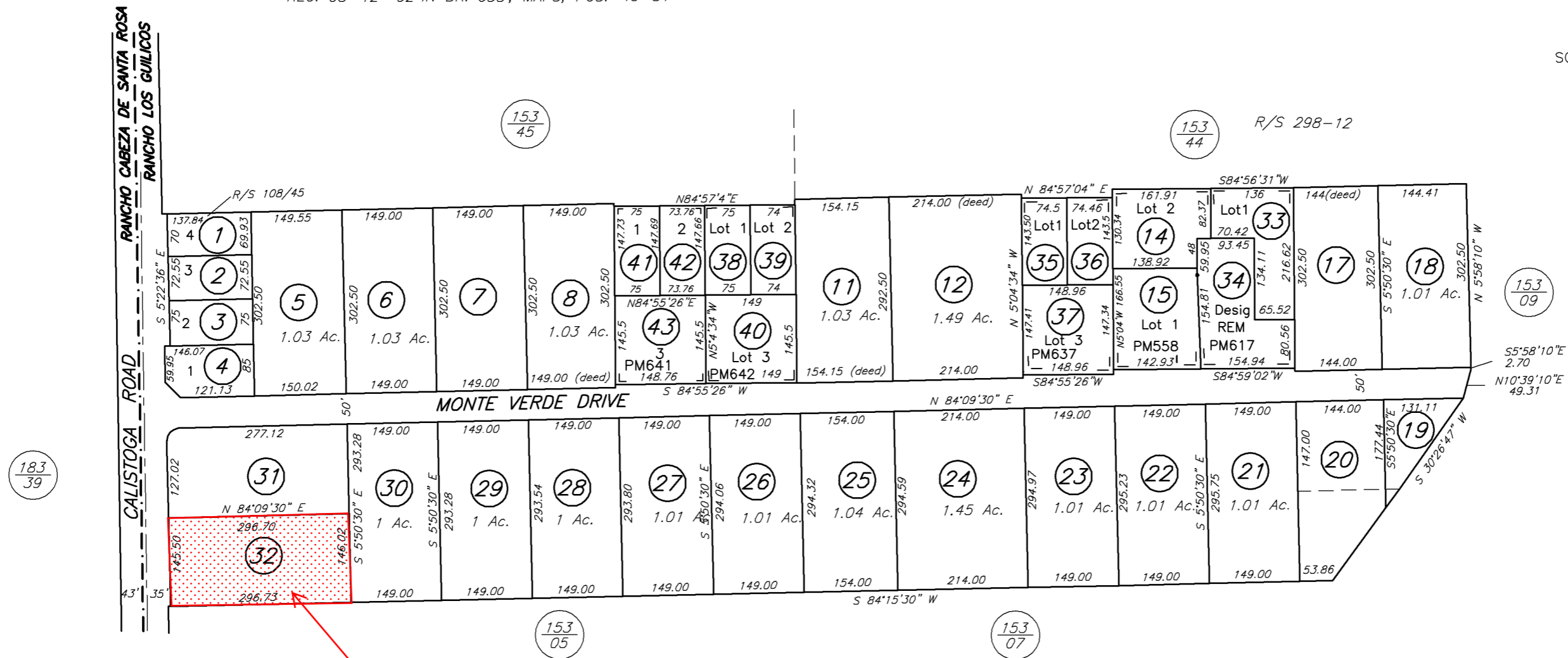
Pcl. Map No. 617  
REC. 08-12-02 IN BK. 638, MAPS, PGS. 49-51

Pcl. Map No. 642  
REC. 08-01-06 IN BK. 698, MAPS, PGS. 40-43



SCALE: 1" = 200'

REVISED  
12-11-02=34-LF  
08-18-04=37-LF  
09-25-06=40-MH  
10-12-06=43-BC



NOTE: This map was prepared for Assessment purposes only and does not indicate either parcel legality or a valid building site. No liability is assumed for the accuracy of the data delineated. The acreages are based on the information supplied to the Assessor (i.e. recorded survey maps recorded deeds, prior assessment maps, etc.)

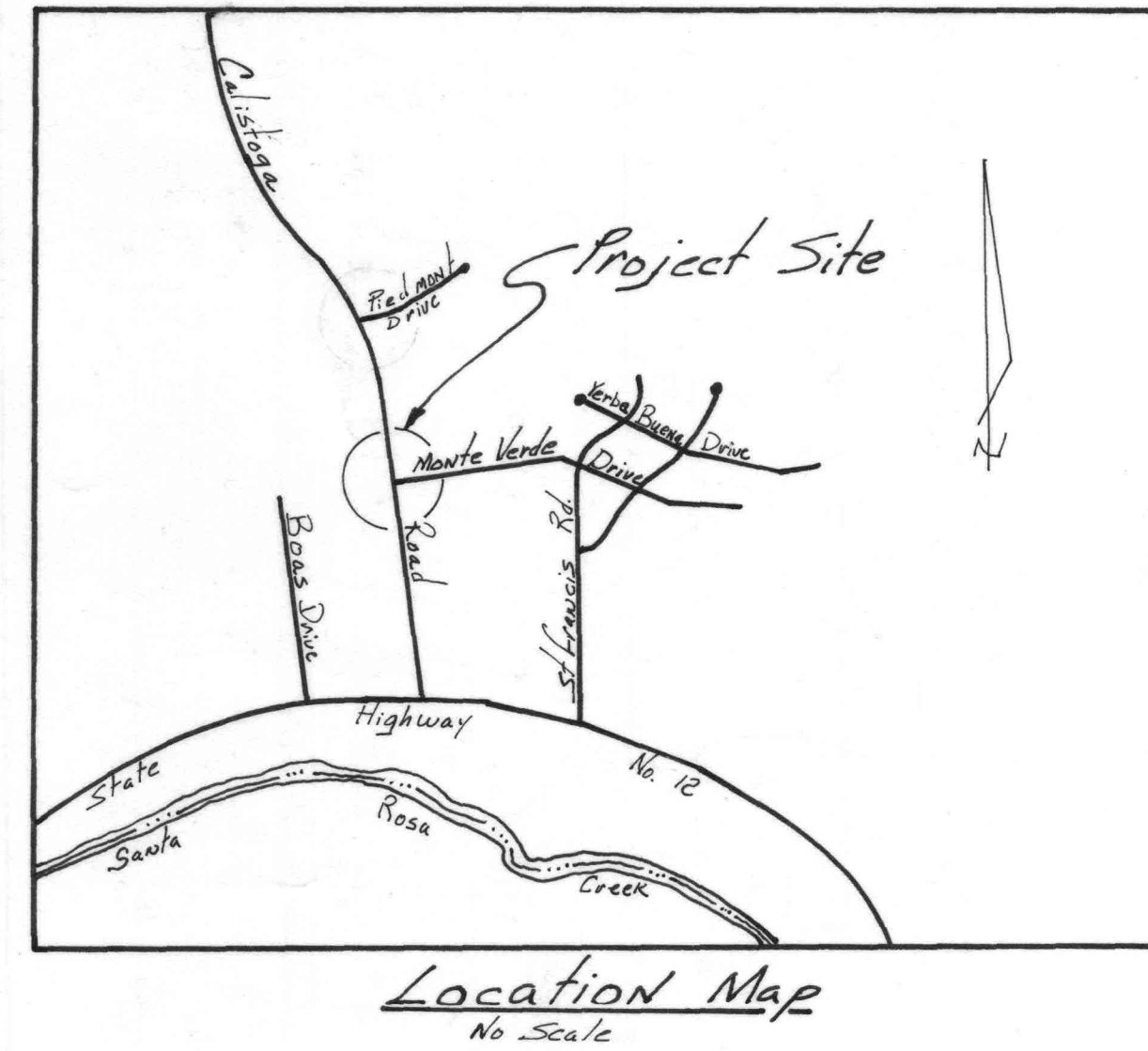
NOTE: Assessor's parcels do not necessarily constitute legal lots. To verify legal parcel status, check with the appropriate city or county community development or planning division.

Assessor's Map Bk. 153, Pg. 43  
Sonoma County, Calif. (ACAD)

KEY 11/13/07 RL

GENERAL NOTES

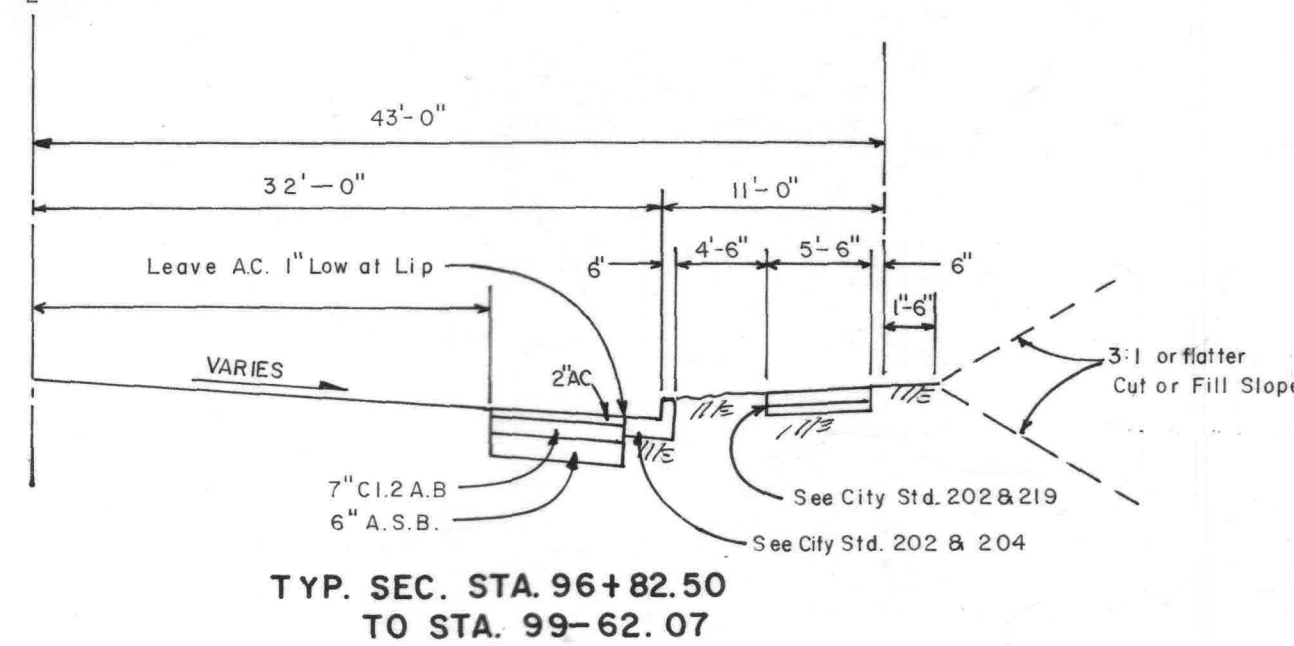
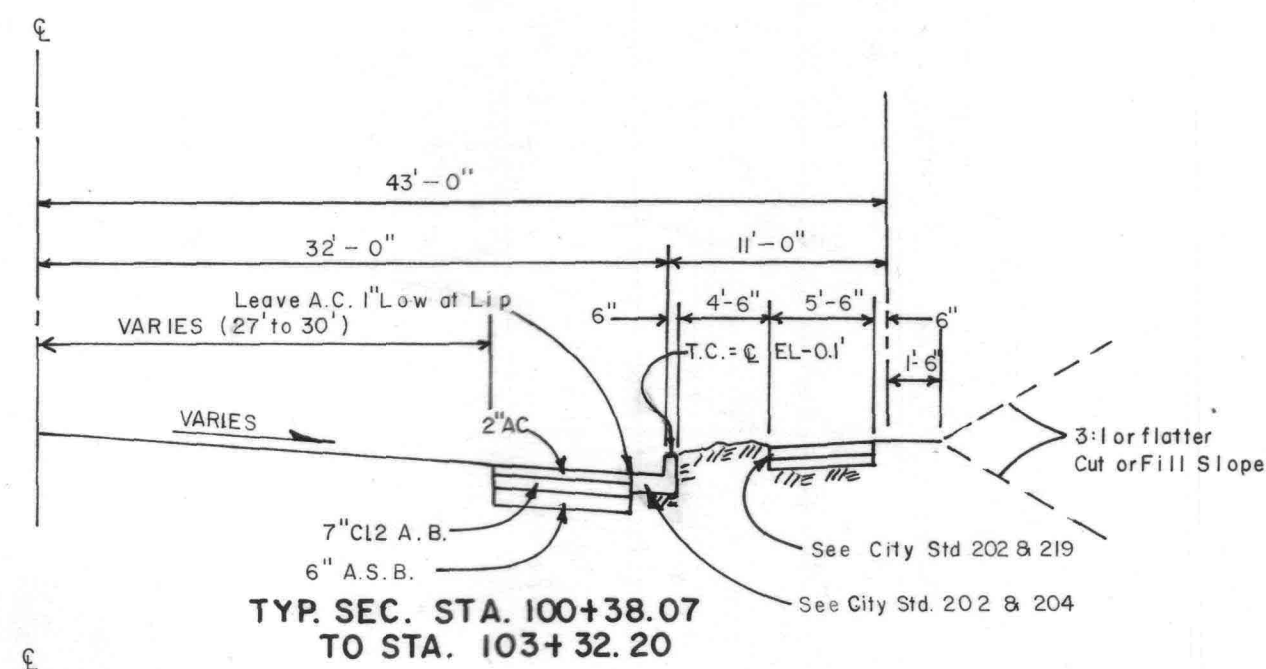
1. ALL WORKMANSHIP, MATERIALS AND CONSTRUCTION SHALL CONFORM TO THE STATE STANDARD SPECIFICATIONS AND STANDARD PLANS DATE JANUARY, 1975.
2. THE LOCATION OF EXISTING UTILITIES AS SHOWN ON THE PLANS ARE BASED ON THE BEST AVAILABLE INFORMATION, HOWEVER THE CITY OF SANTA ROSA ASSUMES NO RESPONSIBILITY FOR THE ACCURACY OF THE INFORMATION SHOWN OR THE INADVERTANT OMISSION OF ANY SUCH INFORMATION.
3. PRIOR TO THE COMMENCEMENT OF THIS PROJECT, THE CONTRACTOR SHALL CONTACT PACIFIC GAS AND ELECTRIC COMPANY 544-2235 EXT. 28. PACIFIC TELEPHONE AND TELEGRAPH 542-9000 EXT. 436.
4. ALL WORKMANSHIP, MATERIALS AND CONSTRUCTION SHALL CONFORM TO THE CITY OF SANTA ROSA STANDARD PLANS AND CONSTRUCTION SPECIFICATIONS FOR PUBLIC IMPROVEMENTS.
5. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DAMAGES CAUSED BY HIS OPERATIONS TO ANY CITY UTILITIES.
6. WATER LATERALS WILL BE ADJUSTED BY CITY FORCES. THE CONTRACTOR SHALL COOPERATE WITH THESE FORCES IN ORDER TO PROVIDE A MINIMUM OF WATER OUTAGE TIME OF ALL WATER FACILITIES.



# IMPROVEMENT PLANS FOR CALISTOGA RD. AT MONTE VERDE DR. STORM DRAIN, CURB, GUTTER AND SIDEWALK

AS BUILT

Project Started - 7-20-78  
Contractor - Paul Hawkins  
Sup - " " "  
Inspector - Russ Ham



FIELD SERVICES \_\_\_\_\_ DATE \_\_\_\_\_  
DESIGN \_\_\_\_\_ DATE \_\_\_\_\_  
CONSTRUCTION \_\_\_\_\_ DATE \_\_\_\_\_  
SURVEY \_\_\_\_\_ DATE \_\_\_\_\_

			<b>CITY OF SANTA ROSA</b>		Date <u>MARCH 1978</u>	Scale: <u>none</u>
			CALISTOGA ROAD at MONTE VERDE DR.		APPROVED: <u>BROYDON J. RIMA, DIRECTOR OF PUBLIC WORKS</u>	
			TITLE SHEET		BY: <u>Allen A. Petre</u>	DATE: <u>7/12/78</u>
					DWN: <u>JKR</u>	Sheet <u>1</u> of <u>1</u>
					CHK: _____	File Number <u>78-29</u>
NO.	DATE	REVISION	BY			



