



Upper Petaluma Flood Control Project

SCWA Flood Control Zone 2A Update



December 5, 2019



COMMITMENT & INTEGRITY DRIVE RESULTS

Agenda

- Project Background
- Initial Results/Takeaways
- Next Steps
- Q&A

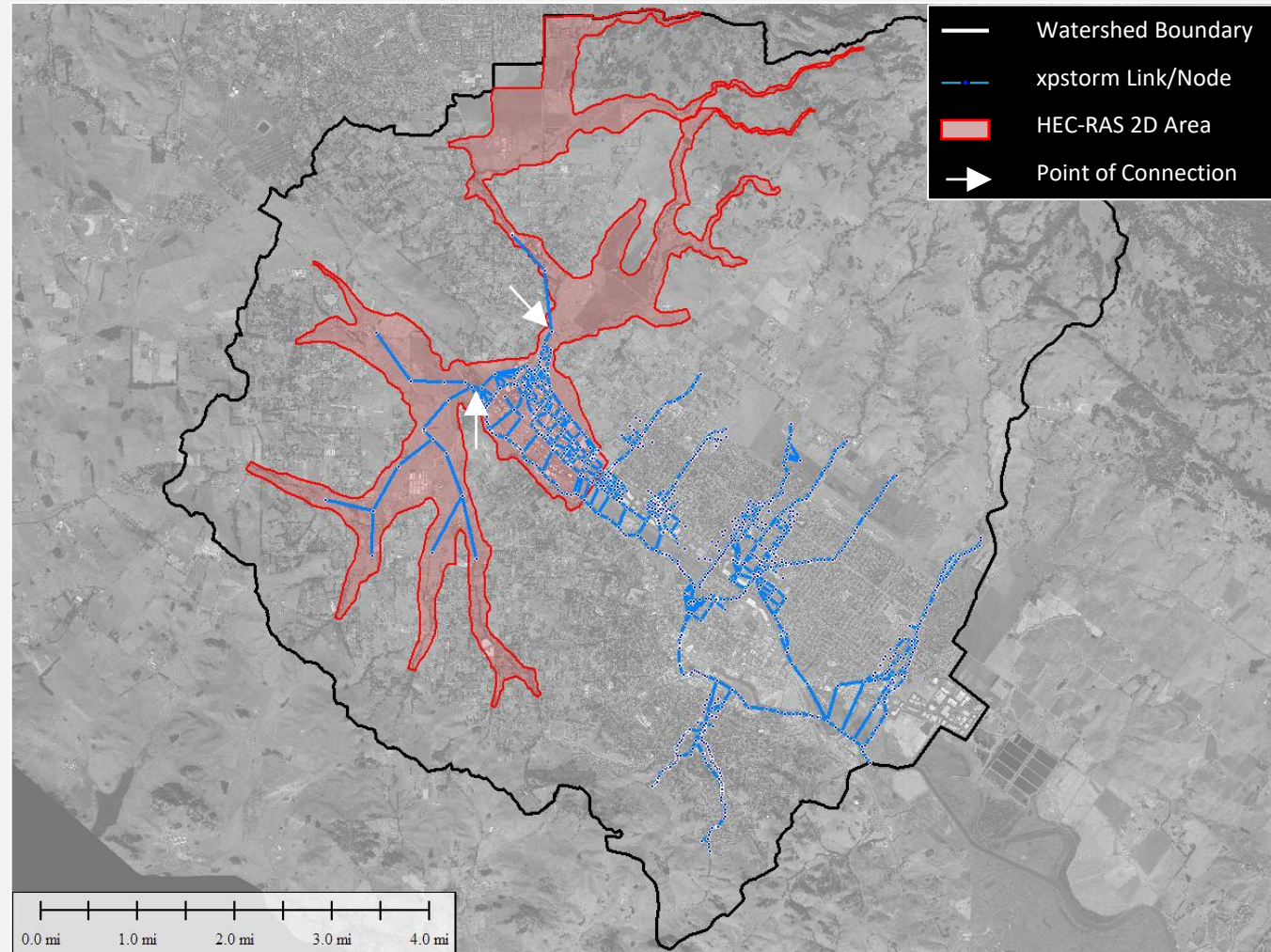


Project Background

- Goal:
 - Build and calibrate a refined hydrologic/hydraulic model of the upper Petaluma River watershed
 - Improve spatial resolution and level of detail
 - Maintain consistency with past work by the City and the currently-effective FEMA modeling approach
 - Use the refined model to screen flood control concepts

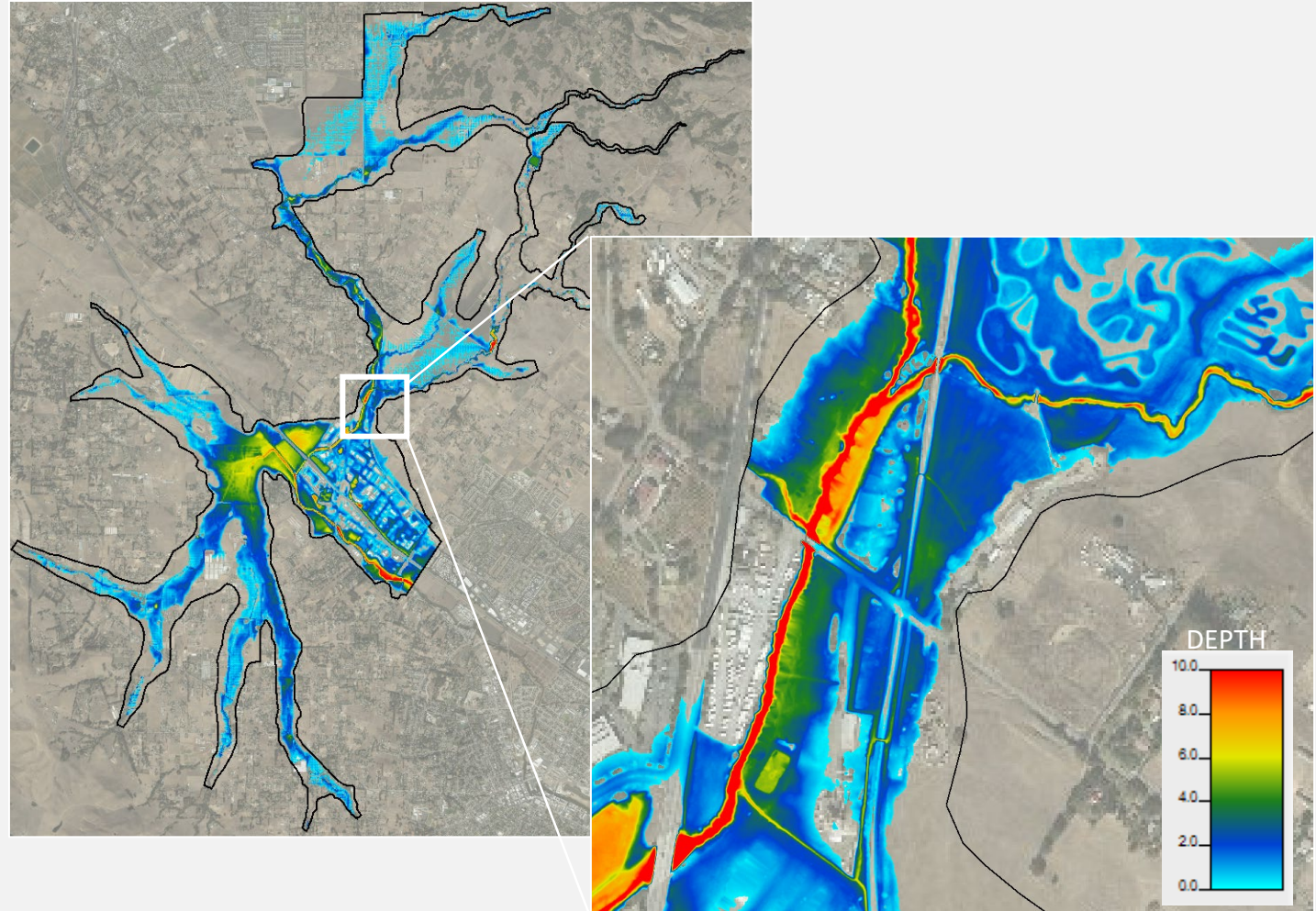
Model Build and Calibration Overview

- HEC-RAS model
 - Extensive 2-d grid covering all major channels and floodplains
 - Points of connection to the existing downstream model for both the north and south tributaries
 - Overlap with the downstream model for connection point fidelity



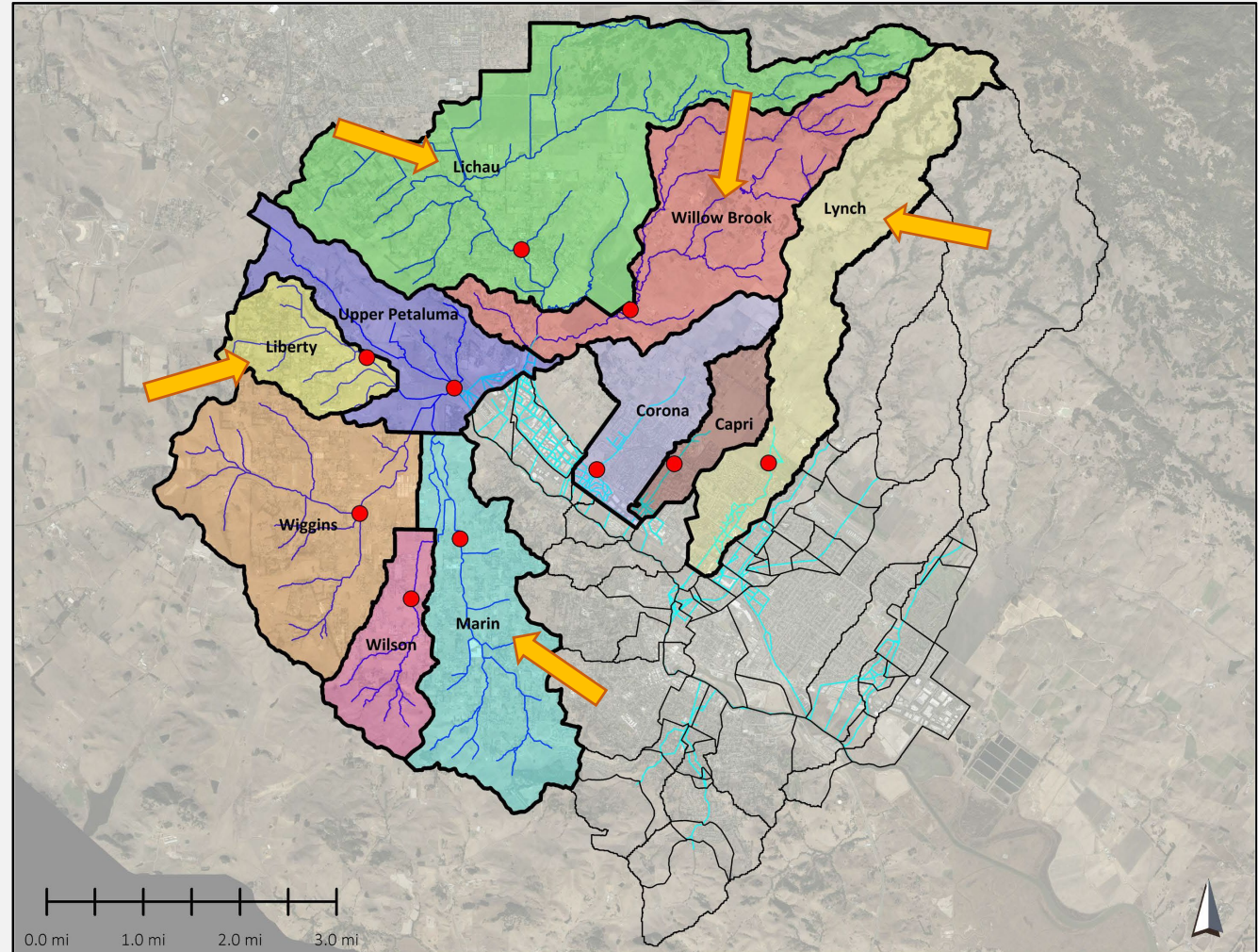
Model Build and Calibration Overview

- Model results
 - High resolution flood boundaries and depths
 - Clear definition of break-out points
 - Dynamic modeling captures impacts of existing floodplain storage and flow barriers



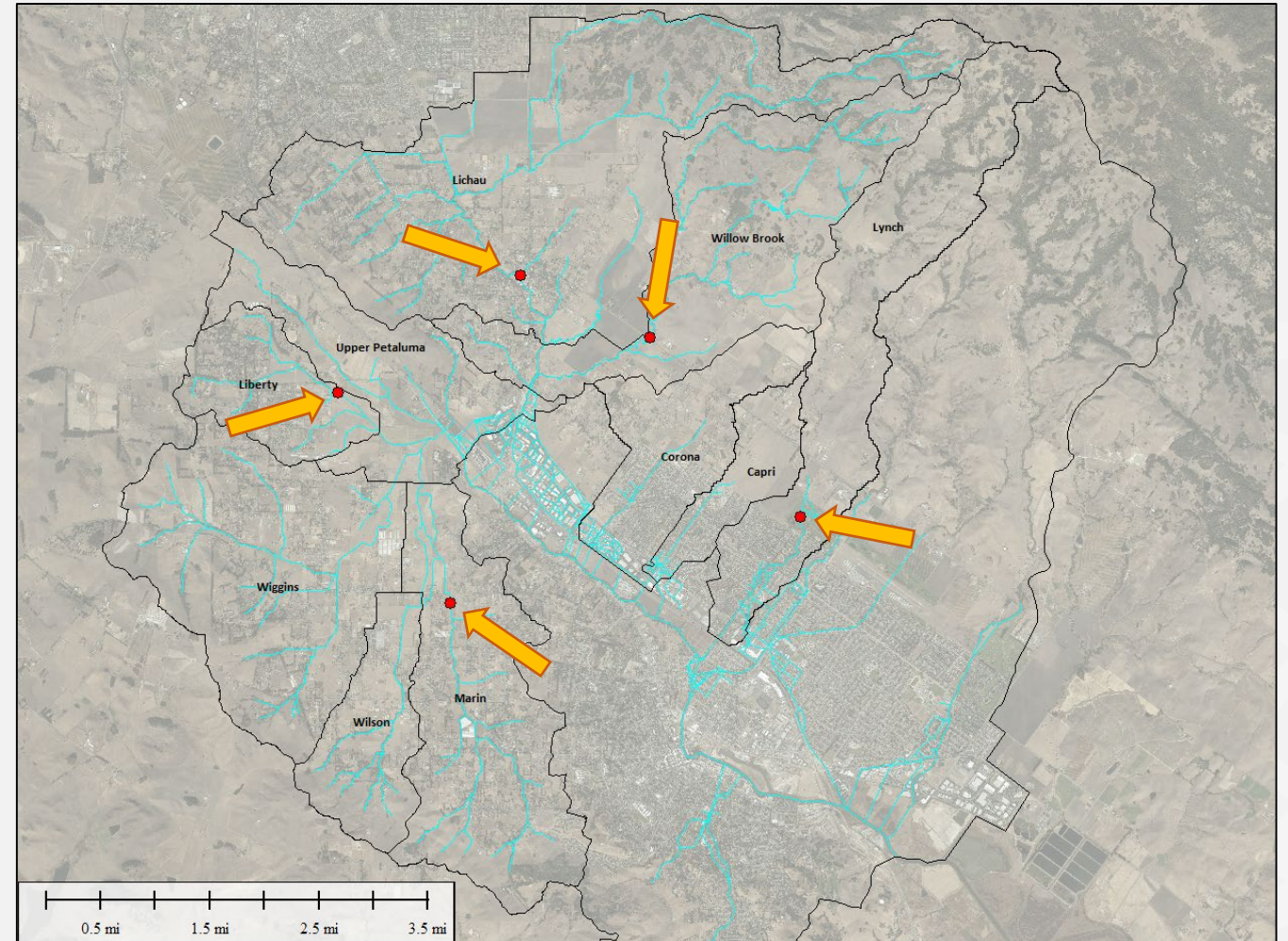
Selection of Tributaries for Screening

- Tributaries selected for concept screening include diverse size, shape and attributes
 - Marin
 - Liberty
 - Lichau
 - Willow Brook
 - Lynch



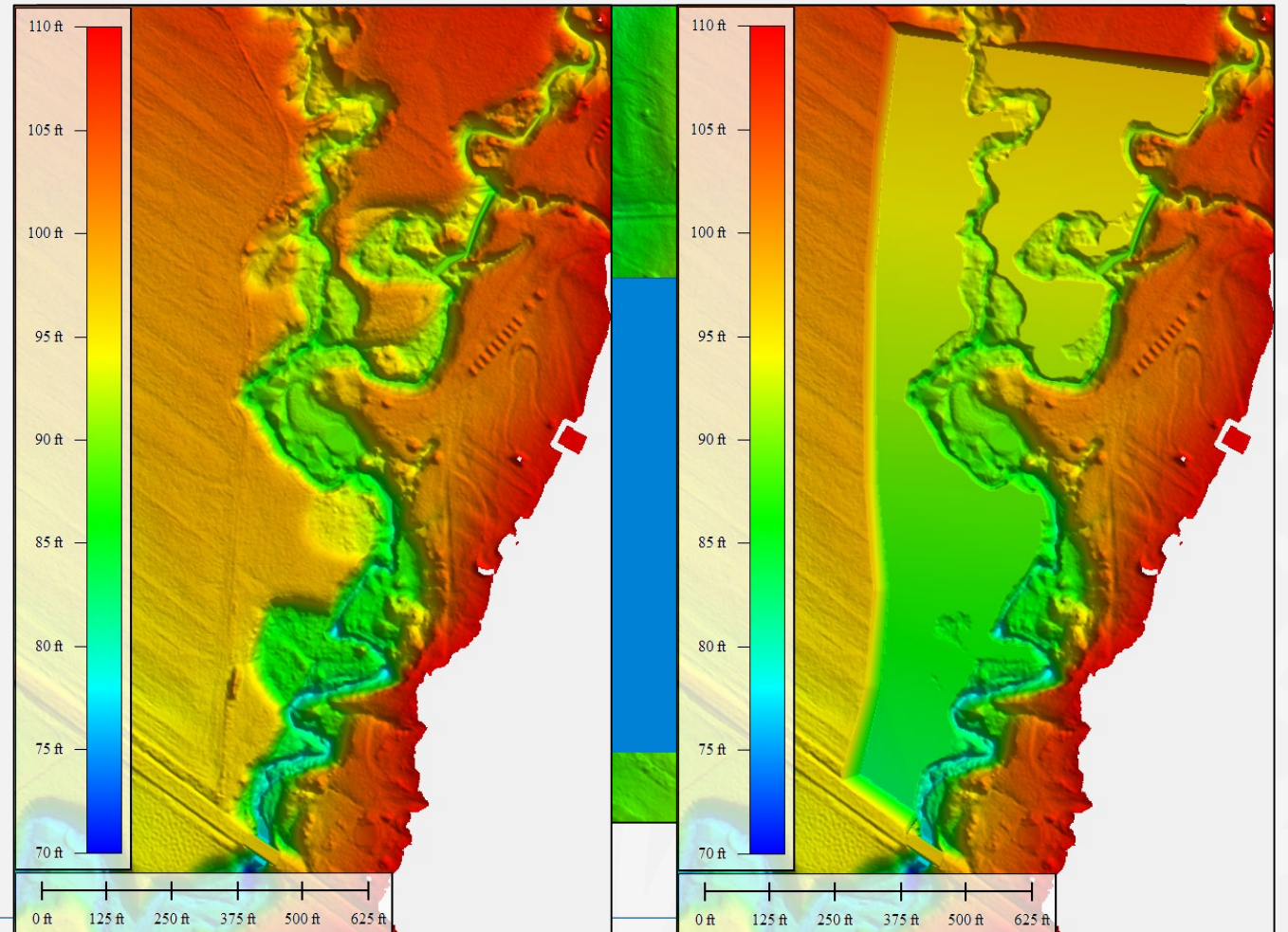
Screening Project Locations

- Selected to have a consistent “watershed location” across the various tributaries



Screening Concept Types

- Detention Basin
- Floodplain Modification



Key Takeaways – Project Type

- Detention projects have greater flood reduction benefits compared to floodplain modification projects.
- Offline retention (represented by the detention projects) is less likely to result in adverse downstream flood impacts compared with online detention (represented by the floodplain modification projects) due to flow not reentering the creeks along the tail end of the hydrograph.
- Floodplain modification projects provide a greater peak flow attenuation benefit when combined with a downstream constriction such as a culvert under an elevated roadway.

Key Takeaways - Tributaries

- Peak flow attenuation benefits are more significant from projects along the Willow Brook and Lichau Creek tributaries due to their larger size and peaked hydrographs.
- Peak flow attenuation benefits are less significant from projects along the Marin and Liberty Creek tributaries due to the significant attenuation already provided through Denman Flats.
- Peak flow attenuation benefits are less significant from projects along Lynch Creek given the inability of the projects to impact upstream reaches, the existing attenuation provided along the golf course, and the timing of peak flows along Lynch Creek and the Petaluma River not coinciding.

Next Steps

- Score/Rank/Prioritize concept alternatives and document results
- Scope a Feasibility Study for more in-depth analysis of preferred concept alternatives
- Continued use of the model. Can be used to:
 - Evaluate the identified project alternatives
 - Assess other project types (restoration, recharge, etc.)
 - Evaluate projects within the other tributaries
 - Examine alternative locations with any given tributary

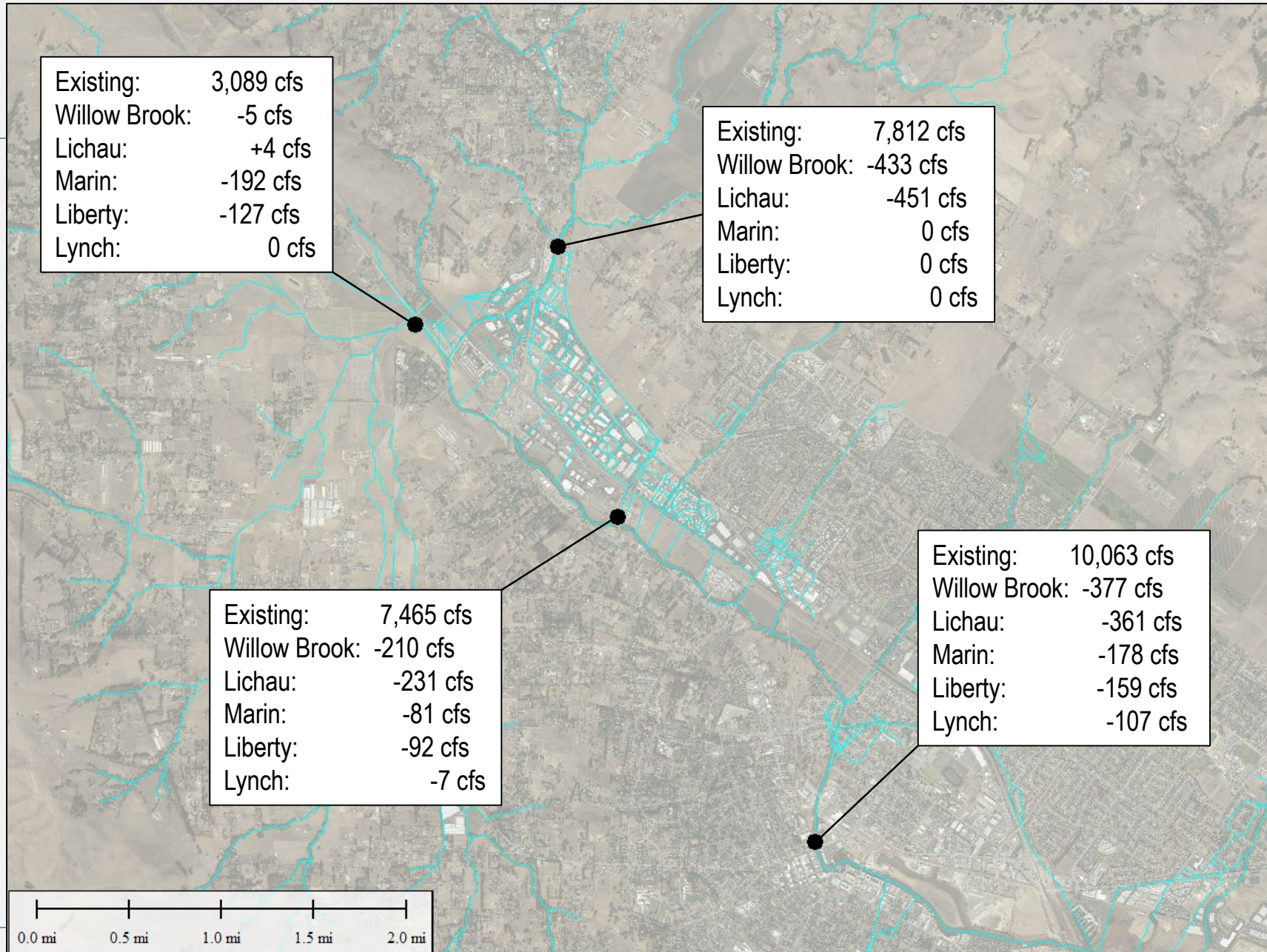
Questions?



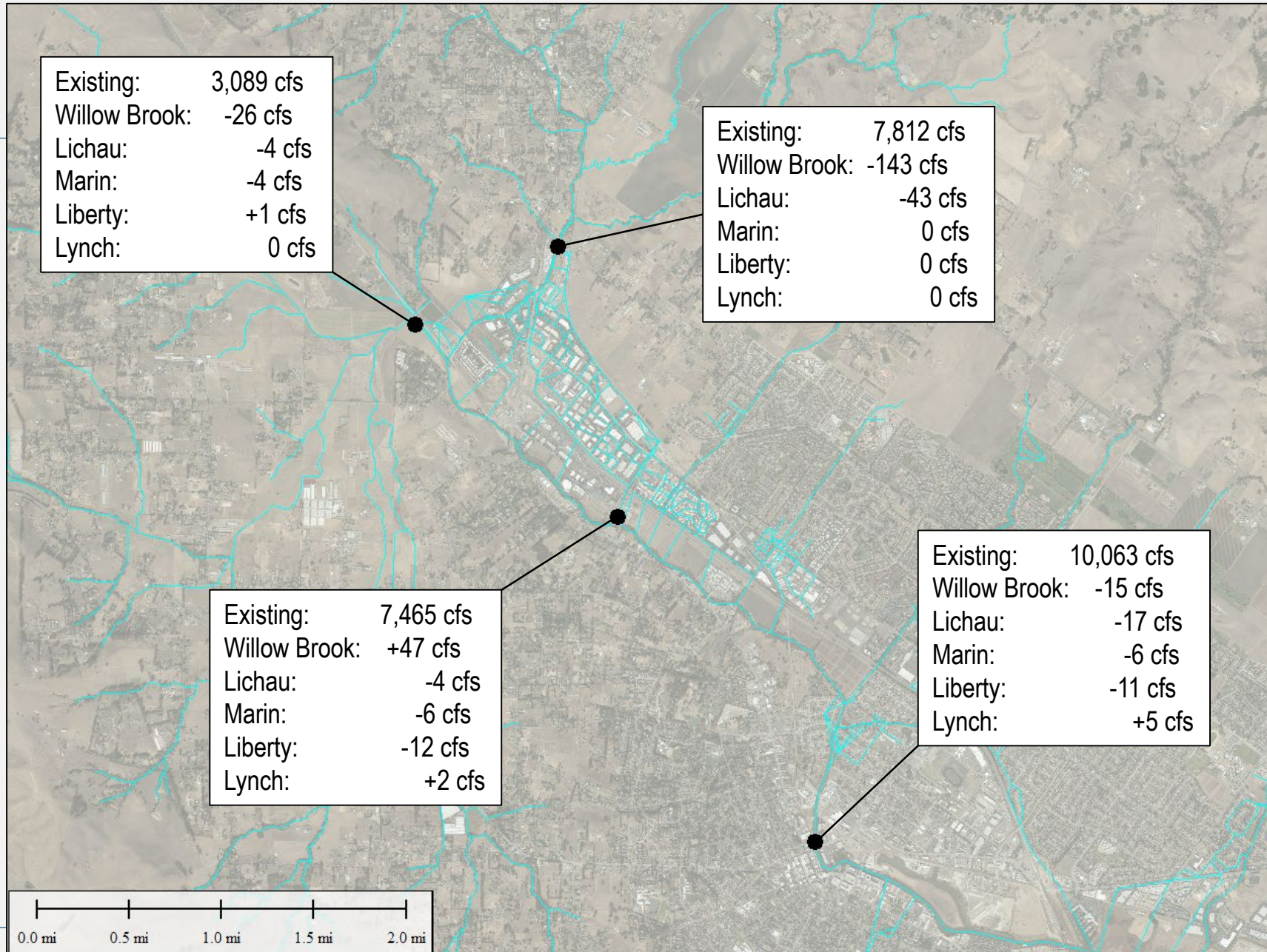


Extra

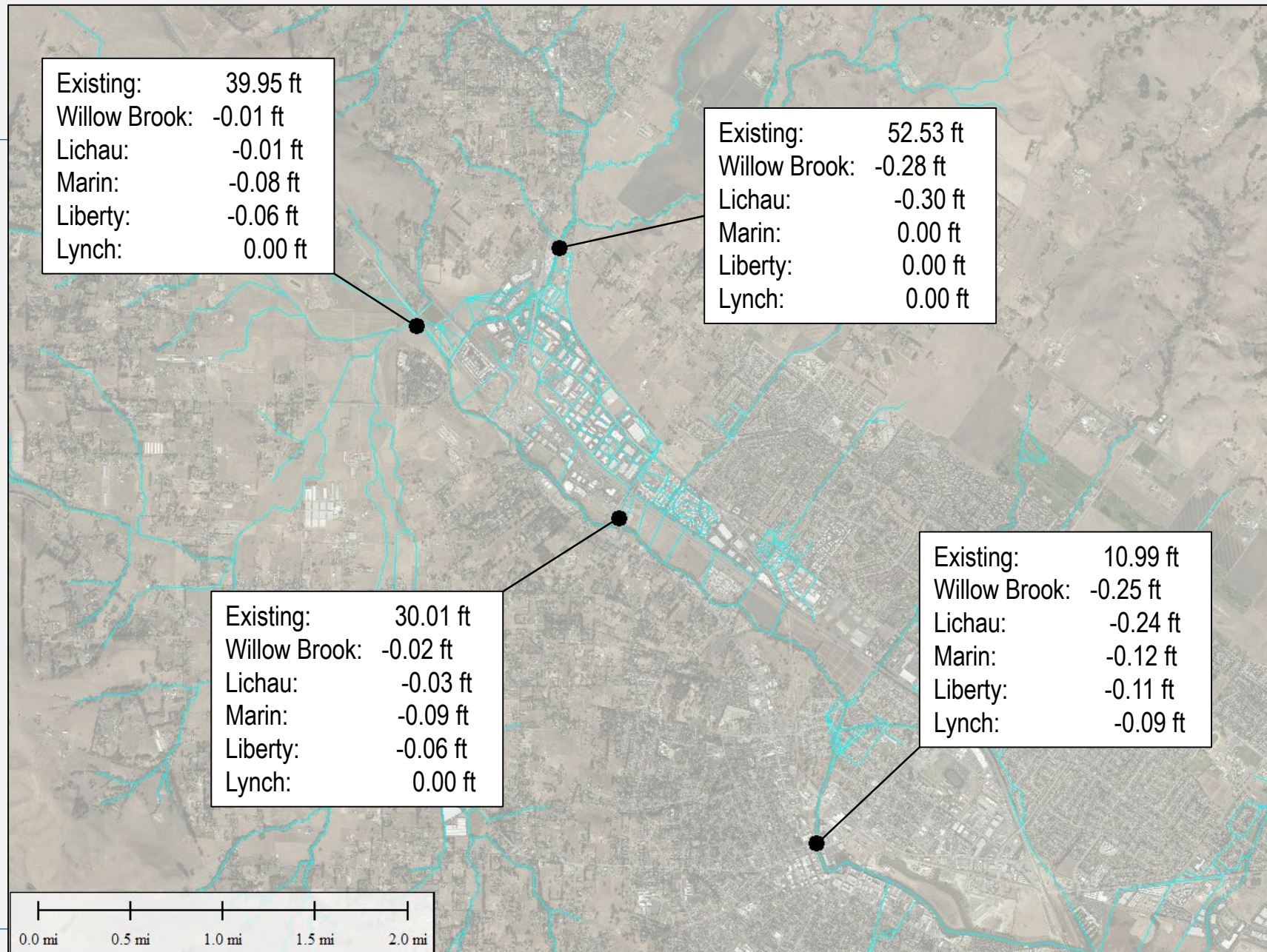
Detention Projects: Change in 100yr Peak Flow Rates



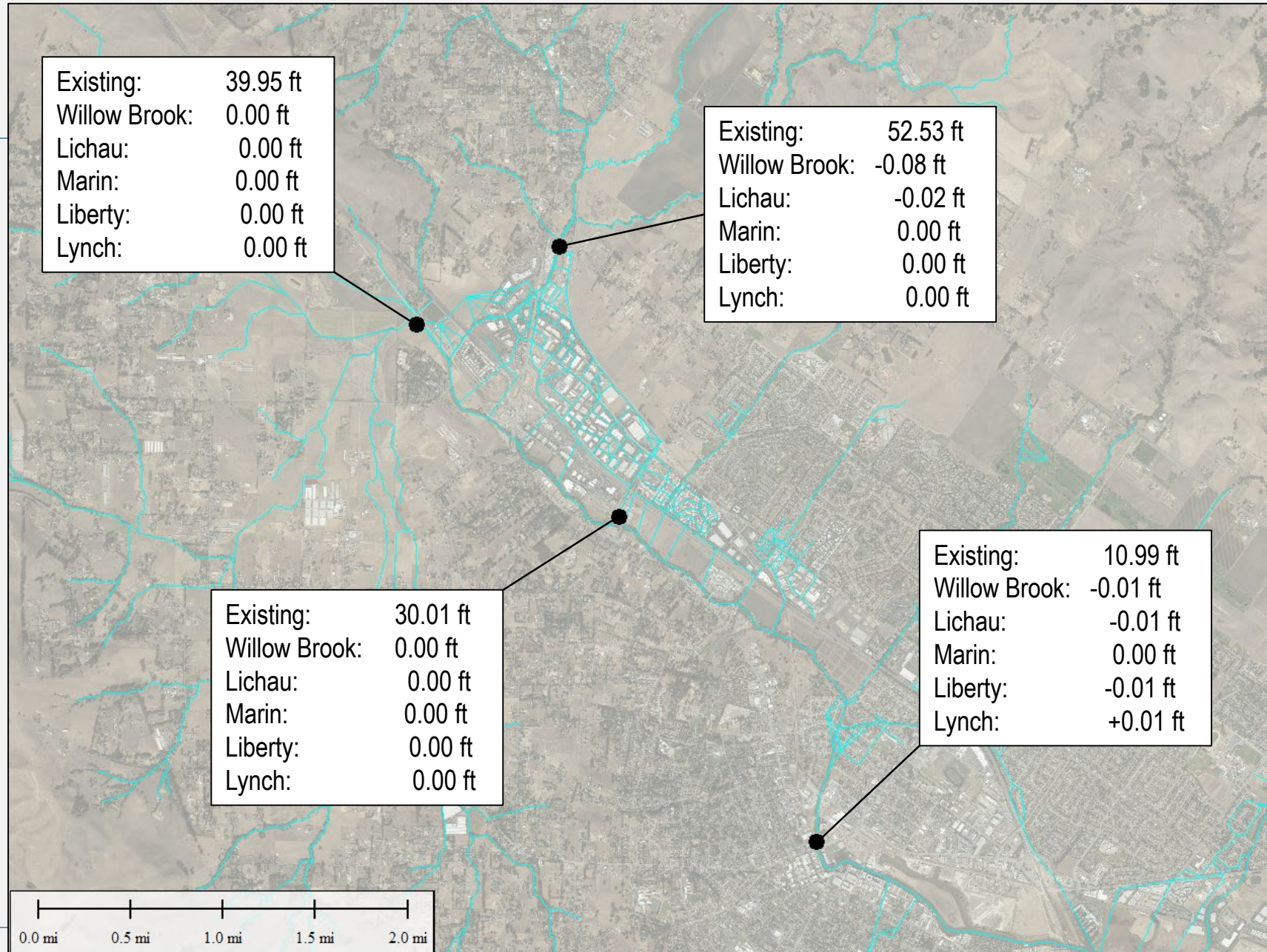
Floodplain Projects: Change in 100yr Peak Flow Rates



Detention Projects: Change in 100yr WSEs



Floodplain Projects: Change in 100yr WSEs





100-year Downstream Results Summary

Location	Peak Flow Rate	Change in Peak Flow Rate									
		Detention Basin Scenario					Floodplain Modification Scenario				
		Willow Brook	Lichau	Marin	Liberty	Lynch	Willow Brook	Lichau	Marin	Liberty	Lynch
Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	
	<i>cfs</i>	<i>cfs</i>	<i>cfs</i>	<i>cfs</i>	<i>cfs</i>	<i>cfs</i>	<i>cfs</i>	<i>cfs</i>	<i>cfs</i>	<i>cfs</i>	
Willow Brook Creek at Ely Rd	7,812	-433	-451	0	0	0	-143	-43	0	0	0
Denman Flat near Stony Pt Rd	3,089	-5	4	-192	-127	0	-26	-4	-4	1	0
Petaluma River at Corona Rd	7,465	-210	-231	-81	-92	-7	47	-4	-6	-12	2
Petaluma River at E Washington St	10,063	-377	-361	-178	-159	-107	-15	-17	-6	-11	5

Location	Peak WSE	Change in Peak Water Surface Elevation									
		Detention Basin Scenario					Floodplain Modification Scenario				
		Willow Brook	Lichau	Marin	Liberty	Lynch	Willow Brook	Lichau	Marin	Liberty	Lynch
Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	
	<i>ft</i>	<i>ft</i>	<i>ft</i>	<i>ft</i>	<i>ft</i>	<i>ft</i>	<i>ft</i>	<i>ft</i>	<i>ft</i>	<i>ft</i>	
Willow Brook Creek at Ely Rd	52.53	-0.28	-0.30	0.00	0.00	0.00	-0.08	-0.02	0.00	0.00	0.00
Denman Flat near Stony Pt Rd	39.95	-0.01	-0.01	-0.08	-0.06	0.00	0.00	0.00	0.00	0.00	0.00
Petaluma River at Corona Rd	30.01	-0.02	-0.03	-0.09	-0.06	0.00	0.00	0.00	0.00	0.00	0.00
Petaluma River at E Washington St	10.99	-0.25	-0.24	-0.12	-0.11	-0.09	-0.01	-0.01	0.00	-0.01	0.01

Location	Peak Depth	Change in Peak Flood Depth									
		Detention Basin Scenario					Floodplain Modification Scenario				
		Willow Brook	Lichau	Marin	Liberty	Lynch	Willow Brook	Lichau	Marin	Liberty	Lynch
Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	
	<i>ft</i>	<i>ft</i>	<i>ft</i>	<i>ft</i>	<i>ft</i>	<i>ft</i>	<i>ft</i>	<i>ft</i>	<i>ft</i>	<i>ft</i>	
Willow Brook Creek at Ely Rd	18.72	-0.28	-0.30	0.00	0.00	0.00	-0.08	-0.02	0.00	0.00	0.00
Denman Flat near Stony Pt Rd	12.10	-0.01	-0.01	-0.08	-0.06	0.00	0.00	0.00	0.00	0.00	0.00
Petaluma River at Corona Rd	17.74	-0.02	-0.03	-0.09	-0.06	0.00	0.00	0.00	0.00	0.00	0.00
Petaluma River at E Washington St	17.19	-0.25	-0.24	-0.12	-0.11	-0.09	-0.01	-0.01	0.00	-0.01	0.00

Location	Peak Velocity	Change in Peak Velocity									
		Detention Basin Scenario					Floodplain Modification Scenario				
		Willow Brook	Lichau	Marin	Liberty	Lynch	Willow Brook	Lichau	Marin	Liberty	Lynch
Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	
	<i>ft/s</i>	<i>ft/s</i>	<i>ft/s</i>	<i>ft/s</i>	<i>ft/s</i>	<i>ft/s</i>	<i>ft/s</i>	<i>ft/s</i>	<i>ft/s</i>	<i>ft/s</i>	
Willow Brook Creek at Ely Rd	8.50	0.02	0.03	0.00	0.00	0.00	0.03	0.01	0.00	0.00	0.00
Denman Flat near Stony Pt Rd	1.40	0.00	0.00	-0.02	-0.01	0.00	0.00	0.06	-0.04	-0.01	0.00
Petaluma River at Corona Rd	4.86	-0.03	-0.03	-0.09	-0.07	0.00	0.00	0.00	0.00	0.00	0.00
Petaluma River at E Washington St	6.49	-0.12	-0.11	-0.05	-0.05	-0.02	0.00	0.00	0.00	0.00	0.00



100-year Downstream Results Summary

Location	Peak Flow Rate	Change in Peak Flow Rate									
		Detention Basin Scenario					Floodplain Modification Scenario				
		Willow Brook	Lichau	Marin	Liberty	Lynch	Willow Brook	Lichau	Marin	Liberty	Lynch
Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	
	<i>cfs</i>	<i>cfs</i>	<i>cfs</i>	<i>cfs</i>	<i>cfs</i>	<i>cfs</i>	<i>cfs</i>	<i>cfs</i>	<i>cfs</i>	<i>cfs</i>	<i>cfs</i>
Willow Brook Creek at Ely Rd	7,812	-433	-451	0	0	0	-143	-43	0	0	0
Denman Flat near Stony Pt Rd	3,089	-5	4	-192	-127	0	-26	-4	-4	1	0
Petaluma River at Corona Rd	7,465	-210	-231	-81	-92	-7	47	-4	-6	-12	2
Petaluma River at E Washington St	10,063	-377	-361	-178	-159	-107	-15	-17	-6	-11	5

Location	Peak WSE	Change in Peak Water Surface Elevation									
		Detention Basin Scenario					Floodplain Modification Scenario				
		Willow Brook	Lichau	Marin	Liberty	Lynch	Willow Brook	Lichau	Marin	Liberty	Lynch
Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	
	<i>ft</i>	<i>ft</i>	<i>ft</i>	<i>ft</i>	<i>ft</i>	<i>ft</i>	<i>ft</i>	<i>ft</i>	<i>ft</i>	<i>ft</i>	<i>ft</i>
Willow Brook Creek at Ely Rd	52.53	-0.28	-0.30	0.00	0.00	0.00	-0.08	-0.02	0.00	0.00	0.00
Denman Flat near Stony Pt Rd	39.95	-0.01	-0.01	-0.08	-0.06	0.00	0.00	0.00	0.00	0.00	0.00
Petaluma River at Corona Rd	30.01	-0.02	-0.03	-0.09	-0.06	0.00	0.00	0.00	0.00	0.00	0.00
Petaluma River at E Washington St	10.99	-0.25	-0.24	-0.12	-0.11	-0.09	-0.01	-0.01	0.00	-0.01	0.01

Location	Peak Depth	Change in Peak Flood Depth									
		Detention Basin Scenario					Floodplain Modification Scenario				
		Willow Brook	Lichau	Marin	Liberty	Lynch	Willow Brook	Lichau	Marin	Liberty	Lynch
Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	
	<i>ft</i>	<i>ft</i>	<i>ft</i>	<i>ft</i>	<i>ft</i>	<i>ft</i>	<i>ft</i>	<i>ft</i>	<i>ft</i>	<i>ft</i>	<i>ft</i>
Willow Brook Creek at Ely Rd	18.72	-0.28	-0.30	0.00	0.00	0.00	-0.08	-0.02	0.00	0.00	0.00
Denman Flat near Stony Pt Rd	12.10	-0.01	-0.01	-0.08	-0.06	0.00	0.00	0.00	0.00	0.00	0.00
Petaluma River at Corona Rd	17.74	-0.02	-0.03	-0.09	-0.06	0.00	0.00	0.00	0.00	0.00	0.00
Petaluma River at E Washington St	17.19	-0.25	-0.24	-0.12	-0.11	-0.09	-0.01	-0.01	0.00	-0.01	0.00

Location	Peak Velocity	Change in Peak Velocity									
		Detention Basin Scenario					Floodplain Modification Scenario				
		Willow Brook	Lichau	Marin	Liberty	Lynch	Willow Brook	Lichau	Marin	Liberty	Lynch
Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	
	<i>ft/s</i>	<i>ft/s</i>	<i>ft/s</i>	<i>ft/s</i>	<i>ft/s</i>	<i>ft/s</i>	<i>ft/s</i>	<i>ft/s</i>	<i>ft/s</i>	<i>ft/s</i>	<i>ft/s</i>
Willow Brook Creek at Ely Rd	8.50	0.02	0.03	0.00	0.00	0.00	0.03	0.01	0.00	0.00	0.00
Denman Flat near Stony Pt Rd	1.40	0.00	0.00	-0.02	-0.01	0.00	0.00	0.06	-0.04	-0.01	0.00
Petaluma River at Corona Rd	4.86	-0.03	-0.03	-0.09	-0.07	0.00	0.00	0.00	0.00	0.00	0.00
Petaluma River at E Washington St	6.49	-0.12	-0.11	-0.05	-0.05	-0.02	0.00	0.00	0.00	0.00	0.00



10-year Downstream Results Summary

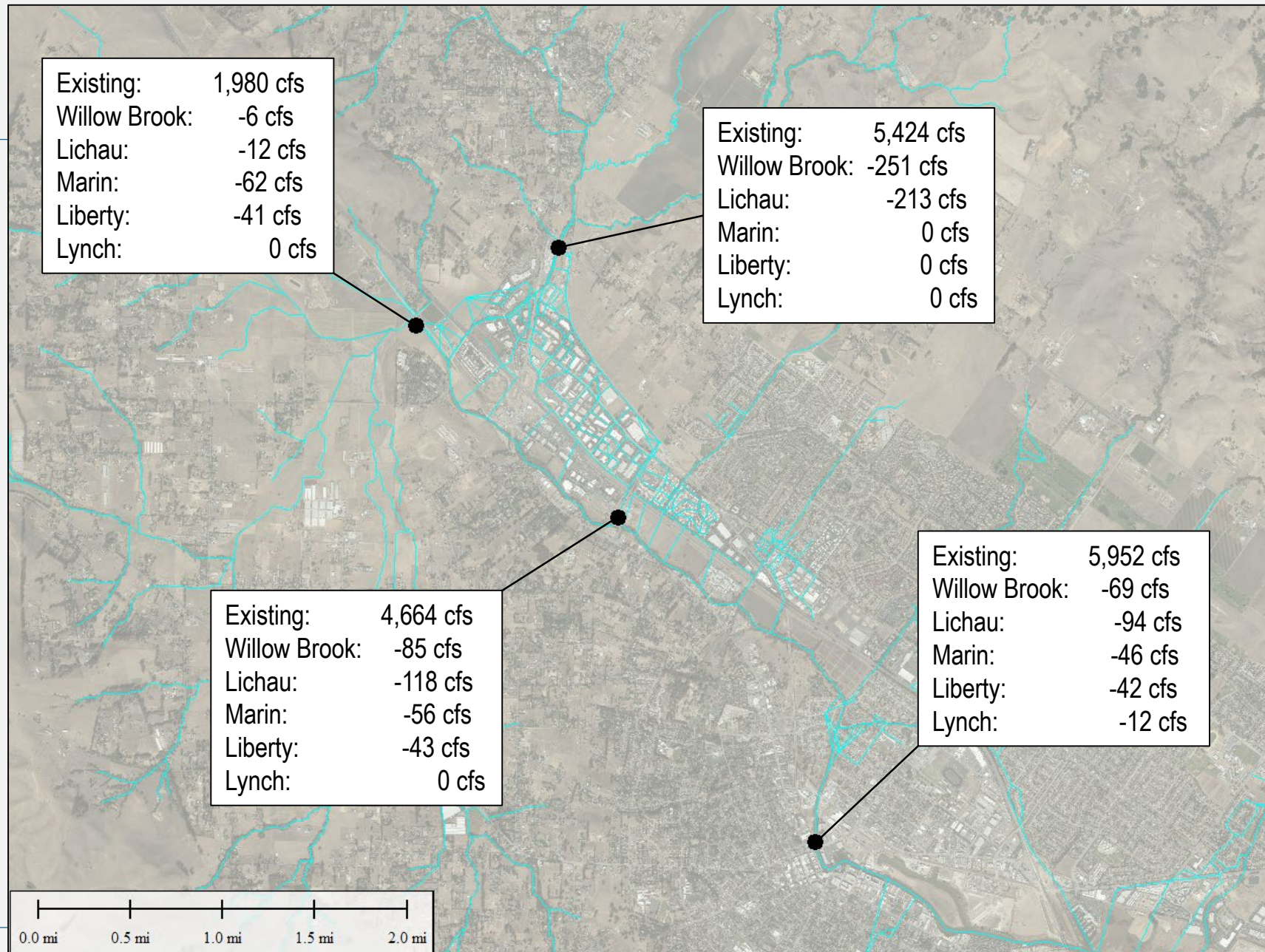
Location	Peak Flow Rate	Change in Peak Flow Rate									
		Detention Basin Scenario					Floodplain Modification Scenario				
		Willow Brook	Lichau	Marin	Liberty	Lynch	Willow Brook	Lichau	Marin	Liberty	Lynch
Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	
	<i>cfs</i>	<i>cfs</i>	<i>cfs</i>	<i>cfs</i>	<i>cfs</i>	<i>cfs</i>	<i>cfs</i>	<i>cfs</i>	<i>cfs</i>	<i>cfs</i>	
Willow Brook Creek at Ely Rd	5424	-251	-213	0	0	0	-155	-24	0	0	0
Denman Flat near Stony Pt Rd	1980	-6	-12	-62	-41	0	0	-5	2	0	0
Petaluma River at Corona Rd	4664	-85	-118	-56	-43	0	8	-14	-4	-3	-1
Petaluma River at E Washington St	5952	-69	-94	-46	-42	-12	1	-12	-5	-5	-2

Location	Peak WSE	Change in Peak Water Surface Elevation									
		Detention Basin Scenario					Floodplain Modification Scenario				
		Willow Brook	Lichau	Marin	Liberty	Lynch	Willow Brook	Lichau	Marin	Liberty	Lynch
Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	
	<i>ft</i>	<i>ft</i>	<i>ft</i>	<i>ft</i>	<i>ft</i>	<i>ft</i>	<i>ft</i>	<i>ft</i>	<i>ft</i>	<i>ft</i>	
Willow Brook Creek at Ely Rd	49.91	-0.21	-0.18	0.00	0.00	0.00	-0.13	-0.02	0.00	0.00	0.00
Denman Flat near Stony Pt Rd	39.07	-0.01	-0.01	-0.05	-0.03	0.00	0.00	0.00	0.00	0.00	0.00
Petaluma River at Corona Rd	28.66	-0.04	-0.06	-0.03	-0.02	0.00	0.00	-0.01	0.00	0.00	0.00
Petaluma River at E Washington St	8.66	0.00	0.00	0.00	0.00	-0.04	0.00	-0.01	0.00	0.00	0.00

Location	Peak Depth	Change in Peak Flood Depth									
		Detention Basin Scenario					Floodplain Modification Scenario				
		Willow Brook	Lichau	Marin	Liberty	Lynch	Willow Brook	Lichau	Marin	Liberty	Lynch
Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	
	<i>ft</i>	<i>ft</i>	<i>ft</i>	<i>ft</i>	<i>ft</i>	<i>ft</i>	<i>ft</i>	<i>ft</i>	<i>ft</i>	<i>ft</i>	
Willow Brook Creek at Ely Rd	16.10	-0.21	-0.18	0.00	0.00	0.00	-0.13	-0.02	0.00	0.00	0.00
Denman Flat near Stony Pt Rd	11.22	-0.01	-0.01	-0.05	-0.03	0.00	0.00	0.00	0.00	0.00	0.00
Petaluma River at Corona Rd	16.39	-0.04	-0.06	-0.03	-0.02	0.00	0.00	-0.01	0.00	0.00	0.00
Petaluma River at E Washington St	14.86	0.00	0.00	0.00	0.00	-0.04	0.00	-0.01	0.00	0.00	0.00

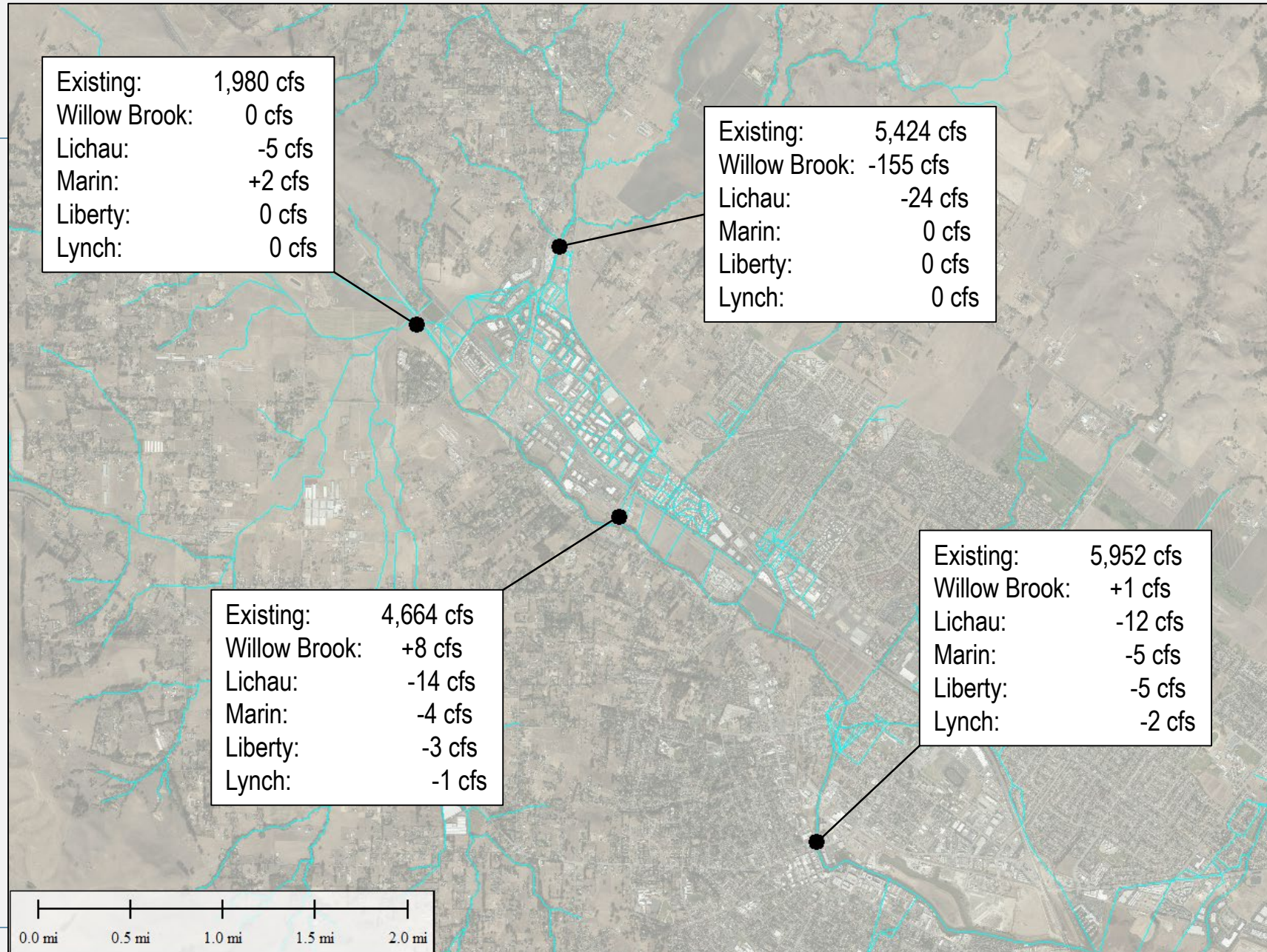
Location	Peak Velocity	Change in Peak Velocity									
		Detention Basin Scenario					Floodplain Modification Scenario				
		Willow Brook	Lichau	Marin	Liberty	Lynch	Willow Brook	Lichau	Marin	Liberty	Lynch
Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	Existing	
	<i>ft/s</i>	<i>ft/s</i>	<i>ft/s</i>	<i>ft/s</i>	<i>ft/s</i>	<i>ft/s</i>	<i>ft/s</i>	<i>ft/s</i>	<i>ft/s</i>	<i>ft/s</i>	
Willow Brook Creek at Ely Rd	7.48	-0.21	-0.18	0.00	0.00	0.00	-0.13	-0.02	0.00	0.00	0.00
Denman Flat near Stony Pt Rd	1.50	0.00	0.00	-0.01	-0.01	0.00	0.00	0.03	-0.02	0.00	0.00
Petaluma River at Corona Rd	3.69	-0.05	-0.07	-0.03	-0.02	0.00	0.00	-0.01	0.00	0.00	0.00
Petaluma River at E Washington St	4.79	-0.04	-0.06	-0.03	-0.03	-0.01	0.00	-0.01	-0.01	-0.01	-0.01

Detention Projects: Change in 10yr Peak Flow Rates

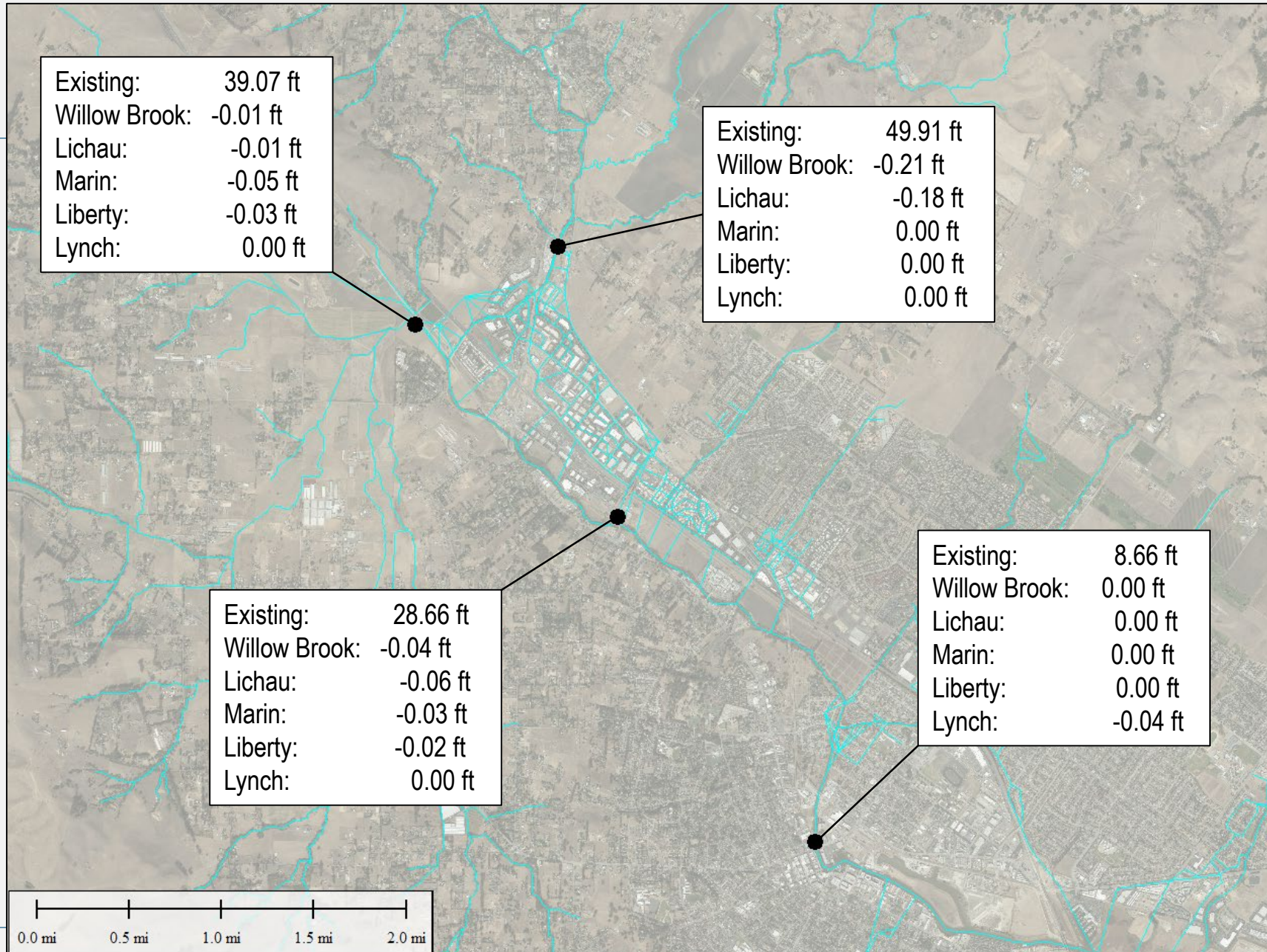




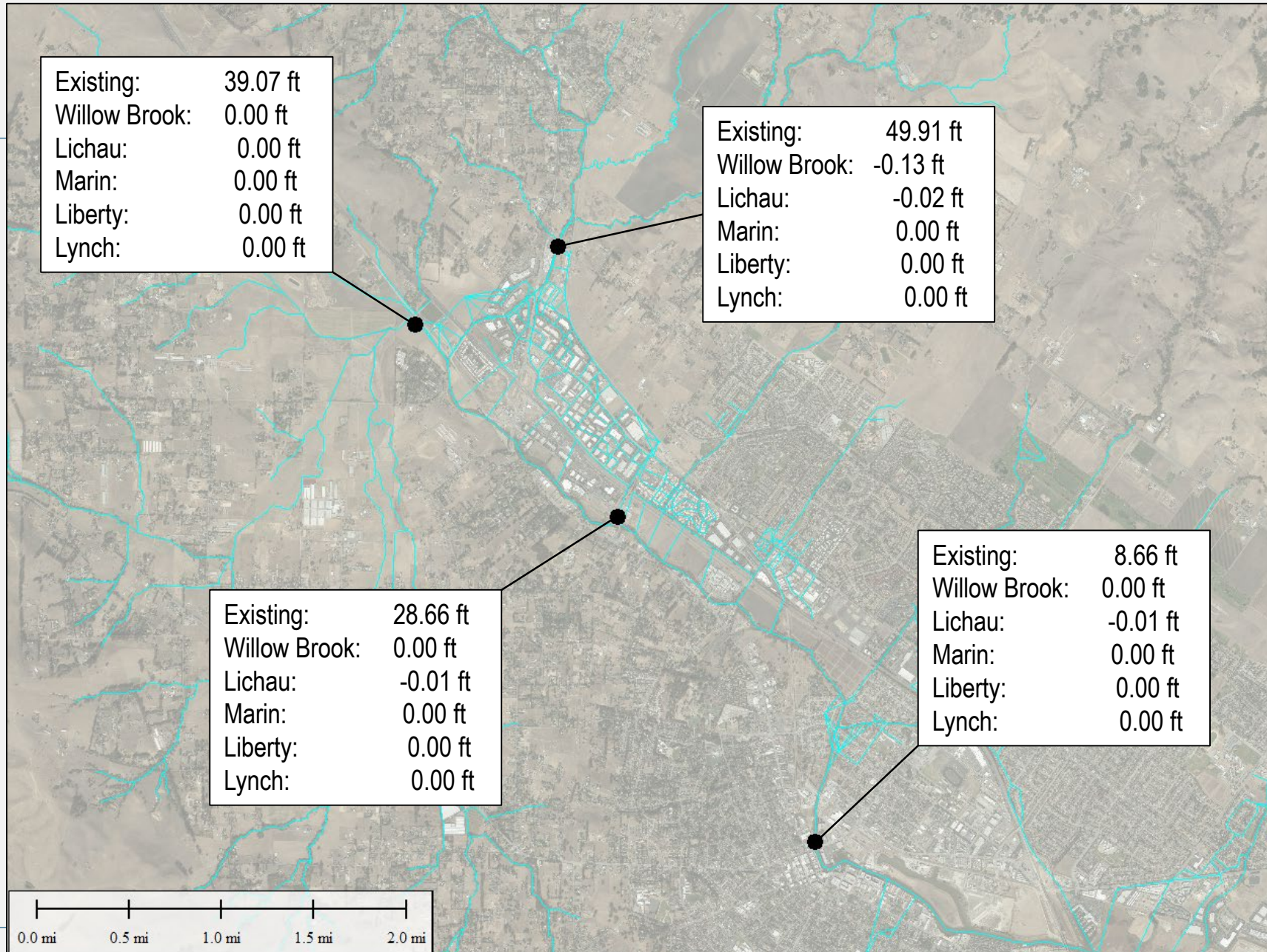
Floodplain Projects: Change in 10yr Peak Flow Rates



Detention Projects: Change in 10yr WSEs



Floodplain Projects: Change in 10yr WSEs





Willow Brook Localized Results Summary

100-year Flood

Location	Peak Flow Rate			Peak Water Surface Elevation			Peak Flood Depth			Peak Velocity		
	Existing <i>cfs</i>	Det <i>cfs</i>	FM <i>cfs</i>	Existing <i>ft</i>	Det <i>ft</i>	FM <i>ft</i>	Existing <i>ft</i>	Det <i>ft</i>	FM <i>ft</i>	Existing <i>ft/s</i>	Det <i>ft/s</i>	FM <i>ft/s</i>
Upstream	2,795	2,795	2,797	102.08	102.04	100.88	8.56	8.52	7.36	7.18	7.20	9.10
Downstream	2,502	1,721	2,203	81.85	81.35	81.68	6.69	6.19	6.52	7.96	7.45	7.79

10-year Flood

Location	Peak Flow Rate			Peak Water Surface Elevation			Peak Flood Depth			Peak Velocity		
	Existing <i>cfs</i>	Det <i>cfs</i>	FM <i>cfs</i>	Existing <i>ft</i>	Det <i>ft</i>	FM <i>ft</i>	Existing <i>ft</i>	Det <i>ft</i>	FM <i>ft</i>	Existing <i>ft/s</i>	Det <i>ft/s</i>	FM <i>ft/s</i>
Upstream	1,713	1,713	1,716	100.76	100.76	99.89	7.24	7.24	6.37	5.73	5.73	7.07
Downstream	1,631	1,369	1,496	81.25	80.96	81.07	6.09	5.80	5.91	7.37	7.08	7.24



Lichau Localized Results Summary

100-year Flood

Location	Peak Flow Rate			Peak Water Surface Elevation			Peak Flood Depth			Peak Velocity		
	Existing <i>cfs</i>	Det <i>cfs</i>	FM <i>cfs</i>	Existing <i>ft</i>	Det <i>ft</i>	FM <i>ft</i>	Existing <i>ft</i>	Det <i>ft</i>	FM <i>ft</i>	Existing <i>ft/s</i>	Det <i>ft/s</i>	FM <i>ft/s</i>
Upstream	4,213	4,210	4,214	78.28	78.28	78.22	12.73	12.73	12.67	9.36	9.37	12.64
Downstream	4,331	3,824	4,285	63.49	63.27	63.45	10.69	10.47	10.65	7.52	7.30	7.48

10-year Flood

Location	Peak Flow Rate			Peak Water Surface Elevation			Peak Flood Depth			Peak Velocity		
	Existing <i>cfs</i>	Det <i>cfs</i>	FM <i>cfs</i>	Existing <i>ft</i>	Det <i>ft</i>	FM <i>ft</i>	Existing <i>ft</i>	Det <i>ft</i>	FM <i>ft</i>	Existing <i>ft/s</i>	Det <i>ft/s</i>	FM <i>ft/s</i>
Upstream	2,889	2,889	2,894	77.57	77.56	77.40	12.02	12.01	11.85	9.09	9.10	12.49
Downstream	2,970	2,735	2,958	62.93	62.83	62.92	10.13	10.03	10.12	6.99	6.88	6.98



Marin Localized Results Summary

100-year Flood

Location	Peak Flow Rate			Peak Water Surface Elevation			Peak Flood Depth			Peak Velocity		
	Existing <i>cfs</i>	Det <i>cfs</i>	FM <i>cfs</i>	Existing <i>ft</i>	Det <i>ft</i>	FM <i>ft</i>	Existing <i>ft</i>	Det <i>ft</i>	FM <i>ft</i>	Existing <i>ft/s</i>	Det <i>ft/s</i>	FM <i>ft/s</i>
Upstream	1,568	1,568	1,570	50.97	50.96	50.66	4.03	4.02	3.72	3.52	3.55	4.49
Downstream	2,295	1,920	2,283	46.29	46.07	46.29	4.73	4.51	4.73	3.47	3.29	3.53

10-year Flood

Location	Peak Flow Rate			Peak Water Surface Elevation			Peak Flood Depth			Peak Velocity		
	Existing <i>cfs</i>	Det <i>cfs</i>	FM <i>cfs</i>	Existing <i>ft</i>	Det <i>ft</i>	FM <i>ft</i>	Existing <i>ft</i>	Det <i>ft</i>	FM <i>ft</i>	Existing <i>ft/s</i>	Det <i>ft/s</i>	FM <i>ft/s</i>
Upstream	950	950	951	50.48	50.48	50.16	3.54	3.54	3.22	3.19	3.21	3.97
Downstream	1,302	1,106	1,291	45.65	45.49	45.65	4.09	3.93	4.09	2.95	2.78	2.99



Liberty Localized Results Summary

100-year Flood

Location	Peak Flow Rate			Peak Water Surface Elevation			Peak Flood Depth			Peak Velocity		
	Existing <i>cfs</i>	Det <i>cfs</i>	FM <i>cfs</i>	Existing <i>ft</i>	Det <i>ft</i>	FM <i>ft</i>	Existing <i>ft</i>	Det <i>ft</i>	FM <i>ft</i>	Existing <i>ft/s</i>	Det <i>ft/s</i>	FM <i>ft/s</i>
Upstream	436	436	435	82.46	82.46	82.31	4.11	4.11	3.96	3.97	3.97	4.41
Downstream	541	126	488	52.81	52.12	52.75	2.78	2.09	2.72	2.23	1.40	2.16

10-year Flood

Location	Peak Flow Rate			Peak Water Surface Elevation			Peak Flood Depth			Peak Velocity		
	Existing <i>cfs</i>	Det <i>cfs</i>	FM <i>cfs</i>	Existing <i>ft</i>	Det <i>ft</i>	FM <i>ft</i>	Existing <i>ft</i>	Det <i>ft</i>	FM <i>ft</i>	Existing <i>ft/s</i>	Det <i>ft/s</i>	FM <i>ft/s</i>
Upstream	202	202	202	81.97	81.97	81.73	3.62	3.62	3.38	3.02	3.02	3.56
Downstream	244	101	206	52.46	52.03	52.40	2.43	2.00	2.37	1.96	1.21	1.86



Lynch Localized Results Summary

100-year Flood

Location	Peak Flow Rate			Peak Water Surface Elevation			Peak Flood Depth			Peak Velocity		
	Existing <i>cfs</i>	Det <i>cfs</i>	FM <i>cfs</i>	Existing <i>ft</i>	Det <i>ft</i>	FM <i>ft</i>	Existing <i>ft</i>	Det <i>ft</i>	FM <i>ft</i>	Existing <i>ft/s</i>	Det <i>ft/s</i>	FM <i>ft/s</i>
Upstream	2,109	2,114	2,109	125.67	125.67	125.67	6.04	6.04	6.04	8.83	8.83	8.83
Downstream	1,801	1,223	1,782	62.83	61.19	62.81	11.23	9.59	11.20	3.17	3.17	3.31

10-year Flood

Location	Peak Flow Rate			Peak Water Surface Elevation			Peak Flood Depth			Peak Velocity		
	Existing <i>cfs</i>	Det <i>cfs</i>	FM <i>cfs</i>	Existing <i>ft</i>	Det <i>ft</i>	FM <i>ft</i>	Existing <i>ft</i>	Det <i>ft</i>	FM <i>ft</i>	Existing <i>ft/s</i>	Det <i>ft/s</i>	FM <i>ft/s</i>
Upstream	1,266	1,266	1,266	125.26	125.29	125.26	5.63	5.66	5.63	8.84	8.83	8.83
Downstream	808	677	810	59.07	58.39	59.08	7.46	6.79	7.47	3.16	3.18	3.32