



City-Wide Flooding and Community Flood & Storm Protection Initiative

June 2023

OBJECTIVES

- 1 Provide overview of the City's stormwater system
- 2 Review preliminary findings by Schaaf & Wheeler on New Year's Eve flooding
- 3 Discuss Community Storm and Flood Protection Initiative
- 4 Listen to community concerns

Background

Watersheds



Population

105,000



Area

12 sq. mi.
land

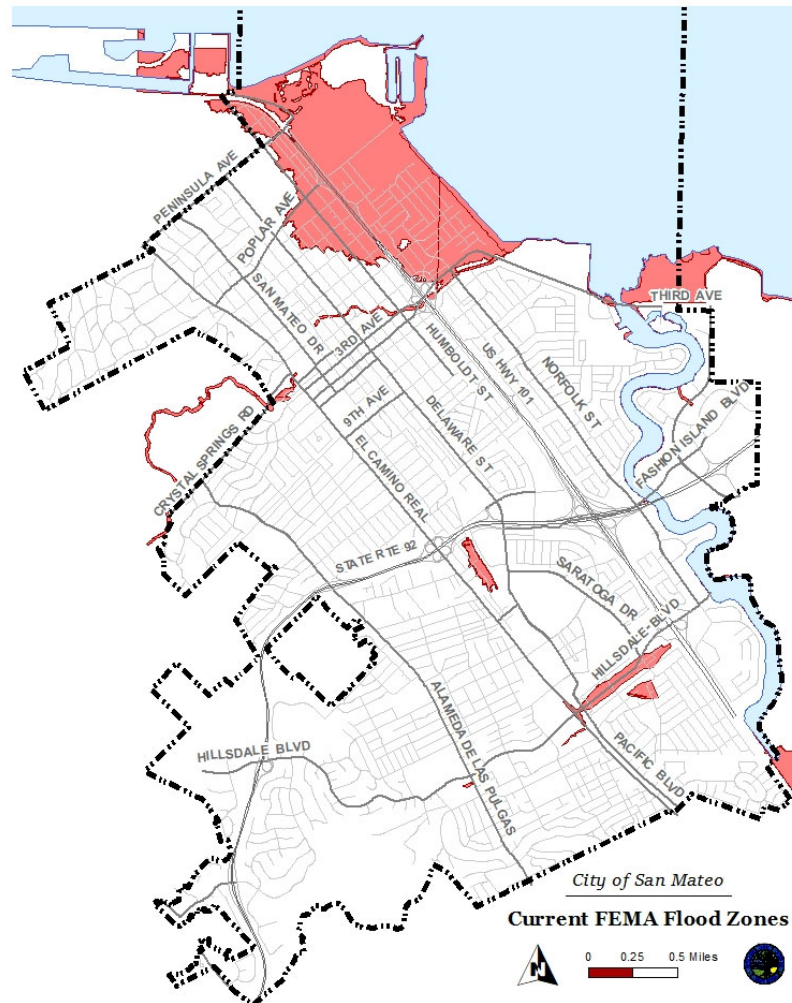


Seven major watersheds

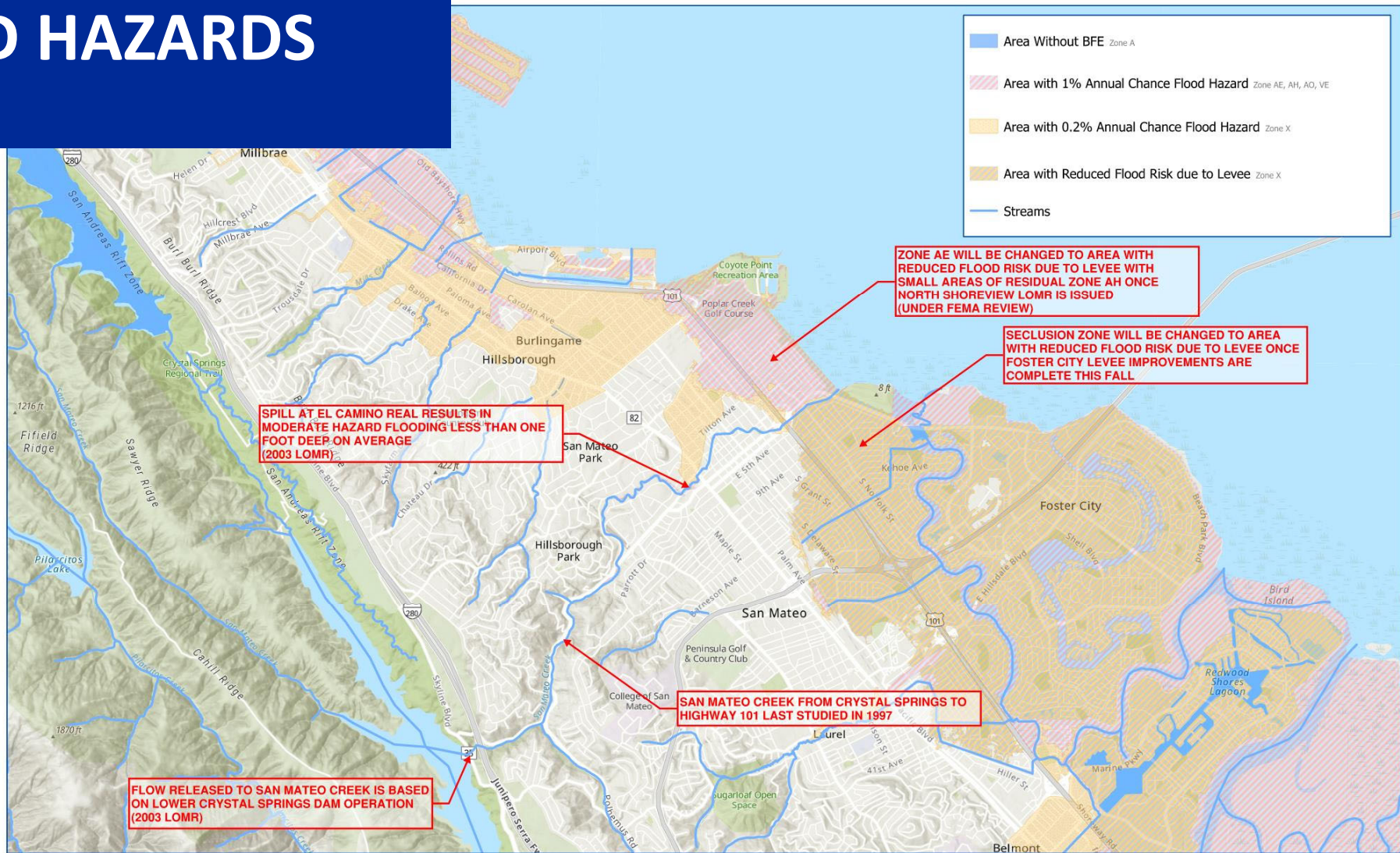
- North Shoreview District
- San Mateo Creek
- East Third Avenue
- 16th Avenue
- 19th Avenue
- Laurel Creek
- Direct drainage to Marina Lagoon



FEMA 100 Year Flood Zones



FLOOD HAZARDS



Stormwater System

Our stormwater system is comprised of:



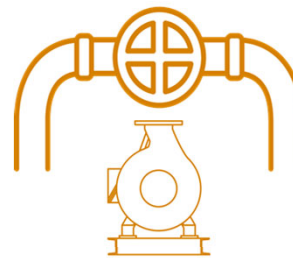
130 miles
of storm drains



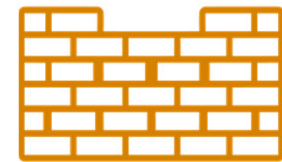
20 miles
open creeks &
drainage channels



1
flood control
lagoon
(Marina Lagoon)



10
pump stations



3-mile
Bayfront levee

Our stormwater system was built in the middle of the 20th century and is **aged** and **degraded**.

Pump Stations and Trash Racks



City of San Mateo
Public Works Department

Storm Pump Stations with Backup Power

Storm Pump Stations
Backup Power?

Yes
No

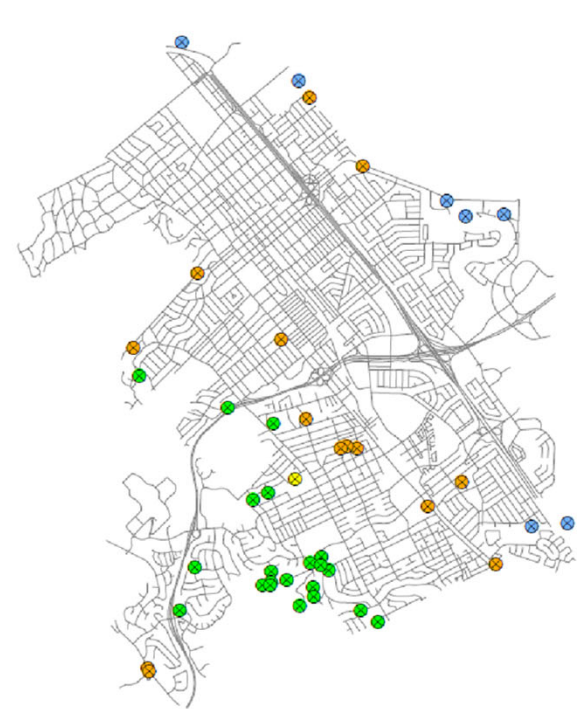


City of San Mateo
Public Works Department

Sewer Pump Stations with Backup Power

Sewer Pump Stations
Backup Power?

Yes
No



City of San Mateo
Public Works Department

Trash Rack Storm Maintenance

Trash Racks
Maintained By:

SEWER/STREET
PUMPS
SEWER
STREET



37 Pump Stations, 3 Pump Mechanics, 1 Laborer

CITY OF SAN MATEO

San Mateo Levees





A Closer Look

The Marina Lagoon System

Inflow:

- O'Neill Tide Gate (south end)
- Creeks/Channels
 - Laurel Creek
 - 19th Avenue Channel/Borel Creek
 - 16th Avenue Channel/Leslie Creek
- Direct Marina Lagoon Drainage
- Fill Pump (north end)
 - 1 – 75,000 gallons per minute (gpm) pump

Outflow:

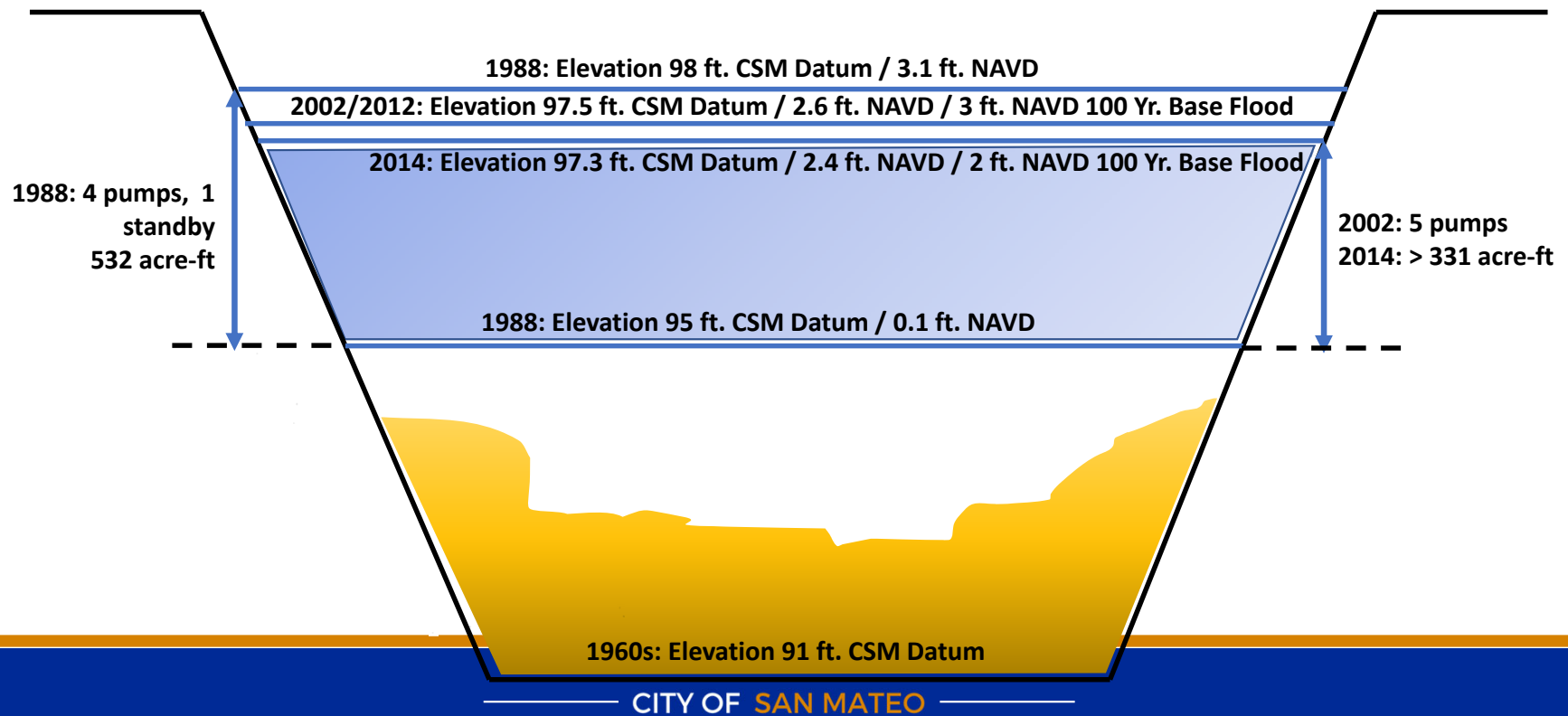
- Discharge Pumps
 - 5 – 150,000 gpm pumps

MARINA LAGOON PUMPS



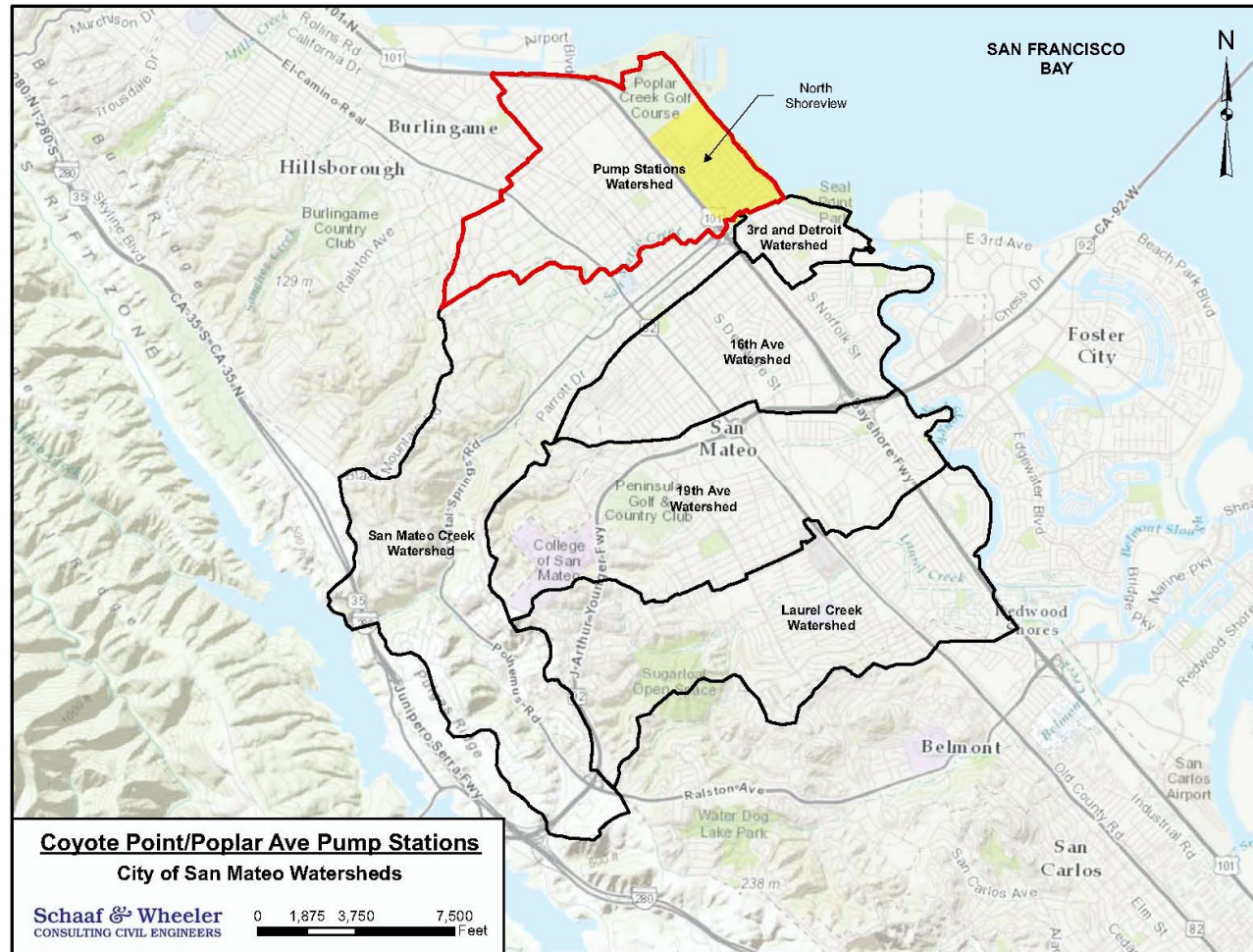
PUMP OPERATION

Volume



North Shoreview Improvements

- North Shoreview / Central – in 100-year flood zone
- Pump stations deficiencies and lower levee height
- Major replacements at two pump station sites
- Raised 1,300 feet of levee
- Project Duration: 2 years, 7 months
- Funding: Measure S and formation of an assessment

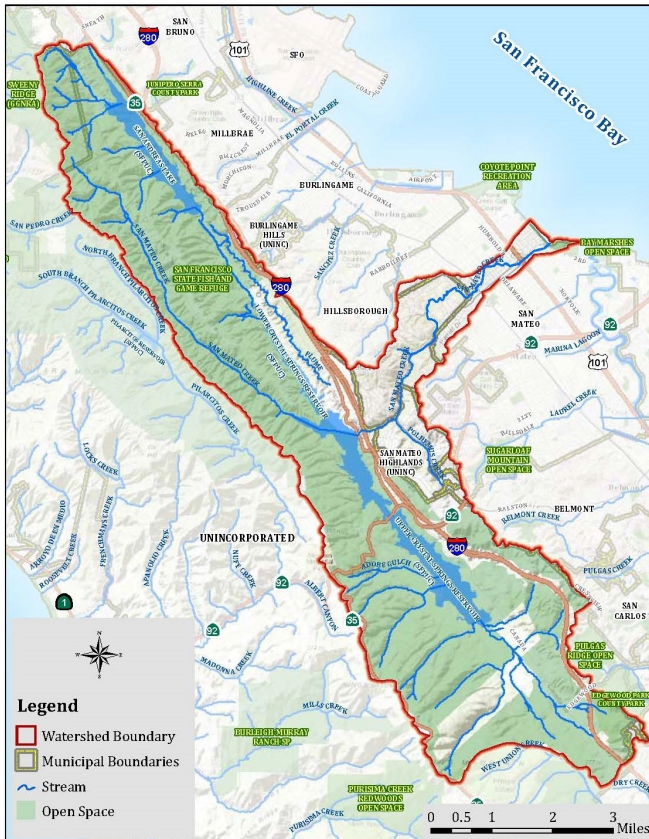


San Mateo Creek



San Mateo Creek Crystal Springs Reservoir

- Coordination with the San Francisco Public Utilities Commission
- Reservoir releases during no rain



Wet Weather Preparation

- **Pump Crew:**
 - 27 sanitary sewer pump stations
 - 11 storm water pump stations
 - 3 Mechanics + 1 Laborer
- **Sewer Crew:**
 - Sewers, catch basins, trash tracks
- **Streets Crew:**
 - Potholes, catch basins, trash racks
 - 24/7 public sandbag station
- **24/7 Wastewater treatment plant**
- **Staff on standby for wet weather events, after-hours**

———— CITY OF **SAN MATEO** ————



System Deficiencies

Undersized Infrastructure

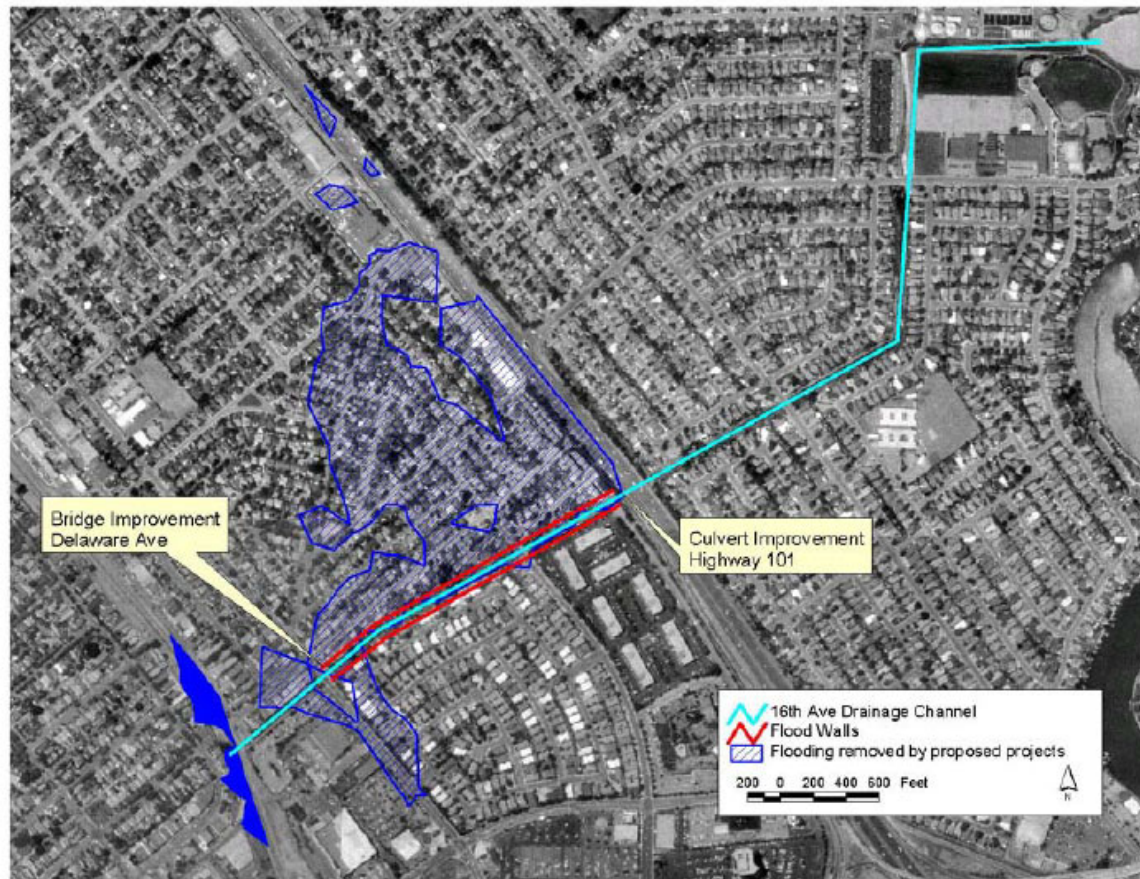


Figure 5-2: Recommended 16th Avenue Drain Projects (Flood hazard reduction in blue.)

System Deficiencies

Undersized Infrastructure

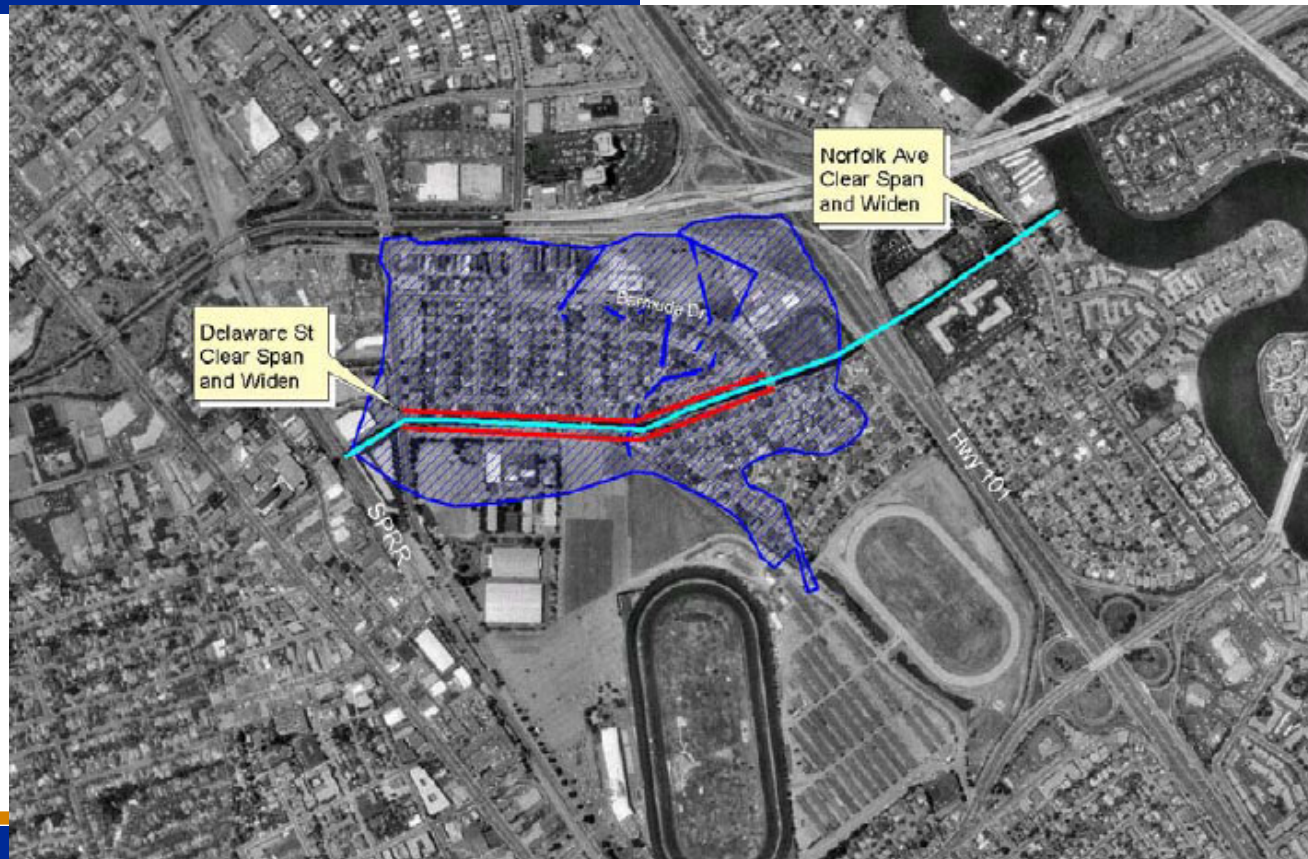


Figure 5-3: Recommended 19th Avenue Drain Projects (Flood hazard reduction in blue.)

System Deficiencies

Undersized Infrastructure

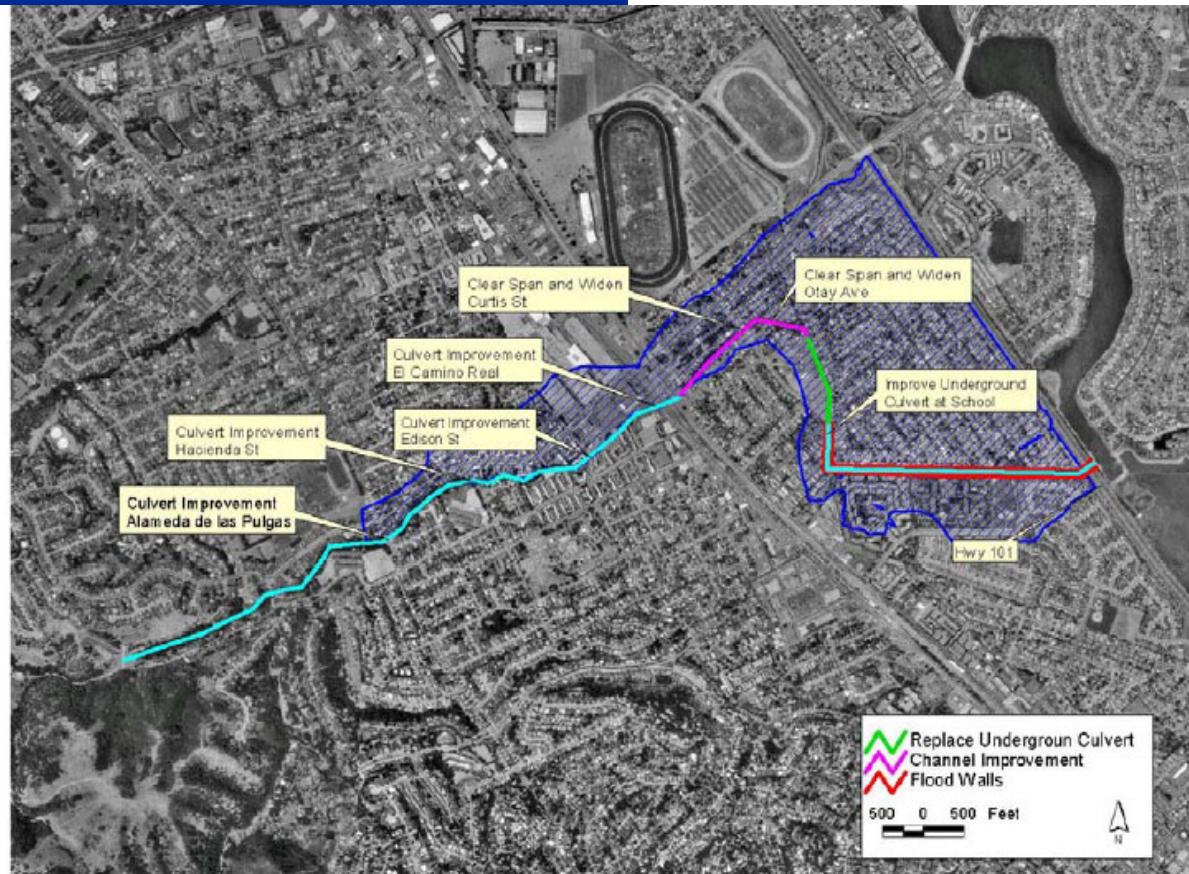
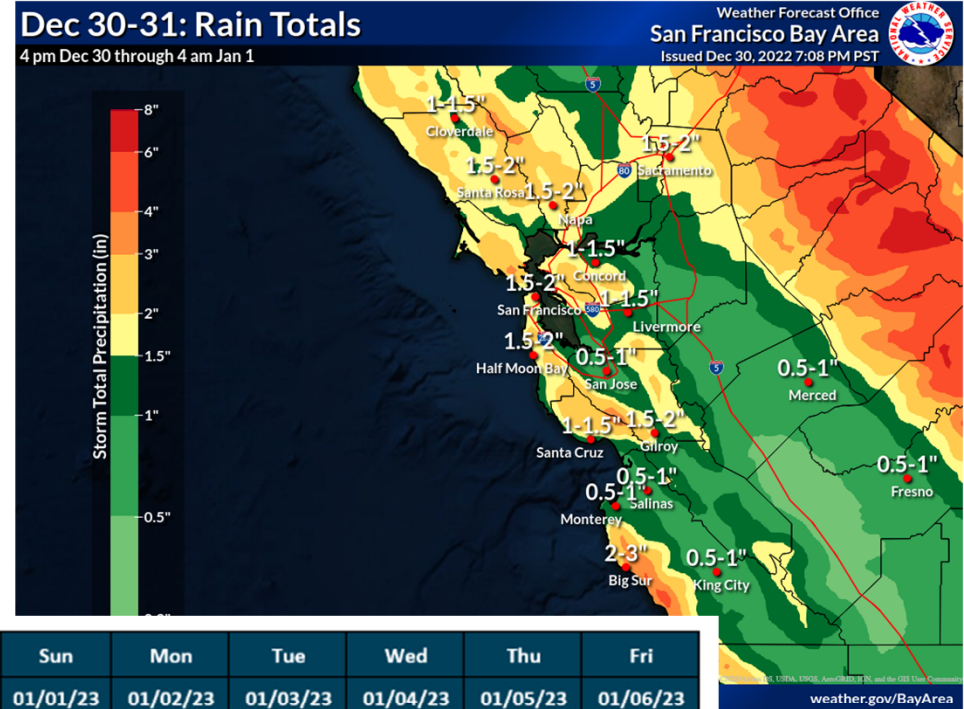


Figure 5-4: Recommended Laurel Creek Improvements (Flood hazard reduction in blue.)

NEW YEAR'S EVE

Weather Patterns



						Fri		Sat		Sun		Mon		Tue		Wed		Thu		Fri	
						12/30/22		12/31/22		01/01/23		01/02/23		01/03/23		01/04/23		01/05/23		01/06/23	
Rain Station	12/25/22	12/26/22	12/27/22	12/28/22	12/29/22	%	Amt	%	Amt	%	Amt	%	Amt	%	Amt	%	Amt	%	Amt	%	Amt
San Mateo WWTP - AU221	0.000	0.190	0.260	0.000	0.260	95%	0.43	95%	0.95	0%	0.00	95%	0.41	70%	0.39	90%	1.81	70%	1.15	50%	0.16
San Mateo WWTP - AU981	0.000	0.220	0.420	0.020	0.310	95%	0.43	95%	0.95	0%	0.00	95%	0.41	70%	0.39	90%	1.81	70%	1.15	50%	0.16
San Mateo WWTP - C4751	0.000	0.150	0.350	0.000	0.330	95%	0.43	95%	0.95	0%	0.00	95%	0.41	70%	0.39	90%	1.81	70%	1.15	50%	0.16
San Mateo WWTP - E4076	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	95%	0.43	95%	0.95	0%	0.00	95%	0.41	70%	0.39	90%	1.81	70%	1.15	50%	0.16
San Mateo WWTP - KSFO	0.000	0.220	0.190	0.000	0.298	95%	0.43	95%	0.95	0%	0.00	95%	0.41	70%	0.39	90%	1.81	70%	1.15	50%	0.16

If 50% or greater chance of rain, cell is highlighted in yellow.

If previous day's actual precipitation is greater than 0.00", cell is highlighted in orange.

A value of *0.00* indicates that no data were available and the assumed rainfall is 0.00".

CITY OF SAN MATEO



Conditions Experienced After Storms in the City

The background of the slide is a dark blue topographic map with intricate white contour lines. A white rectangular border frames the central text area.

Schaaf & Wheeler

CONSULTING CIVIL ENGINEERS

Marina Lagoon – New Years Eve 2022
Hydrologic/Hydraulic Analysis

Topics

Modeling Overview

Rainfall

NYE Event Rainfall

Comparison to Design Rainfall

Runoff

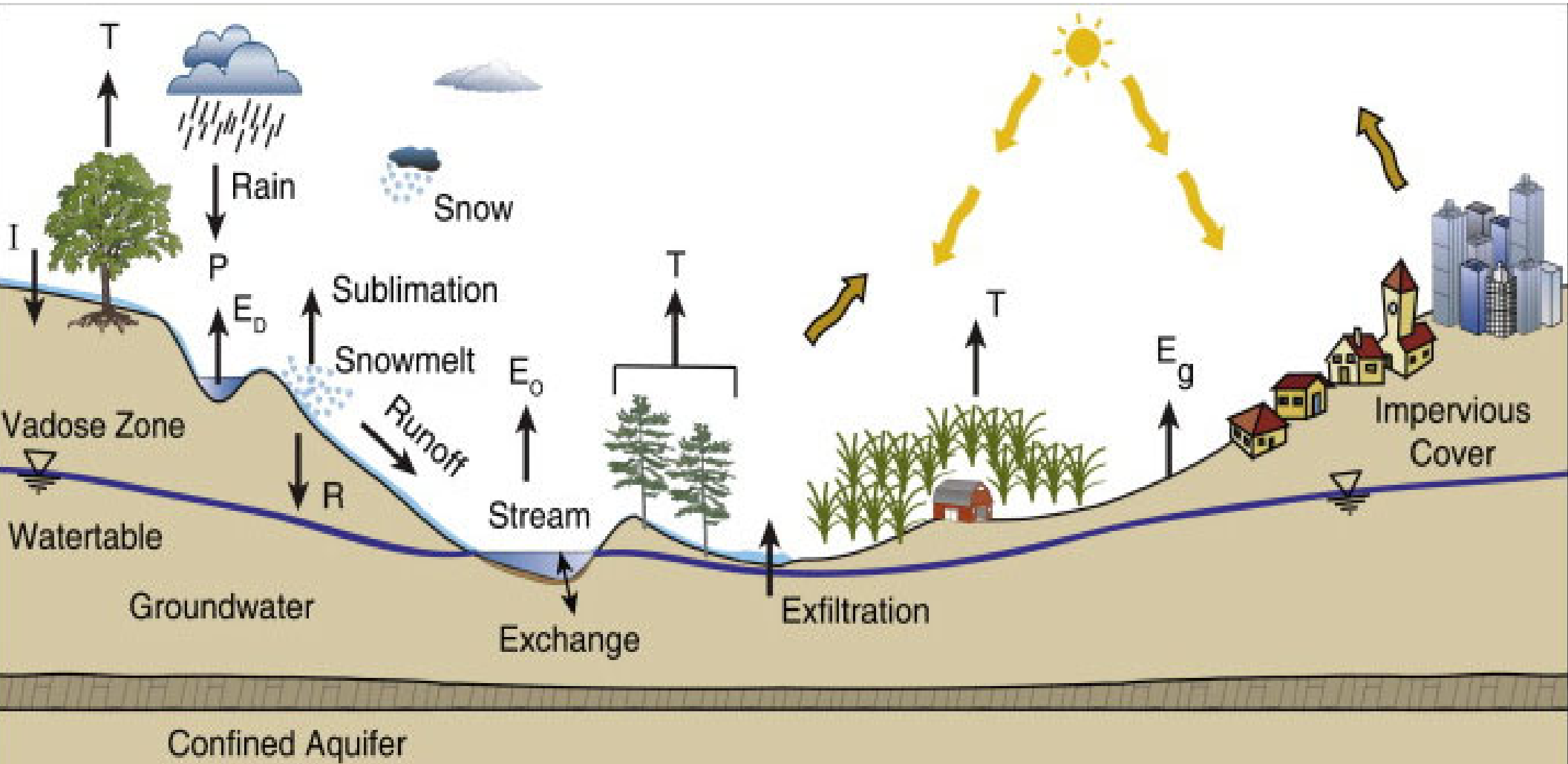
Marina Lagoon Watershed

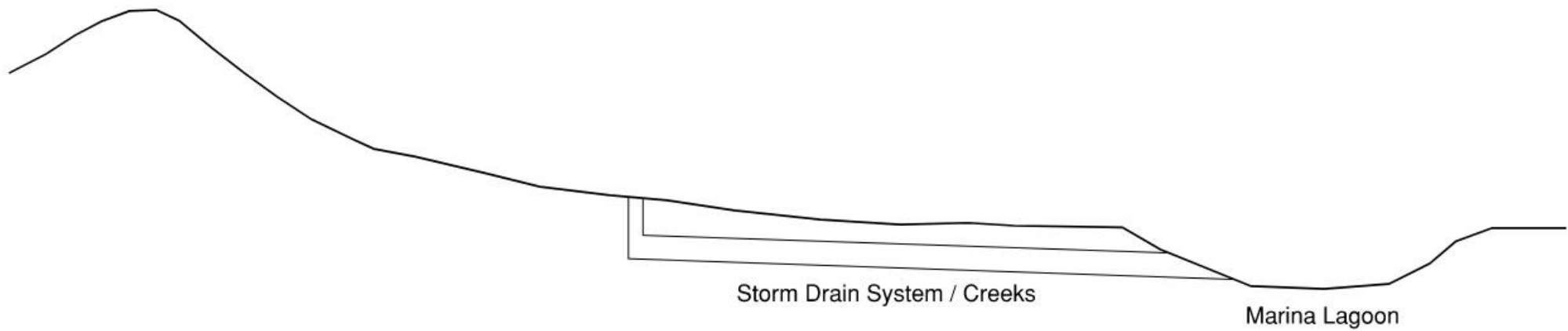
Pump Station Operation

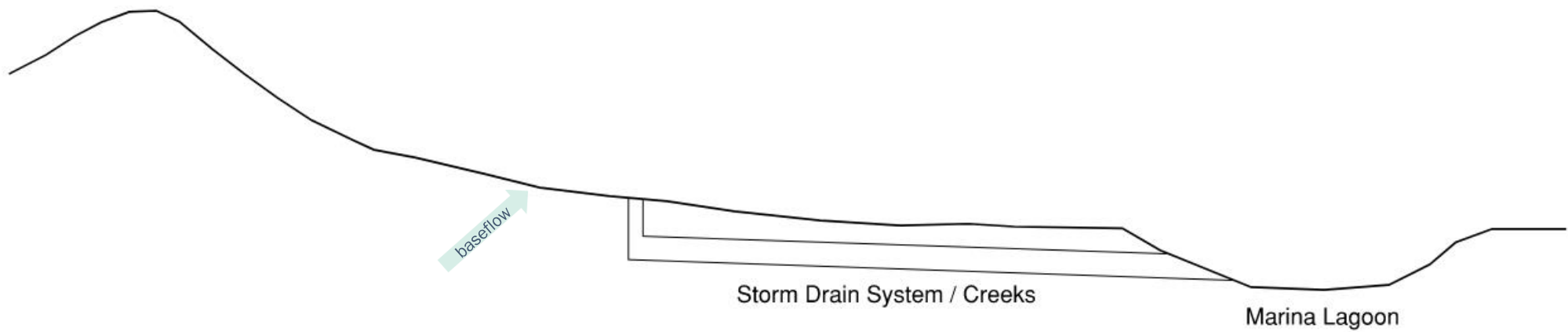
Verification using NYE Observations

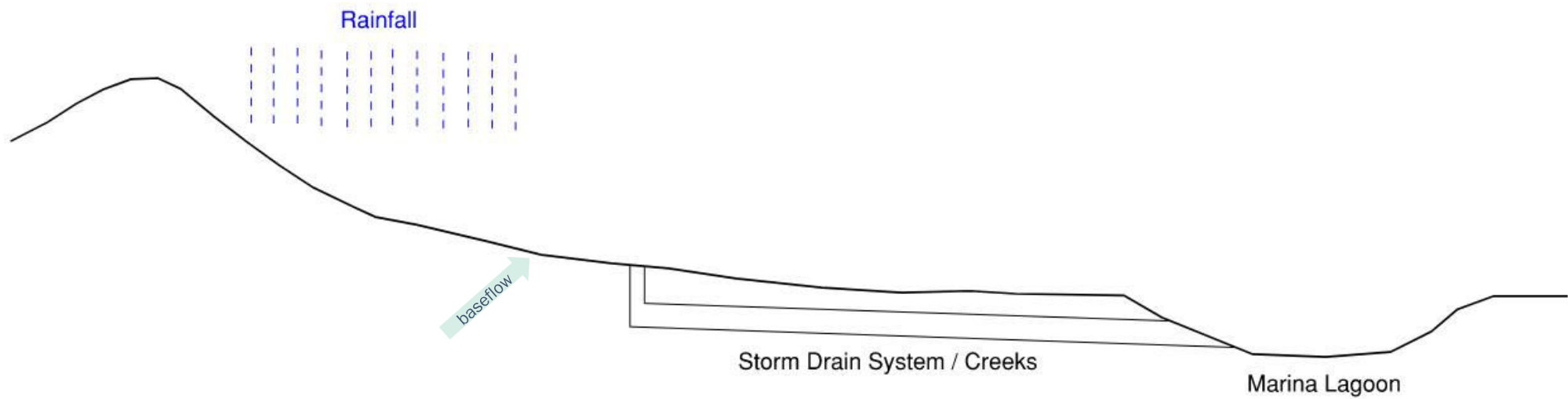
Results and Findings

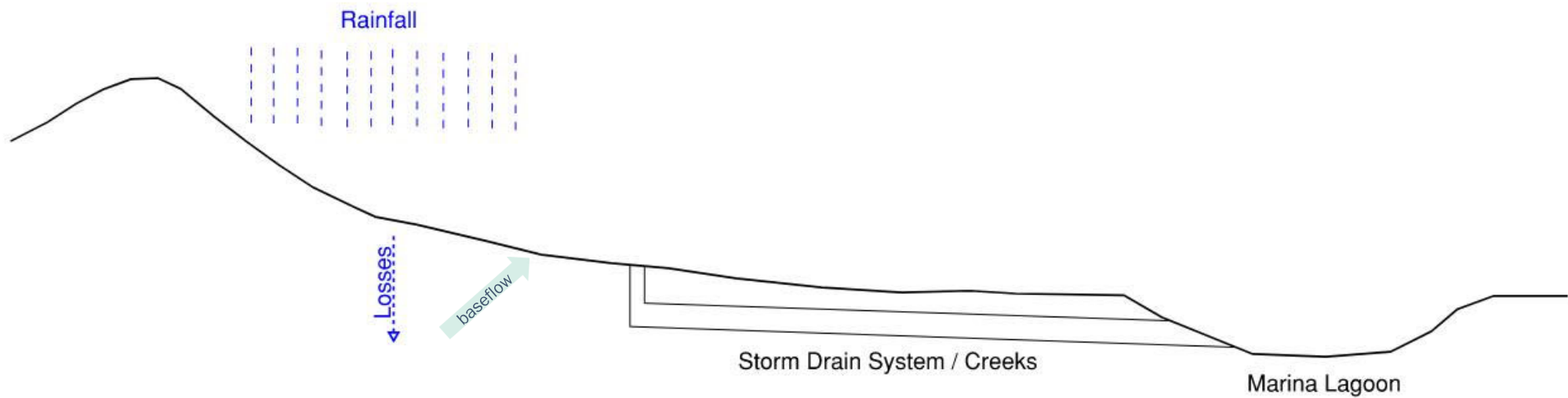
Model Scenarios

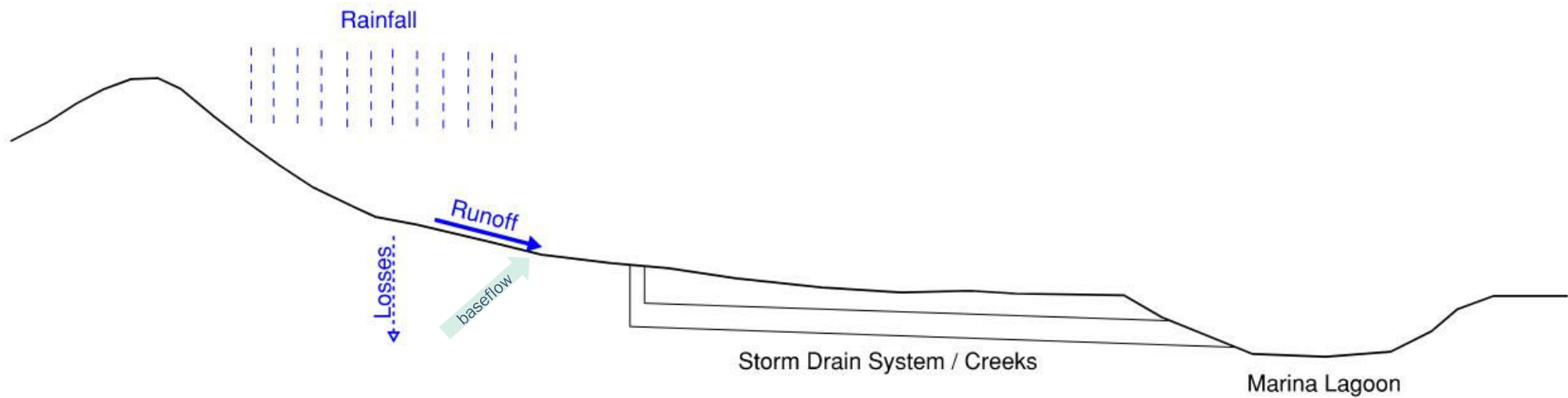


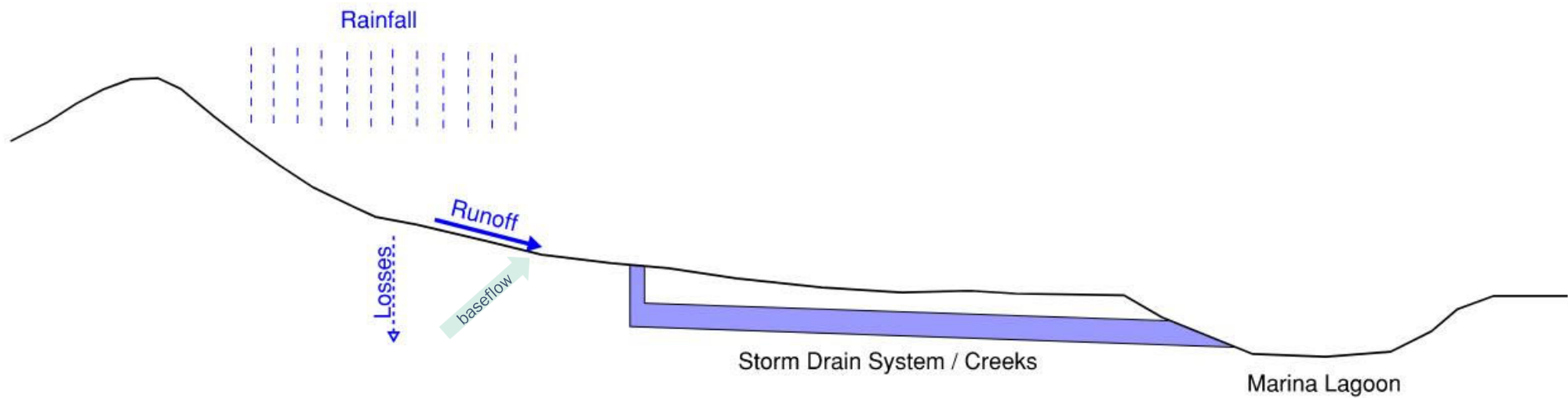


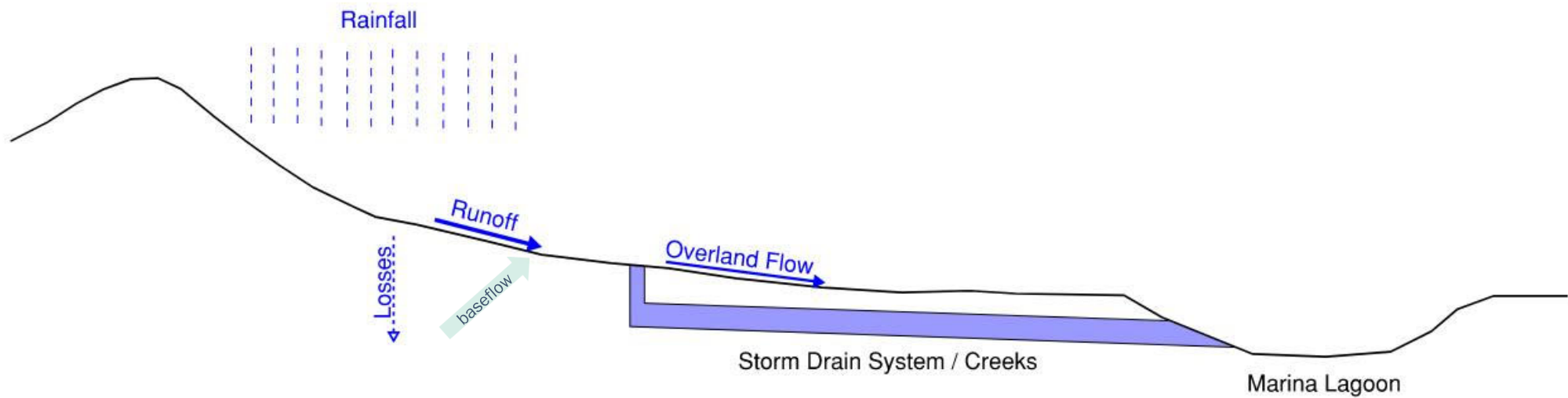


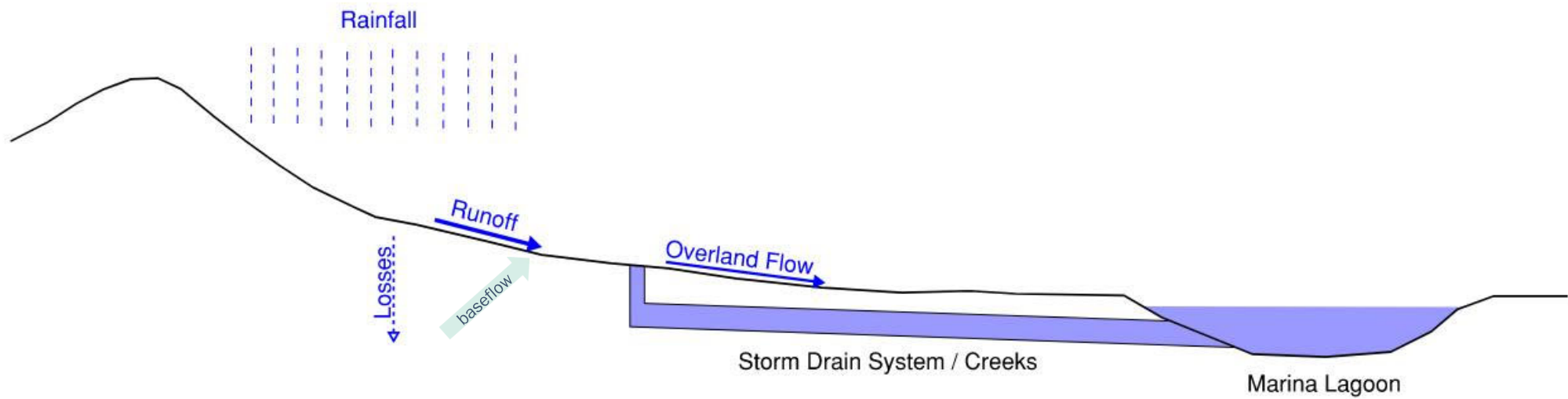


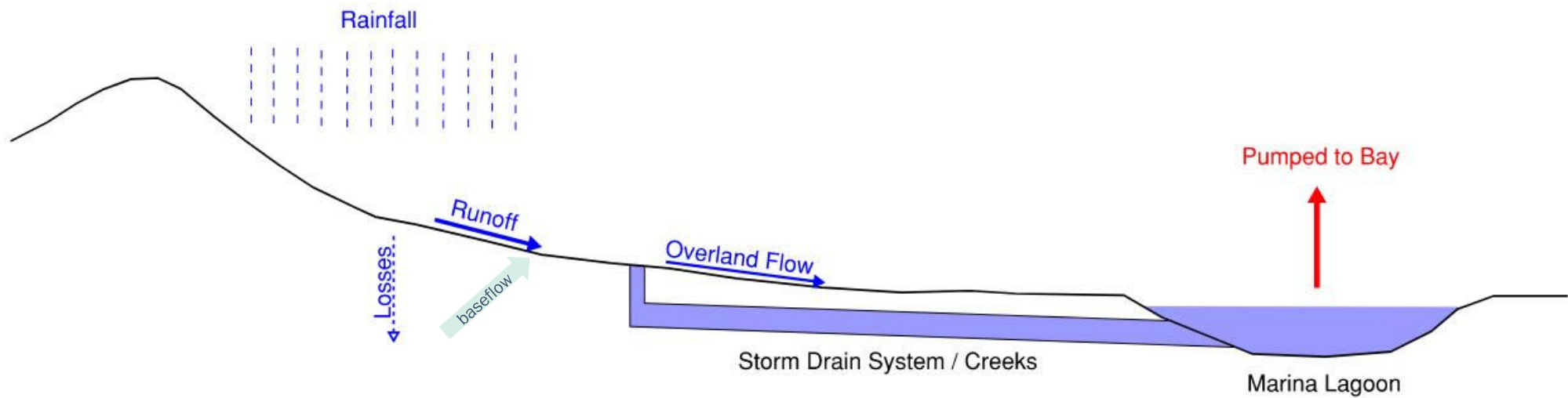


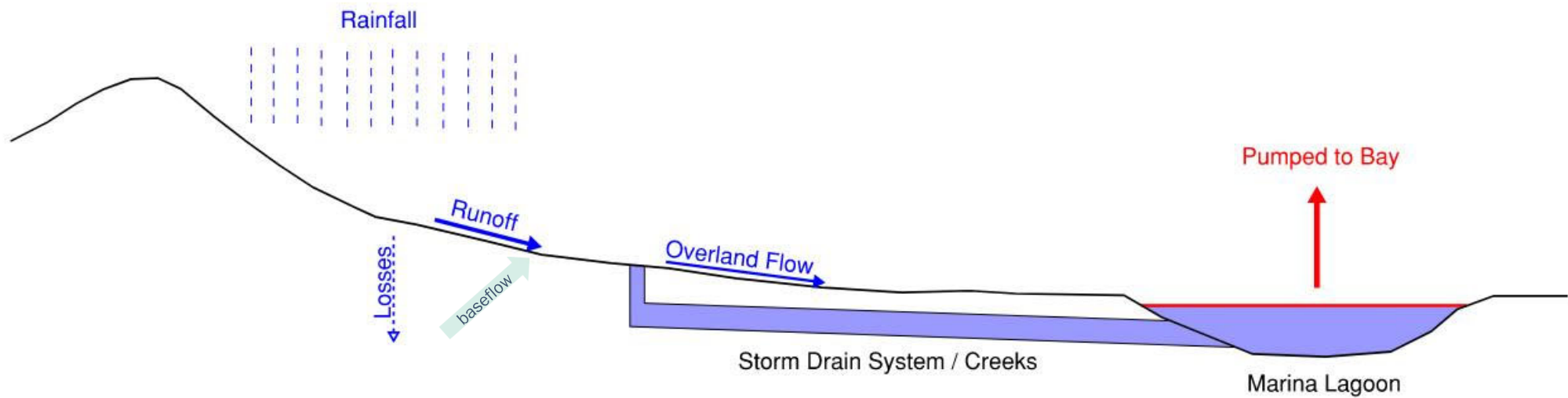


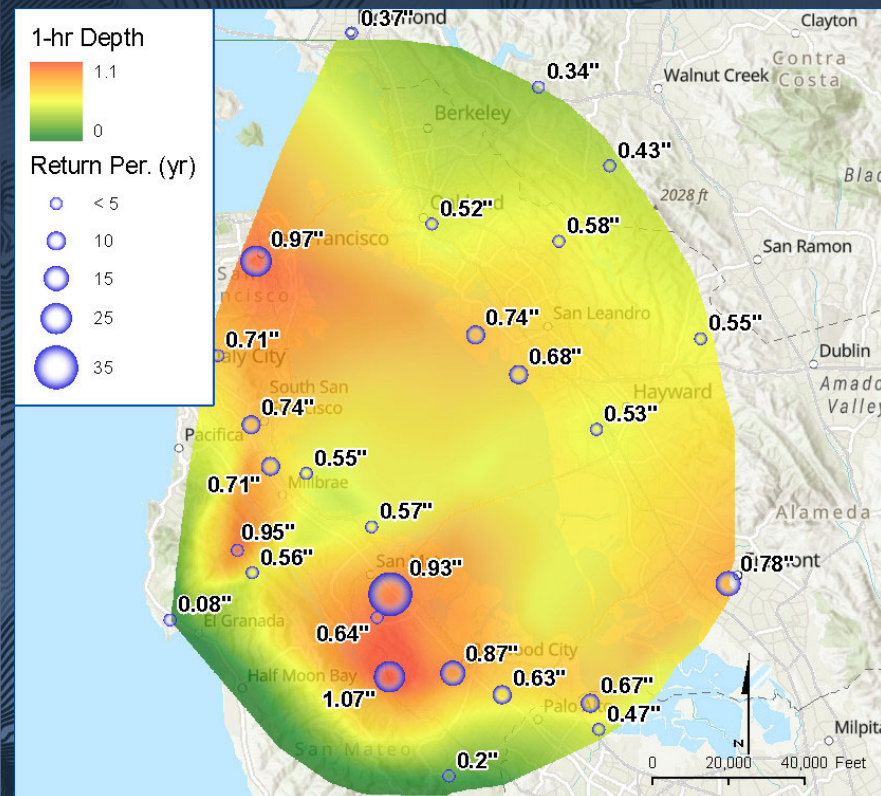










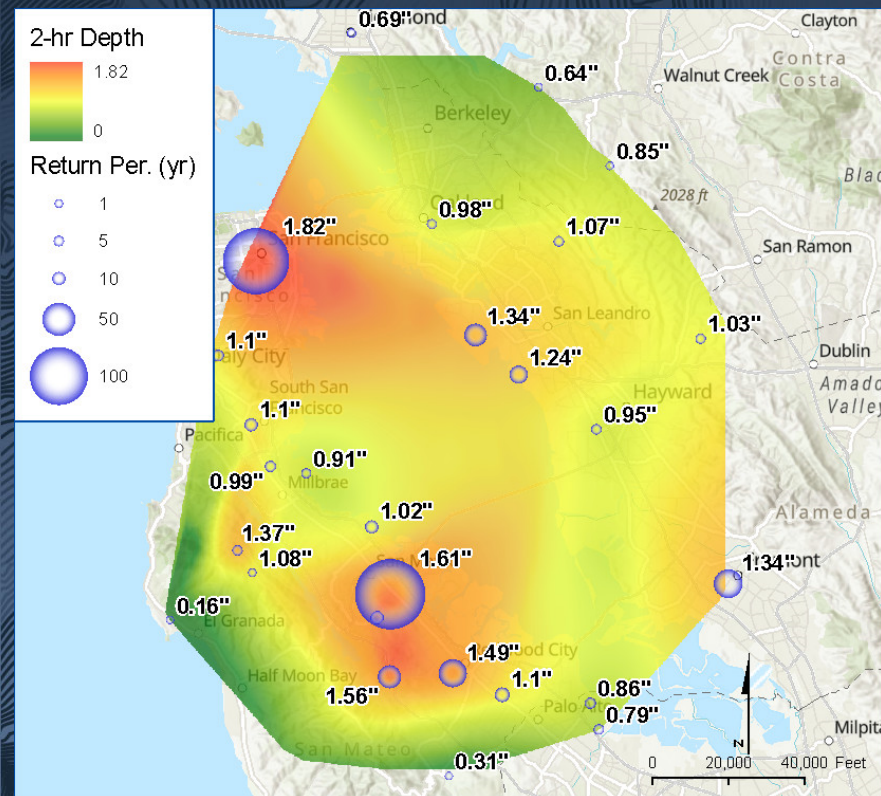


San Mateo, particularly south of Highway 92 and northeast of Interstate 280, had some of the heaviest local rainfall totals during the NYE 2022 storm event.

1-hour

Schaaf & Wheeler
Consulting Civil Engineers

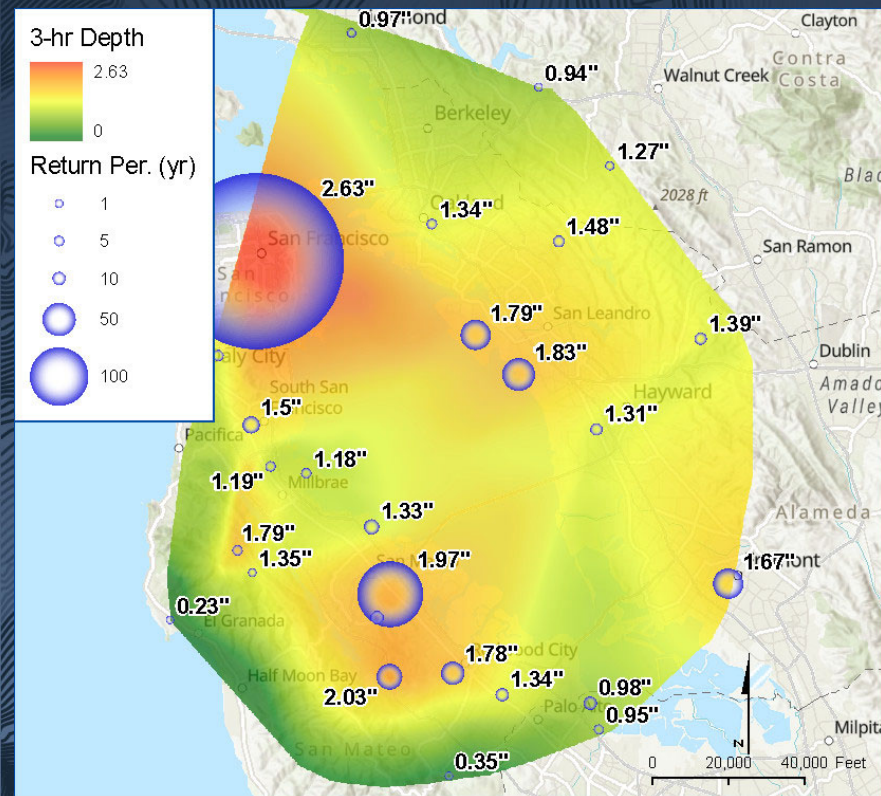
Rainfall



San Mateo, particularly south of Highway 92 and northeast of Interstate 280, had some of the heaviest local rainfall totals during the NYE 2022 storm event.

2-hour

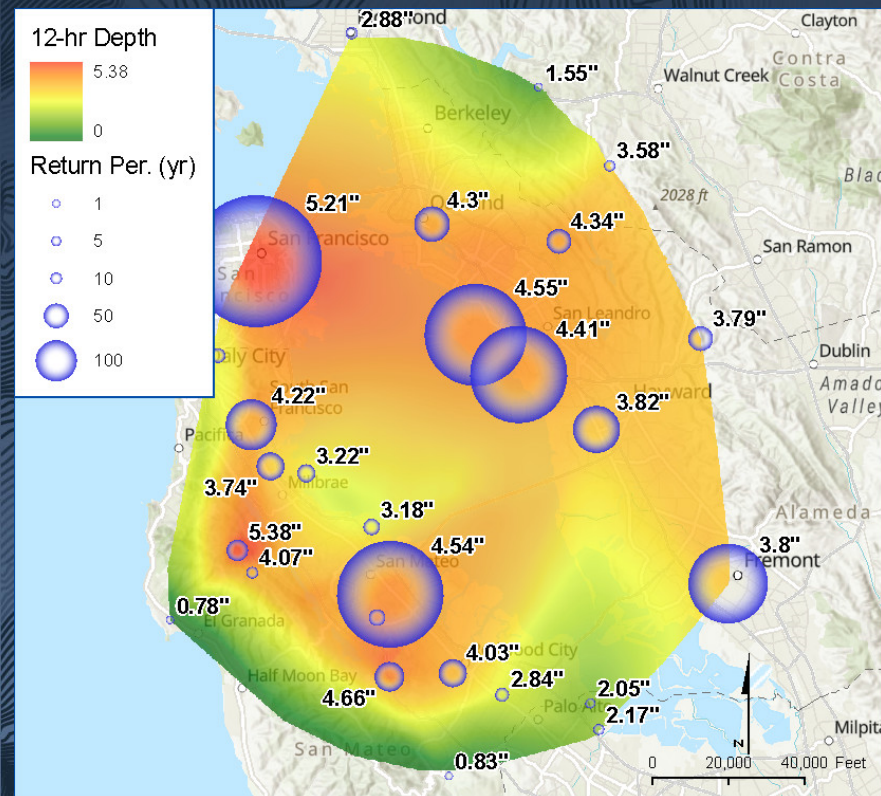
Rainfall



San Mateo, particularly south of Highway 92 and northeast of Interstate 280, had some of the heaviest local rainfall totals during the NYE 2022 storm event.

3-hour

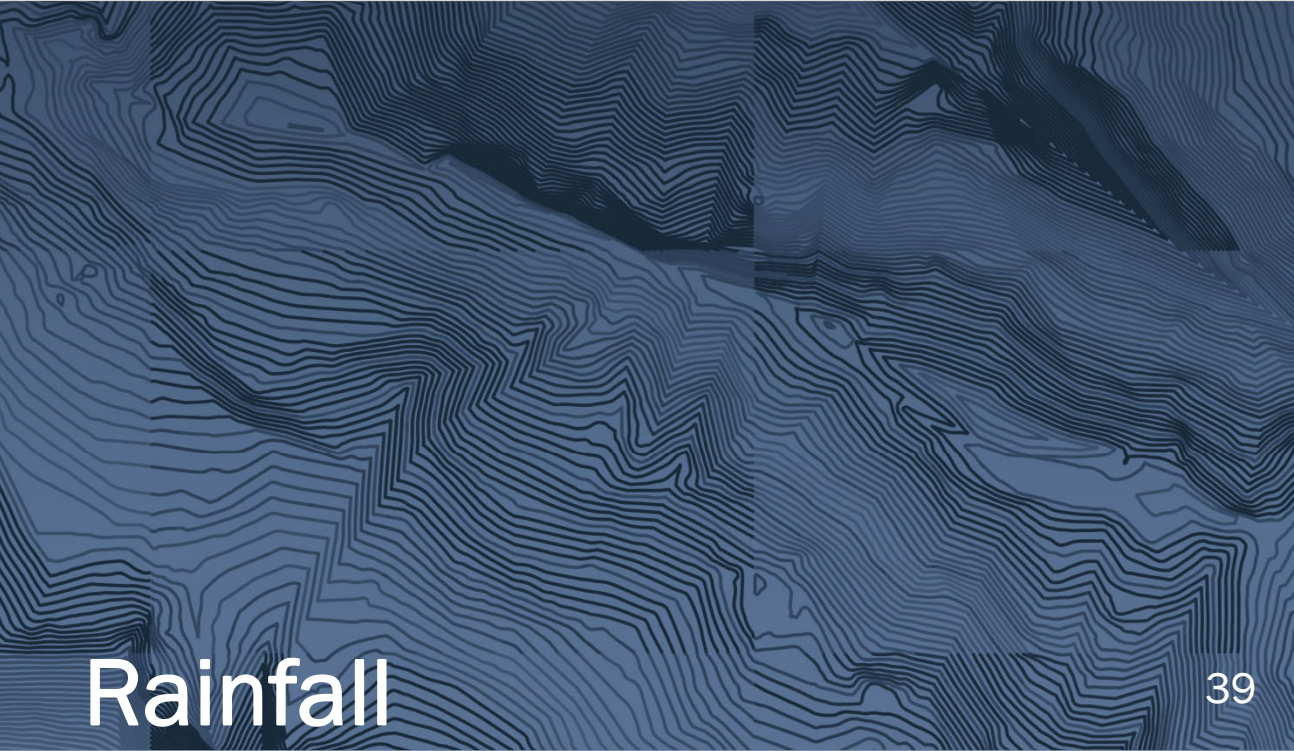
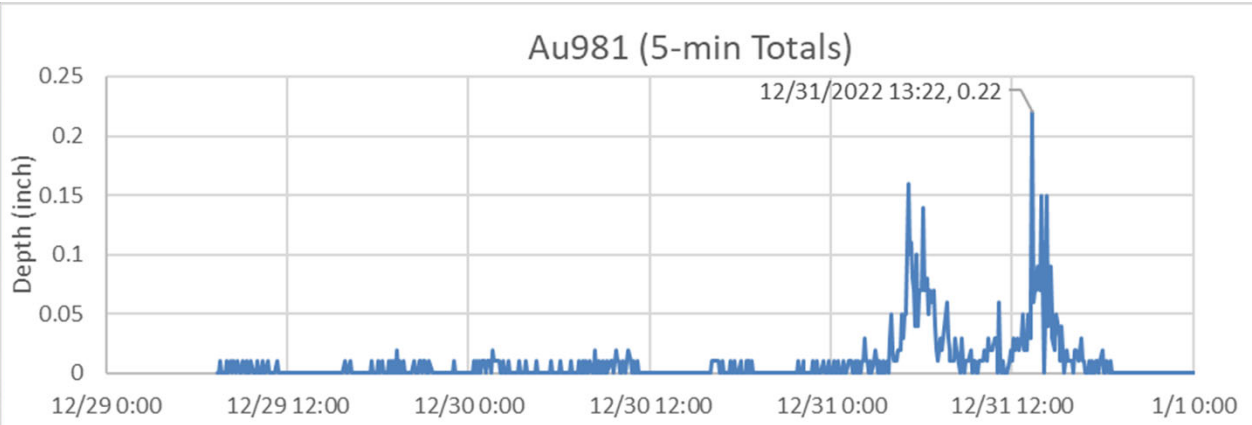
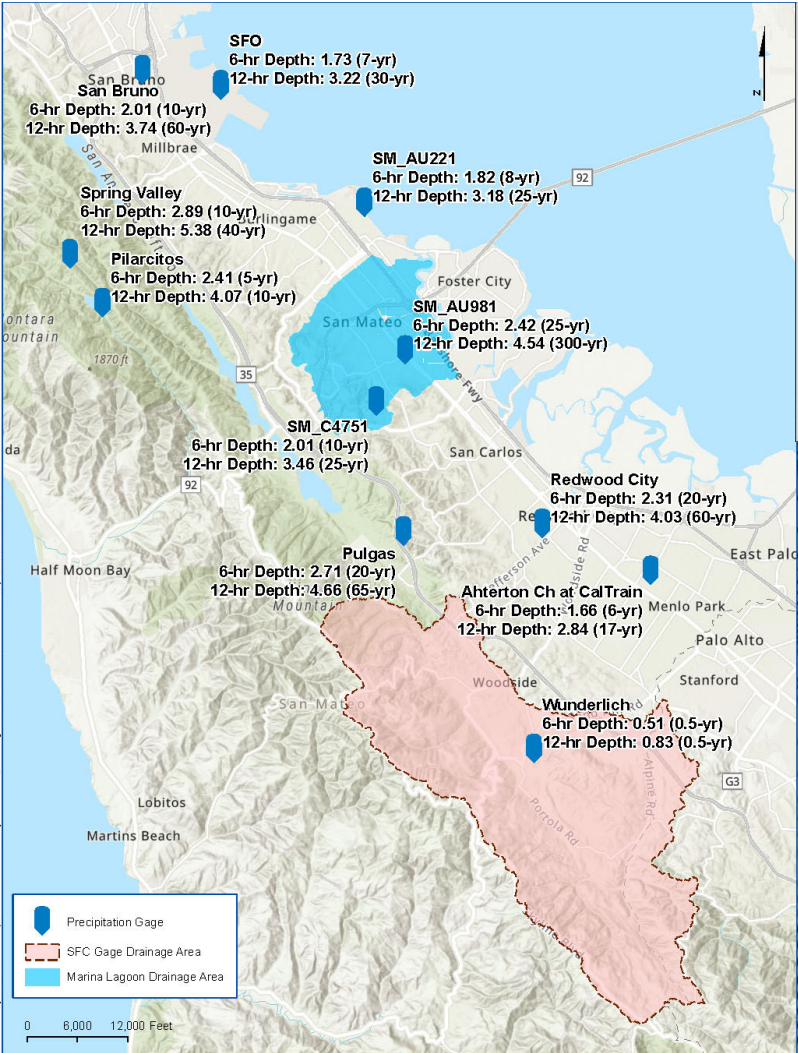
Rainfall

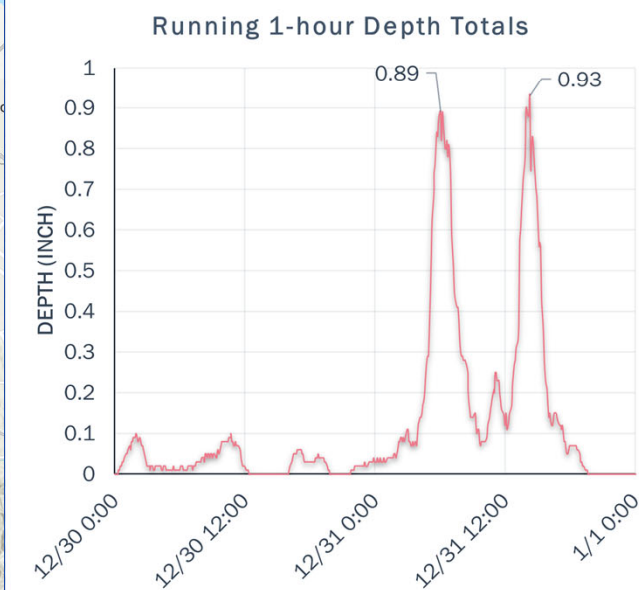
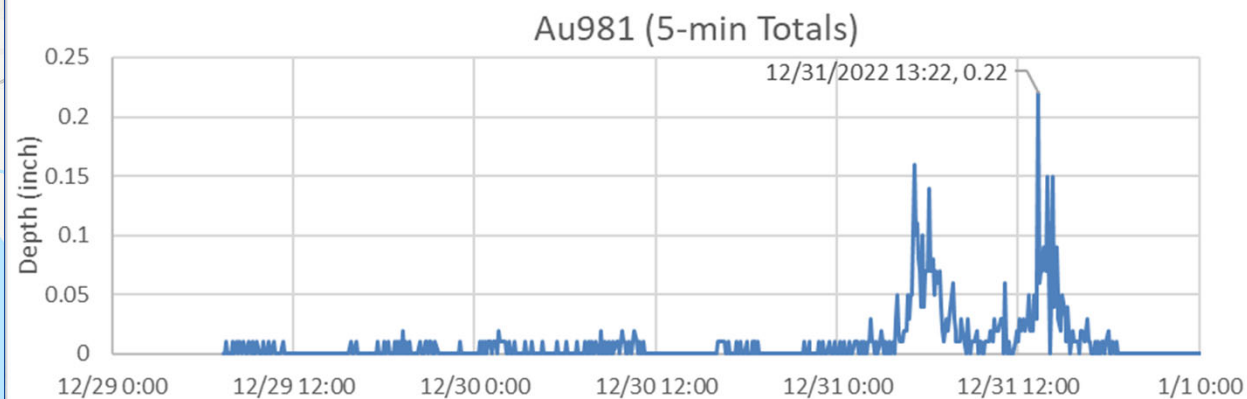
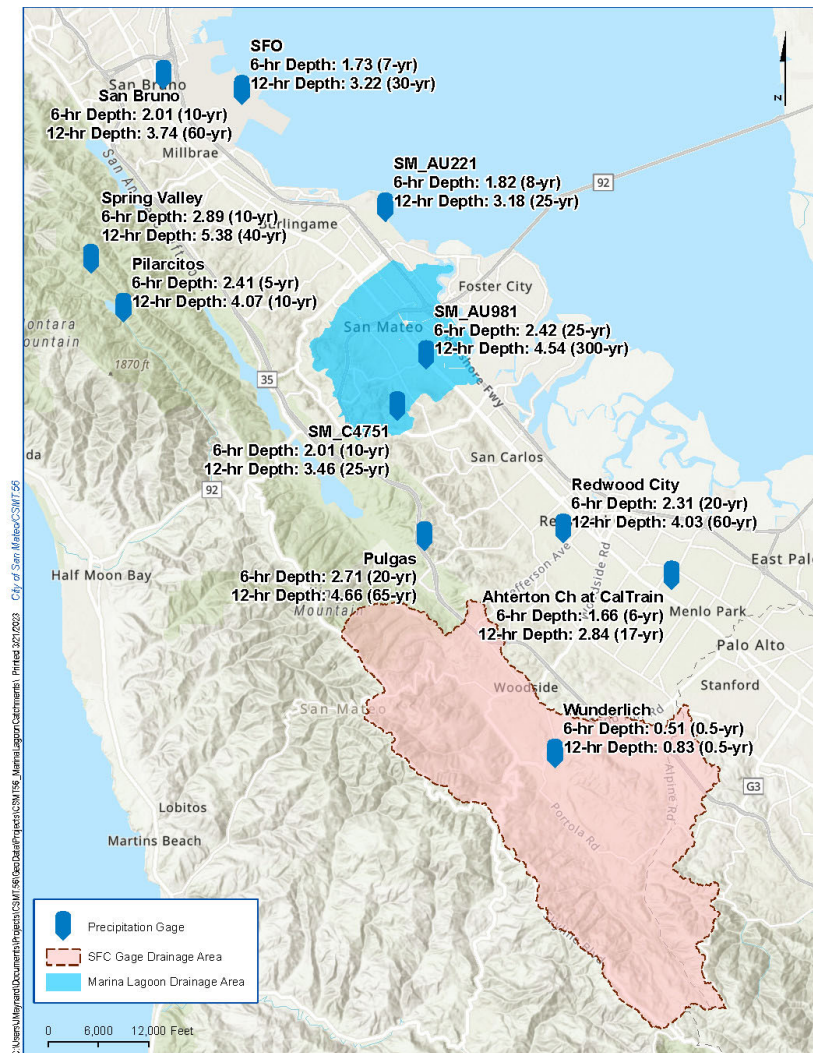


San Mateo, particularly south of Highway 92 and northeast of Interstate 280, had some of the heaviest local rainfall totals during the NYE 2022 storm event.

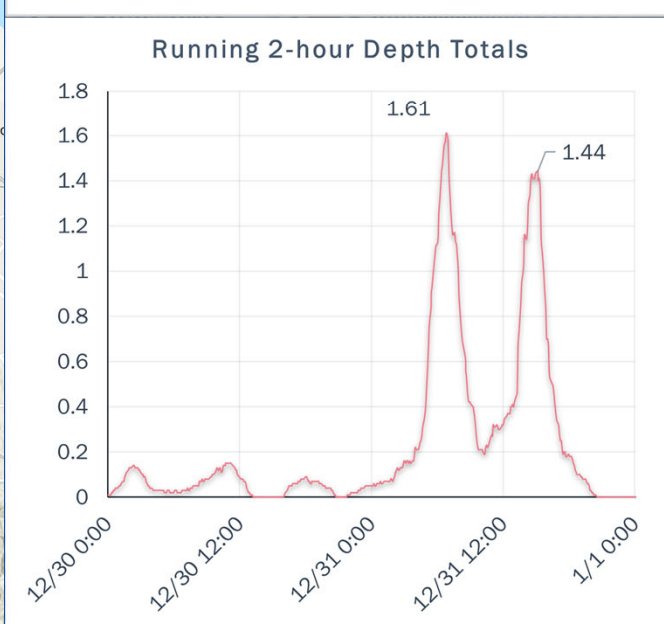
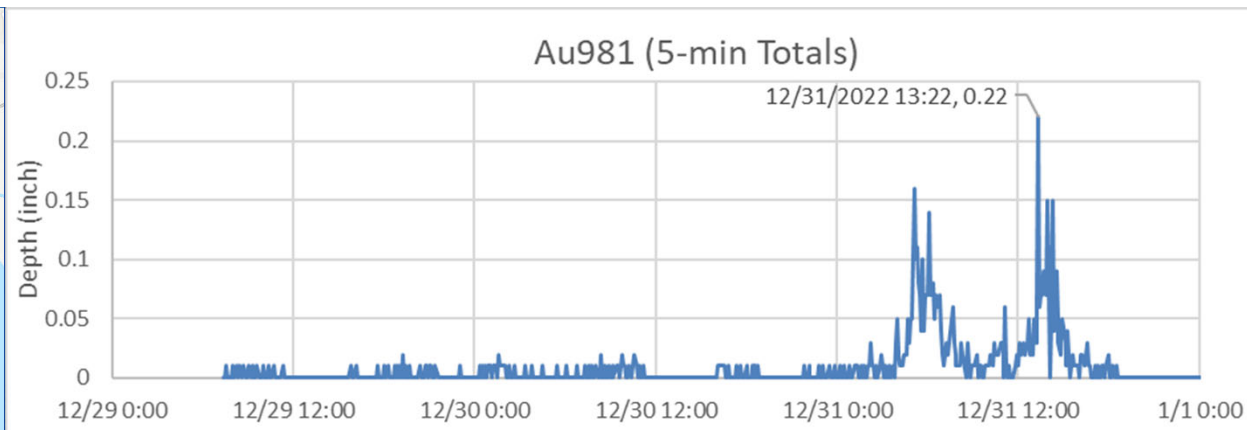
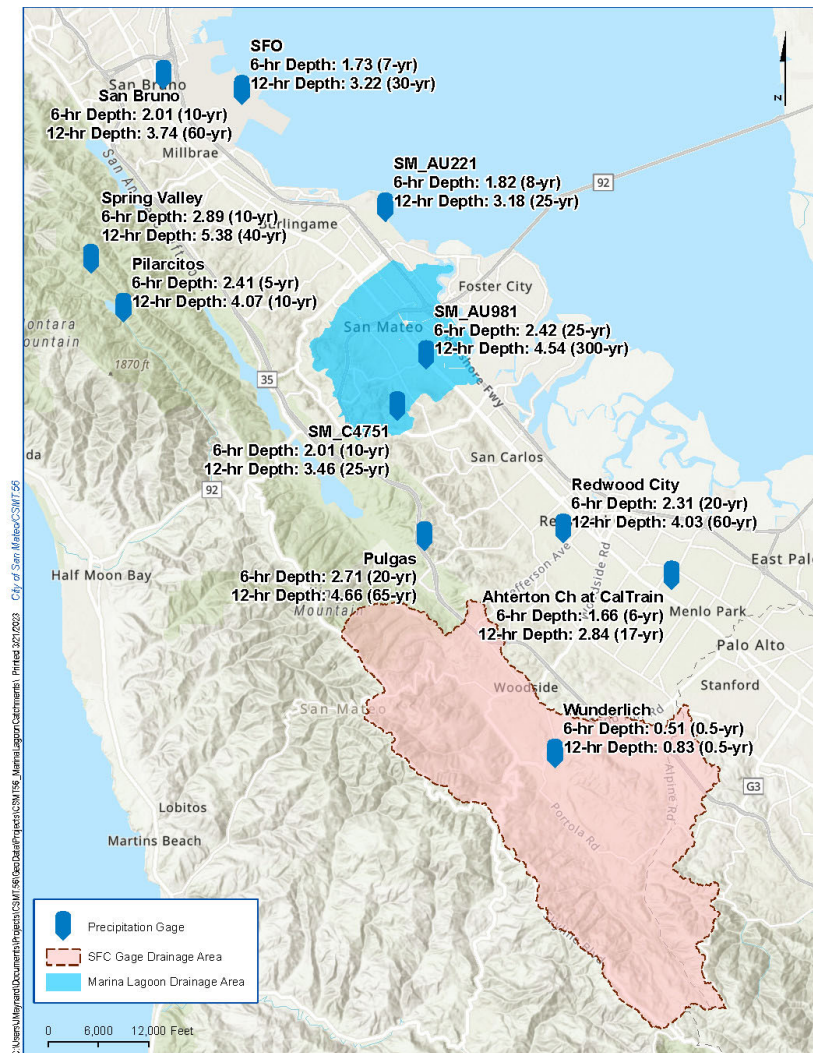
12-hour

Rainfall

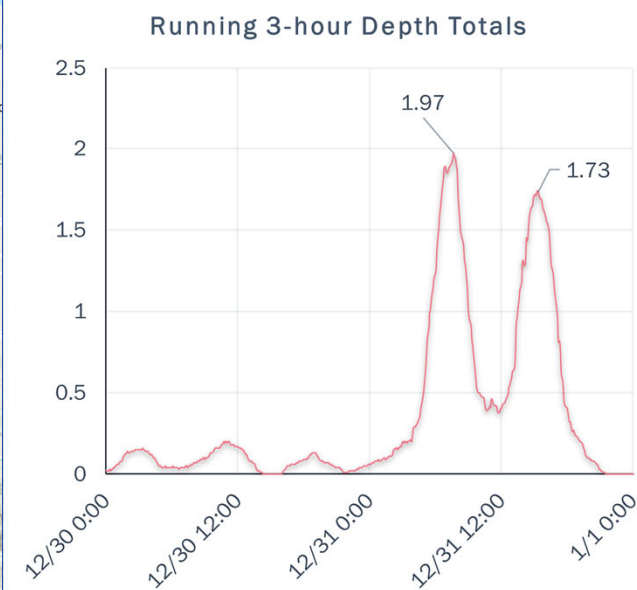
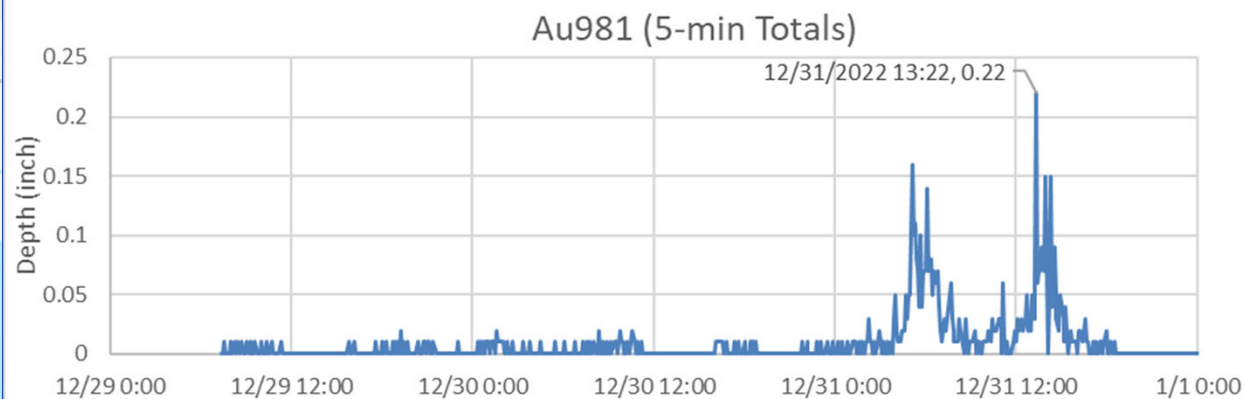
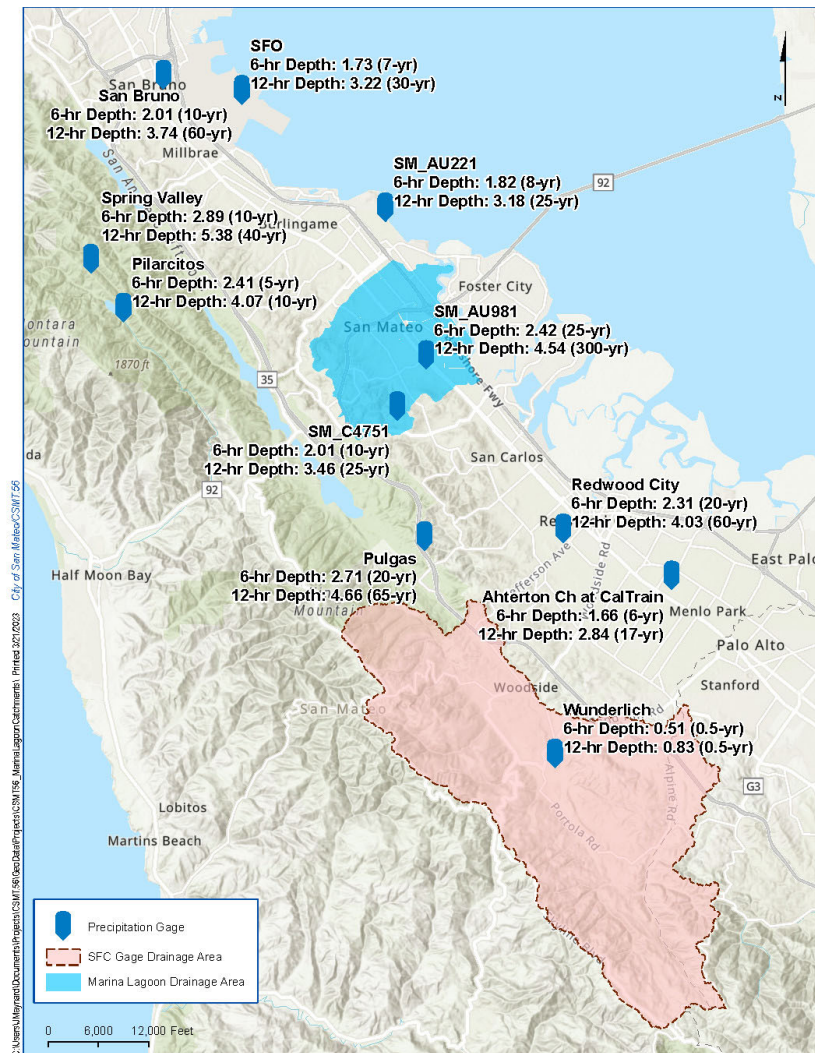




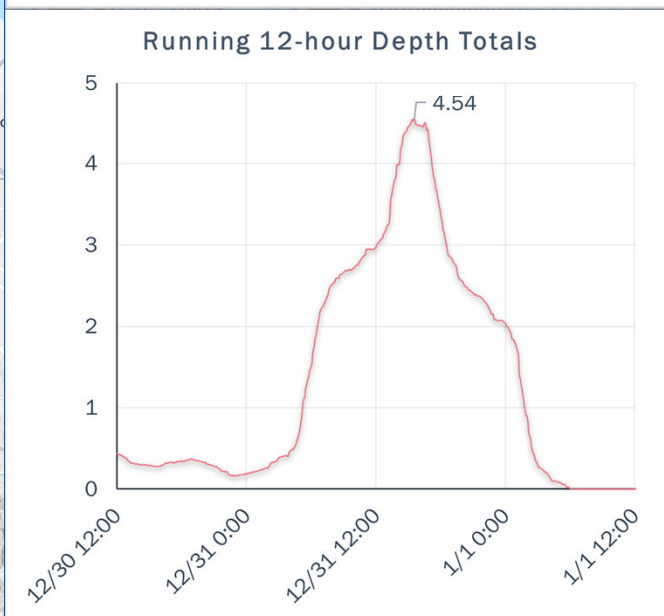
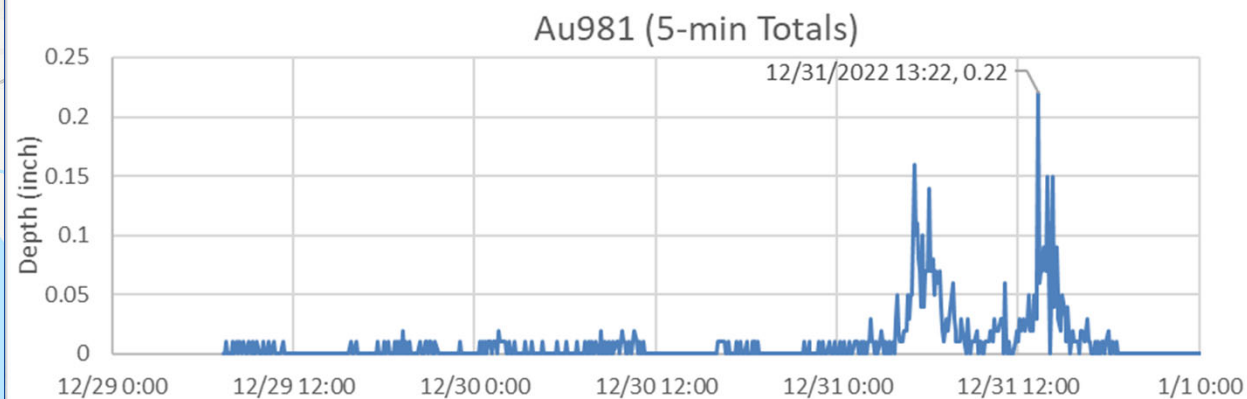
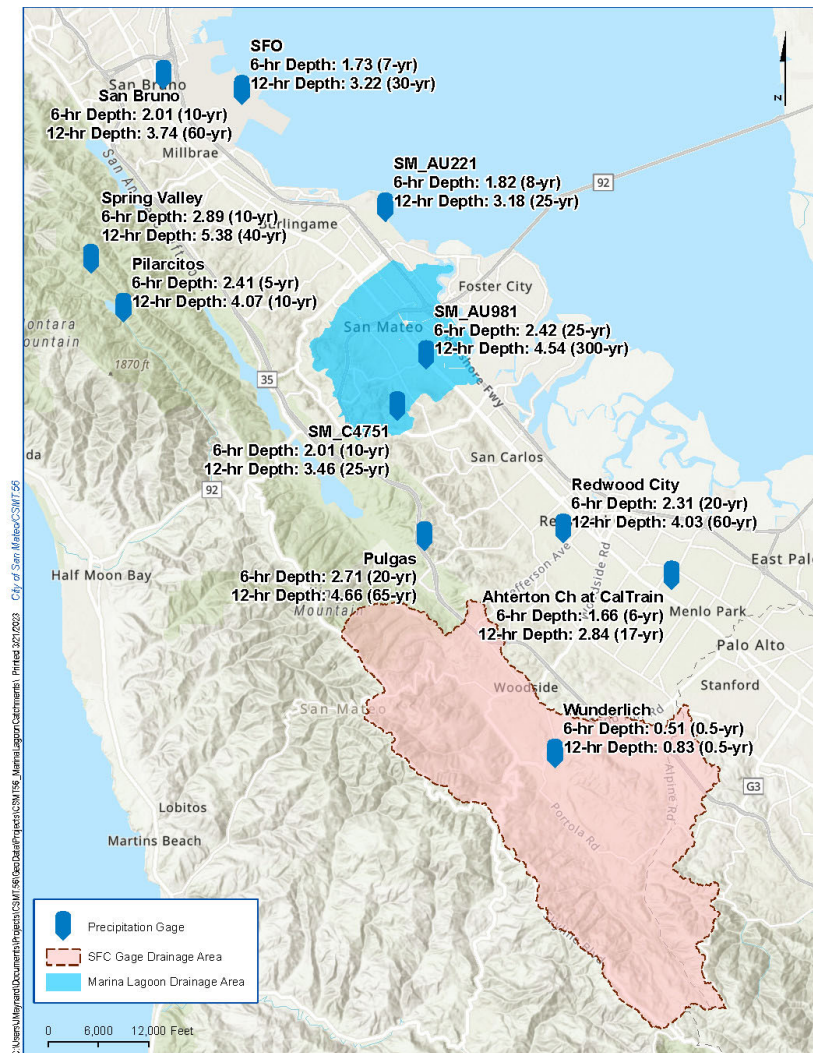
35-year



125-year

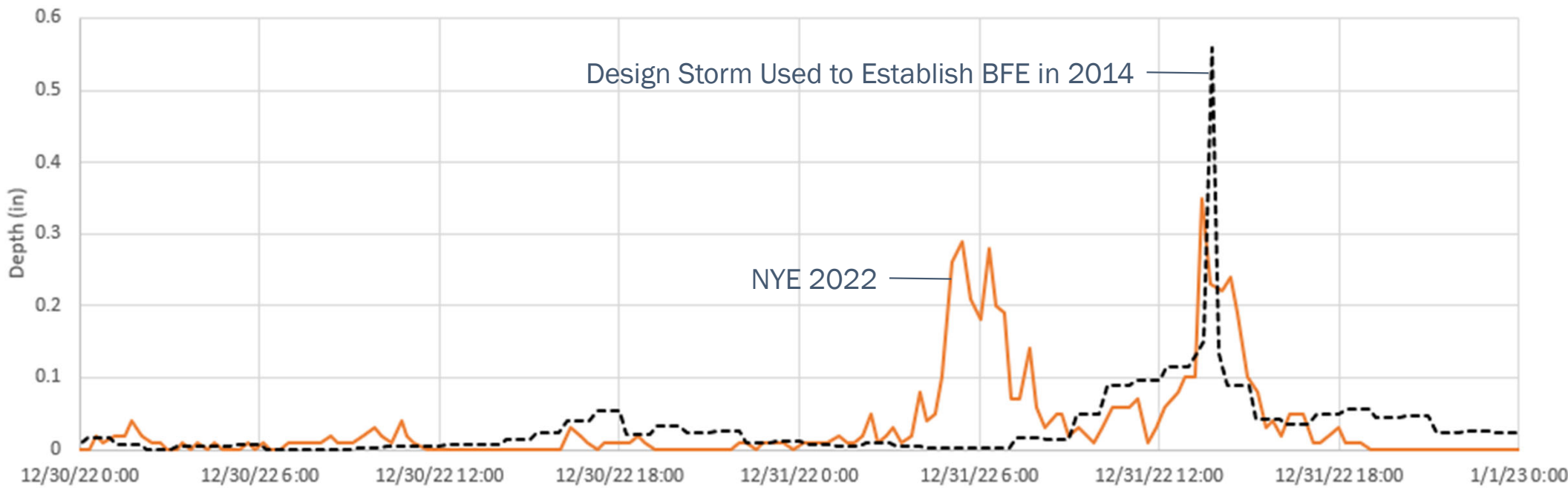


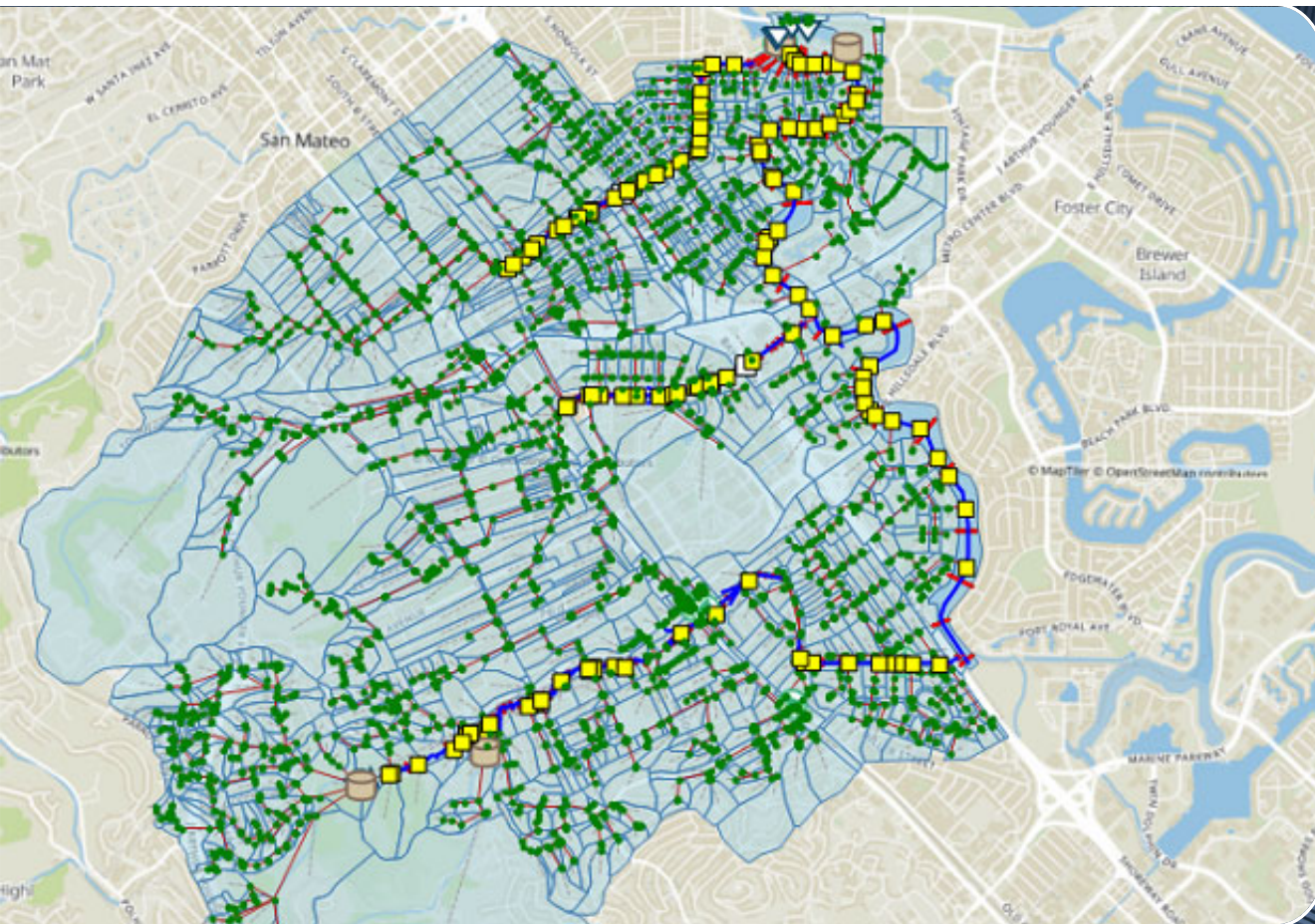
115-year



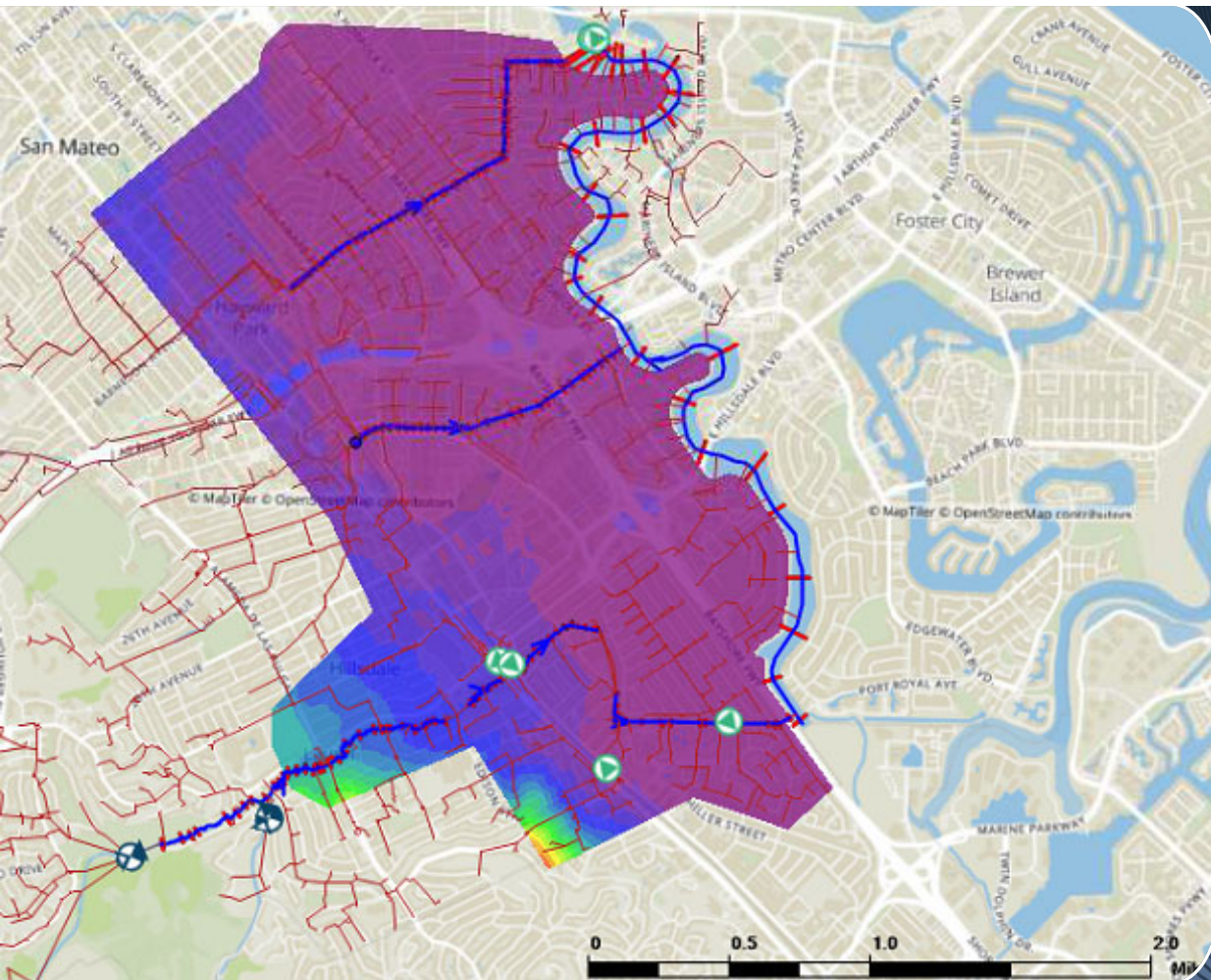
300-year

New Years Eve Storm (15-minute Precip) with 100-yr Design Storm Overlay



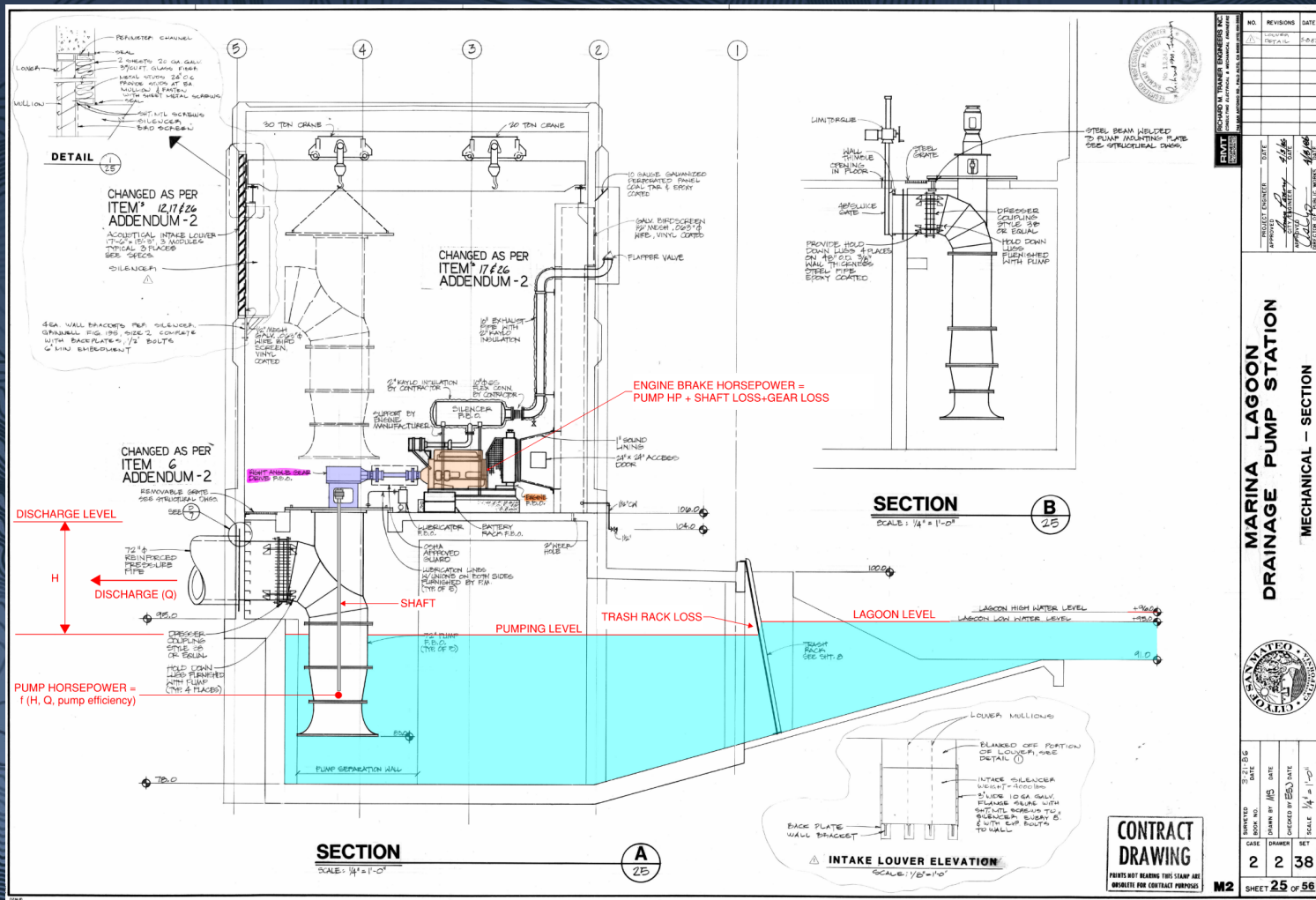


- Important Elements:
 1. Catchments
 2. Pipe System
 3. Three Channels (16th Ave, 19th Ave, and Laurel Creek)
 4. Lagoon (modeled as a river)
 5. Pumps
 6. 2D Domain

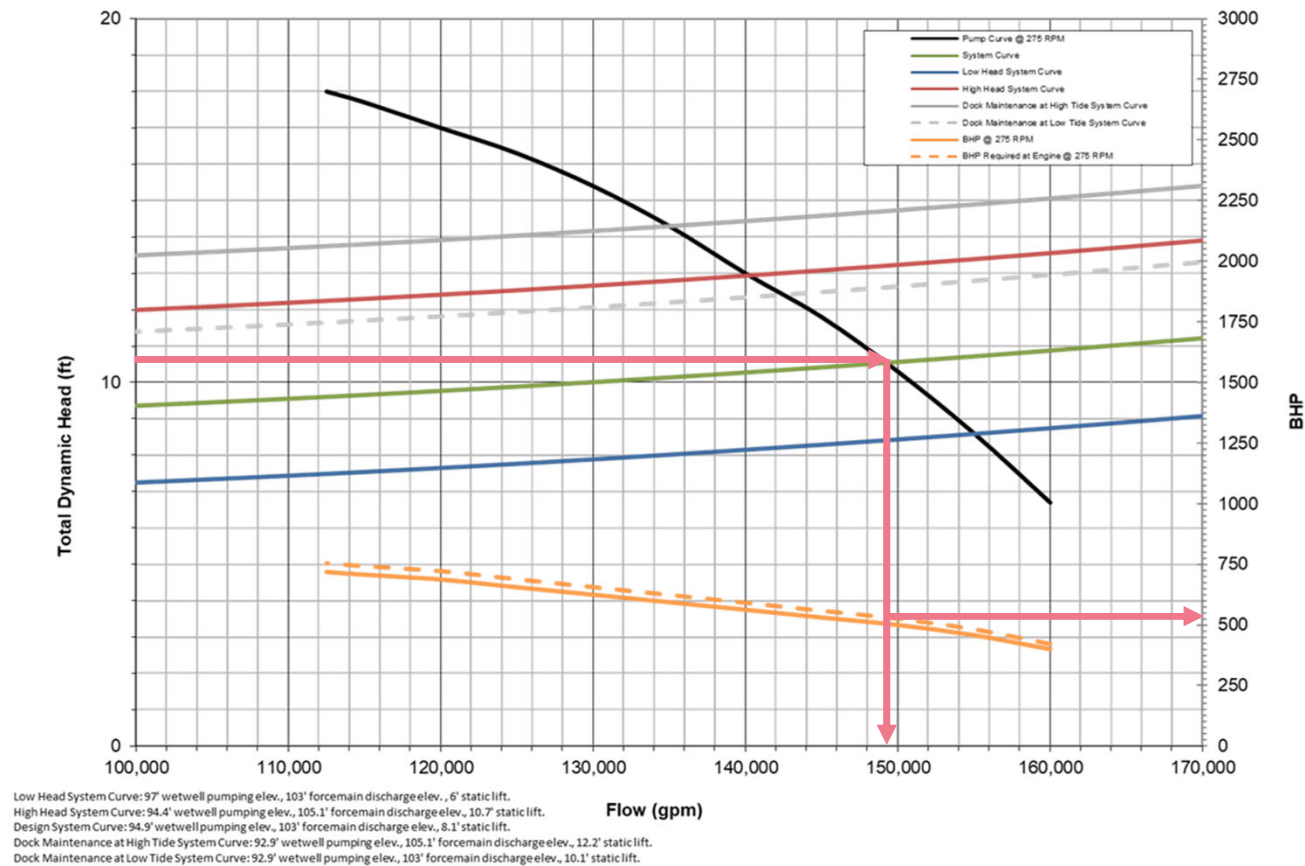


- Important Elements:
 1. Catchments
 2. Pipe System
 3. Three Channels (16th Ave, 19th Ave, and Laurel Creek)
 4. Lagoon (modeled as a river)
 5. Pumps
 6. 2D Domain

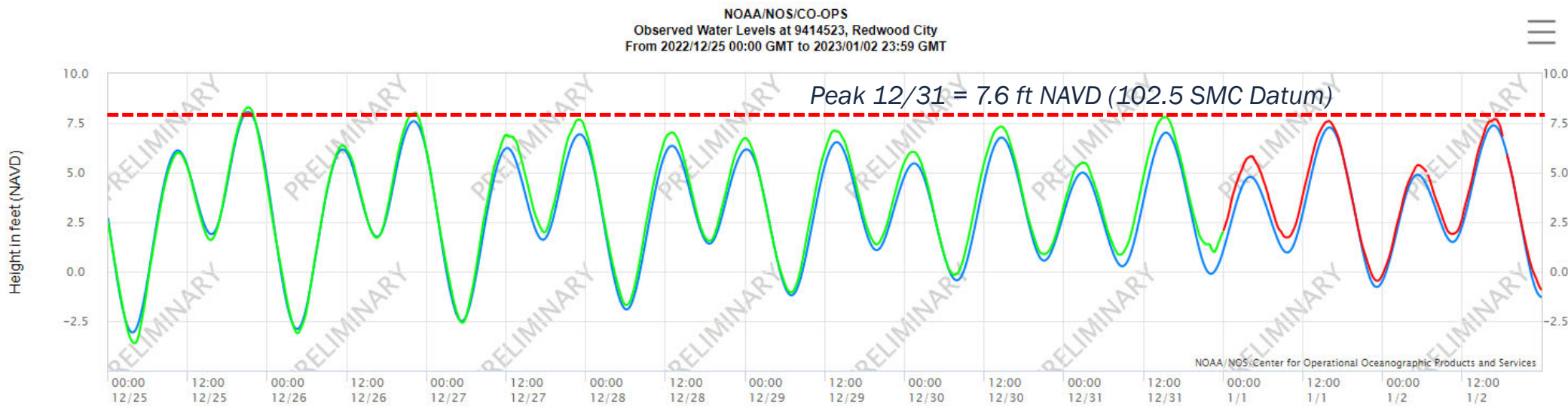
Ground elevations are from
2017 San Mateo County LiDAR

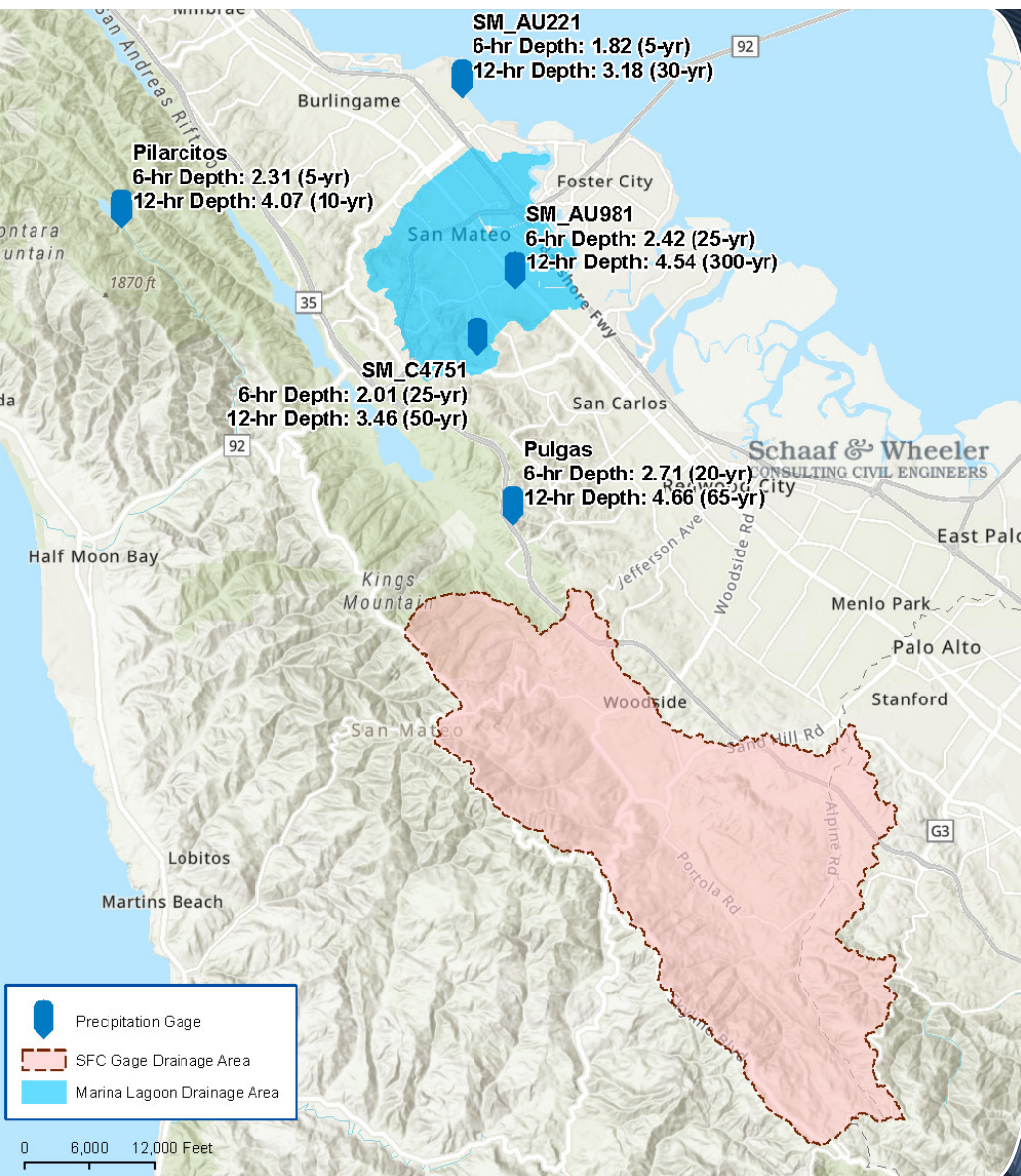


Marina Lagoon Storm Drain Pump Station Pump Hydraulic Conditions



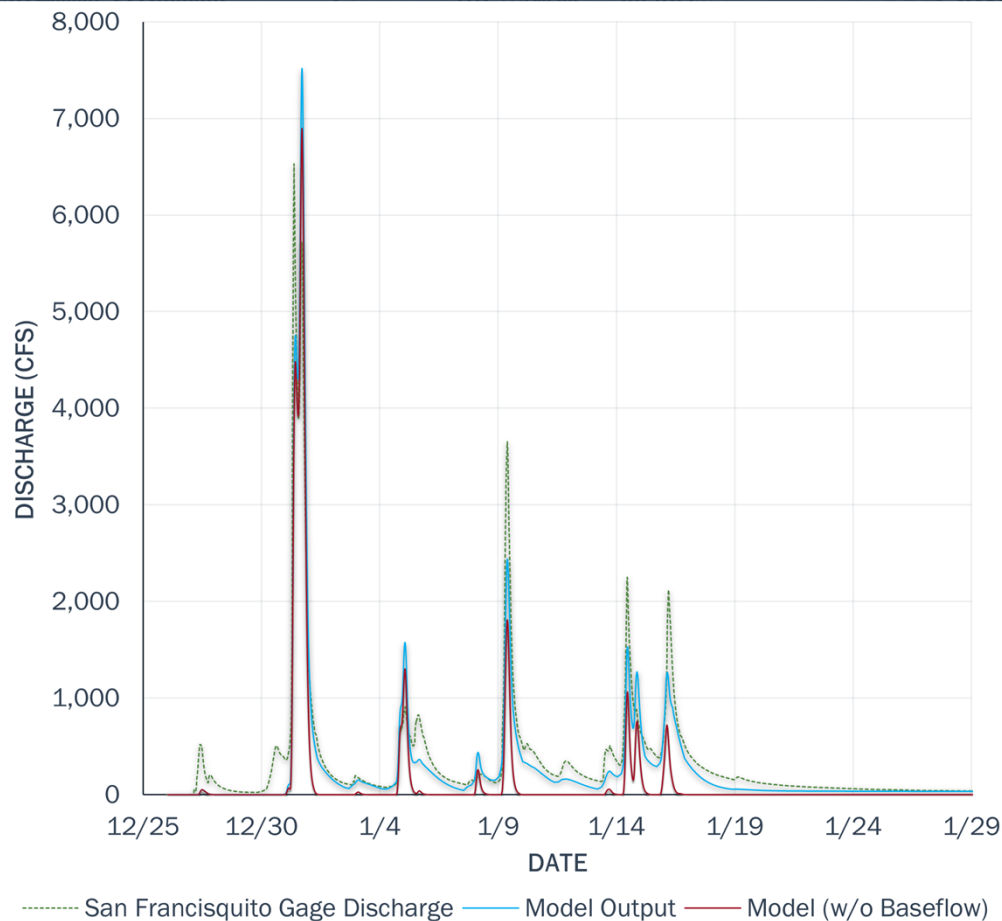
- NOAA tide data checked for simulated event (a little higher than at San Mateo)
- Redwood City gage record shows that tides shouldn't have impacted operations significantly (highest tide below tops of discharge pipes)



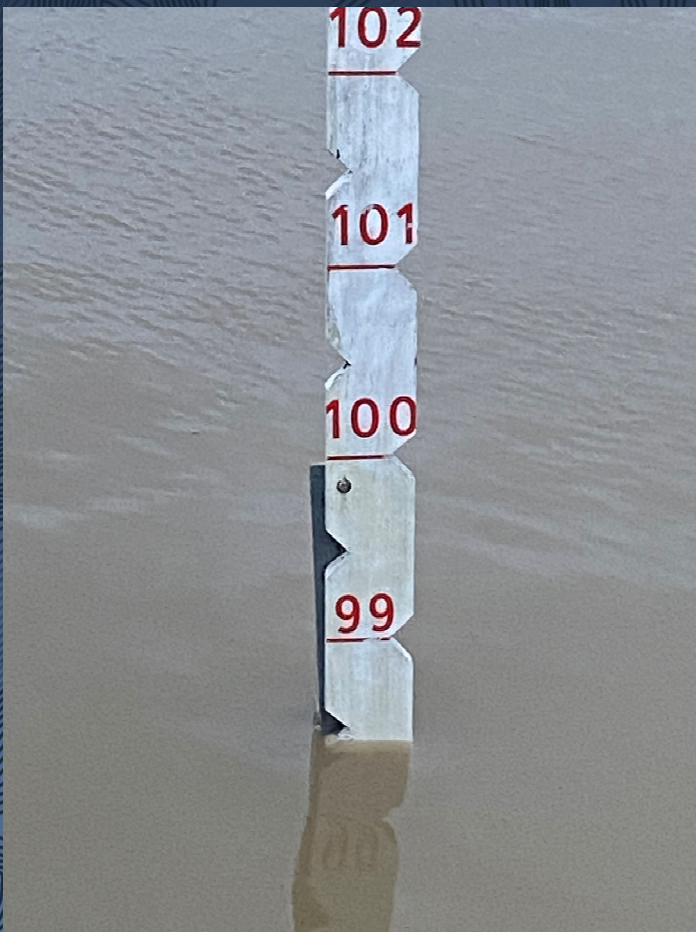


- San Francisquito Creek is the nearest gaged basin
- Given the duration and magnitude of rainfall:
 1. Is baseflow important?
 2. Is an AMC II assumption appropriate?

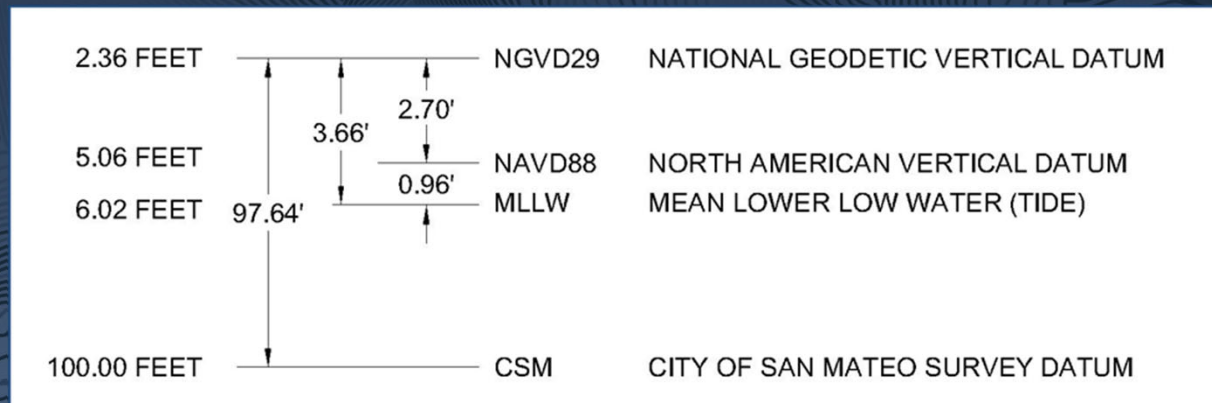
Model Verification



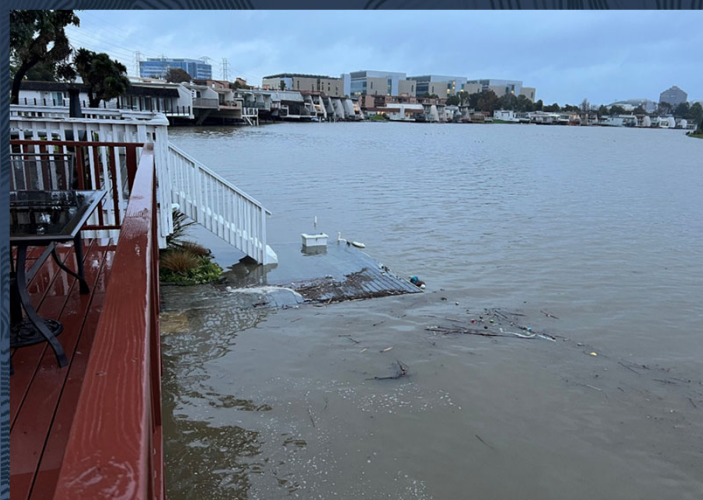
- Baseflow (“RDI”) needs to be included to produce runoff volume that replicates observed levels at Marina Lagoon.
 - RDI parameters adjusted for Marina Lagoon based on comparative drainage areas
- Peaks are relatively accurately represented with the AMC II Curve Number, if rainfall is included prior to 12/31 (essentially utilizing the available initial abstraction depth)



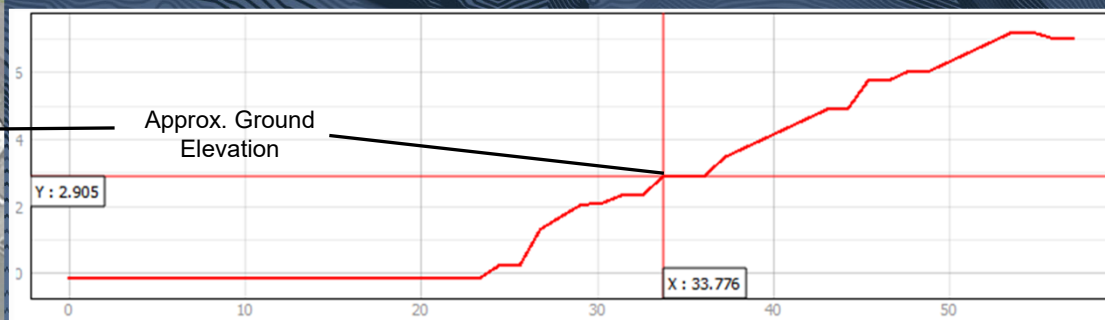
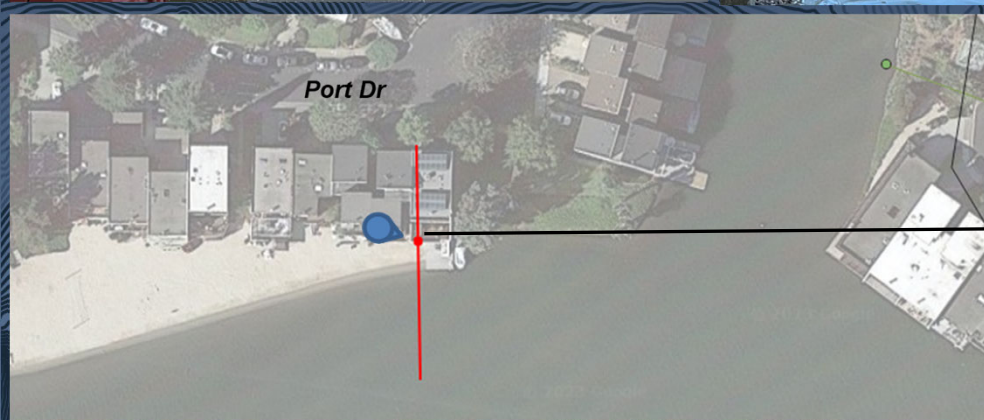
12/31/22, 4:40 PM

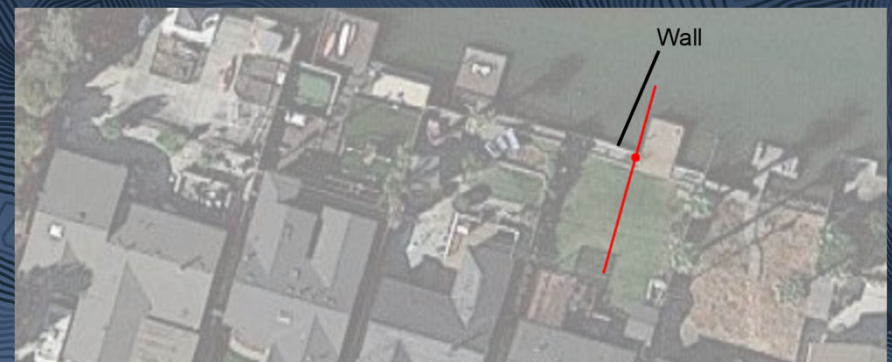


$$98.45 \text{ feet CSM} - 94.94 \text{ feet} = 3.51 \text{ feet NAVD}$$

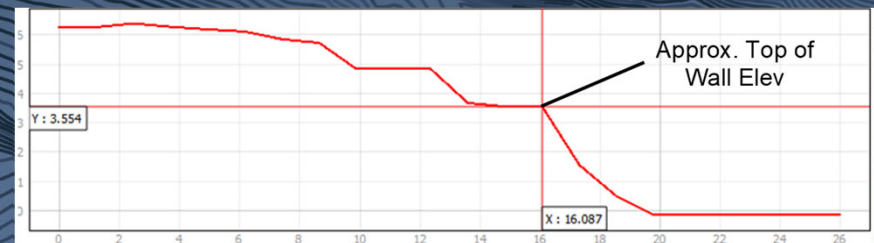


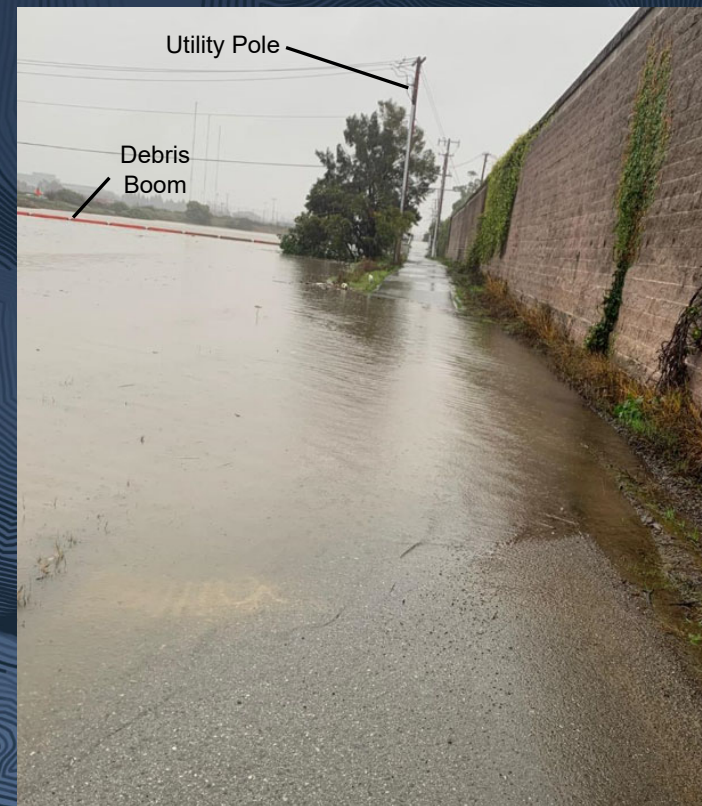
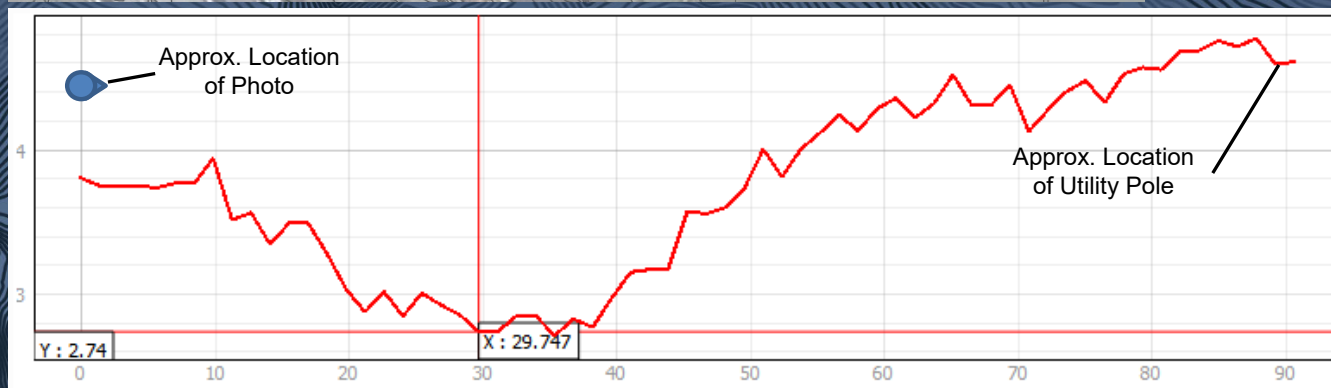
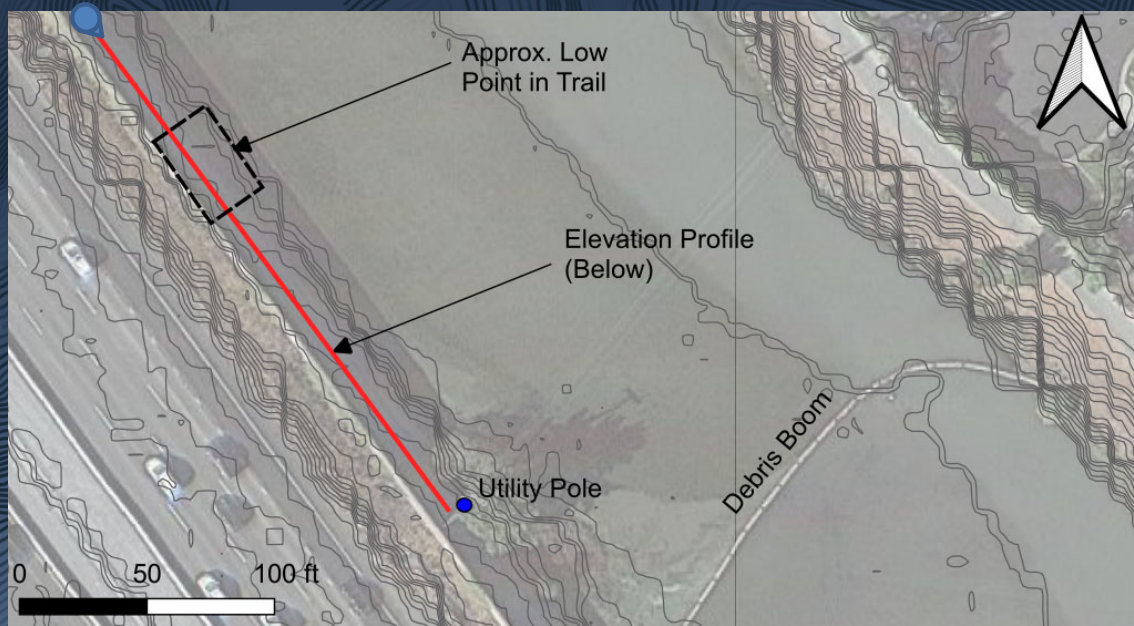
Homes on Port Drive, Facing East
(WSEL > 98 feet CSM)





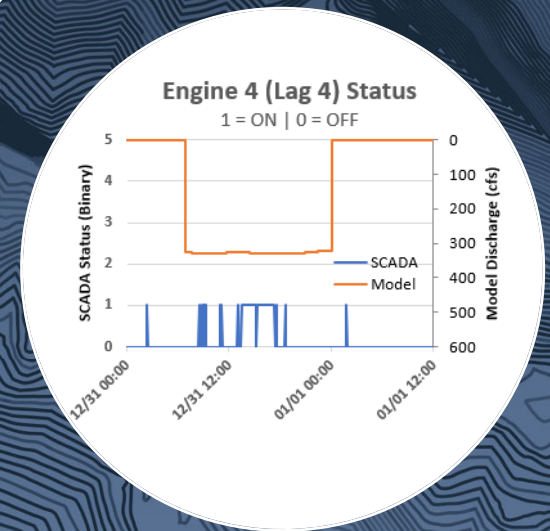
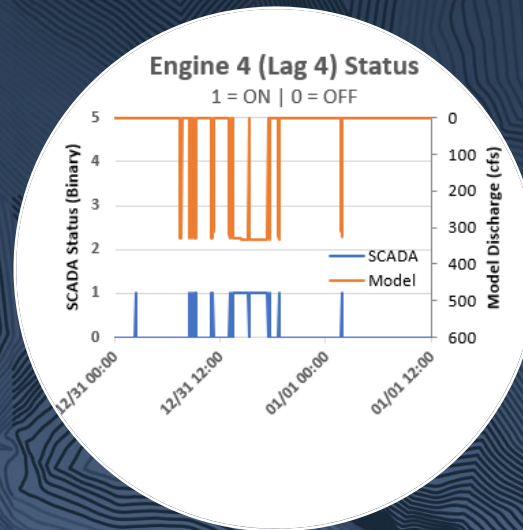
2315 Clipper Street
(12/31/22 3:45 PM WSEL ~ 98.3 feet CSM)



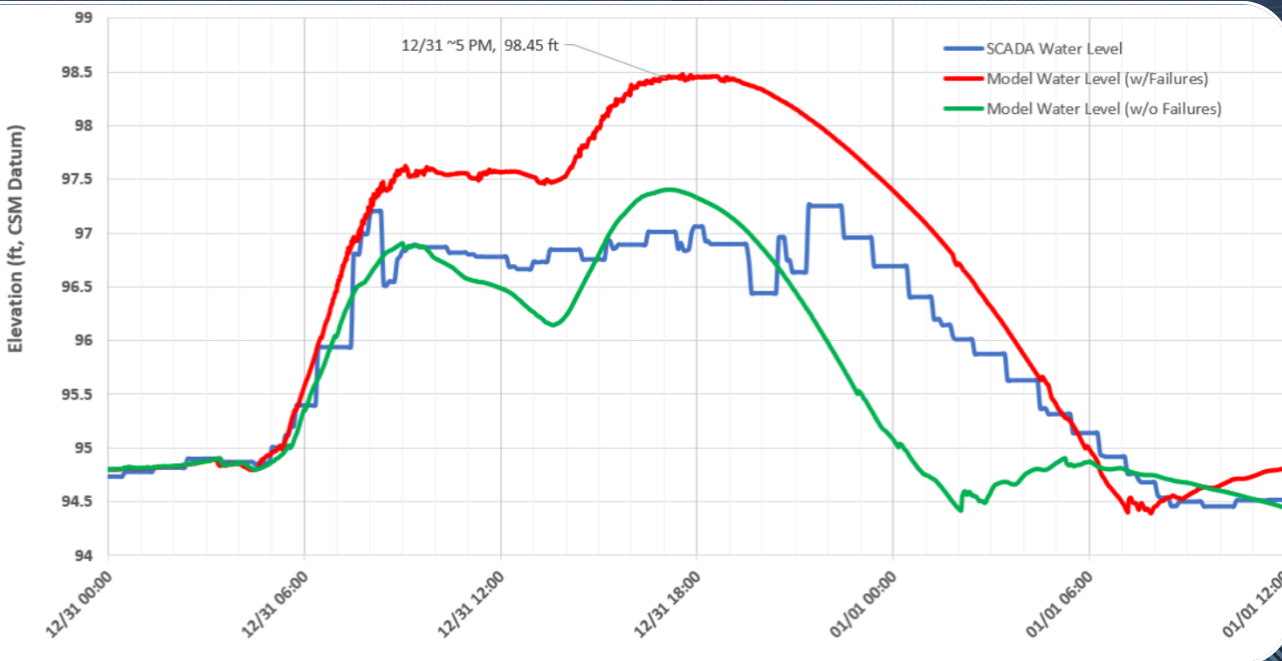


Near O'Neill Slough Tide Gate
(High Water 98.1 – 98.6 feet CSM)

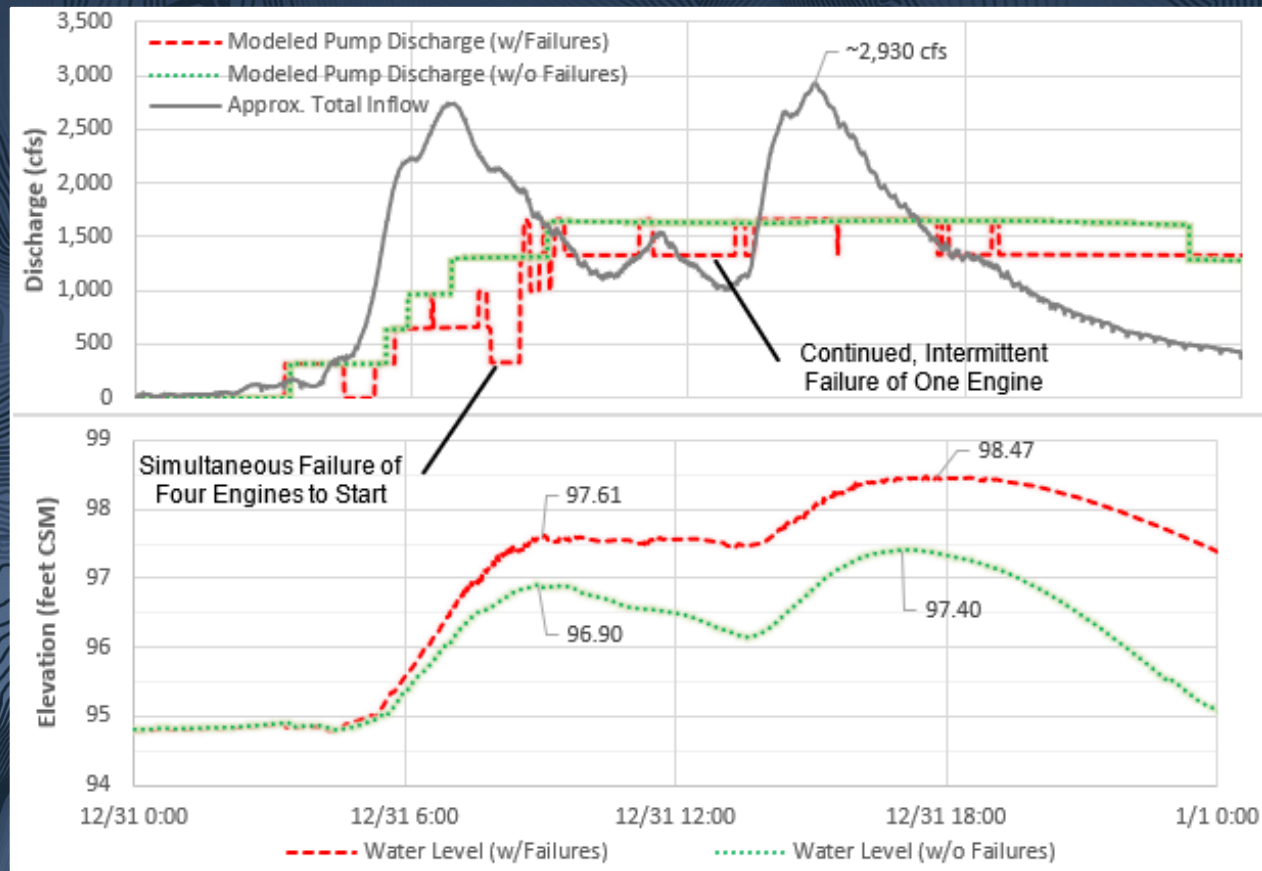
- NYE Storm without Pump Failures
- NYE Storm with Pump Failures



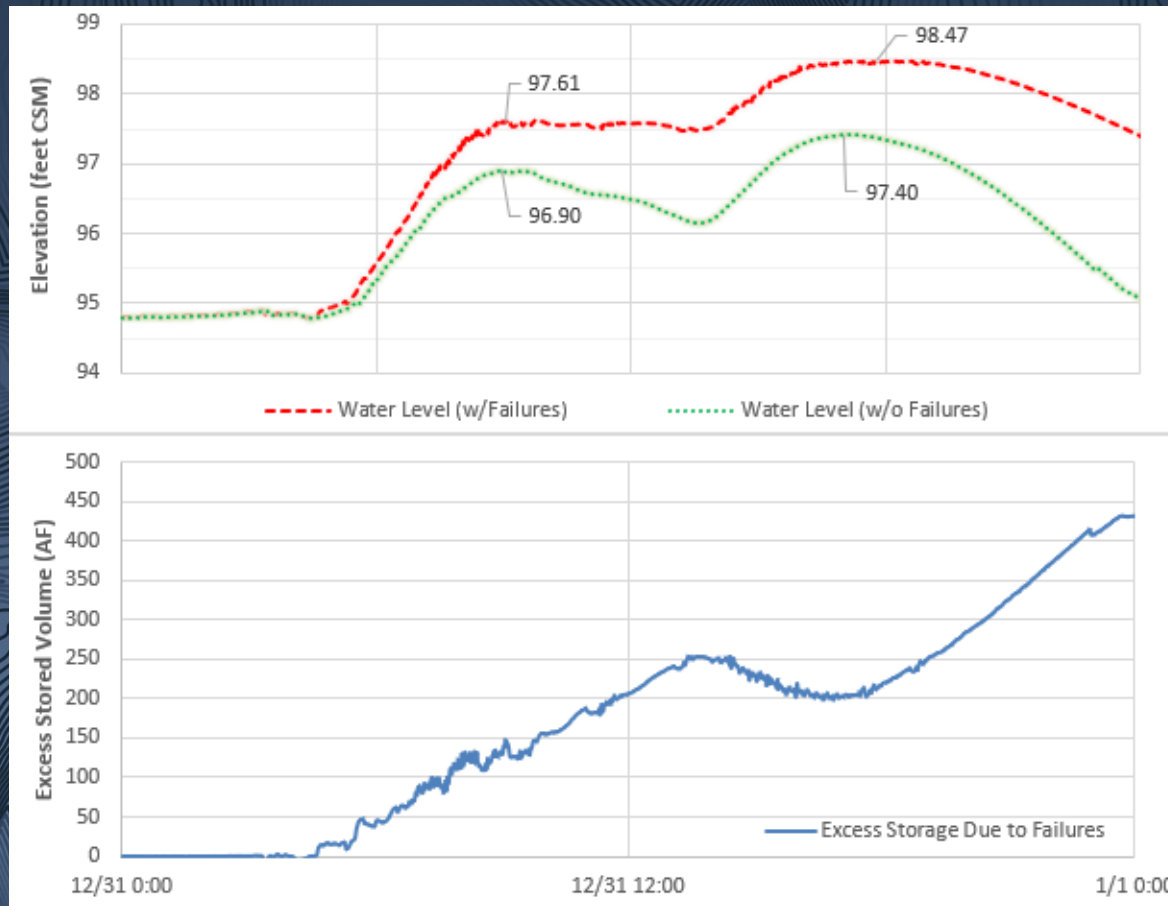
Lagoon Water Levels



Lagoon Water Levels

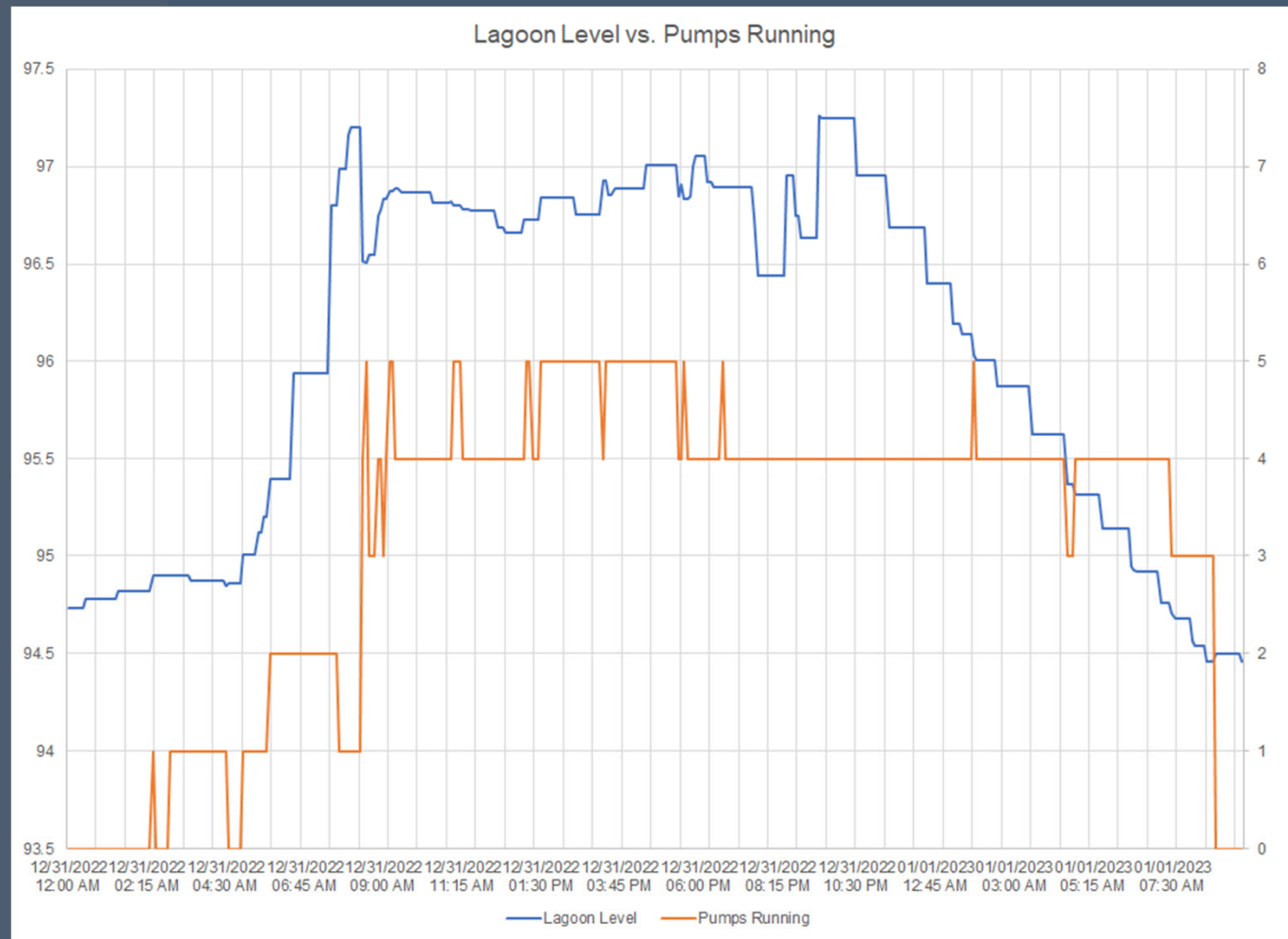


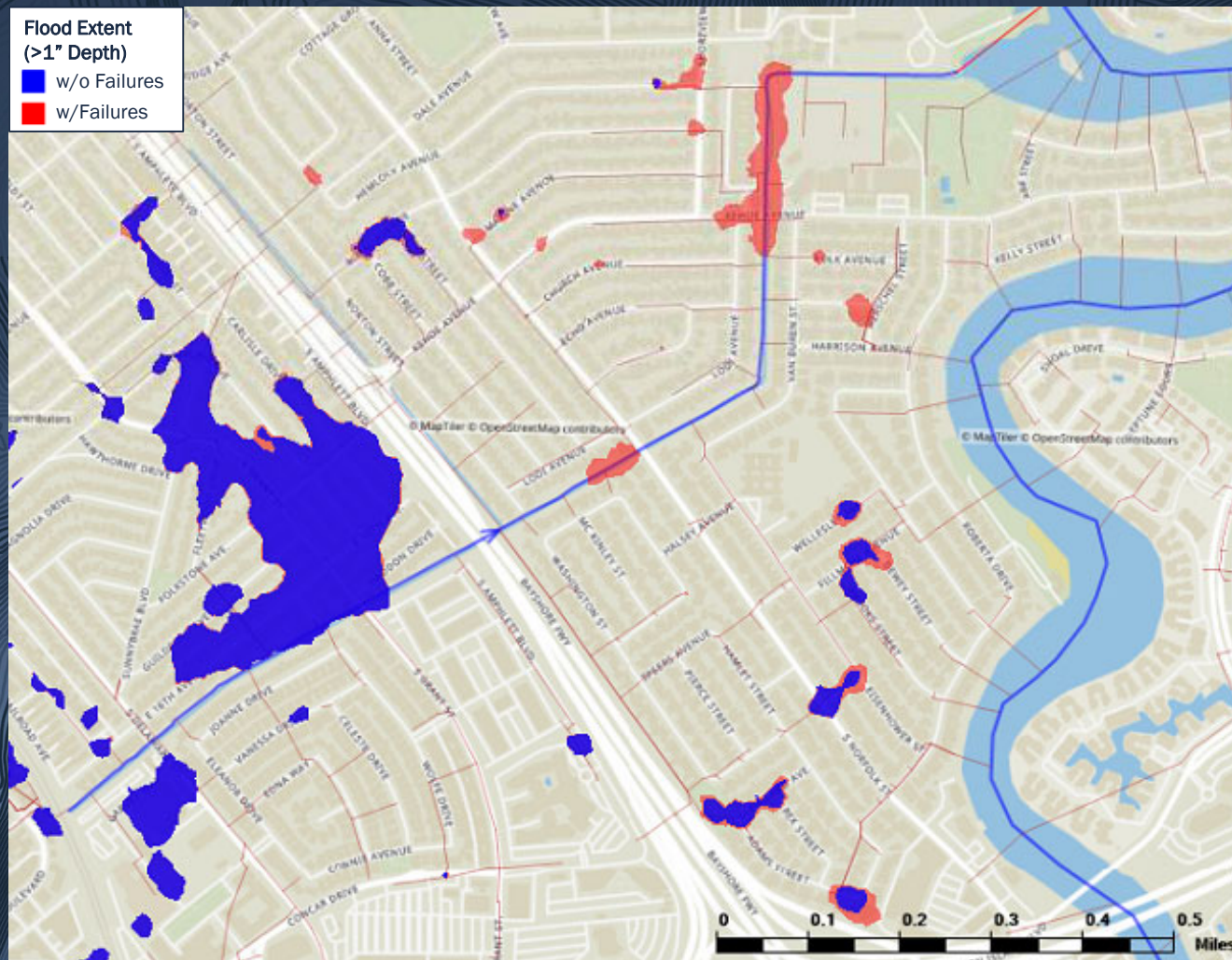
Cumulative Excess Volume

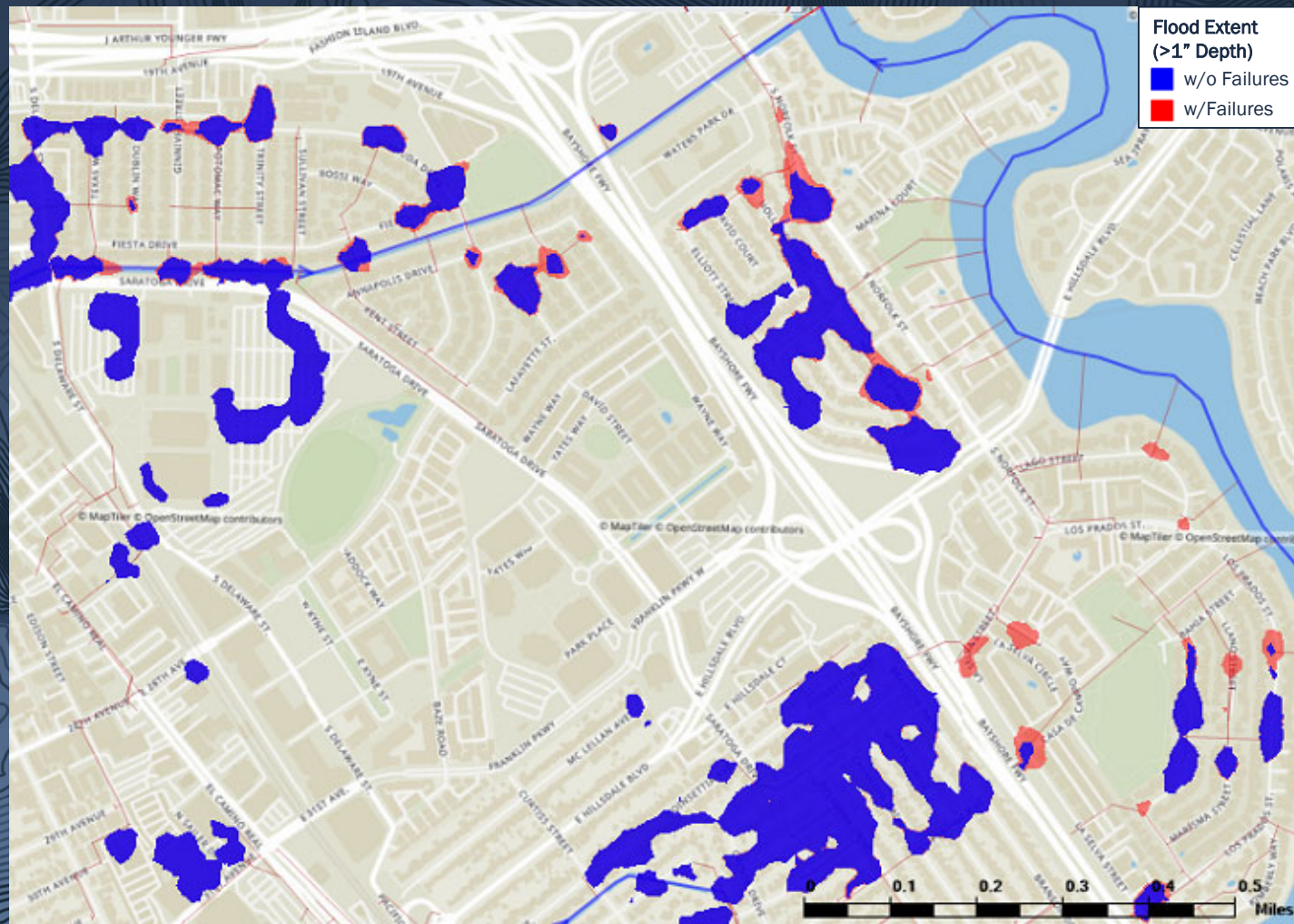


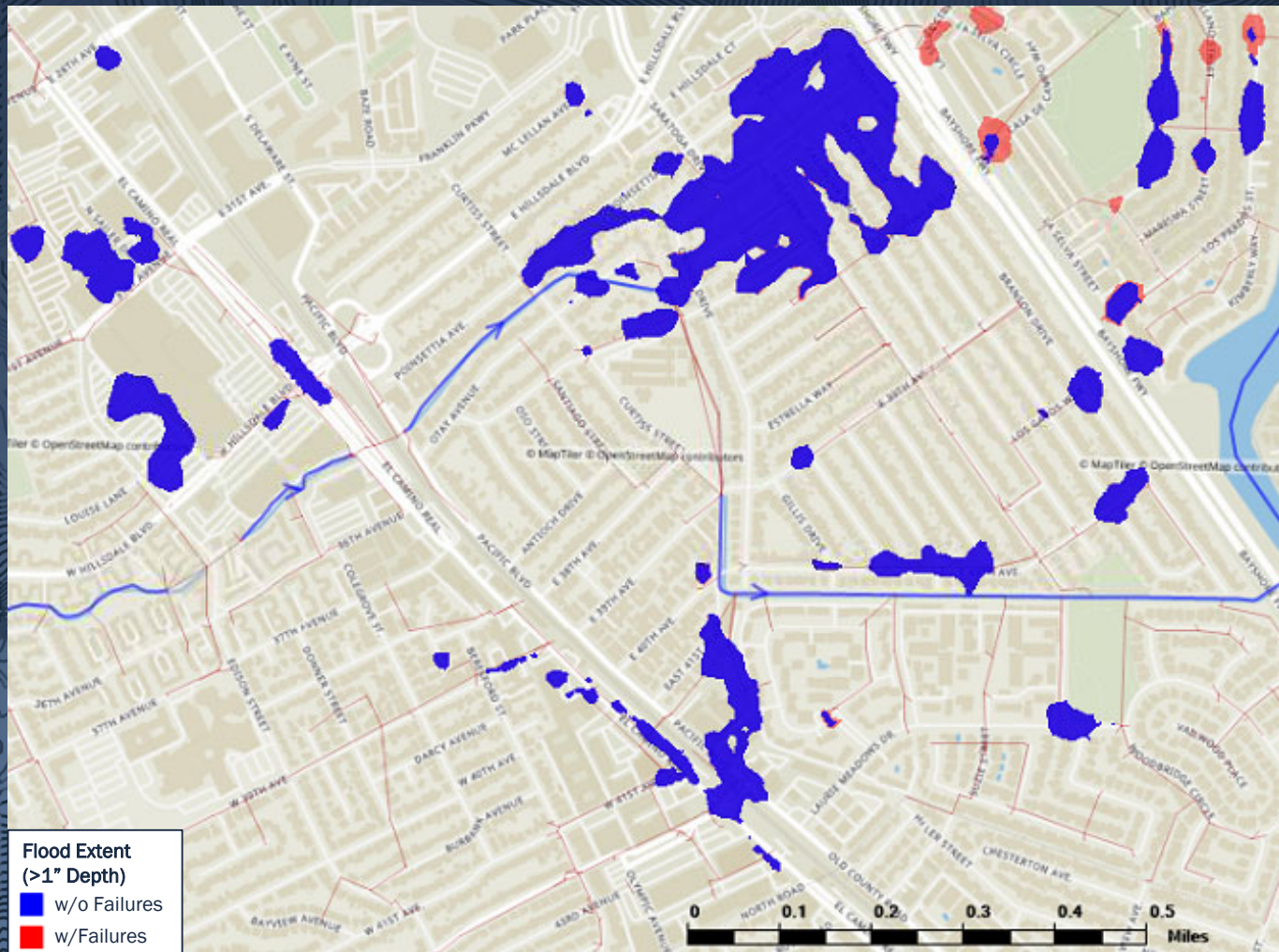
Findings

- Rapid lagoon level rise in early hours of the storm
- Multiple pumps failed at the Marina Lagoon Pump Station between 5-8 AM
- One of the five pumps had problems all day
- Lagoon level rose to 98.4', impacting homes and docks





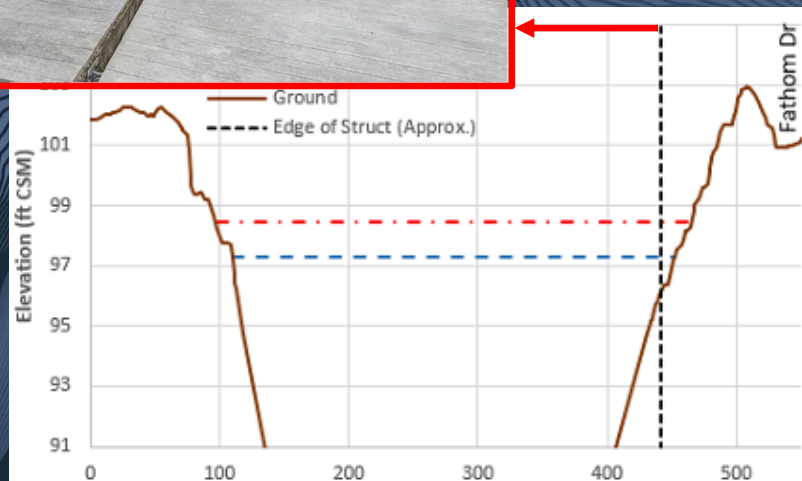
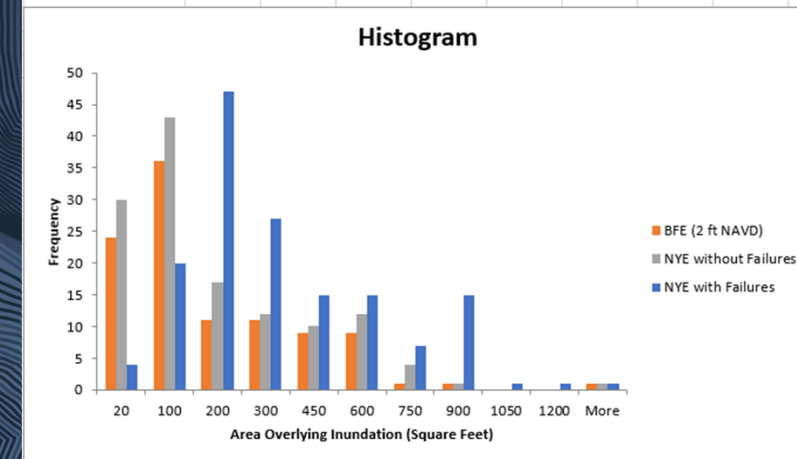






*Conditions at individual structures vary.

Count of Structures Overlaying Inundation				
	Total	< 20 SF	< 100 SF	>= 100 SF
BFE (2 ft NAVD)	103	24	60	43
NYE without Failures	130	30	73	57
NYE with Failures	153	4	24	129



Design BFE = 3.1 feet NAVD

BFE (2014) = 2.4 feet NAVD

WSEL (2022) = 3.5 feet NAVD

Summary

1. The NYE event in San Mateo was greater than the FEMA 100-year design event used to establish Marina Lagoon's base flood elevation.
2. Maximum Lagoon levels were about 1 foot higher during the storm than they would have been had pumps been called per the logbook settings and all pumps operated when called.
3. Most of the street flooding shown during the simulated storm results from inadequate storm drain and creek capacity rather than higher than expected Lagoon levels.
4. The most important preventative measure is to ensure that all pumps are operational when called.

STORMWATER SYTEM DEFICIENCIES

Challenges

- Aging infrastructure may malfunction, leading to costly and damaging emergency situations
- Current infrastructure and funding are insufficient for today's storms. During heavy rain events, the excess water can overwhelm the existing stormwater system, causing flooding in low-lying areas.
- Equipment failures more frequent with aging infrastructure, leading to worsened flooding conditions over time.

Financial Needs

- City-wide infrastructure improvements - \$68M
- Marina Lagoon dredging - \$80M
- Operation and maintenance



Stormwater Infrastructure – What it Does

- Stormwater infrastructure protects residents and businesses from flooding.
- Safe communities have robust stormwater systems that protect residents and businesses from flooding.

COMMUNITY FLOOD & STORM PROTECTION INITIATIVE

The City's Plan:

- Develop a financially self-supporting stormwater system through a user fee, which requires property owner approval via a City-wide ballot measure.
- **Annual Revenue:** \$4 million (less than half of what is needed)
- **Annual Cost Breakdown Per Home:** Around \$8 per month (annual increase with CPI)
- **How Would Residents Be Billed The Fee?** Included as an annual property-related fee on property tax bill
 - Would be charged annually in perpetuity unless changed by another act of Council
- **Is there a chance the fee would increase?** Yes, but the fee increase would go through a public process.



IF PASSED, what specific projects the fund go towards?

- **Stormdrain Condition and Capacity Assessments**
- **Updated Storm Drain Master Plan**
- **Marina Lagoon Dredging**
- **Maintenance Permitting**
- **Pollution Prevention Projects**
- **Flood prevention and storm water system drain capacity improvement projects**
- **Stormwater pump station upgrades**
- **Levee improvements**

NEXT STEPS

NYE Storm reconstruction

- Marina Lagoon model update
- San Mateo Creek model update

Marina Lagoon Pump Station Analysis

- Pump / engine condition assessment

City-Wide Feedback

Funding requests for City-wide comprehensive stormwater assessment

- Update of the City's hydraulic models to include major public and private creeks
- Identification of storm system improvements for the City's pump stations, pipes / culverts / channels, and Marina Lagoon dredging needs.
- City-wide creek monitoring program.

Stormwater Fee, October / November Ballot

Community Questions?

Azalea Mitch – Public Works Director

Matt Fabry – Deputy Director – mfabry@cityofsanmateo.org

Jimmy Vo – Senior Engineer – jvo@cityofsanmateo.org

For more information on the Community Flood & Storm Protection Initiative, please visit the website below:
<https://www.cityofsanmateo.org/2288/Community-Flood-Storm-Protection-Initiat>