FLOODING REPORT

SANTA CLARA COUNTY

DECEMBER 2022 – MARCH 2023

Prepared by the Hydraulics, Hydrology, and Geomorphology Unit
October 2023

Contents

Tables

Figures

Winter Season Summary

The 2022-2023 winter season included very high rainfall amounts as compared to the seasonal average, as shown in Figure 1. Much of the state experienced heavy rainfall, with many places in the Sierra Nevada reporting near record snowfall. As of April 25, 2023, the snow-water content was at 256% of the average to date[1] and ten of the state's 17 major water supply reservoirs were over 100% of the historical average, with one as high as 131% of the historical average[2].

The 2022-2023 winter season began with several small storms and one medium-sized storm between October and mid-December. However, starting December 26, 2022, a series of nine atmospheric rivers (ARs) came through California within a three-week period through mid-January[3]. The consistent rainfall in that period left soils very saturated and resulted in significant flooding events and reservoir spill events. After this series of ARs, there was a month and a half of relatively dry weather. Then, in early March, another series of ARs resulted in more flooding and reservoir spills. Four notable storm systems are listed below in Table 1 and are discussed in further detail in this report. Although multiple reservoirs spilled as designed during the four identified events, only spills from Uvas Reservoir resulted in significant flooding, as described in further detail later in this report.

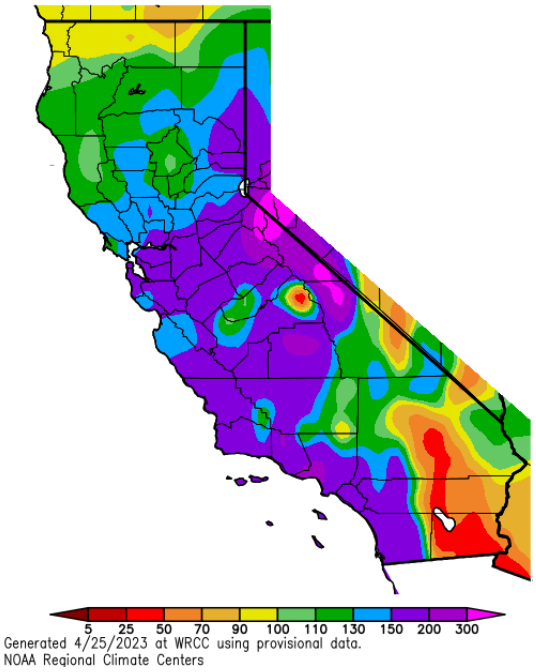

Figure 1. Percent of average precipitation for WY 2022-2023 as of April 24, 2023.

All data presented herein is considered preliminary at the time of this document's preparation. Final values (such as flow and rainfall amounts) may be subject to change.

Table 1. Significant Storm Events of 2022-2023 Storm Season

Dates	Major Flood Locations (Creeks)	Reservoir Spills
12/29/22 – 1/1/23	San Francisquito, West Little Llagas	Almaden, Uvas
1/8/23 – 1/10/23	West Little Llagas, Uvas	Almaden, Chesbro, Coyote, Uvas
1/14/23 – 1/16/23	West Little Llagas	Almaden, Coyote, Lexington, Uvas
3/8/23 – 3/10/23	West Little Llagas, Uvas	Almaden, Chesbro, Uvas

[1] California Department of Water Resources, California Data Exchange Center. Snow-Water Content Graph. Screenshot April 25, 2023.
[2] California Department of Water Resources. Current Reservoir Conditions. Retrieved April 25, 2023.
[3] University of California – San Diego. Center for Western Weather and Water Extremes (CW3E). 2022-2023 Dec-Feb Winter Recap. https://cw3e.ucsd.edu/cw3e-winter-2022-23-recap/

December 29, 2022, to January 1, 2023, Storm

Weather

A strong atmospheric river brought rain to Santa Clara County on December 26, 2022, leaving the ground saturated but not resulting in any flooding issues. A second atmospheric river with three moisture transport pulses on December 29, 30, and 31 brought consistent rainfall over a three-day period. Rainfall intensities increased in the early morning hours of December 31 and remained higher throughout the day. Table 2 and Figures 2 through 5 show rain gage statistics for three locations that experienced flooding during this time. Table 3 shows statistics for Valley Water rain gages throughout Santa Clara County during this event.

Table 2. Rain Gage Statistics (12/29/22 - 1/1/23)

Rain Gage	Max Rainfall Duration	Max Rainfall Depth	Estimated Return Period[4]
Trappers Trail	3 hours	1.38 inches	5-10 Year
	6 hours	2.17 inches	5-10 Year
	12 hours	4.02 inches	25 Year
	24 hours	5.20 inches	10-25 Year
	48 hours	6.89 inches	10-25 Year
West Little Llagas	3 hours	1.22 inches	2-5 Year
	6 hours	2.17 inches	5-10 Year
	12 hours	2.87 inches	5-10 Year
	24 hours	3.23 inches	2-5 Year
	48 hours	3.35 inches	1-2 Year
Haskins Ranch	3 hours	0.91 inches	1-2 Year
	6 hours	1.26 inches	1-2 Year
	12 hours	2.01 inches	2-5 Year
	24 hours	2.91 inches	5 Year
	48 hours	3.98 inches	5-10 Year

[4] Metstat. Regional All Season Precipitation Frequency Analysis and Mapping in Santa Clara, Alameda, and San Mateo Counties, California, and Comparison to NOAA Atlas 14. October 2016

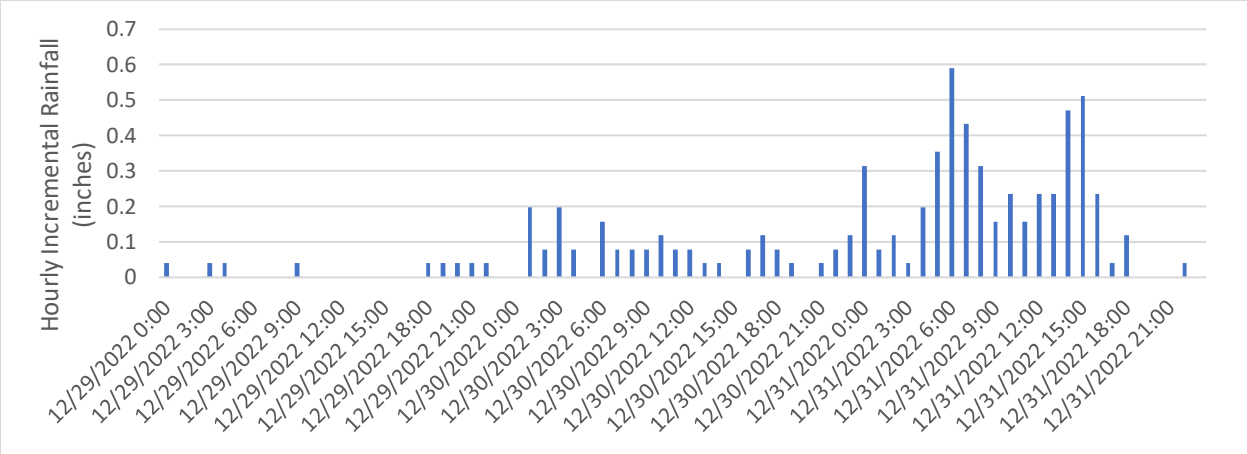

Figure 2. Trappers Trail Rainfall for San Francisquito Creek Watershed (12/29/22 - 12/31/22)

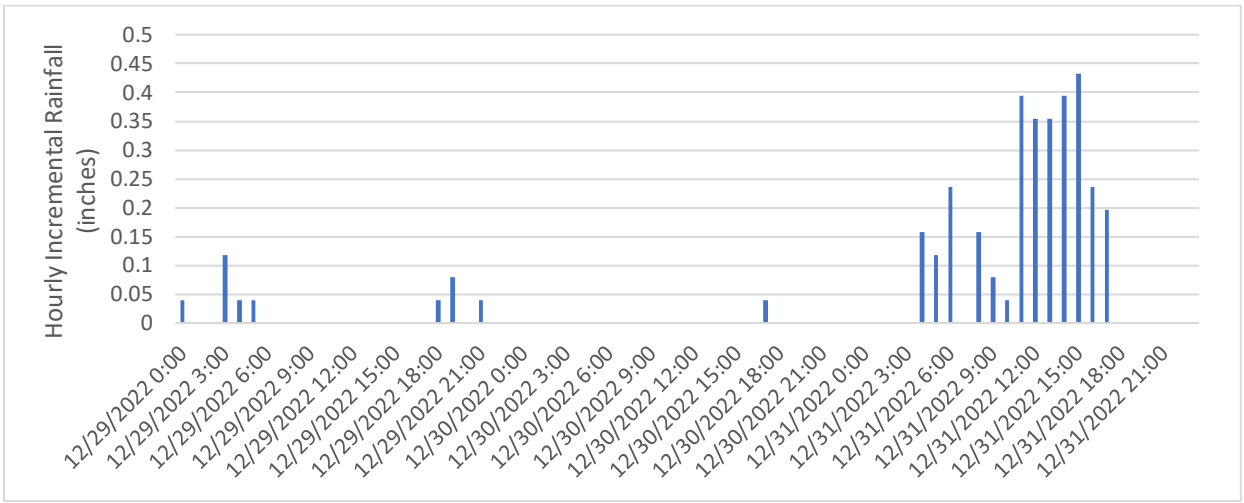

Figure 3. West Little Llagas Rainfall (12/29/22 - 12/31/22)

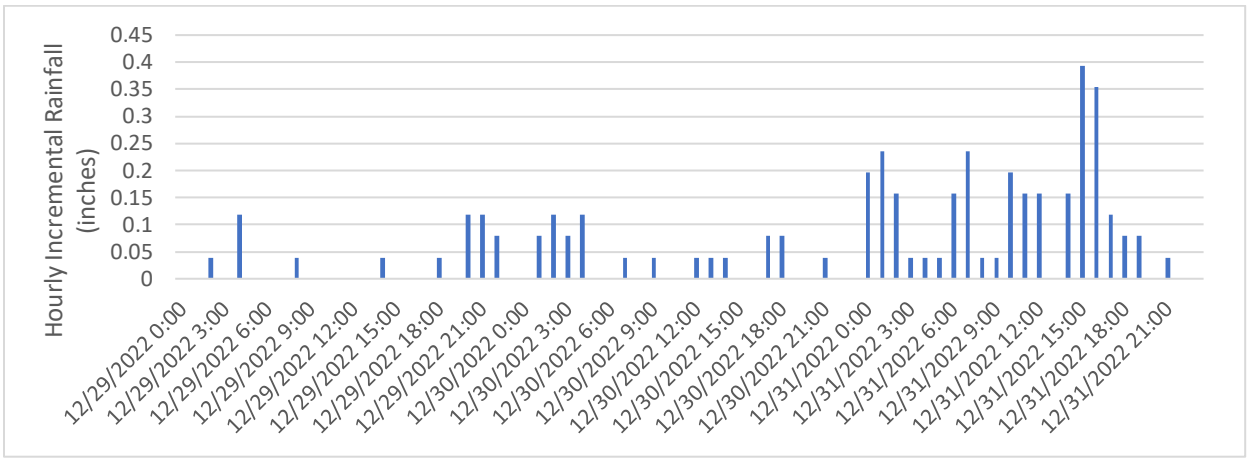

Figure 4. Haskins Ranch Rainfall for Upper Penitencia Creek (12/29/22 - 12/31/22)

Table 3. Valley Water Rain Gage Statistics (12/29/22 – 12/31/22)

Rain Gauge	Max 3hr Rainfall	3hr Return Period	Max 6hr Rainfall	6hr Return Period	Max 12hr Rainfall	12hr Return Period	Max 24hr Rainfall	24hr Return Period	Max 48hr Rainfall	48hr Return Period
Alamitos	0.63	1 year	1.02	1 year	1.34	1 year	1.46	1 year	1.50	<1 year
Almaden Watershed	1.46	2 year	2.56	2-5 year	4.17	5-10 year	5.20	5 year	5.47	2 year
Biel Ranch	0.94	5 year	1.38	5 year	2.32	10 year	3.23	10 year	4.02	10-25 year
Guadalupe Slough	0.67	2 year	0.83	1 year	1.54	5 year	1.81	5 year	1.89	2 year
Coe Park	0.94	1 year	1.77	2 year	3.23	10 year	4.13	5-10 year	4.80	2-5 year
Coit Ranch	1.10	2 year	1.89	2-5 year	2.99	5-10 year	3.43	5 year	3.98	2-5 year
Coyote Reservoir	0.79	< 1 year	1.50	2 year	2.28	2-5 year	2.56	2 year	2.87	1-2 year
Curtner Ranch	0.79	1-2 year	1.10	2 year	1.77	5 year	2.44	5-10 year	3.03	5-10 year
Haskins Ranch	0.91	1-2 year	1.26	1-2 year	2.01	2-5 year	2.91	5 year	3.98	5-10 year
Johnson Ranch	0.87	<1 year	1.54	1 year	2.24	2 year	2.64	1-2 year	2.68	<1 year
Leroy Anderson Dam	1.18	5 year	1.93	5-10 year	2.64	5 year	2.99	2-5 year	3.23	2 year
Loma Prieta	2.36	10-25 year	3.90	25 year	5.87	25 year	7.52	10-25 year	8.43	10-25 year
Sunnyvale Hamilton WTP	0.63	1 year	1.10	1-2 year	1.69	2 year	1.97	2 year	2.01	1-2 year
Mt. Hamilton	1.18	2 year	1.69	2 year	2.95	5-10 year	4.29	5-10 year	5.43	5-10 year
Mt. Umunhum	1.61	1-2 year	2.95	2-5 year	4.76	2-5 year	6.50	2-5 year	8.58	5-10 year

Rain Gauge	Max 3hr Rainfall	3hr Return Period	Max 6hr Rainfall	6hr Return Period	Max 12hr Rainfall	12hr Return Period	Max 24hr Rainfall	24hr Return Period	Max 48hr Rainfall	48hr Return Period
Valley Christian	1.14	<1 year	1.97	<1 year	3.54	1-2 year	4.88	2 year	5.91	1-2 year
Rinconada	0.63	<1 year	1.14	<1 year	1.77	1-2 year	2.13	1 year	2.20	<1 year
Shanti Ashrama	0.83	1 year	1.38	1-2 year	2.28	2-5 year	2.87	2-5 year	3.39	2 year
Penitencia WTP	0.87	2 year	1.06	2 year	1.57	5 year	2.09	5 year	2.32	2-5 year
Stevens Creek Reservoir	0.79	<1 year	1.42	<1 year	2.40	1-2 year	3.03	1-2 year	3.58	1 year
UTC	0.67	1 year	0.91	1 year	1.26	1 year	1.42	<1 year	1.50	<1 year
Uvas Reservoir	1.50	2 year	2.76	5 year	4.53	10 year	5.75	10-25 year	6.42	5 year
West Yard	0.55	<1 year	0.98	1-2 year	1.50	2 year	1.73	1-2 year	1.73	1 year
Mtn. View Corp. Yard	0.71	2 year	0.94	1-2 year	1.61	5 year	1.97	2-5 year	1.97	2 year
Guadalupe Watershed	1.38	<1 year	2.64	1-2 year	4.41	2-5 year	5.43	5 year	5.71	<1 year
Vasona Pump Station	0.63	<1 year	1.06	<1 year	1.65	1-2 year	2.01	1-2 year	2.05	<1 year
Cow Ridge	0.94	1-2 year	1.34	1 year	1.97	2 year	2.48	1-2 year	3.35	2 year
Calero Watershed	1.14	1-2 year	1.77	1-2 year	2.48	2 year	2.83	1-2 year	2.83	<1 year
Palo Alto Reclamation Plant	1.10	10-25 year	1.26	5 year	2.17	10 year	2.52	10 year	2.56	5 year
City of San Jose	0.71	2 year	0.87	1 year	1.02	1 year	1.18	<1 year	1.22	<1 year
Evergreen	0.63	1 year	0.75	<1 year	0.98	<1 year	1.18	<1 year	1.30	<1 year

Rain Gauge	Max 3hr Rainfall	3hr Return Period	Max 6hr Rainfall	6hr Return Period	Max 12hr Rainfall	12hr Return Period	Max 24hr Rainfall	24hr Return Period	Max 48hr Rainfall	48hr Return Period
Church Ave. Perc. Ponds	0.87	1 year	1.46	2 year	2.09	2 year	2.52	2 year	2.76	1-2 year
Uvas Canyon County Park	2.48	5 year	4.13	5-10 year	6.89	10-25 year	8.86	10-25 year	9.96	5-10 year
Banjo Point (Lexington Reservoir)	0.98	<1 year	1.69	<1 year	2.76	1-2 year	3.58	1-2 year	4.06	<1 year
West L. Llagas	1.22	2-5 year	2.17	5-10 year	2.87	5-10 year	3.23	2-5 year	3.35	1-2 year
Rancho San Antonio	0.79	<1 year	1.26	<1 year	2.24	1-2 year	2.99	1-2 year	3.78	1-2 year
Palm Avenue	1.14	5 year	1.73	5 year	2.20	2-5 year	2.52	2-5 year	2.52	1-2 year
Trappers Trail	1.38	5 year	2.17	5-10 year	4.02	25 year	5.20	10-25 year	6.89	10-25 year
Edmundson	1.42	5-10 year	2.13	5-10 year	3.07	10 yer	3.50	5 year	3.62	2-5 year
Maryknoll Fields	0.67	<1 year	1.06	1 year	1.89	2-5 year	2.28	2 year	2.52	1-2 year
Canada de los Osos	0.67	<1 year	1.10	1 year	1.73	2 year	2.13	1-2 year	2.91	2 year
Los Trancos	1.57	5 year	2.44	5 year	4.25	10-25 year	6.14	10-25 year	8.82	25 year
Westwind Community Barn	0.91	1-2 year	1.38	2 year	2.68	5-10 year	3.27	5 year	3.82	2-5 year

Flooding

San Francisquito Creek

In the early morning of December 31, flow on San Francisquito Creek rapidly increased, as shown in Figure 5, with flows increasing tenfold over approximately five hours at the USGS gage near Stanford University. Table 4 shows the estimated peak flow at the USGS gage at Stanford University. San Francisquito Creek overtopped its banks at many locations causing widespread flooding in Menlo Park, East Palo Alto, and Palo Alto.

Table 4. Peak Flow – San Francisquito Creek (12/29/22 - 1/1/23)

Gage Location	Peak Flow (Preliminary)	Estimated Return Period[5]
Stanford University	5,880 cfs	25-50 Year

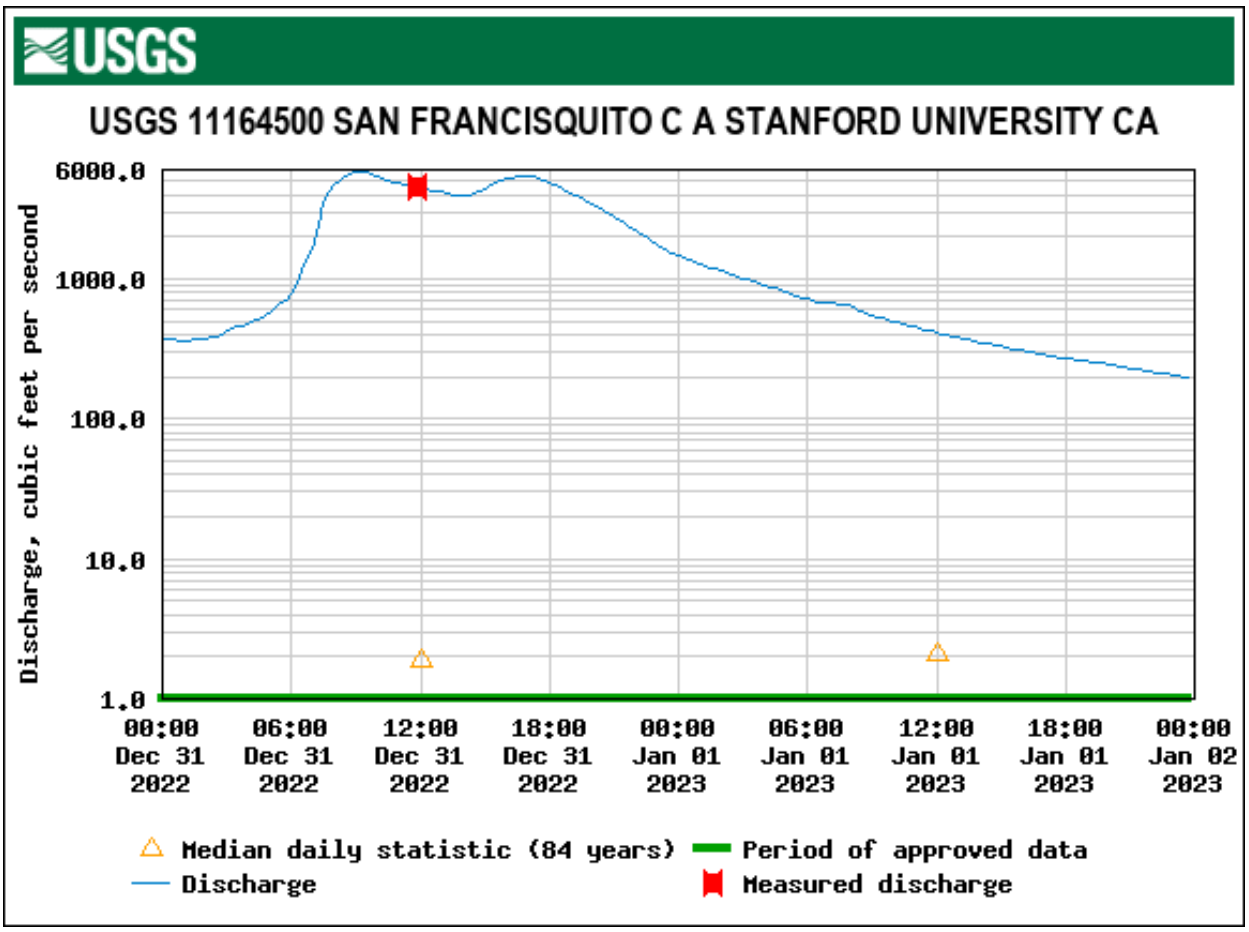

Figure 5. San Francisquito Creek Flows (12/31/22 - 1/1/23)

[5] Santa Clara Valley Water District. Design Flood Flow Manual for All District Watersheds. Prepared by Jack Xu. December 2020.

Figure 6. Creek Overbanking Upstream of Pope Chaucer Bridge in Menlo Park

Figure 7. Street Flooding from Creek Overbank near Duveneck Elementary School in Palo Alto

Figure 8. Street Flooding from Creek Overbank in East Palo Alto

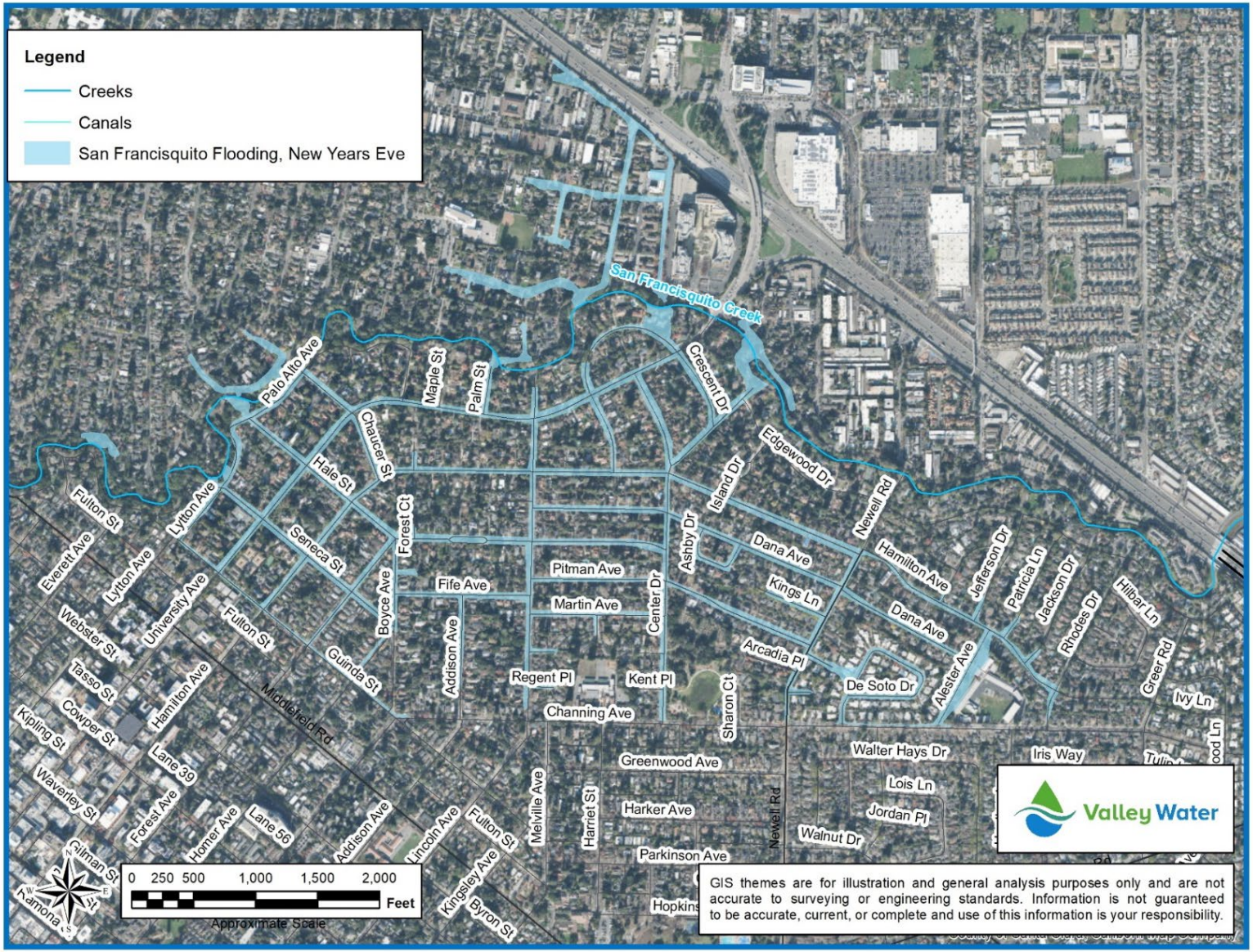

Figure 9. San Francisquito Creek Flooding Extents, 12/31/22 - 1/1/23

West Little Llagas Creek

Flows increased on the afternoon of December 31 on West Little Llagas Creek. Table 5 shows the estimated peak flow at the West Little Llagas Creek gage below Edmundson Avenue. West Little Llagas Creek overtopped its bank at one known location near the intersection of Monterey and Watsonville Roads.

Table 5. Peak Flow – West Little Llagas Creek (12/29/22 - 1/1/23)

Gage Location	Peak Flow (Preliminary)	Estimated Return Period[6]
Below Edmundson Avenue	311 cfs	5-10 Year

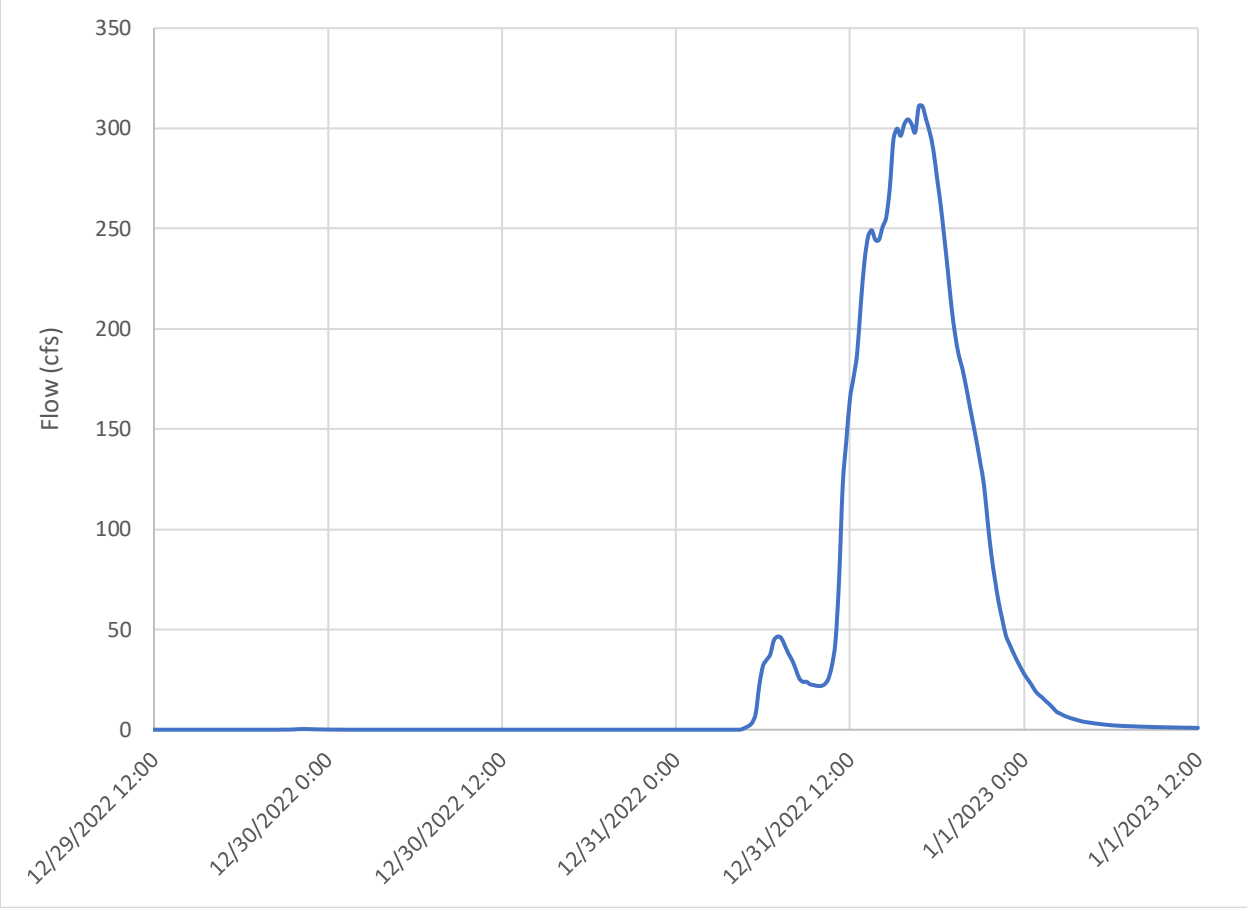

Figure 10. West Little Llagas Flows (12/29/22 – 1/1/2023)

[6] Based on gage data

Figure 11. West Little Llagas Creek Floodplain (12/31/22)

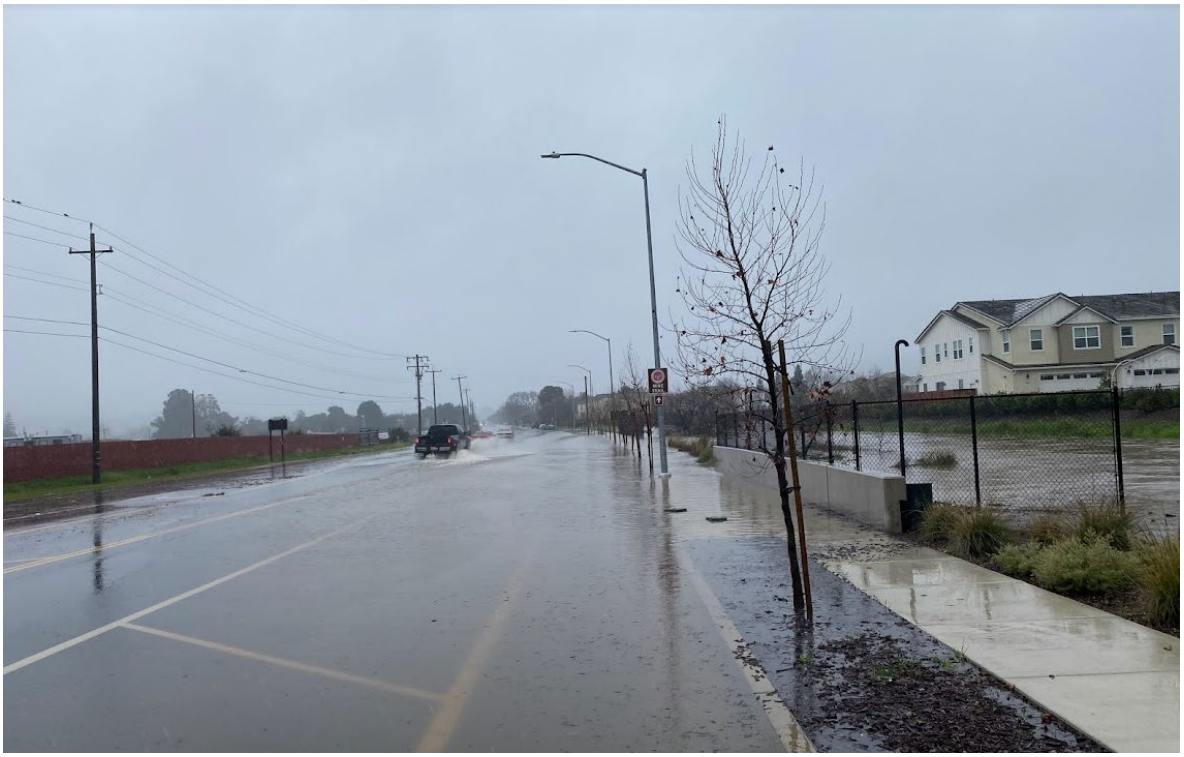

Figure 12. West Little Llagas Creek Overtopping Watsonville Road (12/31/22)

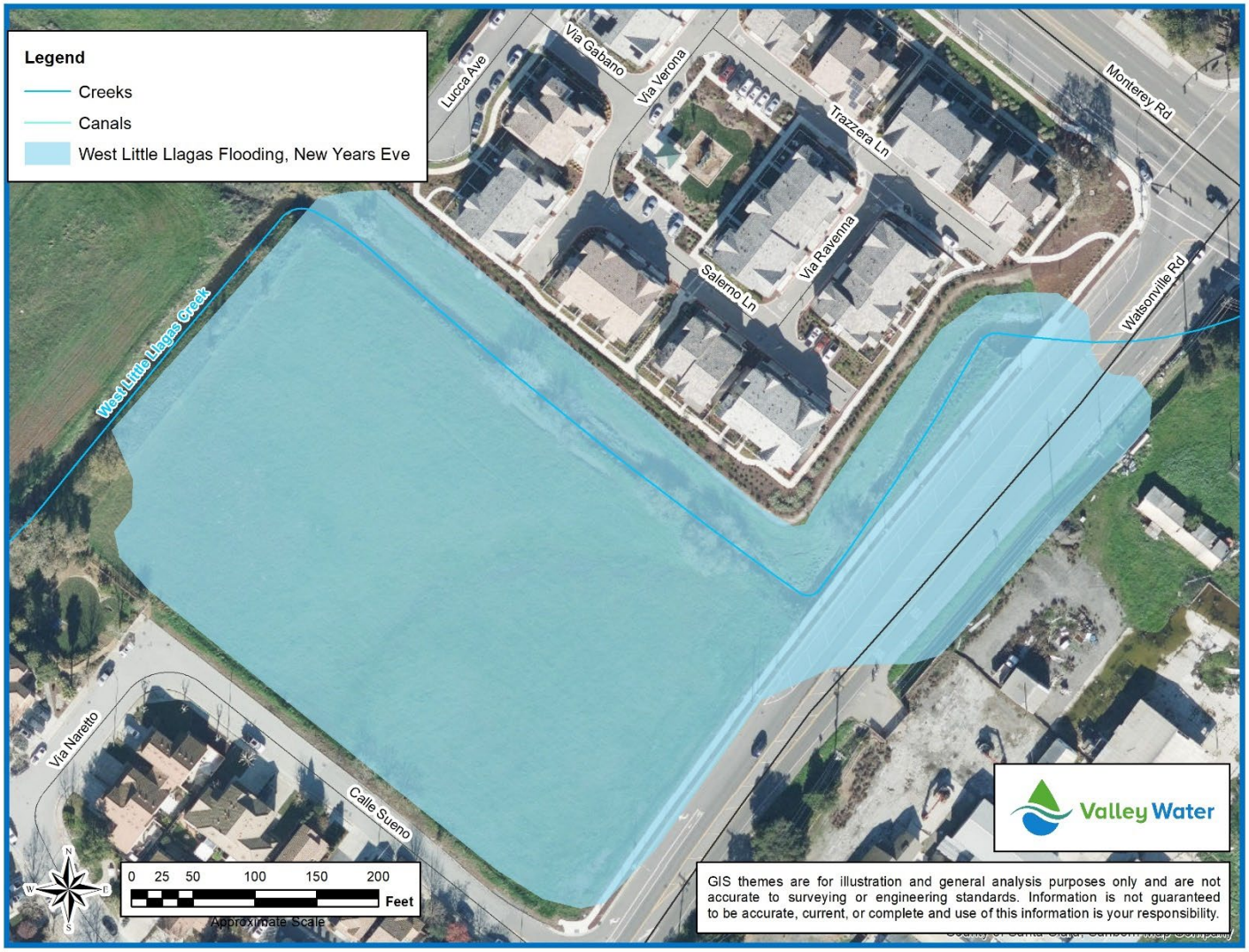

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Figure 13. West Little Llagas Creek Flooding Extents (12/31/22-1/1/23)

Upper Penitencia Creek

Flows on Upper Penitencia Creek peaked in the afternoon of December 31. Upper Penitencia Creek overtopped its banks slightly at several locations between Jackson Avenue and King Road. Table 6 shows the estimated peak flow at Dorel Avenue, upstream of the flooding locations.

Table 6. Peak Flow – Upper Penitencia Creek (12/29/22 - 1/1/23)

Gage Location	Peak Flow (Preliminary)	Estimated Return Period[7]
Dorel Avenue	1,000 cfs	10 year

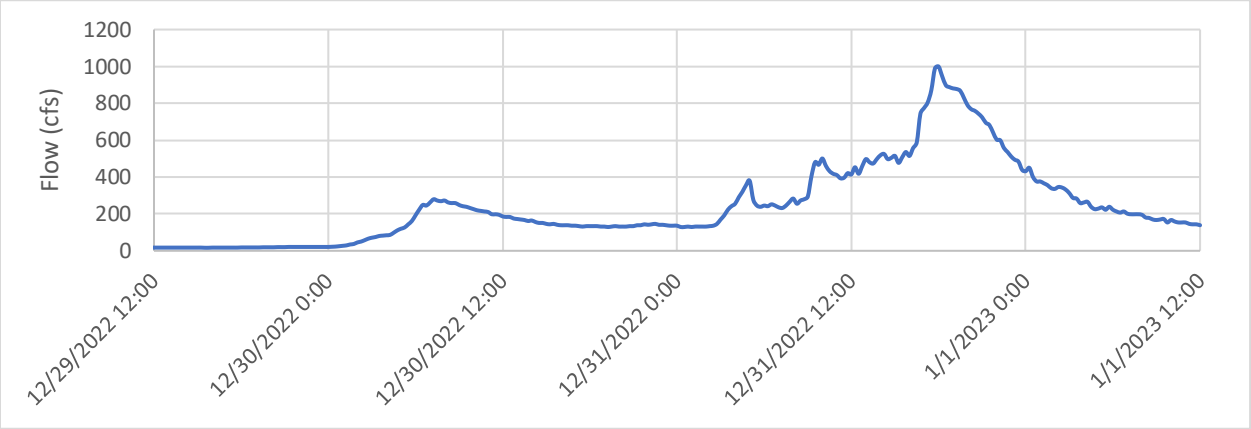

Figure 14. Upper Penitencia Creek Flows (12/29/22 - 1/1/23)

Figure 15. Upper Penitencia Creek at Mabury Road near Pine Hollow Circle (12/31/22)

[7] Based on gage data

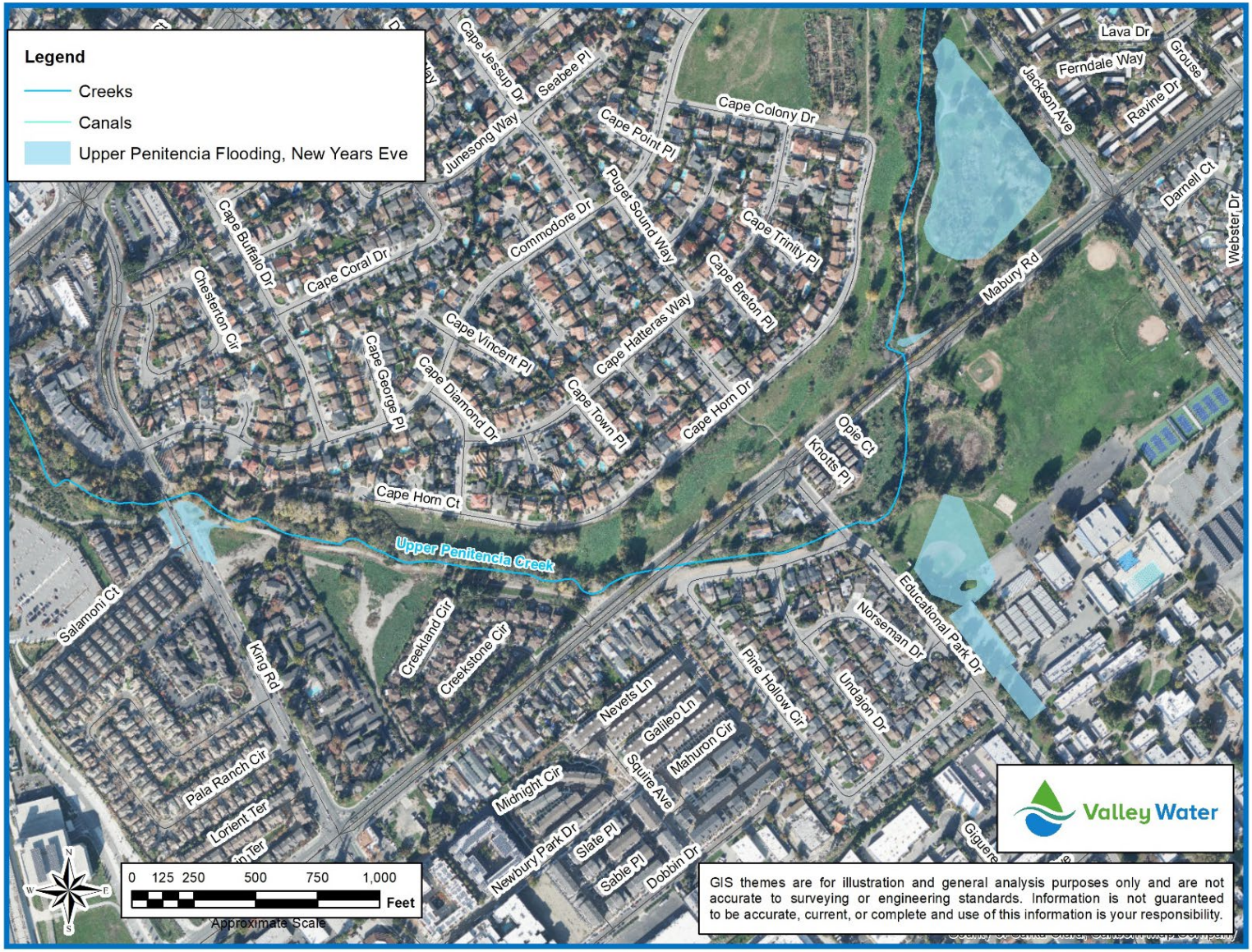

Figure 16. Upper Penitencia Creek Flooding Extents (12/31/22 - 1/1/23)

January 9, 2023 Storm

Weather

Two periods of relatively intense rainfall occurred on January 5 and 8, 2023, before the atmospheric river on January 9, 2023. These two periods did not result in flooding issues, but they did keep the ground very saturated. This atmospheric river brought very intense rainfall for six hours in the early morning of January 9, 2023.

Table 7. Rain Gage Statistics (1/8/23-1/10/23)

Rain Gage	Max Rainfall Duration	Max Rainfall Depth (Preliminary)	Estimated Return Period[8]
West Little Llagas	3 hours	1.42 inches	5-10 Year
	6 hours	2.01 inches	5-Year
	12 hours	2.36 inches	2-5 Year
	24 hours	2.48 inches	1-2 Year
	48 hours	3.74 inches	2-5 Year
Uvas Canyon	3 hours	1.26 inches	2-5 Year
	6 hours	1.97 inches	2-5 Year
	12 hours	2.44 inches	2-5 Year
	24 hours	2.56 inches	1-2 Year
	48 hours	3.58 inches	2 Year
Coit Ranch	3 hours	1.26 inches	2-5 Year
	6 hours	1.97 inches	2-5 Year
	12 hours	2.44 inches	2-5 Year
	24 hours	2.56 inches	1-2 Year
	48 hours	3.58 inches	2 Year

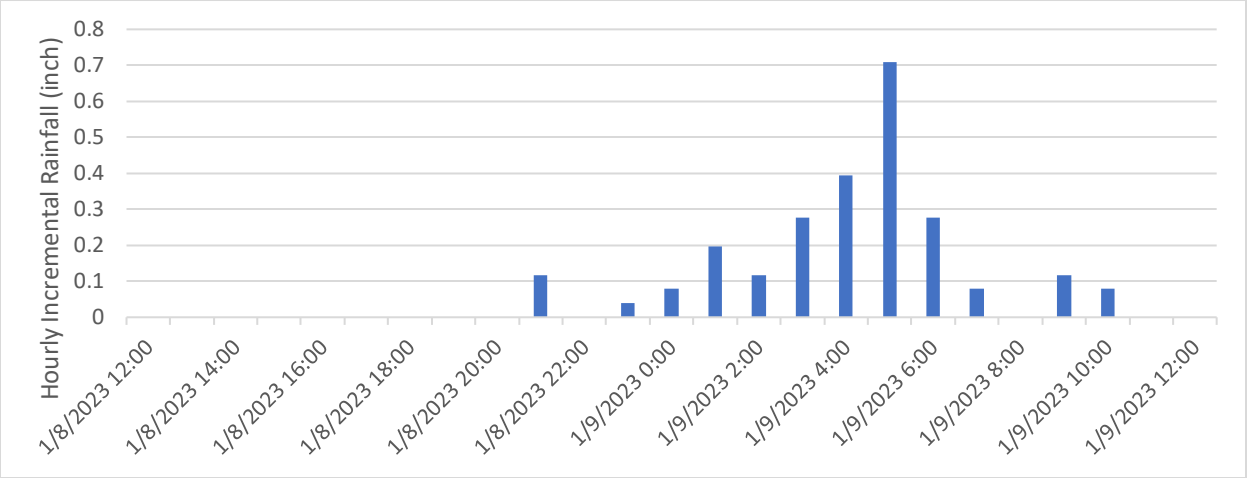

Figure 17. West Little Llagas Rainfall (1/8/23-1/9/23)

[8] Metstat. Regional All Season Precipitation Frequency Analysis and Mapping in Santa Clara, Alameda, and San Mateo Counties, California, and Comparison to NOAA Atlas 14. October 2016

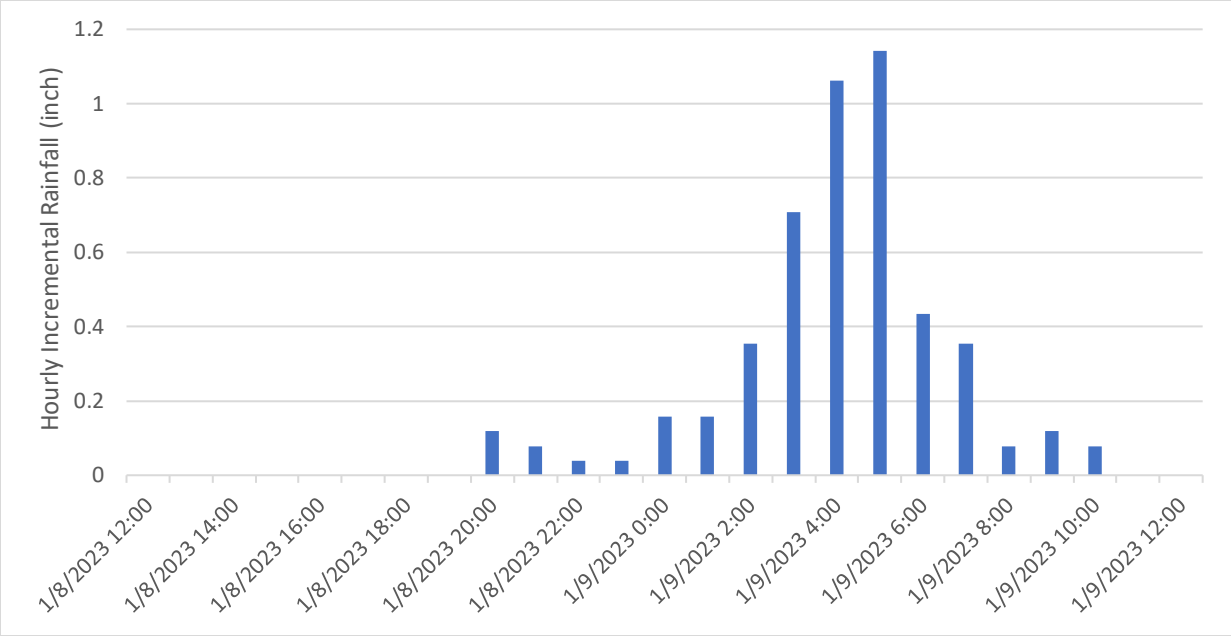

Figure 18. Uvas Canyon Rainfall (1/8/23-1/9/23)

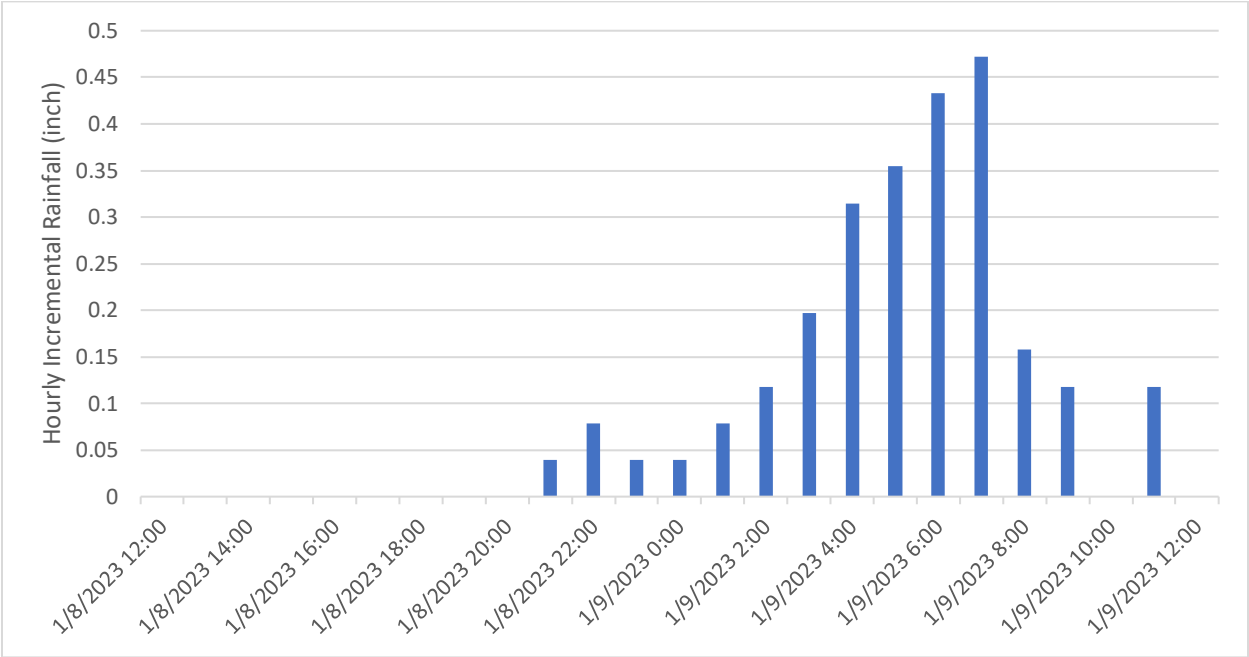

Figure 19. Coit Ranch Rainfall (1/8/23-1/9/23)

Table 8. Valley Water Rain Gage Statistics (1/8/23-1/9/23)

Rain Gage	Max 3hr Rainfall	3hr Return Period	Max 6hr Rainfall	6hr Return Period	Max 12hr Rainfall	12hr Return Period	Max 24hr Rainfall	24hr Return Period	Max 48hr Rainfall	48hr Return Period
Alamitos	0.71	1 year	1.14	1-2 year	1.54	2 year	1.65	1-2 year	2.44	2 year
Almaden Watershed	1.57	2-5 year	2.40	2-5 year	3.11	2 year	3.27	1 year	5.28	1-2 year
Biel Ranch	0.91	2-5 year	1.34	5 year	1.54	2 year	1.65	1 year	2.36	1-2 year
Guadalupe Slough	0.31	<1 year	0.51	<1 year	0.75	<1 year	0.79	<1 year	1.02	<1 year
Coe Park	1.22	2-5 year	1.73	2 year	2.17	1-2 year	2.28	1 year	4.13	2-5 year
Coit Ranch	1.26	2-5 year	1.97	2-5 year	2.44	2-5 year	2.56	1-2 year	3.58	2 year
Coyote Reservoir	0.94	1-2 year	1.30	1 year	1.81	1 year	1.81	< 1 year	2.87	1-2 year
Curtner Ranch	0.59	<1 year	0.94	1 year	1.10	1 year	1.14	<1 year	1.50	<1 year
Haskins Ranch	0.79	1 year	1.18	1 year	1.38	1 year	1.50	<1 year	1.97	<1 year
Johnson Ranch	0.91	1 year	1.50	1 year	2.05	1-2 year	2.13	<1 year	3.62	2 year
Leroy Anderson Dam	1.46	10 year	2.01	10 year	2.48	5 year	2.56	2 year	3.86	2-5 year
Loma Prieta	2.24	10-25 year	3.19	5-10 year	3.94	2-5 year	4.21	1-2 year	6.22	2-5 year
Sunnyvale Hamilton WTP	0.55	<1 year	0.91	1 year	1.38	1-2 year	1.46	1 year	2.13	1-2 year
Mt. Hamilton	1.22	2-5 year	1.73	2-5 year	2.17	2 year	2.36	1 year	4.09	2-5 year
Mt. Umunhum	1.93	2-5 year	2.95	2-5 year	3.66	1-2 year	3.86	<1 year	5.87	1-2 year

Rain Gage	Max 3hr Rainfall	3hr Return Period	Max 6hr Rainfall	6hr Return Period	Max 12hr Rainfall	12hr Return Period	Max 24hr Rainfall	24hr Return Period	Max 48hr Rainfall	48hr Return Period
Valley Christian	1.57	1 year	2.64	2 year	3.78	2 year	3.98	1 year	5.71	1-2 year
Rinconada	0.94	1-2 year	1.38	1 year	1.93	1-2 year	2.01	1 year	3.03	1-2 year
Shanti Ashrama	1.06	2 year	1.69	1 year	2.17	2-5 year	2.24	1-2 year	3.39	2 year
Penitencia WTP	0.51	<1 year	0.87	1 year	1.06	1 year	1.10	<1 year	1.61	1 year
Stevens Creek Reservoir	0.94	<1 year	1.54	1 year	2.32	1-2 year	2.44	<1 year	4.06	1-2 year
UTC	0.67	1 year	1.18	2 year	1.65	2 year	1.69	1 year	2.48	1-2 year
Uvas Reservoir	2.24	25 year	2.95	5-10 year	3.54	2-5 year	3.66	2 year	5.63	2-5 year
West Yard	0.67	1 year	1.06	2 year	1.50	2 year	1.57	1 year	2.32	2 year
Mtn. View Corp. Yard	0.39	<1 year	0.71	<1 year	1.10	1 year	1.18	<1 year	1.61	1 year
Guadalupe Watershed	1.69	1-2 year	2.56	1-2 year	3.27	1-2 year	3.43	1 year	5.47	1 year
Vasona Pump Station	0.75	1 year	1.18	1 year	1.69	1-2 year	1.73	1 year	2.76	1-2 year
Cow Ridge	0.87	1 year	1.38	1-2 year	2.01	2 year	2.09	<1 year	3.35	2 year
Calero Watershed	1.34	2-5 year	2.01	2-5 year	2.48	2 year	2.64	1-2 year	4.09	2 year
Palo Alto Reclamation Plant	0.51	<1 year	0.63	<1 year	0.87	<1 year	0.94	<1 year	1.26	<1 year
City of San Jose	0.43	<1 year	0.71	<1 year	0.94	<1 year	0.94	<1 year	1.38	<1 year
Evergreen	0.43	<1 year	0.71	<1 year	1.10	1 year	1.14	<1 year	1.69	<1 year

Rain Gage	Max 3hr Rainfall	3hr Return Period	Max 6hr Rainfall	6hr Return Period	Max 12hr Rainfall	12hr Return Period	Max 24hr Rainfall	24hr Return Period	Max 48hr Rainfall	48hr Return Period
Church Ave. Perc. Ponds	1.06	2 year	1.50	2 year	1.85	1-2 year	1.97	1 year	2.99	2 year
Uvas Canyon County Park	2.91	10-25 year	4.06	5-10 year	4.72	2-5 year	4.92	1-2 year	7.36	2 year
Banjo Point (Lexington Reservoir)	1.46	1-2 year	2.20	1-2 year	2.87	1-2 year	2.99	<1 year	4.84	1-2 year
West L. Llagas	1.42	5-10 year	2.01	5 year	2.36	2-5 year	2.48	1-2 year	3.74	2-5 year
Rancho San Antonio	0.91	1 year	1.46	1 year	2.28	1-2 year	2.32	<1 year	3.46	1 year
Palm Avenue	1.22	5 year	1.69	2-5 year	2.09	2-5 year	2.20	2 year	3.35	2-5 year
Trappers Trail	1.14	2 year	2.13	5-10 year	2.83	5 year	2.95	2 year	3.82	2 year
Edmundson	1.65	10-25 year	2.32	10 year	2.68	5 year	2.72	2-5 year	4.09	2-5 year
Maryknoll Fields	0.71	1 year	1.06	1 year	1.61	1-2 year	1.69	1 year	2.52	1-2 year
Canada de los Osos	1.30	10 year	1.89	5-10 year	2.20	2-5 year	2.36	2 year	2.87	2 year
Los Trancos	1.42	5 year	2.56	5-10 year	3.50	5 year	3.66	2 year	4.96	2-5 year
Westwind Community Barn	0.83	1 year	1.34	2 year	1.81	1-2 year	1.85	<1 year	2.56	1 year

Flooding

West Little Llagas Creek

Flows peaked on West Little Llagas Creek on the morning of January 9, overtopping its banks near Llagas Road, West Main Avenue, and Watsonville Road. Table 9 shows the estimated peak flow below Edmundson Avenue.

Table 9. Peak Flow – West Little Llagas Creek (1/9/23)

Gage Location	Peak Flow (Preliminary)	Estimated Return Period[9]
Below Edmundson Avenue	364 cfs	10 Year

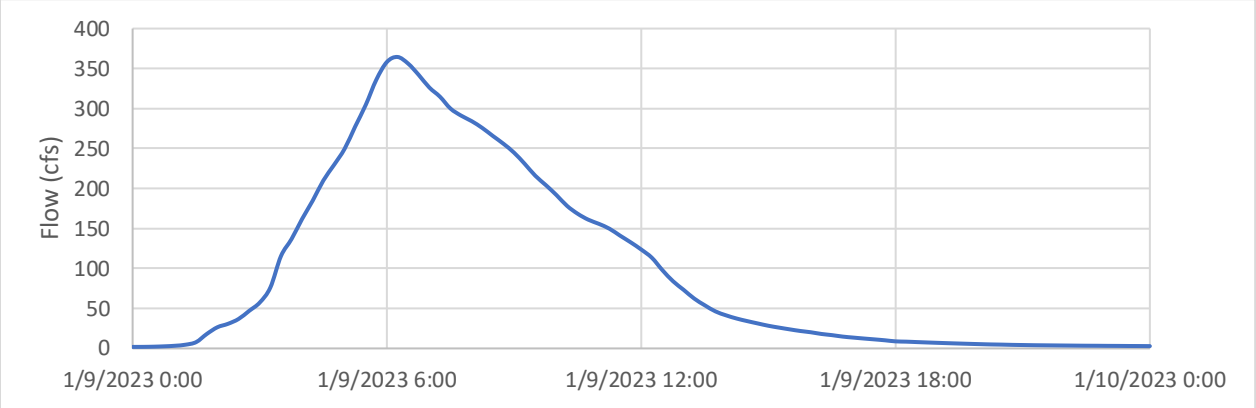

Figure 20. West Little Llagas Creek Flows (1/9/23-1/11/23)

Figure 21. West Little Llagas Creek Overbanking at Llagas Road (1/9/23)

[9] Based on gage data

Figure 22. West Little Llagas Creek Overbanking at West Main Avenue (1/9/23)

Figure 23. West Little Llagas Creek Overbanking at Watsonville Road (1/9/23)

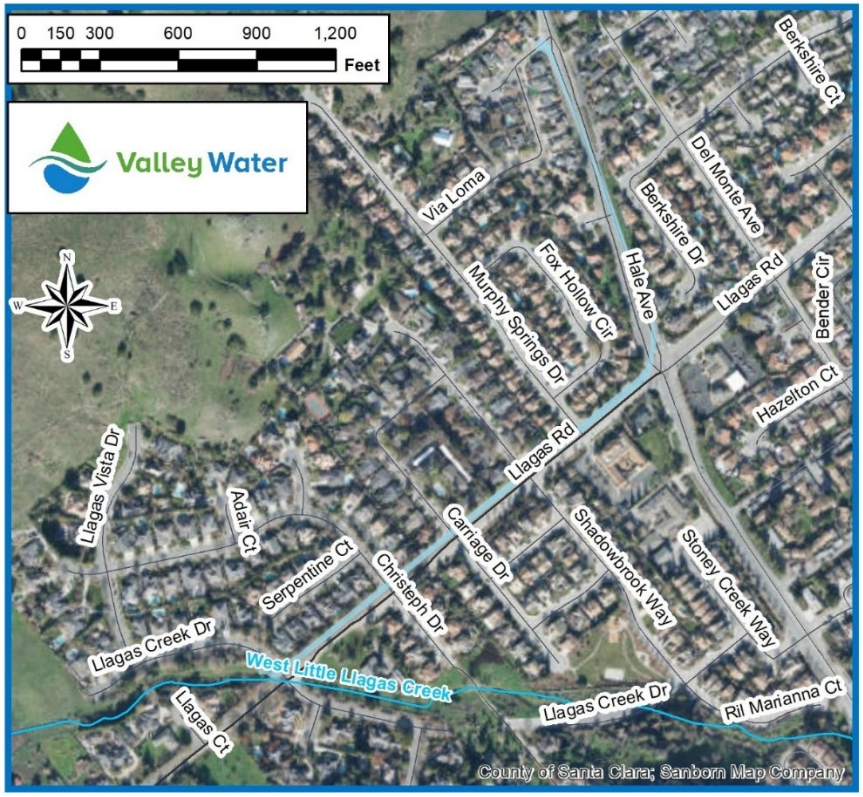

Figure 24. West Little Llagas Creek Flooding Extents near Llagas Road (1/9/23)

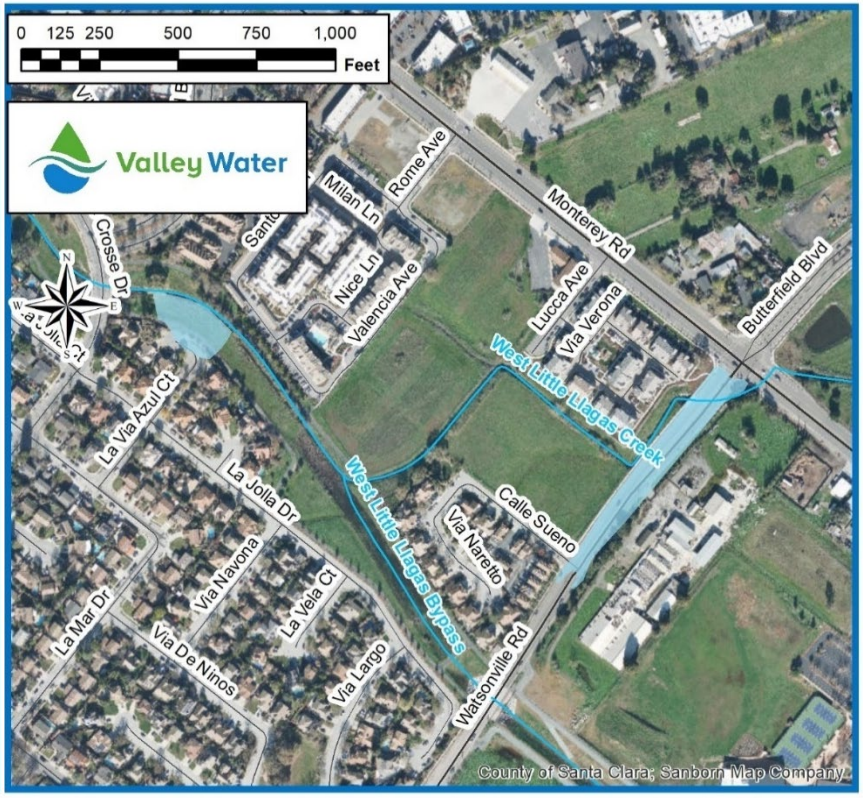

Figure 25. West Little Llagas Creek Flooding Extents near Watsonville Road (1/9/23)

Soap Lake Floodplain

The Soap Lake Floodplain is a natural topographic feature where Pacheco Creek, Llagas Creek, Uvas Creek, and the Pajaro River confluence. Pacheco Creek overbanked in northern San Benito County near Lovers Lane in Hollister, with floodwaters up to several feet deep in places. Uvas Reservoir began spilling on the evening of December 31 and continued to spill through the event on January 9. Spills from Uvas Reservoir peaked around 8 am on January 9 and flows at Luchessa Avenue peaked about four hours later. Table 10 shows the estimated peak flow at West Luchessa Drive. Uvas Creek overtopped its banks at several locations, causing temporary closures of US-101 and CA-25.

Table 10. Peak Flow – Uvas and Llagas Creeks (1/9/23)

Creek	Gage Location	Peak Flow (Preliminary)	Estimated Return Period[10]
Uvas Creek	West Luchessa Avenue	8,201 cfs	10 Year
Llagas Creek	Near Southside Drive	3,470 cfs	10 Year

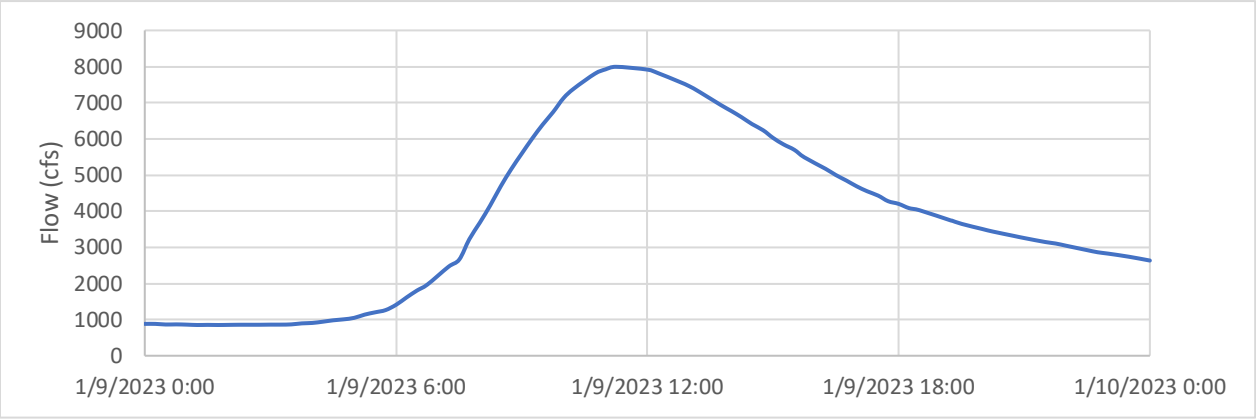

Figure 26. Uvas Creek at Luchessa (1/9/23 - 1/10/23)

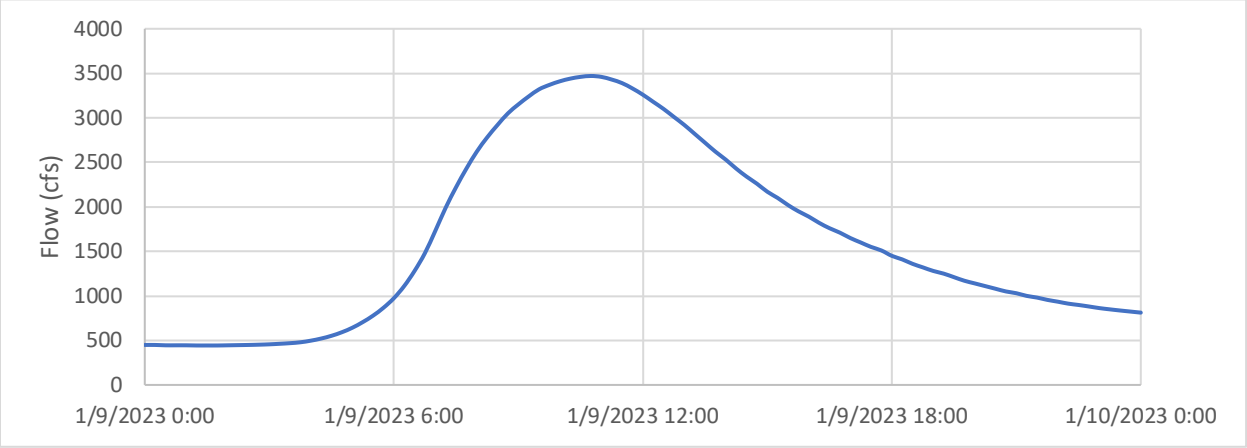

Figure 27. Llagas Creek USGS Gage 11153650 (1/9/23-1/10/23)

[10] Based on gaga data

Figure 28. Uvas Creek Overbanking Floodplain (1/9/23)

Figure 29. Uvas Creek Overbanking Flooding US-101 (1/9/23)

Figure 30. Soap Lake Floodplain Aerial Photo (1/12/23)

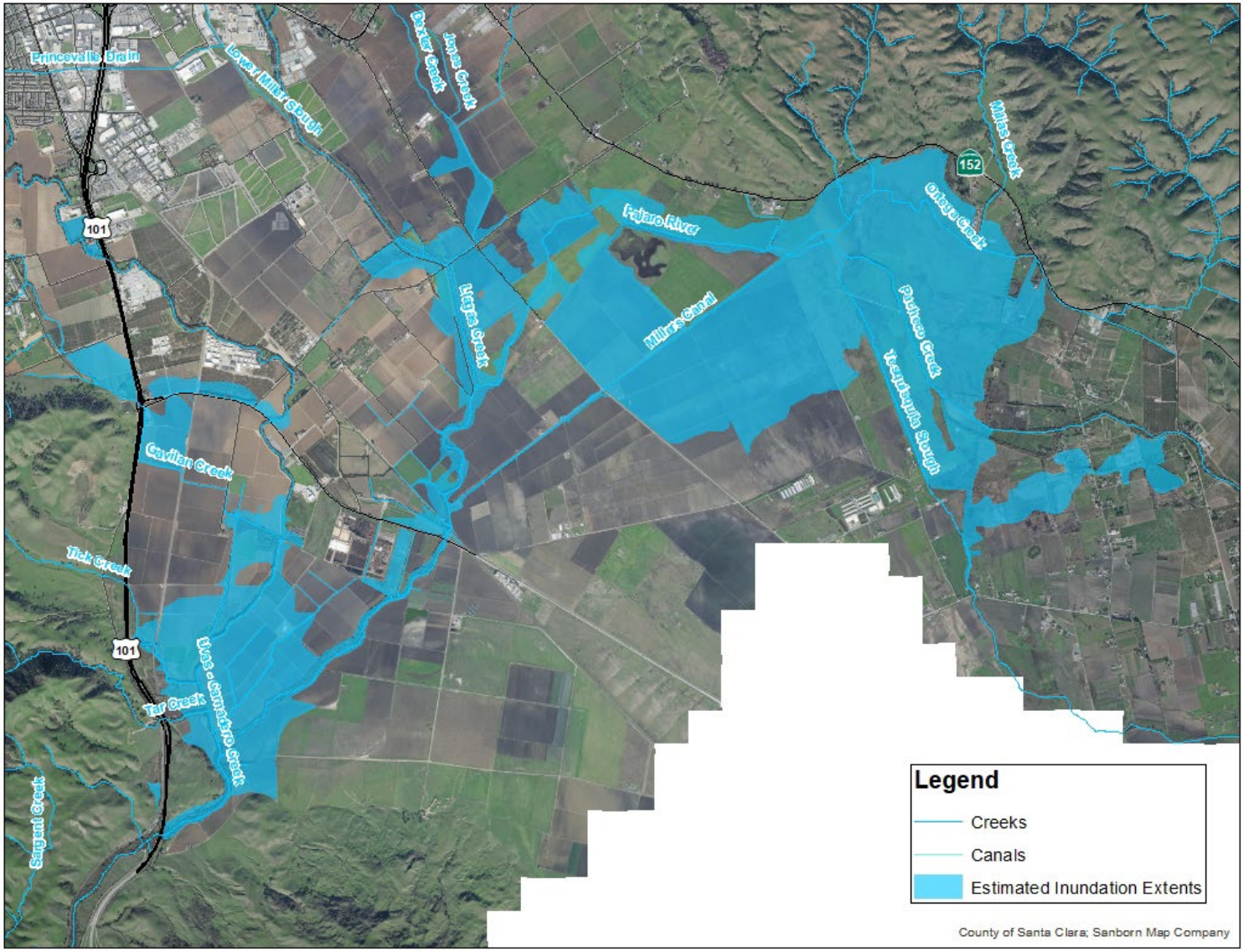

Figure 31. Soap Lake Flooding Extents (1/9/23)

Upper Penitencia Creek

Flows peaked on Upper Penitencia Creek on the morning of January 9. Minor street flooding was experienced near Mabury Drive in San Jose. Table 11 shows the estimated peak flow at Dorel Drive, upstream of the flooding location.

Table 11. Peak Flow – Upper Penitencia Creek (1/9/23)

Gage Location	Peak Flow (Preliminary)	Estimated Return Period[11]
Dorel Dr	704 cfs	5-10 Year

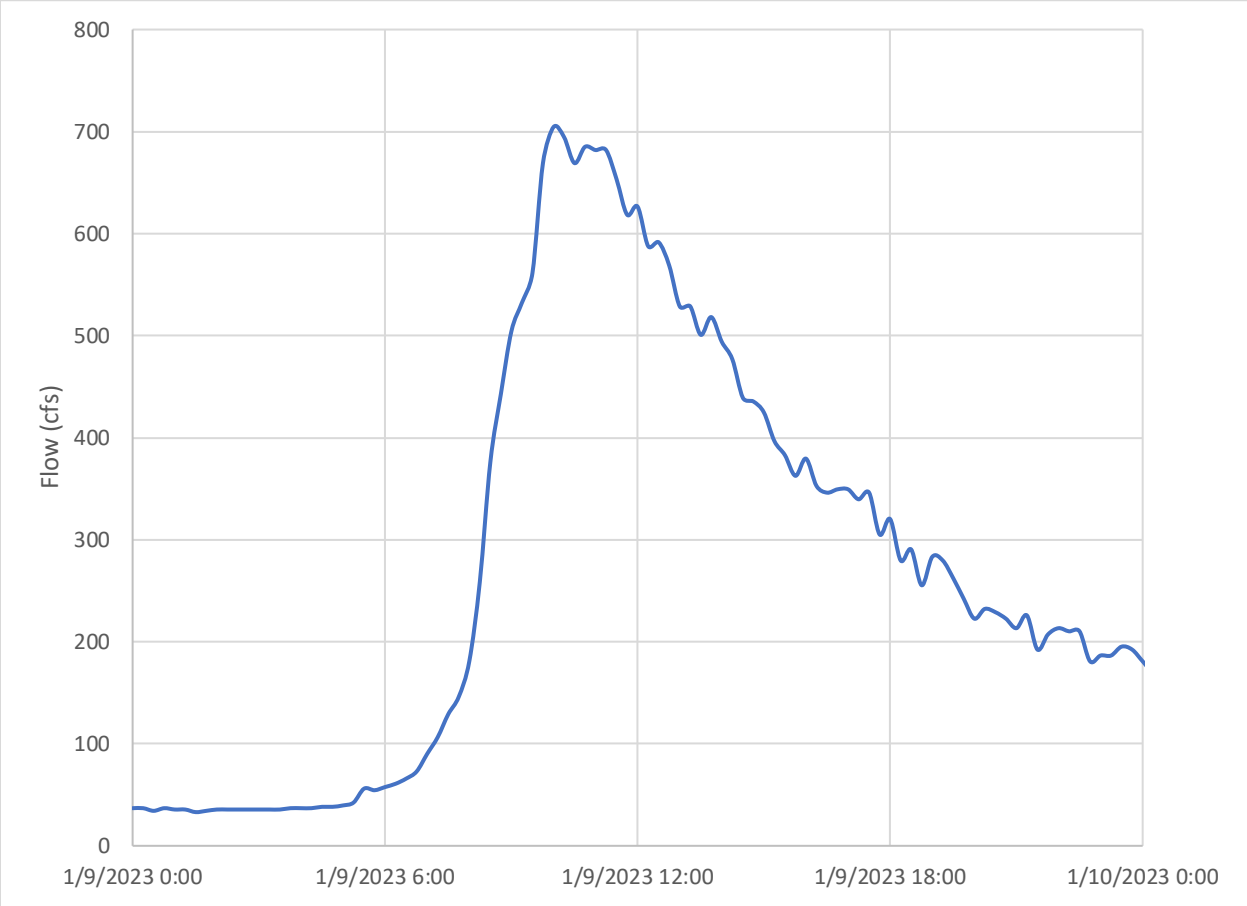

Figure 32. Upper Penitencia Creek Flows (1/9/23-1/10/23)

[11] Based on gage data

Figure 33. Upper Penitencia Creek Flooding Extents (1/9/23-1/10/23)

Figure 34. Upper Penitencia Creek flooding on Mabury Road (1/9/23)

January 14-16, 2023 Storm

Weather

Between January 10 and 13, Santa Clara County received relatively consistent, low-intensity rainfall, which kept the ground saturated after the January 9 event. Two pulses of rainfall occurred on January 14 and 16, respectively. Minor flooding occurred mainly in the southern area of the County.

Table 12. Rain Gage Statistics (1/14/23 – 1/16/23)

Gage	Max Rainfall Duration	Max Rainfall Depth (Preliminary)	Estimated Return Period[12]
West Little Llagas	3 hours	1.22 inches	2-5 Year
	6 hours	1.57 inches	1-2 Year
	12 hours	1.73 inches	1 Year
	24 hours	2.20 inches	1-2 Year
	48 hours	3.74 inches	2-5 Year
Uvas Canyon	3 hours	1.89 inches	1-2 Year
	6 hours	2.52 inches	1-2 Year
	12 hours	3.50 inches	1-2 Year
	24 hours	5.04 inches	1-2 Year
	48 hours	6.18 inches	1-2 Year
Loma Prieta	3 hours	1.57 inches	2-5 Year
	6 hours	2.13 inches	1-2 Year
	12 hours	2.68 inches	1 Year
	24 hours	4.17 inches	1-2 Year
	48 hours	5.31 inches	1-2 Year

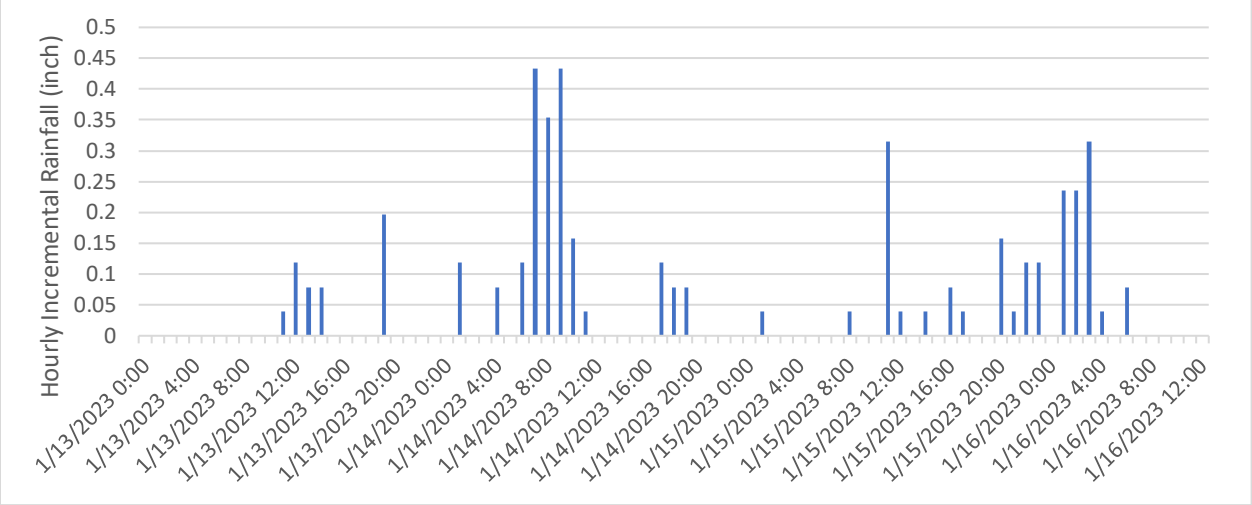

Figure 35. West Little Llagas Rainfall (1/13/23-1/16/23)

[12] Metstat. Regional All Season Precipitation Frequency Analysis and Mapping in Santa Clara, Alameda, and San Mateo Counties, California, and Comparison to NOAA Atlas 14. October 2016

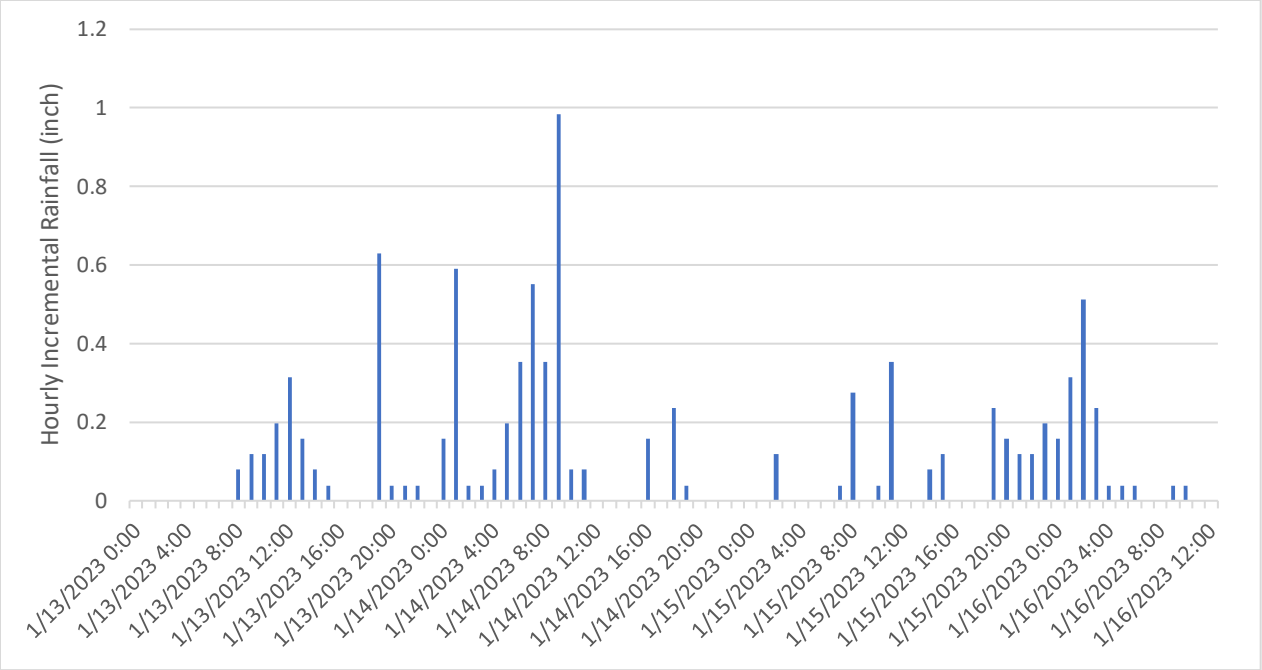

Figure 36. Uvas Canyon Rainfall (1/13/23-1/16/23)

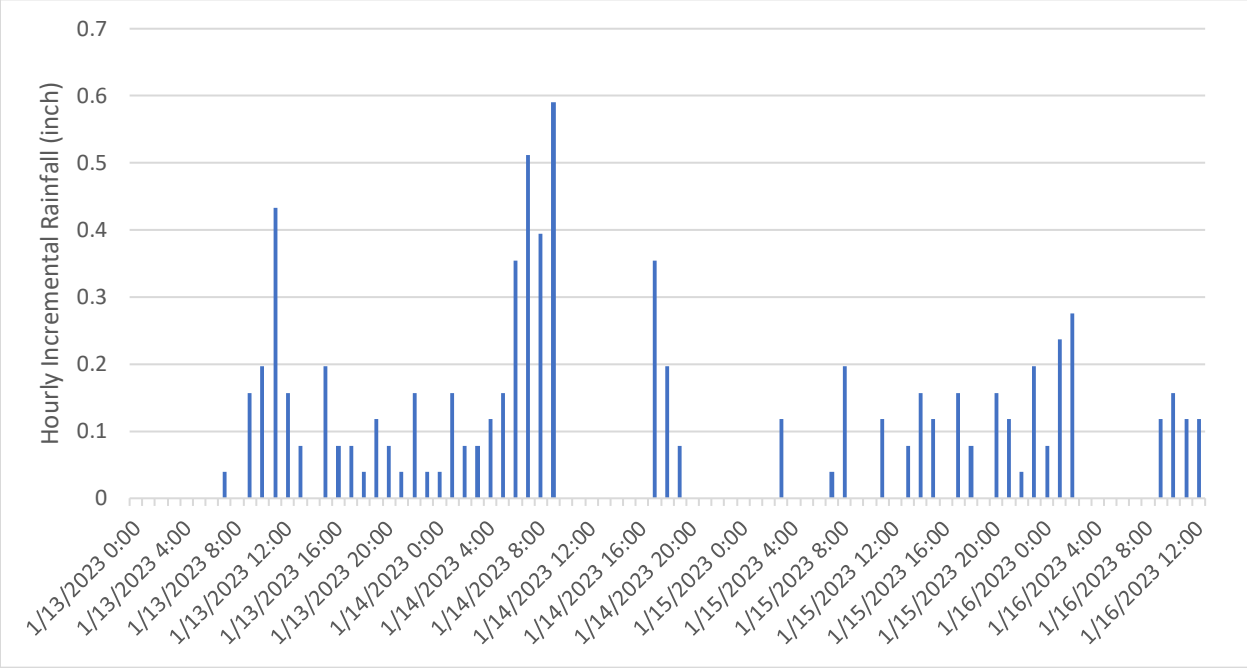

Figure 37. Loma Prieta Rainfall (1/14-1/16)

Table 13. Valley Water Rain Gage Statistics (1/14/23-1/16/23)

Rain Gage	Max 3hr Rainfall	3hr Return Period	Max 6hr Rainfall	6hr Return Period	Max 12hr Rainfall	12hr Return Period	Max 24hr Rainfall	24hr Return Period	Max 48hr Rainfall	48hr Return Period
Alamitos	0.75	1 year	1.18	1-2 year	1.42	1-2 year	1.57	1 year	2.68	2-5 year
Almaden Watershed	1.26	1 year	1.85	1 year	2.24	<1 year	3.23	1 year	4.76	1-2 year
Biel Ranch	0.43	<1 year	0.51	<1 year	0.75	<1 year	1.18	<1 year	1.57	<1 year
Guadalupe Slough	0.51	1 year	0.71	1 year	1.06	1 year	1.18	1 year	1.69	1-2 year
Coe Park	0.83	<1 year	1.18	<1 year	1.57	<1 year	2.01	<1 year	3.46	1-2 year
Coit Ranch	0.71	<1 year	1.10	<1 year	1.46	<1 year	1.73	<1 year	3.19	1-2 year
Coyote Reservoir	0.59	<1 year	0.94	<1 year	1.02	<1 year	1.34	<1 year	2.52	1 year
Curtner Ranch	0.87	2 year	1.02	1 year	1.38	2 year	1.50	1 year	2.95	5-10 year
Haskins Ranch	0.59	<1 year	0.75	<1 year	0.94	<1 year	1.30	<1 year	2.36	1-2 year
Johnson Ranch	0.91	1 year	1.30	1 year	1.61	<1 year	2.24	1 year	3.46	1-2 year
Leroy Anderson Dam	1.14	2-5 year	1.54	2 year	1.69	1 year	2.09	1 year	3.70	2-5 year
Loma Prieta	1.57	2 year	2.13	1-2 year	2.68	1 year	4.17	1-2 year	5.31	1-2 year
Sunnyvale Hamilton WTP	0.98	5 year	1.18	2 year	1.46	2 year	1.69	1-2 year	2.87	2-5 year
Mt. Hamilton	1.02	1 year	1.06	<1 year	1.26	<1 year	1.81	<1 year	2.52	<1 year
Mt. Umunhum	1.77	2 year	2.44	1-2 year	2.91	<1 year	4.21	1 year	5.12	1-2 year
Valley Christian	1.54	1 year	2.32	1 year	2.99	1 year	4.49	1-2 year	6.06	1-2 year

Rain Gage	Max 3hr Rainfall	3hr Return Period	Max 6hr Rainfall	6hr Return Period	Max 12hr Rainfall	12hr Return Period	Max 24hr Rainfall	24hr Return Period	Max 48hr Rainfall	48hr Return Period
Rinconada	0.94	1-2 year	1.34	1 year	1.57	1 year	2.60	2 year	3.23	1-2 year
Shanti Ashrama	0.75	<1 year	1.06	<1 year	1.22	<1 year	1.81	<1 year	3.11	1-2 year
Penitencia WTP	0.63	1 year	0.87	1 year	1.14	1 year	1.38	1 year	2.17	2-5 year
Stevens Creek Reservoir	1.10	1 year	1.69	1 year	2.09	1 year	2.91	1-2 year	3.94	1-2 year
UTC	0.63	1 year	0.79	<1 year	1.02	<1 year	1.30	<1 year	2.40	1-2 year
Uvas Reservoir	1.57	2 year	2.13	2 year	2.40	1 year	2.91	1 year	4.88	2 year
West Yard	0.75	1-2 year	1.10	2 year	1.42	2 year	1.65	1 year	2.76	2-5 year
Mtn. View Corp. Yard	0.55	1 year	0.79	1 year	1.18	1 year	1.42	1 year	2.20	2 year
Guadalupe Watershed	1.61	1 year	2.13	<1 year	2.44	<1 year	3.70	1-2 year	4.49	<1 year
Vasona Pump Station	0.83	1 year	1.26	1 year	1.42	<1 year	2.09	1-2 year	3.15	2-5 year
Cow Ridge	0.71	<1 year	0.83	<1 year	1.22	<1 year	1.69	<1 year	2.76	1 year
Calero Watershed	1.06	1 year	1.46	1 year	1.81	<1 year	2.40	1 year	3.66	1-2 year
Palo Alto Reclamation Plant	0.51	<1 year	0.87	1 year	1.10	1 year	1.22	1 year	1.77	1-2 year
City of San Jose	0.55	1 year	0.91	1 year	1.22	1-2 year	1.50	1-2 year	2.13	2 year
Evergreen	0.67	1 year	0.87	1 year	1.06	1 year	1.30	<1 year	2.01	1-2 year
Church Ave. Perc. Ponds	0.63	<1 year	0.87	<1 year	1.14	<1 year	1.50	<1 year	2.64	1-2 year

Rain Gage	Max 3hr Rainfall	3hr Return Period	Max 6hr Rainfall	6hr Return Period	Max 12hr Rainfall	12hr Return Period	Max 24hr Rainfall	24hr Return Period	Max 48hr Rainfall	48hr Return Period
Uvas Canyon County Park	1.89	1-2 year	2.52	1 year	3.50	1-2 year	5.04	1-2 year	6.18	1-2 year
Banjo Point (Lexington Reservoir)	1.10	<1 year	1.69	<1 year	2.28	<1 year	3.46	1 year	4.29	1 year
West L. Llagas	1.22	2-5 year	1.57	2 year	1.73	1 year	2.20	1 year	3.74	2-5 year
Rancho San Antonio	0.91	1 year	1.42	1 year	1.69	<1 year	2.36	<1 year	3.62	1-2 year
Palm Avenue	0.98	2 year	1.30	1-2 year	1.57	1 year	2.13	1-2 year	2.52	1-2 year
Trappers Trail	0.98	1-2 year	1.46	1-2 year	1.89	1 year	2.64	1-2 year	4.17	2-5 year
Edmundson	1.34	5 year	1.61	2 year	1.85	1-2 year	2.28	1-2 year	3.62	2-5 year
Maryknoll Fields	1.02	5 year	1.42	2 year	1.57	1-2 year	2.05	1-2 year	3.03	2-5 year
Canada de los Osos	0.67	<1 year	1.02	1 year	1.26	<1 year	1.89	1 year	3.46	2-5 year
Los Trancos	1.06	1 year	1.73	1-2 year	2.01	<1 year	3.31	1-2 year	4.41	1-2 year
Westwind Community Barn	0.67	<1 year	1.06	<1 year	1.50	1 year	1.69	<1 year	3.03	1-2 year

Flooding

West Little Llagas Creek

Flows peaked on West Little Llagas Creek twice in response to two rainfall pulses on January 14 and 16. On January 14, West Little Llagas Creek overtopped its banks at several locations near Llagas Road and Watsonville Road.

Table 14. Peak Flow – West Little Llagas Creek (1/14/23 – 1/16/23)

Gage Location	Date	Peak Flow (Preliminary)	Estimated Return Period[13]
Below Edmundson Avenue	1/14/23	282 cfs	2-5 Year
Below Edmundson Avenue	1/16/23	233 cfs	2-5 Year

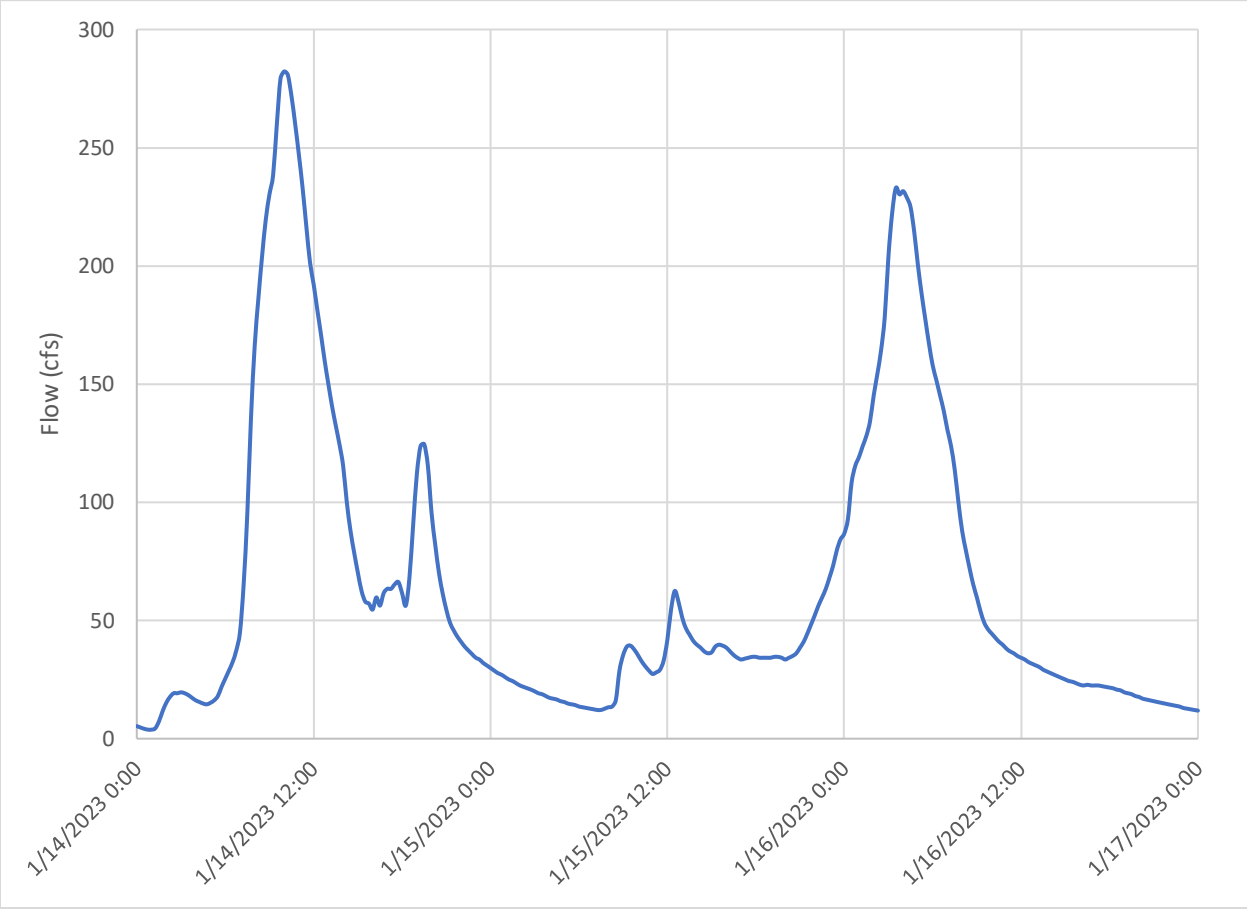

Figure 38. West Little Llagas Creek Flow (1/14/23-1/17/23)

[13] Based on gage Data

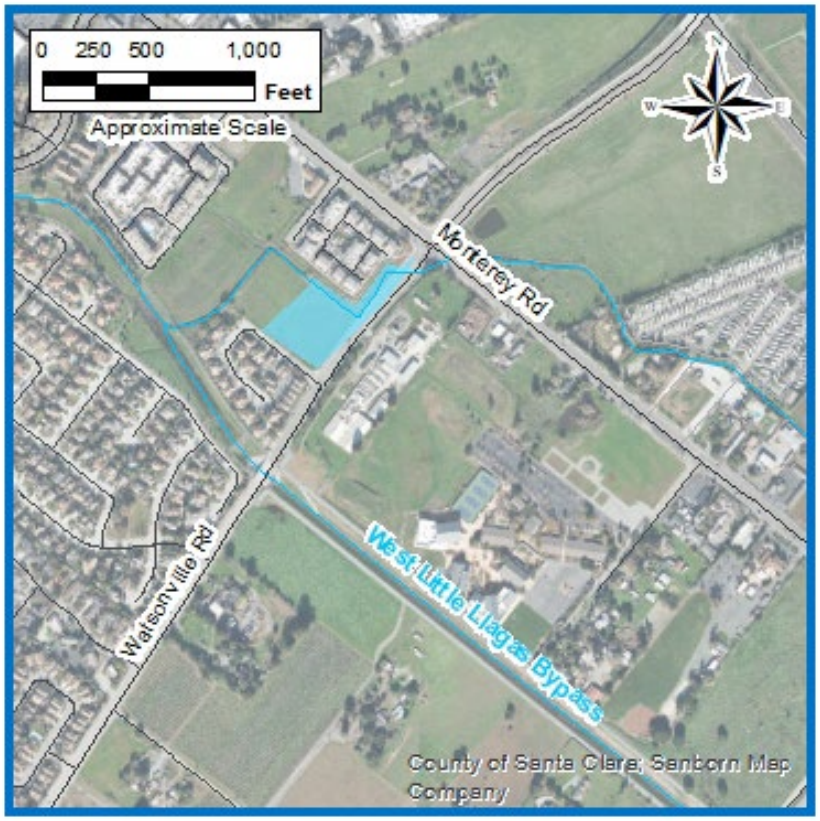

Figure 39. West Little Llagas Creek Flooding Extents near Watsonville Road (1/14/23)

Figure 40. West Little Llagas Creek Flooding at Watsonville Road (1/14/23)

Figure 41. West Little Llagas Creek Flooding Extents near Llagas Dr and Hale Ave (1/14/23)

Figure 42. Flooding along Llagas Creek Dr and Llagas Rd, looking northeast along Llagas Rd (1/14/23)

Fisher Creek and Jones Creek

Valley Water Field Information Team (FIT) staff photographed localized flooding on Fisher Creek and Jones Creek during the January 14 event. Based on the gage at Monterey Road, flows on Fisher Creek peaked twice in response to each pulse of rainfall between January 14 and 16. Gage data is not available for Jones Creek.

Both Fisher and Jones Creek are small, agricultural ditches that experience frequent flooding. From the observations presented in this report, it can be reasonably concluded that many other small drainage channels in the south County experienced flooding. These are not documented in this report, which aims to focus on urbanized flooding of higher consequence to public safety.

Table 15. Peak Flow – Fisher Creek (1/14/23 – 1/16/23)

Gage Location	Date	Peak Flow (Preliminary)	Estimated Return Period[14]
Monterey Road	1/14/23	277 cfs	2-5 Year
Monterey Road	1/16/23	295 cfs	2-5 Year

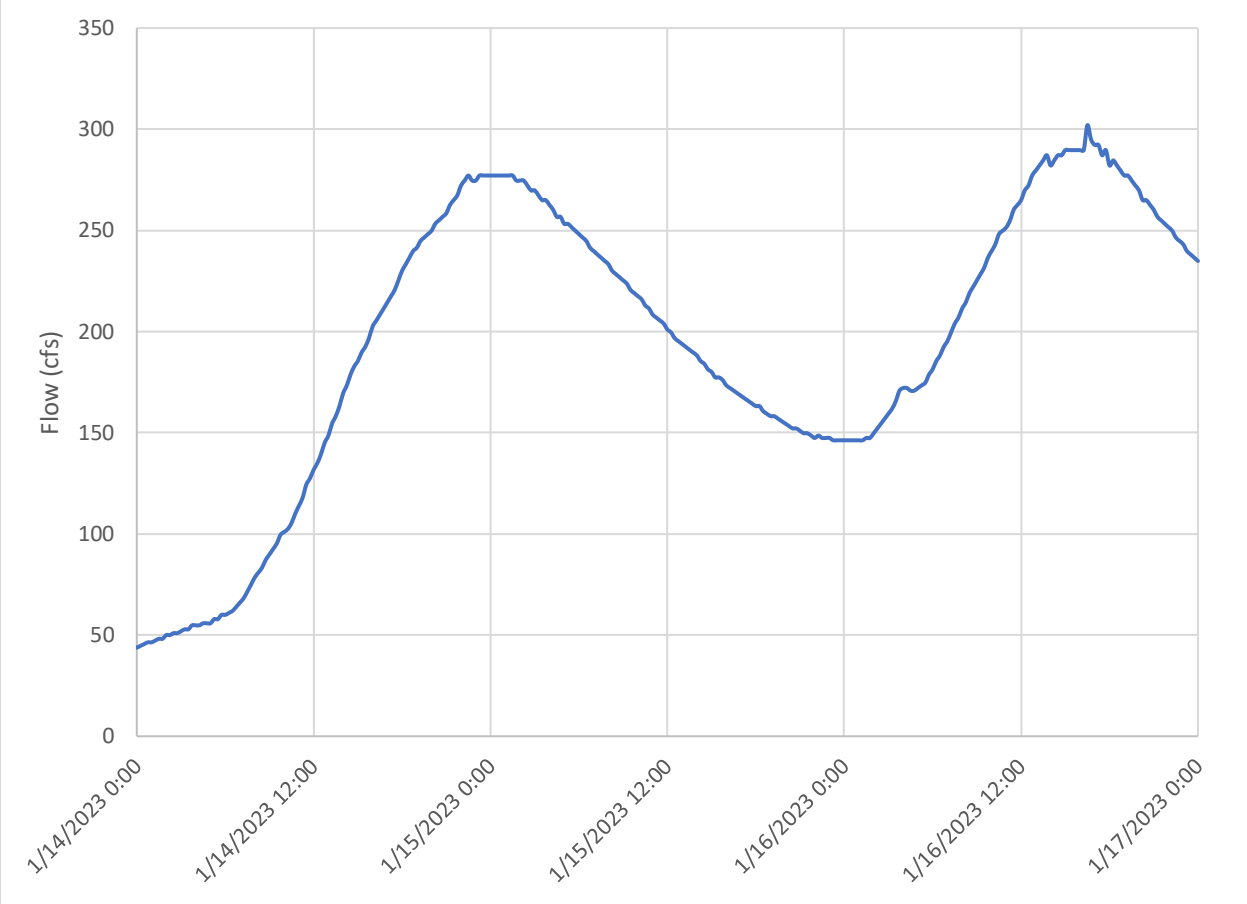

Figure 43. Fisher Creek at Monterey Road Flows (1/14/23-1/16/23)

[14] Based on gage data

Figure 44. Flooding at Fisher Creek downstream of Tilton Ave, looking south (1/14/23)

Figure 45. Flooding from Jones Creek upstream of Pacheco Pass Hwy, looking east (1/14/23)

March 9-10, 2023 Storm

Weather

Several small rainfall events occurred in the two weeks leading up to the March 9-10 event, leaving the watersheds saturated and primed for runoff production. Precipitation began on the morning of March 9 continued until the early morning of March 10. Flood impacts focused once again on the south County.

Table 16. Rain Gage Statistics (3/9/23 – 3/11/23)

Gage	Max Rainfall Duration	Max Rainfall Depth (Preliminary)	Estimated Return Period[15]
West Little Llagas	3 hours	0.83 inches	1 Year
	6 hours	1.30 inches	1 Year
	12 hours	2.20 inches	2 Year
	24 hours	2.80 inches	2-5 Year
	48 hours	2.91 inches	1-2 Year
Uvas Canyon	3 hours	1.61 inches	2 Year
	6 hours	2.68 inches	2-5 Year
	12 hours	4.76 inches	5-10 Year
	24 hours	5.98 inches	2-5 Year
	48 hours	6.50 inches	2-5 Year

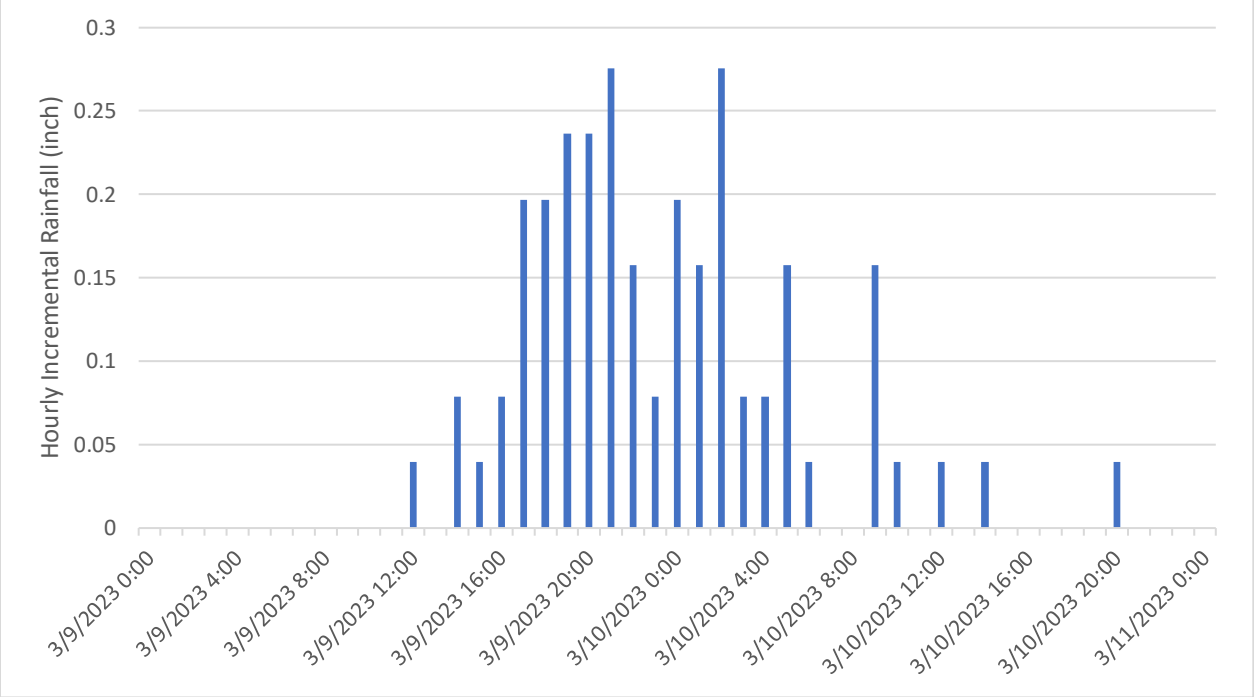

Figure 46. West Little Llagas Rainfall (3/9/23 - 3/10/23)

[15] Metstat. Regional All Season Precipitation Frequency Analysis and Mapping in Santa Clara, Alameda, and San Mateo Counties, California, and Comparison to NOAA Atlas 14. October 2016

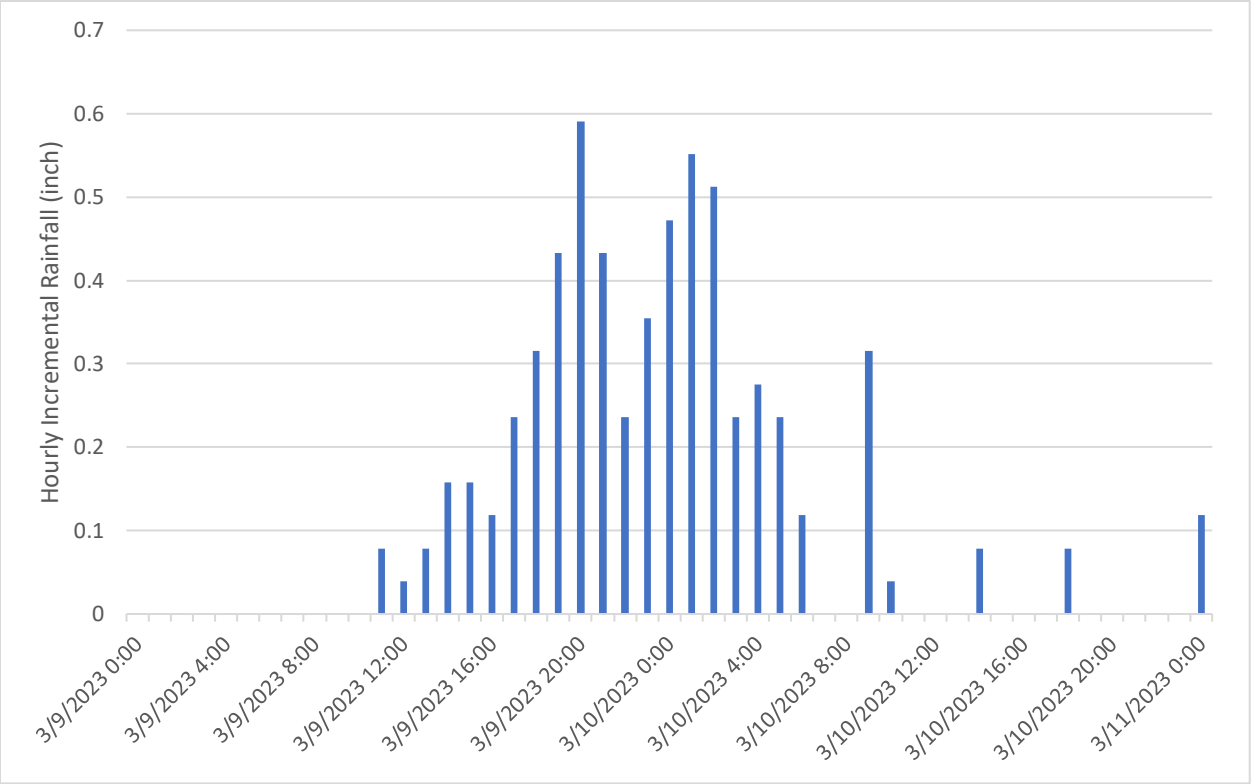

Figure 47. Uvas Canyon Rainfall (3/9/23 - 3/10/23)

Table 17. Valley Water Rain Gage Statistics (3/9/23-3/10/23)

Rain Gage	Max 3hr Rainfall	3hr Return Period	Max 6hr Rainfall	6hr Return Period	Max 12hr Rainfall	12hr Return Period	Max 24hr Rainfall	24hr Return Period	Max 48hr Rainfall	48hr Return Period
Alamitos	0.35	< 1 year	0.47	< 1 year	0.87	< 1 year	1.14	< 1 year	1.18	< 1 year
Almaden Watershed	1.10	1 year	1.73	1 year	2.95	2 year	3.66	1-2 year	3.86	<1 year
Biel Ranch	0.71	1 year	0.83	<1 year	1.46	1-2 year	2.05	1-2 year	2.13	1-2 year
Guadalupe Slough	1.65	10-25 year	2.44	10-25 year	3.82	25 year	5.20	>50 year	5.51	10-25 year
Coe Park	0.43	< 1 year	0.59	< 1 year	0.91	1 year	0.98	< 1 year	1.30	< 1 year
Coit Ranch	0.67	< 1 year	1.02	< 1 year	1.54	< 1 year	2.20	1 year	2.56	< 1 year
Coyote Reservoir	0.67	< 1 year	1.02	< 1 year	1.69	< 1 year	2.56	1-2 year	2.87	1 year
Curtner Ranch	0.67	< 1 year	1.02	< 1 year	1.81	1-2 year	2.48	2 year	2.72	1 year
Haskins Ranch	0.67	1 year	0.79	< 1 year	0.94	< 1 year	1.10	< 1 year	1.18	< 1 year
Johnson Ranch	0.39	< 1 year	0.59	< 1 year	0.79	< 1 year	1.14	< 1 year	1.26	< 1 year
Leroy Anderson Dam	0.59	< 1 year	0.87	< 1 year	1.50	< 1 year	1.85	< 1 year	1.97	< 1 year
Loma Prieta	0.63	<1 year	1.06	<1 year	1.85	1-2 year	2.48	2 year	2.60	1 year
Sunnyvale Hamilton WTP	1.34	1-2 year	2.20	1-2 year	3.82	2-5 year	4.96	2 year	5.31	2 year
Mt. Hamilton	0.55	<1 year	0.79	<1 year	1.18	2-5 year	1.30	1 year	1.34	1 year
Mt. Umunhum	0.67	<1 year	0.91	<1 year	1.14	<1 year	1.65	<1 year	2.09	<1 year
Valley Christian	1.54	1-2 year	2.24	1 year	3.94	2 year	4.92	1-2 year	5.91	2 year

Rain Gage	Max 3hr Rainfall	3hr Return Period	Max 6hr Rainfall	6hr Return Period	Max 12hr Rainfall	12hr Return Period	Max 24hr Rainfall	24hr Return Period	Max 48hr Rainfall	48hr Return Period
Rinconada	1.61	2 year	2.36	1 year	3.98	2 year	4.53	2 year	4.69	<1 year
Shanti Ashrama	0.75	1 year	1.10	1 year	1.77	1-2 year	2.13	1 year	2.20	<1 year
Penitencia WTP	0.75	1 year	1.14	1 year	1.46	<1 year	1.93	1 year	2.01	<1 year
Stevens Creek Reservoir	0.39	<1 year	0.55	<1 year	0.71	<1 year	0.87	<1 year	0.91	<1 year
UTC	0.87	<1 year	1.54	1 year	2.44	1-2 year	2.68	1 year	2.76	<1 year
Uvas Reservoir	0.39	<1 year	0.59	<1 year	0.91	<1 year	1.14	<1 year	1.18	<1 year
West Yard	1.34	1-2 year	2.09	1-2 year	3.82	5 year	4.80	5 year	5.16	2-5 year
Mtn. View Corp. Yard	0.47	<1 year	0.71	<1 year	1.34	1-2 year	1.46	1 year	1.50	<1 year
Guadalupe Watershed	0.47	<1 year	0.67	<1 year	0.94	1 year	1.18	<1 year	1.18	<1 year
Vasona Pump Station	1.18	<1 year	1.97	<1 year	3.27	1-2 year	3.98	1-2 year	4.13	<1 year
Cow Ridge	0.79	1 year	1.02	1 year	2.01	2 year	2.28	2 year	2.32	1 year
Calero Watershed	0.51	<1 year	0.79	<1 year	1.10	<1 year	1.54	<1 year	1.61	<1 year
Palo Alto Reclamation Plant	0.75	<1 year	1.22	<1 year	2.09	1 year	2.68	1-2 year	2.76	<1 year
City of San Jose	0.87	2-5 year	0.87	1 year	0.98	<1 year	1.10	<1 year	1.30	<1 year
Evergreen	0.28	<1 year	0.39	<1 year	0.71	<1 year	0.79	<1 year	0.87	<1 year
Church Ave. Perc. Ponds	0.43	<1 year	0.55	<1 year	0.63	<1 year	0.75	<1 year	0.83	<1 year

Rain Gage	Max 3hr Rainfall	3hr Return Period	Max 6hr Rainfall	6hr Return Period	Max 12hr Rainfall	12hr Return Period	Max 24hr Rainfall	24hr Return Period	Max 48hr Rainfall	48hr Return Period
Uvas Canyon County Park	0.87	1 year	1.18	1 year	2.17	2 year	2.91	2-5 year	3.03	2 year
Banjo Point (Lexington Reservoir)	1.61	1 year	2.68	1-2 year	4.76	2-5 year	5.98	2-5 year	6.50	1-2 year
West L. Llagas	1.02	<1 year	1.69	<1 year	2.99	1-2 year	3.62	1-2 year	3.78	<1 year
Rancho San Antonio	0.83	<1 year	1.30	1 year	2.20	2 year	2.80	2-5 year	2.91	1-2 year
Palm Avenue	0.75	<1 year	1.18	<1 year	1.85	<1 year	2.05	<1 year	2.24	<1 year
Trappers Trail	0.59	<1 year	0.98	<1 year	1.73	1-2 year	2.28	2 year	2.28	1 year
Edmundson	1.10	2 year	1.77	2-5 year	2.76	5 year	3.07	2 year	3.15	1-2 year
Maryknoll Fields	0.94	2 year	1.54	2 year	2.64	5 year	3.31	5 year	3.43	2 year
Canada de los Osos	0.67	1 year	0.91	<1 year	1.46	1 year	1.57	<1 year	1.61	<1 year
Los Trancos	0.91	1-2 year	1.46	2 year	2.44	5 year	3.58	10 year	4.06	5-10 year
Westwind Community Barn	1.42	2-5 year	2.20	2-5 year	3.50	5 year	3.86	2 year	3.94	1 year

Flooding

West Little Llagas Creek

Flows peaked on West Little Llagas Creek several times in response to rainfall pulses on March 9 and 10. West Little Llagas Creek overbanked at Llagas Road and Watsonville Road again early on the morning of March 10. Estimated peak flows below Edmundson Avenue are shown in Table 18.

Table 18. Peak Flow – West Little Llagas Creek (3/9/23 – 3/10/23)

Gage Location	Peak Flow (Preliminary)	Estimated Return Period[16]
Below Edmundson Avenue	214 cfs	2-5 Year

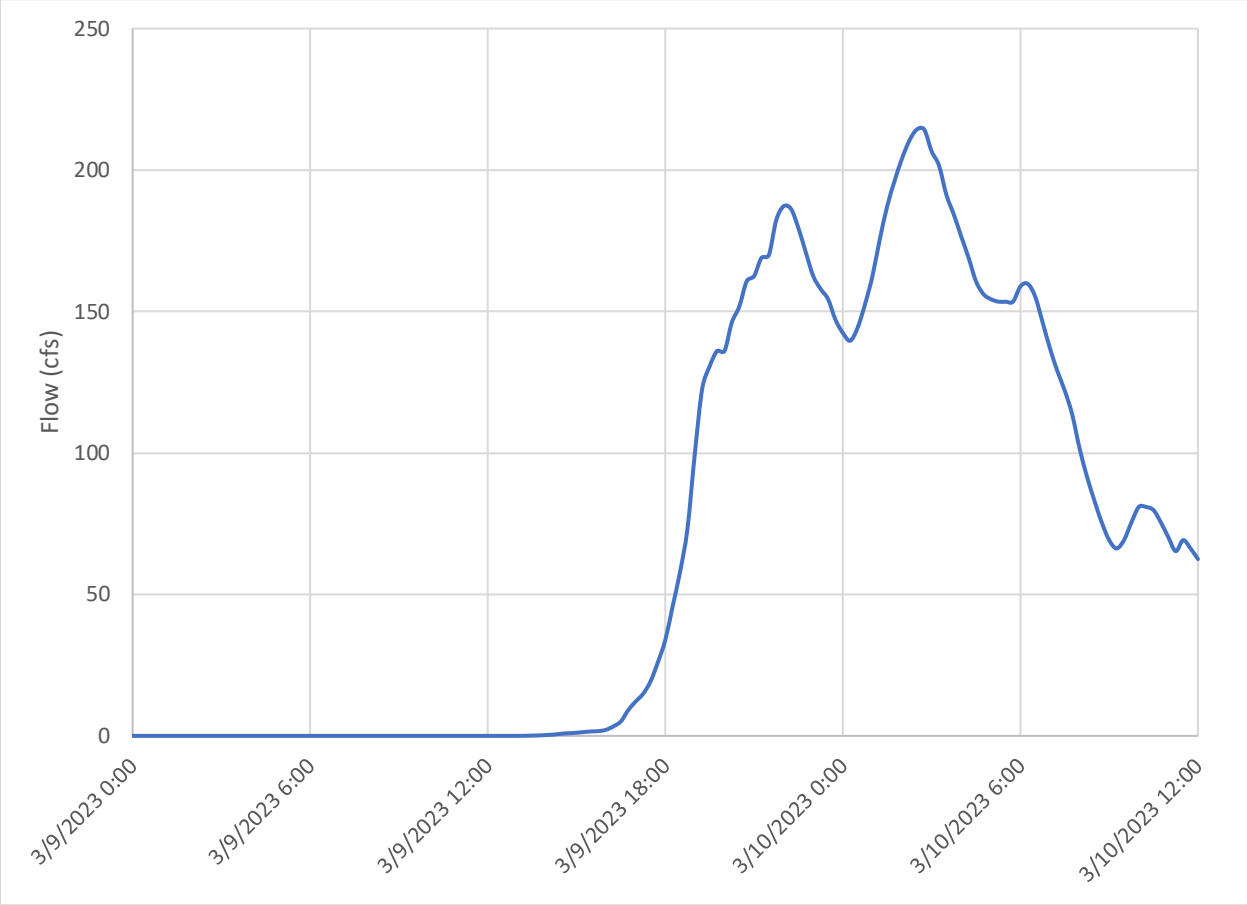

Figure 48. West Little Llagas Creek Flows (3/9/23-3/10/23)

[16] Based on gage Data

Figure 49. West Little Llagas Creek Flooding Extents near Llagas Rd (3/9/23-3/10/23)

Figure 50. West Little Llagas Creek Flooding at Llagas Road (3/10/23)

Soap Lake Floodplain

Flooding was widespread in the Soap Lake floodplain, similar to the January flooding. Uvas Reservoir was full for most of the calendar year and continued to spill through the event on March 9. Spills from Uvas Reservoir peaked around 5 am on March 10 and flows at Luchessa Avenue peaked about three hours later. Based on aerial imagery taken on March 10, Uvas Creek overtopped its banks at several locations and caused closure on US-101 for several hours.

Table 19. Peak Flow – Uvas and Llagas Creeks (3/10/23)

Creek	Gage Location	Peak Flow (Preliminary)	Estimated Return Period[17]
Uvas Creek	West Luchessa Avenue	7,469 cfs	10 Year
Llagas Creek	Near Southside Drive	3,060 cfs	10 Year

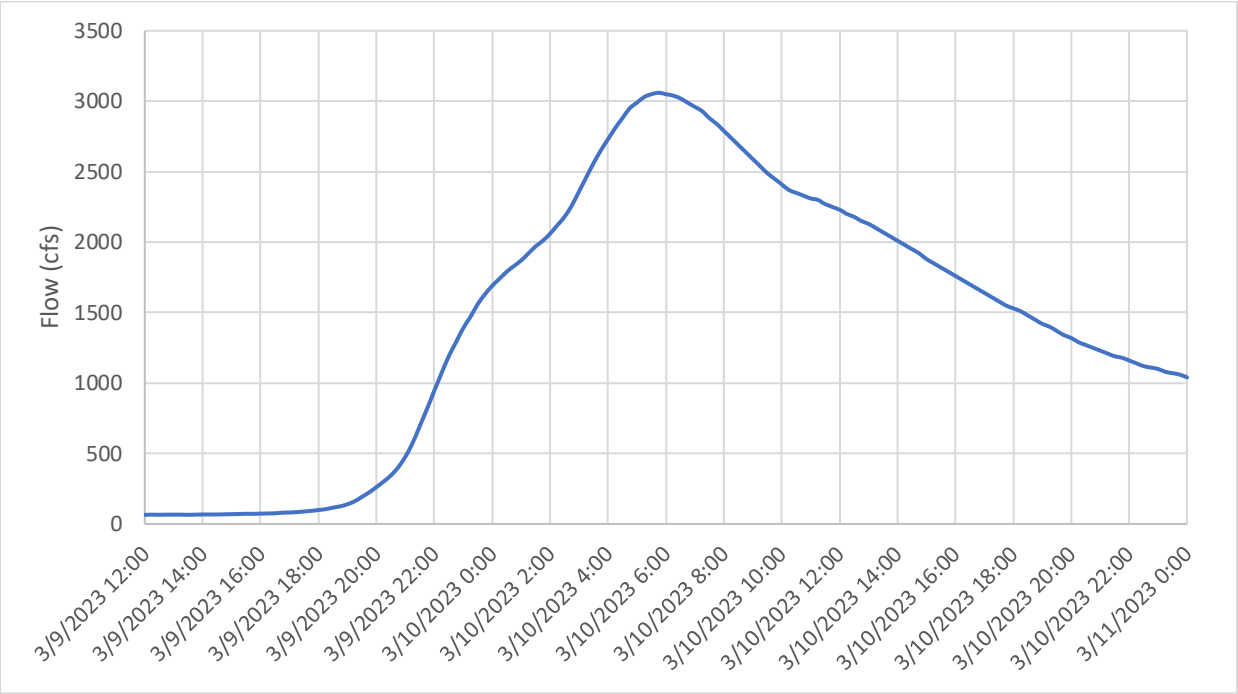

Figure 51. Llagas Creek Hydrograph (3/9/23 – 3/10/23)

[17] Based on gaga data

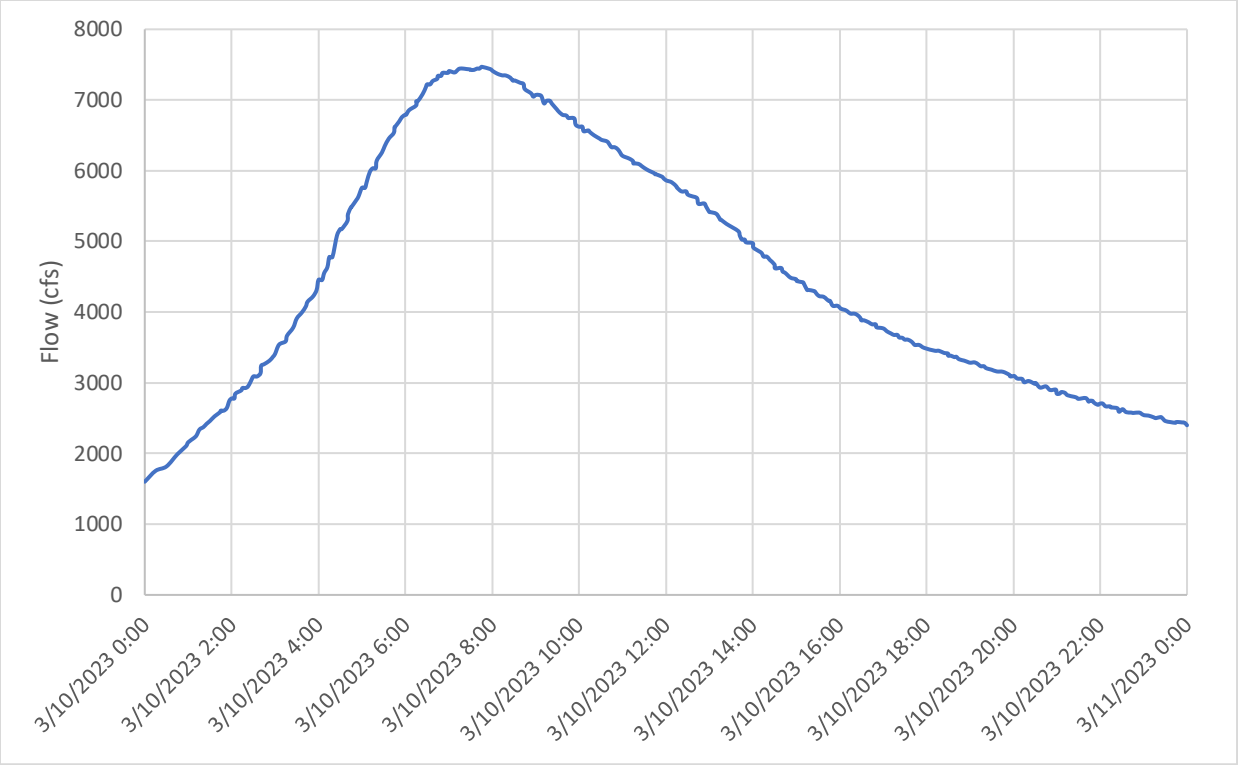

Figure 52. Uvas Creek Flows (3/10/23)

Figure 53. Uvas Creek Overbanking onto US-101 (3/10/23)

Figure 54. Uvas Creek Overland Flow over Castro Valley Road (3/10/23)

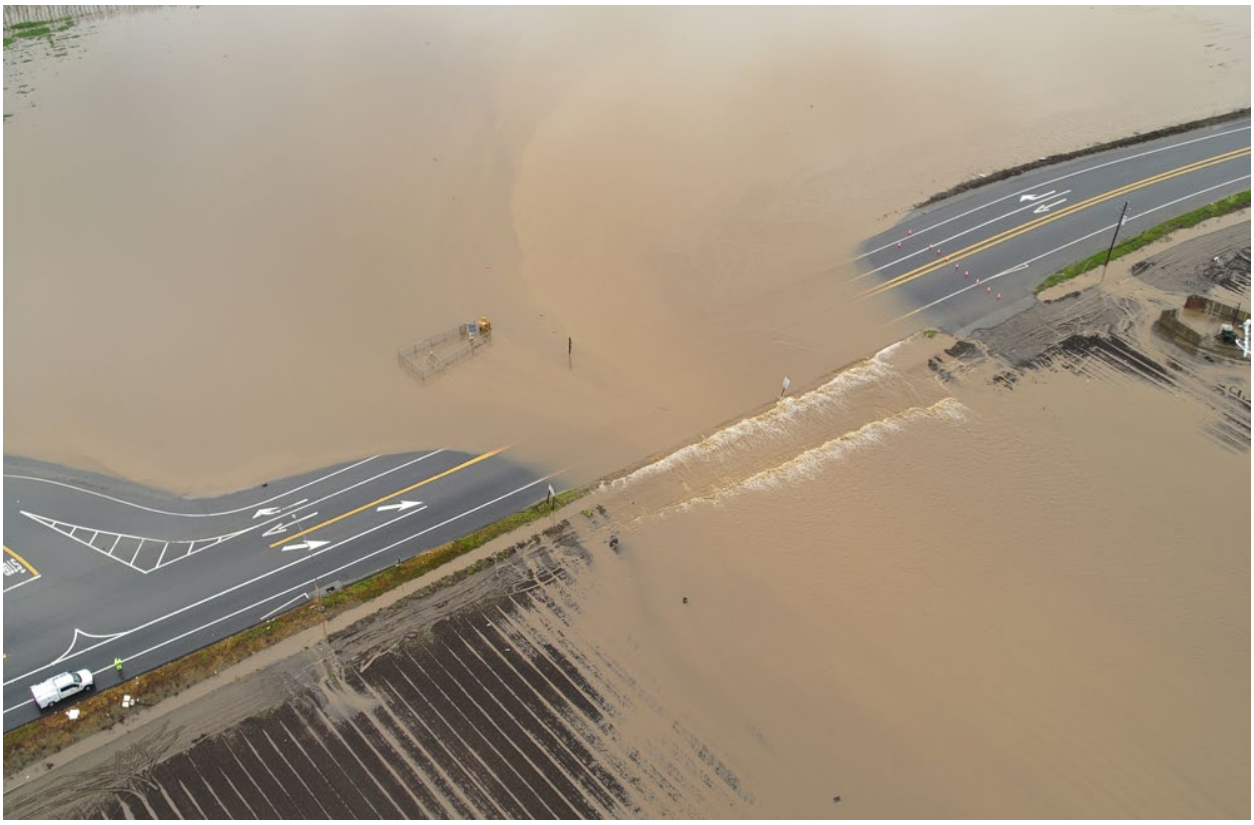

Figure 55. Uvas Creek Overland Flow over CA-25 near US-101 (3/10/23)

Figure 56. Widespread Overland Flooding south (3/10/23)

Figure 57. Widespread Overland Flooding near Dunneville (3/10/23)

Figure 58. Widespread Overland Flooding on Llagas Creek in Soap Lake US-101 (3/10/23)

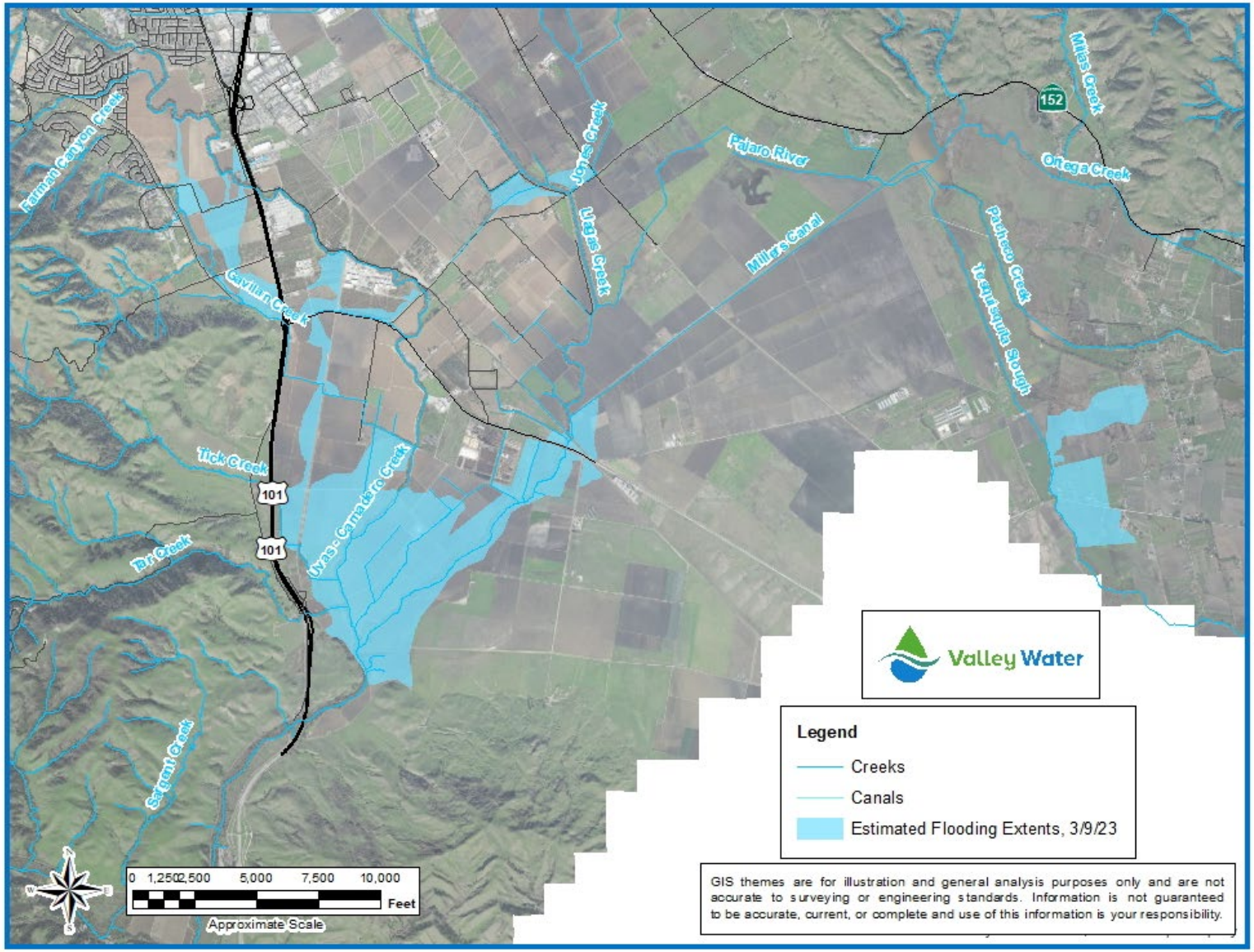

Figure 59. Soap Lake Flooding Extents (3/9/23-3/10/23)

Damage Estimate

Overall damage estimates from the storm event are summarized below. Data was received from the County of Santa Clara Office of Emergency Services. It is noted that the estimates included below were developed not long after the storm events and as such, were preliminary and are subject to change.

Table 20. Summary of Emergency Reimbursements submitted to CalOES and FEMA

Santa Clara County FEMA Reimbursement Requests		
Jurisdictions	**January Storms**	**March Storms**
Valley Water	$ 1,650,000.00	N/A
County	$ 7,367,161.00	$ 5,697,357.00
Palo Alto	$ 644,552.00	N/A
San Jose	$ 41,200,000.00	N/A
Los Altos Hills	$ 233,000.00	$ 85,000.00
Los Gatos	$ 860,000.00	N/A
Milpitas	$ 10,150.00	N/A
Morgan Hill	$ 449,500.00	N/A
Saratoga	$ 363,540.00	$ 407,879.00
Los Altos	N/A	$ 56,670.00
Sunnyvale	N/A	$ 250,000.00
Total	$ 52,777,903.00	$ 6,496,906.00