ADMINISTRATION, PROJECTS & PLANNING EXECUTIVE COMMITTEE MEETING

SEPTEMBER 9, 2024
3:30 P.M.

TAM CONFERENCE ROOM
900 FIFTH AVENUE, SUITE 100
SAN RAFAEL, CALIFORNIA

This meeting will be held in-person and via Zoom webinar.

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How to watch the live meeting using the Zoom link:
https://us02web.zoom.us/j/83035113530?pwd=Ym1lVHdnUHZycllGN2VPZVlBY0Zrdz09

Webinar ID: 830 3511 3530
Passcode: 891953

Teleconference: Members of the public wishing to participate via teleconference, can do so by dialing in to the following number at 3:30 p.m. on the day of the meeting: +**1 669 900 6833**; Access Code: 830 3511 3530; Password: 891953

How to provide public comment (limited to 2 minutes or less):

Before the meeting: Please email your comment to info@tam.ca.gov, no later than 5:00 p.m. Sunday, September 8, 2024, to facilitate timely distribution to Committee members. Please include the agenda item number you are addressing and your name and address. Your comments will be forwarded to the Committee members and will be placed into the public record.

During the meeting: For members of the public participating in-person, the Committee Chair will recognize persons from the audience who wish to address the Committee during public open time or on a particular agenda item at the time that item is considered by the Committee.

If watching this meeting online, click the "raise hand" feature in the webinar controls. This will notify TAM staff that you would like to comment. If participating by phone, "raise hand" by pressing *9 and wait to be called upon by the Chair or the Clerk. You will be asked to unmute your device when it is your turn to speak and your comments will become part of the public record.

Late agenda material can be inspected in TAM's office between the hours of 9:00 a.m. and 5:00 p.m. The TAM Office is located at 900 Fifth Avenue, Suite, 100, San Rafael.

The meeting facilities are accessible to persons with disabilities. Requests for special accommodations (assisted listening device, sign language interpreters, etc.) should be directed to Jennifer Doucette, 415-226-0820 or email: jdoucette@tam.ca.gov no later than 5 days before the meeting date.

AGENDA

1. Chair's Report & Commissioner Comments (Discussion)

2. Executive Director's Report (Discussion)

3. Open time for public expression, up to two minutes per speaker, on items not on the agenda that are within the subject matter of the agency's jurisdiction. (While members of the public are welcome to address the Committee, under the Brown Act, Committee members may not deliberate or take action on items not on the agenda, and generally may only listen.)

4. Approval of Meeting Minutes from July 8, 2024 (Action) – **Attachment**

5. Review of the Semi-Annual Project Status Report (Action) – **Attachment**

6. Update on the Sea Level Rise Adaptation Planning for Marin County's Transportation System Project (Discussion) – **Attachment**

MEETING OF THE
TRANSPORTATION AUTHORITY OF MARIN
ADMINISTRATION, PROJECTS & PLANNING
EXECUTIVE COMMITTEE

JULY 8, 2024
3:30 P.M.

TAM CONFERENCE ROOM
900 FIFTH AVENUE, SUITE 100
SAN RAFAEL, CALIFORNIA

MEETING MINUTES

Members Present:	Alice Fredericks, Tiburon Town Council Chance Cutrano, Fairfax Town Council Eric Lucan, Marin County Board of Supervisors, Committee Chair Kate Colin, San Rafael City Council Stephanie Moulton-Peters, Marin County Board of Supervisors
Members Absent:	None
Staff Members Present:	Anne Richman, Executive Director Bill Whitney, Principal Project Delivery Manager Dan Cherrier, Director of Project Delivery David Chan, Director of Programming and Legislation Derek McGill, Director of Planning Grace Zhuang, Accounting and Payroll Specialist Jennifer Doucette, Executive Assistant/Clerk of the Board Joanne O'Hehir, Administrative Assistant Melanie Purcell, Director of Finance and Administration Mikaela Hiatt, Associate Transportation Planner Molly Graham, Public Outreach Coordinator Scott McDonald, Senior Transportation Planner

Chair Lucan called the meeting to order at 3:30 p.m.

Chair Lucan welcomed everyone to the meeting and asked Executive Assistant/Clerk of the Board Jennifer Doucette to conduct a roll call to ensure a quorum.

A quorum of the Administration, Projects & Planning (AP&P) Executive Committee was confirmed, including the remote participation by Commissioner Moulton-Peters pursuant to the "Just cause" clause of Assembly Bill (AB) 2449.

Chair Lucan provided information about how the public may participate.

1. Chair's Report & Commissioners Comments (Discussion)

Chair Lucan reported on public transit ridership during the 2024 Marin County Fair, including an all-time daily ridership record for the Sonoma-Marin Area Rail Transit (SMART) on July 3rd with 4,007 passengers.

2. Executive Director's Report (Discussion)

Executive Director (ED) Anne Richman reported on the upcoming Lagunitas Creek Bridge Replacement Project informational meeting in Point Reyes, scheduled for July 10; the 101-580 project partnership

Canal Community Fair, scheduled for July 13; TAM's Clean Fleet Expo, scheduled for September 12; and the California Transportation Commission's (CTC's) approval of more than $2 billion to improve and maintain the state's transportation projects from the State Highway Operations and Protection Program (SHOPP).

Chair Lucan asked if any members of the public wished to speak or had submitted a comment by e-mail and hearing none, closed this item.

3. Open Time for Public Expression

Chair Lucan asked if any members of the public wished to speak.

Marin City resident Damian Morgan commented on the importance of communication and public engagement with the Marin City community.

4. Approval of Meeting Minutes June 10, 2024 (Action)

Chair Lucan asked if any members of the public wished to speak, and hearing none, closed public comment and asked for a motion.

Commissioner Cutrano moved to approve the Minutes of the June 10, 2024 meeting, which was seconded by Commissioner Fredericks. A roll call vote was conducted, and the motion passed unanimously.

5. Allocate Transportation Sales Tax Interest Funds for the Marin City Soundwall Project (Action)

Director of Project Delivery Dan Cherrier presented this item, which recommends the AP&P Executive Committee recommend to the TAM Board the authorization to allocate $250,000 in Transportation Sales Tax Interest funds to the Marin City Soundwall Project.

Commissioner Moulton-Peters provided a brief historical summary of the project and expressed support for staff's recommendation.

In response to Commissioner Colin, ED Richman explained that the California Department of Transportation (Caltrans) requires a Project Study Report (PSR) as the first step in developing a project on the state right-of-way, and that the PSR provides preliminary information regarding the scope and cost of the project. ED Richman also explained that TAM and the County will be working with the Marin City community throughout the process to the extent possible given the PSR requirements and budget.

Commissioner Fredericks commented on the importance of community engagement.

Chair Lucan asked if any members of the public wished to speak.

Marin City resident and Tamalpais High School student Damysia Walls expressed support for a barrier wall along the highway corridor in Marin City and provided a visual presentation regarding historical public policy and noise levels in the area and outlined the potential benefits to the community.

Marin City Community Services District (MCCSD) Board member and Marin City Climate Resilience and Health Justice ED Terrie Green provided handouts; expressed concern regarding air and noise pollution along the US 101 corridor through Marin City; and expressed support for a barrier wall. Ms. Green also expressed concern regarding the timeline and commented on the importance of identifying funding sources and expediting the project.

Marin City resident Damian Morgan expressed support for a barrier wall along the US 101 corridor through Marin City, commented on the life expectancy of Marin City residents, and inquired about the projected timeline of the project.

Mill Valley resident Rebekah Helzel expressed support for the allocation of $250,000 in Transportation Sales Tax Interest funds to the Marin City Soundwall Project.

Commissioner Cutrano commented on the importance of clear communication with the public, including all of the required milestones associated with the project timeline; and inquired about the possibility of expediting the project as it relates to issues of environmental justice. Commissioner Cutrano also commented on the importance of identifying additional funding, if needed, for comprehensive public outreach and engagement.

Commissioner Colin expressed support for staff's recommendation and commented on the importance of expediting the project, if possible.

Commissioner Fredericks expressed support for staff's recommendation; and commented that Caltrans' project requirements may prove challenging for expedition.

In response to Chair Lucan, ED Richman explained that previous studies included noise measurements of the Marin City area as a component of the County's General Plan but were not specific to the development of a sound wall.

Commissioner Moulton-Peters made a motion to refer staff's recommendation to the TAM Board, which was seconded by Commissioner Cutrano. A roll call vote was conducted, and the motion passed unanimously.

6. Recommend Award of the Contract for Vehicle Miles Traveled (VMT) Reduction and Mobility Enhancement Toolkit (Action)

Director of Planning Derek McGill and Associate Transportation Planner Mikaela Hiatt presented this item, which recommends the AP&P Executive Committee refer to the TAM Board to authorize the ED to negotiate and execute a professional services contract for the Vehicle Miles Traveled (VMT) Reduction and Mobility Enhancement Toolkit in an amount not to exceed the amount provided by the Caltrans planning grant of $518,934.

Commissioner Colin commented that different areas of the county may have varying needs with respect to a toolkit; and that the City of San Rafael has taken a hybrid approach by using VMT to capture broader, system wide goals, and level of service (LOS) to capture more detailed specifications at locations adjacent to projects.

Mr. McGill concurred that trip-making behavior in areas such as West Marin differs from those areas closer to activity centers; and that the development of the toolkit will incorporate localized VMT guidance.

In response to Commissioner Fredericks, Mr. McGill explained that VMT data is primarily collected from the California Household Travel Survey and big data sets, which include information from mobile phones and Global Positioning System (GPS) devices.

In response to Commissioner Cutrano, Mr. McGill explained that future One Bay Area Grant (OBAG) funding policy conditioning may require a jurisdiction to have a VMT reduction policy; and that TAM intends to work on the toolkit with local planning directors in order for such a policy to be adopted at the local jurisdictional level.

Commissioner Moulton-Peters commented on the importance of including future housing planning into the VMT reduction analysis; and inquired about future housing as it relates to the Countywide Transportation Plan (CTP). Mr. McGill explained that the quantity and locations of future housing element sites are being mapped out in the CTP and that quality analysis and quality control will continue to be performed on those data sets. Mr. McGill also explained that the toolkit will identify areas that may face challenges mitigating VMT.

In response to Chair Lucan, Mr. McGill explained that the VMT information on the TAM website will be updated this summer to reflect the traffic counts and data collected in 2022. Chair Lucan commented on the importance of using data that captures new hybrid working conditions.

Chair Lucan asked if any members of the public wished to speak.

WTB-TAM Director of Planning Matthew Hartzell commented on the importance of shifting to multi-modal transportation alternatives to driving, including public transit, biking, and walking. Mr. Hartzell also commented on the importance of completing gap closure projects within the pedestrian/bike path network in order to encourage such a shift; and that both existing and new housing developments contribute to VMT.

Commissioner Colin made a motion to refer staff's recommendation to the TAM Board, which was seconded by Commissioner Fredericks. A roll call vote was conducted, and the motion passed unanimously.

The meeting was adjourned at 4:46 p.m.

Transportation Authority of Marin

DATE: September 9, 2024

TO: Transportation Authority of Marin
Administration, Projects & Planning Executive Committee

FROM: Anne Richman, Executive Director
Project Delivery Team

SUBJECT: Review of the Semi-Annual Project Status Report (Action), Agenda Item No. 5

RECOMMENDATION

The Administration, Projects & Planning (AP&P) Executive Committee reviews and refers the September 2024 TAM Project Status Report to the TAM Board for acceptance.

BACKGROUND

In order to provide up to date funding and expenditure information that can help the Board and the general public understand the overall status of the suite of projects that TAM manages, these project updates are presented approximately every six months. The intent of these updates is to provide a broad overview of projects directly managed by TAM, and to update and identify potential issues that may require future Board actions. As projects progress, they will require specific Board deliberations and actions, such as consultant contract amendments or acceptance of work products.

DISCUSSION/ANALYSIS

Project Status Report Highlights:

The Project Status Report covers key on-going projects that are active and those that are in the active planning phase. State Route 37 and Improvements in Marin City to reduce flooding have multiple components that are either in planning or active phases.

Active Projects covers all projects that are in environmental, design or construction phases. These projects are well defined and, in most cases, fully funded. This report includes four active projects: (1) US 101 Marin-Sonoma Narrows – B7 and B8; (2) North-South Greenway Gap Closure Project – North Segment; (3) Improve Bellam Boulevard off-ramp from Northbound US 101; and (4) State Route 37.

Planning Projects covers emerging high-priority projects for which TAM is studying various options. These projects most likely will become active projects in the foreseeable future. The report includes four projects in the planning phase: (1) US 101/I-580 Multimodal and Local Access Improvement, (2) Studies of Highway 101 Interchanges and Approaching Roadways, (3) US 101 Part-Time Transit Lane, and (4) Improvements in Marin City to reduce flooding. Note the US 101/I-580 Multimodal and Local Access Improvement Project will transition to the Active category upon entering the environmental phase in October.

FISCAL IMPACTS

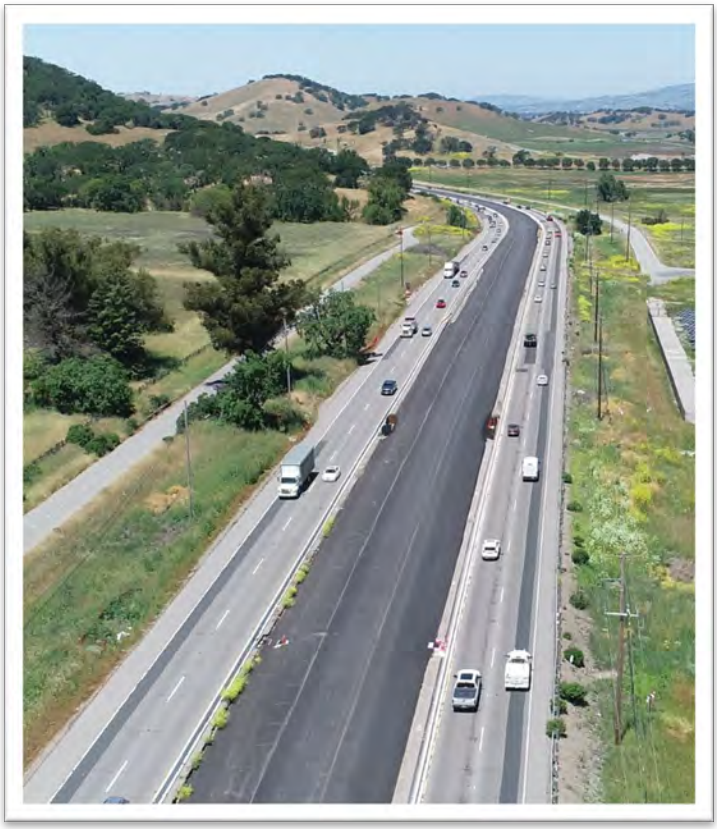
Not applicable.

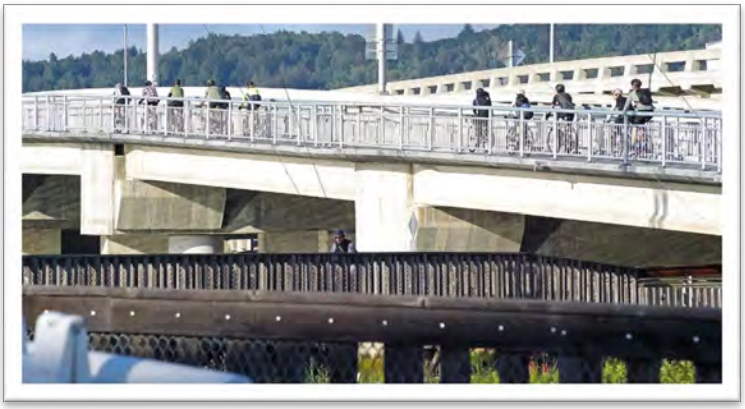
NEXT STEPS

The next Project Status Report update will be provided in the Winter/Spring of 2025.

ATTACHMENTS

Attachment A – September 2024 TAM Project Status Report
Attachment B – PowerPoint Presentation





Transportation Authority of Marin

Project Status Report

September 2024

ON-GOING PROJECTS

A. PROJECTS – ACTIVE

B. PROJECTS - PLANNING PHASE

C. OTHER

Project Status Report - Active — September 2024

Project: US 101 Marin-Sonoma Narrows Overview

Partners Caltrans, Sonoma County Transportation Authority and Transportation Authority of Marin
Jurisdiction(s) Novato, Petaluma

Scope

Widening of approximately 17 miles of US 101 from four to six lanes by adding HOV lanes in each direction; improving public transit and access to SMART rail network; installing continuous Class I and Class II bikeways between Novato and Petaluma; and constructing new interchanges and frontage roads to remove unsafe access from private properties and local roads.

Project will be completed through a series of phases based on operational priority and funding availability. As of the third quarter of 2024, all mainline HOV segments between Petaluma and Novato have been built or are under construction.

Status

- The final MSN HOV lane project on the corridor and in Marin County (MSN B7) commenced construction in July 2022 and is estimated to be substantially complete with HOV lanes open to the public in summer 2025.
- Various non-mainline projects are still outstanding and will require funding.

Issues/Areas of Concern

The MSN B7 project is fully funded for construction with assistance from SB1 SCCP and MTC federal discretionary fund sources. There is environmental mitigation that requires additional funds, however, the bulk of the funding will come from bid savings supplemented with local funds. The accompanying MSN B8 utility relocation project has entered the ROW acquisition phase and will encounter delay due to parcel owner resistance and funding. Minor vegetation restoration projects and a local San Antonio Road bridge reconstruction project (MSN B6) still remain as part of the overall MSN corridor work.

MARIN-SONOMA NARROWS STATISTICS

Project length.....17 miles

Avg. daily traffic – 2017.....153,000 vehicles

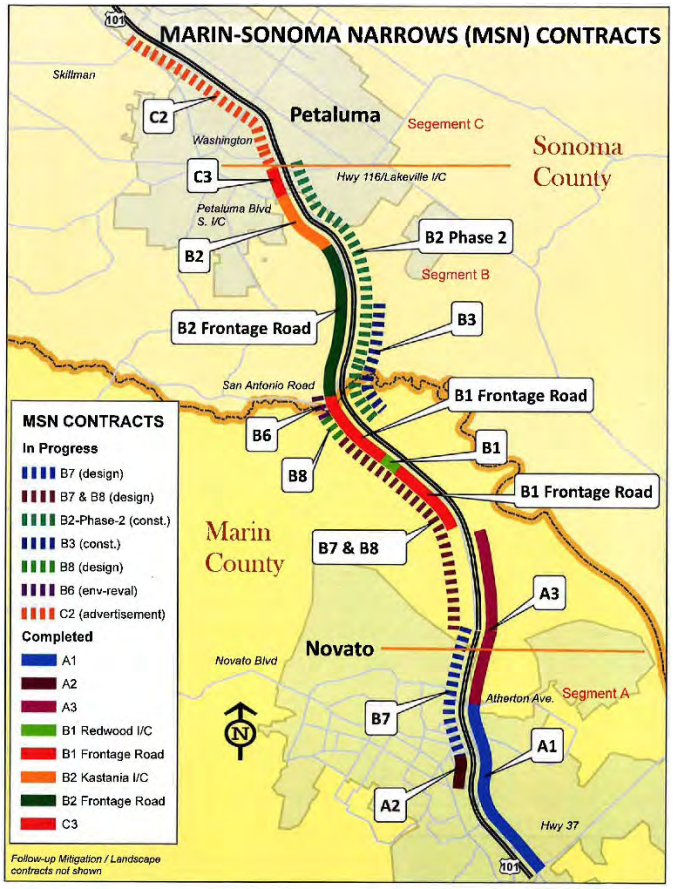
Avg. daily truck traffic – 2013.....6,200 trucks

Marin/Sonoma total populations.....258,000/495,000

Vehicle hours of delay (at less than 35 mph).....978,400

Funds programmed for MSN.....~$720,819,000

Funds needed to complete MSN.....~ $40,000,000



Major Phase Status

A1	Completed
A2	Completed
A3	Completed
B1 Phase I	Completed
B7 (Formerly B1-Phase II; See Fact Sheet)	In Progress
B2 Phase I	Completed
B2 Phase II	Completed
B3	Completed
B8 (Formerly A4 & B5; See Fact Sheet)	In Progress
B6	In Progress
C1	Completed
C2	Completed
C3	Completed

Project Status Report - Active — September 2024

Project: US 101 Marin-Sonoma Narrows – B7 and B8

Partners Caltrans, Sonoma County Transportation Authority and Transportation Authority of Marin
Jurisdiction(s) Novato

Scope

Construct a southbound HOV lane from 0.3 mile south of the Marin/Sonoma County line to just south of Franklin Avenue Overhead, and a northbound HOV lane from 1.7 miles north of Atherton Avenue Overcrossing to 0.3 mile south of the Marin/Sonoma County line. Project includes bridge widening, interchange modifications, completing all HOV lanes in the NB and SB directions, standardizing shoulders, Class 2 bike lane construction and correcting the roadway alignment and vertical profiles, along with relocating remaining utilities.

Status

The project design was funded with local, state and federal funds, with the HOV Lane design (MSN B7) completed in December 2020. Construction began in July 2022 and is estimated to be substantially complete with HOV lanes open to the public summer 2025. The MSN B8 design is on-going and will relocate major utility lines outside the Caltrans ROW and add Class 2 bike lanes to a county road. ROW acquisition, in terms of needed funds and resistance from property owners, is delaying completion of design.

Issues/Areas of Concern

- The project is an aggregate of three MSN projects, formerly called the B1 Phase 2, A4 and B5 projects. Due to the lengthy process with right-of-way (ROW) acquisition, the project was split into two concurrent paths: (1) design and construction of the HOV lanes (MSN B7) and (2) ROW acquisition and utility relocation (MSN B8).
- While the MSN B7 project continues to make good progress with substantial completion in summer 2025, the construction budget to complete the job is tight due to issues caused by severe winter storms in 2022 and 2023 that resulted in change orders and additional costs.
- The B8 project faces significant challenges with ROW acquisition and delay and lack of funding.

Updates from Previous Report

- B7 (HOV Lanes) is about seventy five percent complete. Stage 3 of the 4 stages started in the spring of 2024.
- Caltrans and TAM staff worked with executives to successfully preserve initial surplus of SB1 and MTC federal funds for the B7 and B8 projects to accommodate various funding shortfalls, however, estimates to complete the project have increased and may require additional funds

Schedule	
Planning	N/A
Environmental Clearance	2009
Design	2019-2020
Right of Way and Utilities	2018-2023
Construction	2022-2026

Estimated Cost by Project Phase	
Planning	N/A
Environmental Clearance	N/A
Design	$8,300,000
Right of Way and Utilities	11,100,000
Construction	123,100,000
TOTAL	$142,500,000

Funding by Source	
STIP Right of Way Excess Fund	$4,550,000
SB1-LPP	500,000
Measure AA Sales Tax	6,905,000
STP	2,000,000
SB1-SCCP	40,118,000
RM3/MTC Fed Discretionary & Other	88,427,000
TOTAL	$142,500,000

Project Status Report - Active — September 2024

Project: US 101 Marin- Sonoma Narrows – B7 and B8

Contracts and Agreements Managed by TAM

Contract or Agreement No.	Amend No.	Open/ Closed	Agency/Consultant	Description	Appropriated Amount	Funding Source	Billed to Date	Percent Billed
C-FY18-12	8	Open	BKF Engineers	Design and Support Engineering Services and Construction Support	$8,644,329	STIP ROW Fund & STP, RM3	$8,262,551	96%
C-FY20-02	1	Open	Fremier Enterprises Inc.	Project Management	$450,000	STIP ROW Fund & STP, RM3	$29,873	7%
				TOTAL	$9,094,329		$8,292,424	92%

Project Status Report - Active — September 2024

Project: North-South Greenway Gap Closure Project – Northern Segment

Partners TAM, MTC, Caltrans and the City of Larkspur
Jurisdiction(s) Caltrans and the City of Larkspur

Scope

The Northern Segment of the North-South Greenway Gap Closure Project will close a key gap in the local and regional non-motorized transportation network between the Central Marin Ferry Connector bridge over Sir Francis Drake Boulevard and the pedestrian overcrossing of US 101 on Old Redwood Highway.

Status

- The multiuse path over Corte Madera Creek opened for public use in July of 2022 (Caltrans segment).
- The City of Larkspur administered construction of the multiuse path on Old Redwood Highway (City Segment).
- TAM provided Design Servies During Construction.
- The multi-use path over Corte Madera Creek has been recognized by the American Council of Engineering Companies to receive an Honor Award for Engineering Excellence. The project has also been recognized by the American Society of Civil Engineers for the Outstanding Bridge Project in California. This is in addition to the Active Transportation Project of the Year from the California Transportation Foundation.

Issues/Areas of Concern

- None.

Updates from Previous Report

- A Ribbon Cutting Ceremony was held on May 17, 2024 to celebrate the opening of the Old Redwood Highway Segment of the Greenway. The path is now in service for public use.
- Although the path is open, a few constructions item remain to be completed. Once complete, the City will initiate project close-out procedures.

Schedule	
Planning	Complete
Environmental Clearance	Complete
Design	Complete
Right of Way and Utilities	Complete
Construction	2021-2024

Estimated Cost by Project Phase	
Planning	-
Environmental Clearance	$1,800,000
Design	$3,400,000
Right of Way and Utilities	-
Construction	$15,640,812
TOTAL	$20,840,812

Funding by Source	
RM2	$15,000,000
CMAQ (Old Redwood Highway)	$1,120,000
Measure A Interest Funds	$1,225,000
SB1 LPP Incentive	$1,500,000
LPP Formula	$1,100,000
TDA	$462,175
Local (City of Larkspur)	$150,000
BAAQMD TFCA	$283,637
TOTAL	$20,840,812

Project Status Report - Active — September 2024

Project: North-South Greenway Gap Closure Project – Northern Segment

Contracts and Agreements Managed by TAM

Contract or Agreement No.	Amend No.	Open/ Closed	Agency/Consultant	Description	Appropriated Amount	Funding Source	Billed to Date	Percent Billed
C-FY15-08	9	Open	Moffatt & Nichol	Environmental, Plans, Specifications and Estimates, Construction Administration (PAED, PS&E) (CON Support)	$4,654,130	RM2, Measure AA, TDA	$4,605,339	99%
Cooperative Agreement with Caltrans	1	Open	Caltrans	Construction and Construction Support	$13,200,233	RM2 TDA TFCA SB1 LPP	$13,059,429	98%
				TOTAL	$17,854,363		$17,664,768	99%

Note: The CMAQ and SB1 LPP Formula Funds programmed directly to the City of Larkspur.

Project Status Report - Active — September 2024

Project: **North-South Greenway Gap Closure Project – Southern Segment (Larkspur & Corte Madera Segment)**

Partners TAM, MTC, SMART, the City of Larkspur and the Town of Corte Madera

Jurisdiction(s) City of Larkspur and the Town of Corte Madera

Scope

The Southern Segment of the North-South Greenway Gap Closure Project will close a gap in the local and regional non-motorized transportation network between the southern terminus of the Northern Segment through a private easement (not yet secured) then along the Sonoma Marin Area Rail Transit (SMART) right-of-way south to Wornum Drive to connect to existing multi-use paths. The Gap Closure Project is being delivered in two segments, the Northern Segment and the Southern Segment. (Southern Segment shown in the adjacent graphic as red alignment.)

Status

- The use of the SMART right-of-way has been secured.
- The County of Marin Department of Public Works agreed to be the implementing agency for the initial alternative's alignment analysis phase. TAM is the project sponsor.

Issues/Areas of Concern

- The Southern Segment requires acquisition of private right-of-way by means of easement.
- A MOU will be required between partners to identify roles and responsibilities.
- Project development has been suspended pending identification of future funding.

Updates from Previous Report

- No updates to report.

Schedule	
Planning	TBD
Environmental Clearance	TBD
Design	TBD
Right of Way and Utilities	TBD
Construction	TBD

Estimated Cost by Project Phase	
Planning	$500,000
Environmental Clearance	TBD
Design	TBD
Right of Way and Utilities	850,000
Construction	TBD
TOTAL	$1,350,000

Funding by Source	
RM2	$1,350,000
TOTAL	$1,350,000

Project Status Report – Active — September 2024

Project: North-South Greenway Gap Closure Project – Southern Segment

Contracts and Agreements Managed by TAM

Contract or Agreement No.	Amend No.	Open/ Closed	Agency/Consultant	Description	Appropriated Amount	Funding Source	Billed to Date	Percent Billed
A-FY14-22		Open	Marin County, Dept of Public Works	Project Management	$1,350,000*	RM2	$446,015	33%
A-FY14-21		Closed	SMART	Boundary Survey and Title Research	$75,000	RM2	$52,652	100%
A-FY18-18		Closed	SMART	Right-of-Way	$850,000	RM2	$850,000	100%
				TOTAL	$2,275,000		$1,348,667	59%

*A portion of this allocation re-directed to another project.

Project Status Report - Active — September 2024

Project: Improve Bellam Boulevard Off-Ramp from Northbound US 101

Partners Caltrans, Transportation Authority of Marin, and City of San Rafael
Jurisdiction(s) Caltrans and City of San Rafael

Scope

Improve the Bellam Boulevard off-ramp from US 101 by creating additional storage. Traffic making a left turn at Bellam will be directed to the left lane, while traffic heading to I-580 or turning right on Bellam will stay in the right lane. Lane striping will be modified near Bellam to reduce the lane changes required to make a right on Bellam if exiting from eastbound I-580.

The off-ramps are the only freeway access to the economically disadvantaged Canal Neighborhood.

Status

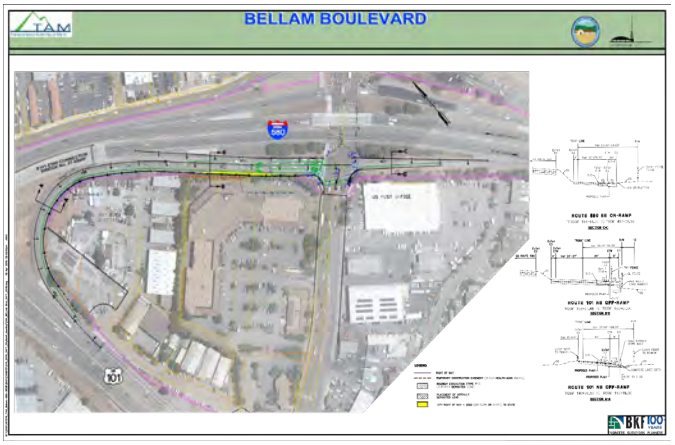
The CEQA document was recorded on August 15, 2018. Caltrans has approved roadway and structures design. Right of Way negotiations are complete. The County of Marin has signed an Interagencey Agreement to administer the construction contract. The funding shortfall has been resolved.

Issues/Area of Concern

Caltrans has taken the unusual step of requiring that the Right of Way process be in strict accordance with State policies. Normally, a local agency is responsible completely for right of way and just certifies the Right of Way Agreement.

Updates from Previous Report

Caltrans approval obtained for all project elements except Right of Way. The County of Marin has selected a Project Management firm and is ready to advertise the Project.



Schedule	
Planning	Complete
Environmental Clearance	Complete
Design	Spring 2024
Right of Way and Utilities	Fall 2024
Construction	Begin Winter 2024

Estimated Cost by Project Phase	
Planning	$30,000
Environmental Clearance	90,000
Design	1,250,000
Right of Way and Utilities	250,000
Construction	7,550,000
TOTAL	$9,170,000

Funding By Source	
Measure A and AA Sales Tax	$8,025,000
Local Partnership Program	1,164,000
TOTAL	$9,189,000

Project Status Report – Active — September 2024

Project: Improve Bellam Boulevard Off-Ramp from Northbound US 101

Contracts and Agreements Managed by TAM

Contract or Agreement No.	Amend No.	Open/ Closed	Agency/Consultant	Description	Appropriated Amount	Funding Source	Billed to Date	Percent Billed
C-FY17-02	3	Open	BKF Engineers	Complete design services including environmental.	$1,176,325	Measure A/AA Sales Tax, RM2	$1,152,278	98%
A-FY19-17		Closed	County of Marin	Agreement to manage construction including construction management*	$63,888*	Measure A Sales Tax	$63,888	100%
				TOTAL	$1,240,213		$1,216,166	98%

*This agreement has expired.

Project Status Report – Planning — September 2024

Project: US 101/I-580 Multimodal and Local Access Improvements

Partners Caltrans, Transportation Authority of Marin, City of San Rafael.
Jurisdiction(s) Caltrans, and City of San Rafael.

Scope

Improve regional connectivity between NB US 101 and EB I-580, traffic operations on local streets, transit and travel times, community cohesion and enhance the bike and pedestrian network. The eastbound approach to the RSR Bridge is one of only two toll bridges in the Bay Area accessed by low-speed local roads with traffic signals resulting in traffic delays on local roads and US 101.

Status

The Project Study Report (PSR) has been approved by Caltrans. Preliminary traffic studies are complete and will continue in the environmental phase. The environmental process will kick off with a Scoping Meeting on October 1, 2024.

Issues/Area of Concern

- Significant comments from Caltrans regarding ramp metering, sea level rise, VMT, and design exceptions.
- Additional funding likely needed for construction.
- Still Exploring options to improve local circulation.

Updates from Previous Report

- The Community Working Group was updated for the Environmental Phase – an initial meeting was held in May 2024.
- Bellam workshops took place in May and July for English and Spanish speaking community members.
- Initial traffic studies for local circulation are complete.
- Environmental Scoping meeting is scheduled for October 1.
- In March 2024, TAM Board dropped alternatives 3B and 6 from further evaluation and added a Local Street Alternative. Alternatives moving forward are alternatives 2, 3A and 7 (new alternative).
- Alternatives will be renumbered for environmental phase.

Schedule	
Planning	2020
Environmental Clearance	2027
Design	2029
Right of Way and Utilities	2031
Construction	2033

Estimated Cost by Project Phase	
Planning	2250000
Environmental Clearance	7,500,000
Design	9,000,000
Right of Way and Utilities	8-30 M
Construction (depends on alternative)	192-315 M
TOTAL	$211-364 M

Funding By Source	
RM 3	$135,000,000
Measure A/AA Sales Tax	17,000,000
TOTAL	$152,000,000

Project Status Report – Active — September 2024

Project: US 101/I-580 Multimodal and Local Access Improvement Project

Contracts and Agreements Managed by TAM

Contract or Agreement No.	Amend No.	Open/ Closed	Agency/Consultant	Description	Appropriated Amount	Funding Source	Billed to Date	Percent Billed
C-FY12-09	1	Closed	CSW/Stuber-Stroeh Engineering Group (Task Order 32)	Develop Alternatives, Cost Estimates, Graphic Rendering, Environmental Evaluation	$102,000	Measure A Sales Tax	$102,000	100%
C-FY20-01	2	Open	Kimley-Horn & Associates, Inc.	Project Approval and Environmental Document (PAED)	$10,000,000	Measure AA Sales Tax, RM3	$3,653,690	37%
C-FY20-02	1	Open	Fremier Enterprises Inc.	Project Management	$600,000	Measure AA Sales Tax, RM3	$326,185	54%
				TOTAL	$10,702,000		$4,081,875	38%

Project Status Report – Planning & Active — September 2024

Project: State Route 37 (Marin Portion)

Partners Caltrans, Metropolitan Transportation Commission, and Transportation Authorities of Marin, Sonoma, Napa and Solano Counties

Jurisdiction(s) Marin County

Scope

State Route 37 is a key transportation corridor stretching from US 101 in Marin County to Interstate 80 in Solano County. Evaluation of the corridor has been assigned to a policy committee comprised of transportation authorities from Marin, Sonoma, Solano and Napa counties to address sea level rise, traffic congestion, transit options and recreational activities.

Status

TAM selected Caltrans to complete the design of Segment 2 – Phase 1. Segment 2 is from US 101 to Atherton Ave; Phase 1 is the bridge over Novato Creek to less than the ultimate width and including temporary transition structures to return to the existing grade.

Issues/Area of Concern

A segment of the four-lane freeway in Novato had been closed due to the flooding of Novato Creek in January and February 2017, in February 2019, and in January 2023. Segment two is the first of the eight segments to enter final design. Current issues include width of the temporary multi-use path, and cost increases.

Updates from Previous Report

The CEQA and NEPA Environmental Documents for Segment 2 have been signed.

TAM selected Caltrans to perform the design for the Phase 1 portion of the work and entered into a Cooperative Agreement.

Caltrans has informed TAM that the chosen delivery method will be the standard Design-Bid-Build. Other delivery methods were originally sought and were a factor in assigning Caltrans the design work.

TAM is continuing to meet and work with the other partners concerning the other segments not in Marin County and to explore tolling options.

Schedule – Segment 2 Phase 1	
Planning	2018
Environmental Clearance	2023
Design	2025
Right of Way and Utilities	TBD
Construction	TBD

Estimated Cost by Project Phase – Segment 2 P1	
Planning	N/A
Environmental	$10,000,000
Design	$15,000,000
Right of Way and Utilities	TBD
Construction	$170,000,000+
TOTAL	$195,000,000+

Funding by Source – Segment 2 Phase 1	
Caltrans SHOPP	$10,000,000
State Earmark	$20,000,000
IIJA PROTECT	$155,200,000
TOTAL	$185,200,000

Project Status Report – Planning & Active — September 2024

Project: State Route 37

Contracts and Agreements Managed by TAM

Contract or Agreement No.	Amend No.	Open/ Closed	Agency/Consultant	Description	Appropriated Amount	Funding Source	Billed to Date	Percent Billed
A-FY16-10		Closed	Solano Transportation Authority	Design Alternatives	$40,000	City/County	$40,000	100%
C-FY17-16	1	Closed	CSW/Stuber-Stroeh Engineering Group (Task Order 11)	Segment A - Improvement Concept Study	$88,000	City/County	$85,922	97%
A-FY19-10		Closed	NVTA, STA, SCTA and TAM	SR37 Travel Behavior Feasibility Study	$11,765	City/County	$11,765	100%
A-FY19-07		Closed	County of Marin	SR37 Adaptation Study	$30,000	City/County	$30,000	100%
		Open	Caltrans	Segment 2 Phase 1 Design	$15,000,000	State Earmark	$3,750,000	25%
				TOTAL	$15,169,765		$3,917,687	26%%

Project Status Report – Planning — September 2024

Project: **Highway 101 Interchanges and Approaching Roadways Studies**
Partners Caltrans, TAM, County of Marin, Marin Cities, Marin Transit, and Golden Gate Transit.
Jurisdiction(s) Caltrans, County of Marin, Marin Cities.

Scope

The Measure AA Expenditure Plan includes a category that provides funding for studies of interchanges on Highway 101. The Studies will be used to develop multi-modal improvement concepts to Highway 101 interchanges and highway access routes to reduce congestion, improve connectivity, and improve local traffic operations.

The transportation sales tax funding will be used as "seed money" to prepare studies and reports that can support application for regional, state, and federal grants.

Status

The studies have been developed to outline existing conditions, define constraints, and present opportunities for potential improvements to twelve interchanges on Highway 101 and their local approaching roadways.

An implementation plan was prepared based on the interchange studies and results from the prioritization plan. The approved recommendation was to advance three interchange locations to the next phase of project development using Caltrans procedures. The following interchanges have advanced to the next phase of project development:

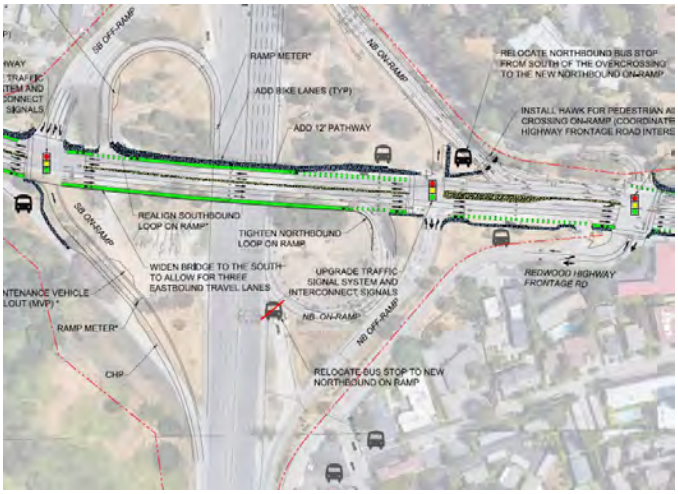
- East Blithedale/Tiburon Blvd (SR 131)
- Manual T. Freitas Parkway/Civic Center Drive
- Alameda Del Prado/Nave Drive

Issues/Area of Concern

None.

Updates from Previous Report

Work continues to refine the improvement concepts and develop a Project Initiation Document (PID) for the three locations.



Schedule	
Planning	2020-2025
Environmental Clearance	TBD
Design	TBD
Right of Way and Utilities	TBD
Construction	TBD

Estimated Cost by Project Phase	
Planning	$4,431,000
Environmental	TBD
Design	TBD
Right of Way and Utilities	TBD
Construction	TBD
TOTAL	$4,431,000

Funding by Source	
Measure AA Sales Tax	$4,431,000
TOTAL	$4,431,000

Project Status Report – Planning

September 2024

Project: Studies for Twelve US 101 Interchanges and Approaching Roadways

Contracts and Agreements Managed by TAM

Contract or Agreement No.	Amend No.	Open/ Closed	Agency/Consultant	Description	Appropriated Amount	Funding Source	Billed to Date	Percent Billed
C-FY20-09		Open	HNTB Corporation	Professional Engineering Services	$4,431,000	Measure AA Sales Tax	$2,964,524	67%
				TOTAL	$4,431,000		$2,964,524	67%

Project Status Report – Planning — September 2024

Project: **Marin County US 101 Part-Time Transit Lane Study**

Partners Caltrans, Marin County, City of San Rafael, City of Novato, Marin Transit, Golden Gate Transit

Jurisdiction(s) Caltrans, Marin County, City of San Rafael and the City of Novato

Scope

This pilot project would provide a part-time transit lane using the highway shoulder of Southbound US 101 in Marin County between Novato and San Rafael. Bus on Shoulder, or Part-Time Transit Lane, is a proven concept to improve transit reliability and speed according to FHWA guidance, and a TAM feasibility study identified benefits to both Golden Gate Transit and Marin Transit Services. The conceptual design would allow for the operation of Transit buses in existing auxiliary lanes, on/off ramps, and shoulder lane with minor modifications to the striping and lane widths on the highway.

Status

TAM has completed a feasibility study and concept design, cost estimates and operational plans for the project among other items in October 2021. The next step will involve Project Initiation with Caltrans and determine funding availability.

Marin Transit was awarded $1,107,000 from the MTC sponsored Transit Performance Initiative with TAM serving as the implementing agency. A local match in the amount of $140,000 will be required by TAM.

Issues/Area of Concern

Performance measurements would be required for any pilot project, these would include safety measures, CHP enforcement, and other concerns raised during the feasibility study. Potential legislation is also being sought to clarify vehicle code and enforcement concerns.

Updates from Previous Report

The Funds have been transferred from FHWA to FTA. TAM and Caltrans are preparing a Cooperative Agreement.

Schedule	
Planning	2021-2025
Environmental Clearance	2026
Design	TBD
Right of Way and Utilities	TBD
Construction	TBD

Estimated Cost by Project Phase	
Planning	$350,000
PID and Environmental	$1,250,000
Design	$1,200,000
Right of Way and Utilities	TBD
Construction	$5,000,000
TOTAL	$7,800,000

Funding by Source	
Caltrans Planning Grant	$350,000
TPI and Match	$1,250,000
TBD	$6,200,000
TOTAL	$7,800,000

Project Status Report – Planning

September 2024

Project: Marin County US 101 Part-Time Transit Lane Study

Contracts and Agreements Managed by TAM

Contract or Agreement No.	Amend No.	Open/ Closed	Agency/Consultant	Description	Appropriated Amount	Funding Source	Billed to Date	Percent Billed
C-FY20-07		Closed	Kimley-Horn and Associates, Inc.	Planning Services	$308,000	Caltrans Grant	$308,000	100%
				TOTAL	$308,000		$308,000	100%

Project Status Report – Planning & Active — September 2024

Project: Marin City Flood Mitigation Projects

Partners Caltrans, County of Marin, and Transportation Authorities of Marin
Jurisdiction(s) Marin County

Scope

TAM is currently administering a $10 million earmark from the state to distribute to the County of Marin for flood mitigation projects within the Marin City area of Marin County.

Status

Four projects have been identified by the County to be funded using the state earmark funds and one by Caltrans to be funded using IIJA PROTECT funds:

1. Portable Pump Station at Donahue Street
2. Permanent Pump Station in Existing Pond
3. Permanent Floodwall
4. Environmental Pond Dredging
5. Second Culvert Under Hwy 101 (Caltrans)

TAM and the County executed a funding agreement to implement the County's four projects.

Issues/Area of Concern

US 101 near Marin City and the Manzanita Park & Ride lot continually experience flood events due to a combination of roadway settlement, sea level rise, higher King tides, and maintenance challenges, sometimes closing off access to these areas.

Updates from Previous Report

TAM and the County executed a funding agreement to implement the County's four projects.

The County of Marin has awarded a contract to initiate purchase and installation of the Portable Pump Station and anticipates its completion later this year. They are pursuing retention of a contractor to operate the pump 24/7.

Schedule	
Planning	N/A
Environmental Clearance	N/A
Design	N/A
Right of Way and Utilities	N/A
Construction	N/A

Funding Distribution by Project/Activity	
Potable Pump Station	$2,500,000
Permanent Pump Station	$400,000
Permanent Floodwall	$750,000
Pond Dredging	$3,000,000
Second Culvert	$2,850,000
TAM Administration	$500,000
Hwy 101 Second Culvert	$20,000,000
TOTAL	$30,000,000

Funding by Source	
County	TBD
Caltrans IIJA PROTECT	$20,000,000
State Earmark	$10,000,000
TOTAL	$30,000,000

Project Status Report – Planning & Active — September 2024

Project: Marin City Flood Mitigation Projects

Contracts and Agreements Managed by TAM

Contract or Agreement No.	Amend No.	Open/ Closed	Agency/Consultant	Description	Appropriated Amount	Funding Source	Billed to Date	Percent Billed
A-FY24-02		Open	County of Marin	County of Marin Mitigation Projects	$6,650,000	State Earmark	$265,554	4%
				TOTAL	$6,650,000		$265,554	4%

PROJECT PHASE DEFINITIONS

Planning – Complete project studies to define general project parameters.

Environmental Clearance – Completion of and approval of environmental studies and/or reports. Environmental analysis assesses the potential impacts a project may have on the natural and/or built environment.

Design – Engineer and design project leading to the preparation of plans, specifications and construction estimates. Resource agency permits are obtained in the final design stage in preparation to advertise the project for construction bidding.

Right of Way and Utilities – Establish cost and obtain ownership/passage through a given area for the benefit of project completion. Establish utilities needed for the project and relocation if necessary. Right-of-way certification required if using federal funds or if the project is on state highway system.

Construction – Includes actual construction, construction management and construction related design. Actual construction close-out duration may go for years after scheduled completion date shown.

Project Management – Project or construction management and oversight support of projects to carry out elements of construction. Project management is provided by in-house agency staff and consultants. Typically includes construction materials testing for contract compliance.

ACRONYMS AND ABBREVIATIONS

ABAG	Association of Bay Area Governments
ATP	Active Transportation Program
BAIFA	Bay Area Infrastructure Financing Authority
BAAQMD	Bay Area Air Quality Management District
Caltrans	California Department of Transportation
CEQA	California Environmental Quality Act
CMAQ	Congestion Mitigation and Air Quality Improvement Program
CMP	Congestion Management Program
CO-OP	Cooperative Agreement
CTC	California Transportation Commission
DPW	Department of Public Works
EEMP	Environmental Enhancement and Mitigation
EIR	Environmental Impact Report
EIS	Environmental Impact Study
ENV MITG	Environmental Mitigation
EV	Electric Vehicles
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
GGT	Golden Gate Transit
GGBHTD	Golden Gate Bridge Highway and Transportation District
HOT Lane	High Occupancy Toll Lane
HOV Lane	High Occupancy Vehicle Lane
ITIP	Interregional Transportation Improvement Program
ITS	Intelligent Transportation Systems
LOS	Level of Service
MCBC	Marin County Bicycle Coalition
MPO	Metropolitan Planning Organization
MPWA	Marin Public Works Association
MT	Marin Transit
MTC	Metropolitan Transportation Commission
MTS	Metropolitan Transportation System

ACRONYMS AND ABBREVIATIONS

NEPA	National Environmental Policy Act
NOP	Notice of Preparation
NTPP	Non-motorized Transportation Pilot Program
OBAG	One Bay Area Grant
PA&ED	Project Approval & Environmental Document
PCA	Priority Conservation Area
PCI	Pavement Condition Index
PDA	Priority Development Area
PID	Project Initiation Document
PS&E	Plans, Specifications and Engineers Estimates
PSR	Project Study Report
PTTL	Part Time Transit Lane
RHNA	Regional Housing Needs Allocation
RM 2	Regional Measure 2
RM3	Regional Measure 3
ROW	Right of Way
ROW CAP	Right of Way Capital
RTIP	Regional Transportation Improvement Plan
RTP	Regional Transportation Plan
SCS	Sustainable Communities Strategy
SLPP	State Local Partnership Program
SMART	Sonoma Marin Area Rail Transit
SR2S	Safe Routes to Schools
STA	State Transit Assistance; also, Solano Transportation Authority
STIP	State Transportation Improvement Program
STIP-IIP	Interregional Transportation Improvement Program
STIP-RIP	Regional Transportation Improvement Program
STP	Surface Transportation Program
TBD	To Be Determined
TCRP	Traffic Congestion Relief Program
TEA-21	Transportation Equity Act for the 21st Century
TIP	Federal Transportation Improvement Program
VRF	Vehicle Registration Fee

TAM Semi-Annual Project Update

Transportation Authority of Marin

Administration, Projects and Planning Executive Committee

September 9, 2024

TAM Project Update

1. Marin-Sonoma Narrows
2. State Route 37
3. North-South Greenway Gap Closure
4. Highway 101 Interchange Studies
5. US 101/I-580 Multimodal and Local Access Improvements
6. Bellam Blvd Off-Ramp from Northbound US 101
7. US 101 & Marin City Flood Mitigation Coordination
8. US 101 Part-Time Transit Lane

US 101 – Marin-Sonoma Narrows B7 & B8

Current Phase:

Construction (B7) & Final Design (B8)

Update from Prior Report:

- MSN B7 construction started in July 2022 and completed Stage 2 in spring 2024. Stage 3 of 4 work is now underway to construct the northbound lanes. Project is estimated to be substantially complete with HOV lanes open in summer 2025.
- MSN B8 (utility relocation and Class 2 bike lane on San Antonio Rd.) in final design but delayed due to difficult and costly right-of-way (ROW) acquisition.
- Funding for B7 stormwater compliance is insufficient. TAM, MTC, and Caltrans are exploring options.

Issues:

- During construction of the MSN B7 project, field challenges and cost must be managed effectively as the budget is tight to complete the project.
- MSN B8 ROW acquisition will continue to be challenging.

Upcoming Activities:

- Continue construction of B7
- Secure funds for shortfalls, apply for environmental permits, and complete the design package for B8.

Transportation Authority of Marin

State Route 37

Current Phase:

Planning and Environmental Clearance

Design for the Novato Creek Bridge

Update from Prior Report:

- Segment 2 – TAM completed negotiations with Caltrans and entered into a Cooperative Agreement to fund the design of Novato Creek Bridge.
- Executive Steering Committee looking at prioritization of the eight identified segments.
- New partnership structure finalized for SR 37 corridor, includes state and regional agencies, and tribal community.
- Funding:
  - $155 million in IIJA-Protect program for Novato Creek Bridge secured by Caltrans for construction. Additional construction funds will be needed.
  - TAM contributed $15 million of the $20 million State Earmark to fund Novato Creek Bridge design.
  - RM3 funds are available
  - Caltrans pursuing federal grant to help with Novato Creek Bridge construction costs.

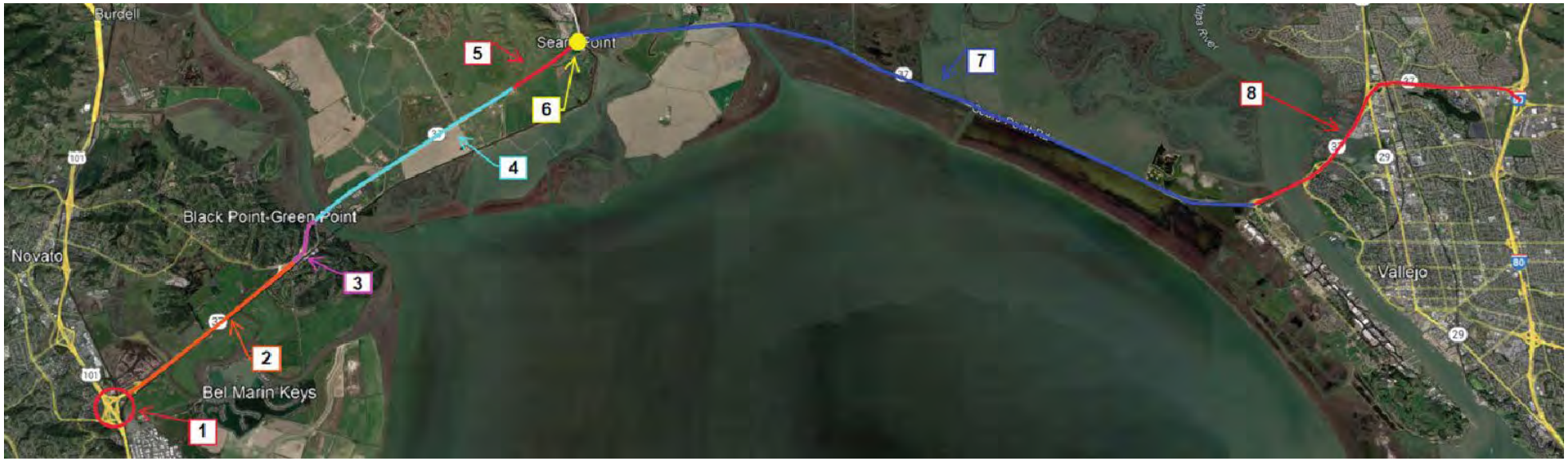
State Route 37 (cont.)

Issues:

- Additional environmental review for Tolay Creek and Strip Marsh East continue
- Additional funding needed for Segments 1 and 3 in Marin, plus Phase 2 of Segment 2

Upcoming Activities:

- Complete design for Novato Creek Bridge
- Further discussions on tolling configuration and limits
- Prioritization of the eight segments
- Pursuit of funding



North-South Greenway Gap Closure – Northern Segment

Current Phase:

Construction of Old Redwood Highway Segment

Update from Prior Report:

- Ribbon Cutting Ceremony held on May 17th
- Path is now open for public use

Issues:

- None

Upcoming Activities:

- City of Larkspur is finalizing a few remaining construction items

Highway 101 Interchange Studies

Current Phase:

Project Initiation Document (PID) Phase for three selected interchange locations:

1. East Blithedale/Tiburon Blvd (SR 131)
2. Manual T. Freitas Parkway/Civic Center Drive
3. Alameda Del Prado/Nave Drive

Update from Prior Report:

- Continue preparation of PID Supporting Documents

Issues:

- None

Upcoming Activities:

- Continue PID development working with Caltrans, Transit Agencies and the County, Cities & Towns

101/580 Multi-Modal & Local Access Improvements

Current Phase:

Environmental

Update from Prior Report:

- Two Bellam Blvd. workshops were held in May (English) July (Spanish)
- First Community Working Group Meeting for Environmental phase held in May
- Traffic studies for environmental phase have begun
- Biological field studies are complete

Issues:

- Caltrans approval of non-standard features
- Caltrans comments on VMT, Sea Level Rise and ramp metering
- Funding shortfall for construction
- Exploring ideas to alleviate Bellam Blvd. congestion

Upcoming Activities:

- Environmental Scoping meeting on October 1, 2024
- Bellam Blvd. workshops and Community Working Group Meeting #2 in fall/winter
- Bring MOU between agencies to TAM Board for consideration
- Begin Archeological and Cultural Resource studies

Bellam Boulevard Off-Ramp Improvements

Current Phase:

Design & Right of Way

Update from Prior Report:

- Final Roadway Design Approved
- Final Structures Design Approved
- Right of Way appraisal and negotiations completed
- Construction Interagency Agreement with County of Marin completed
- $4 million budget shortfall resolved

Issues:

- Caltrans requiring all right of way documents to be in the State format with State clauses (very unusual for a Local Agency managed project)
- Tight construction window due to tree removal

Upcoming Activities:

- Signed ROW Agreement

US 101 & Marin City Flood Mitigation Coordination

Current Phase:

Planning & Design

Update from Prior Report:

- County awarded contract to install drainage infrastructure North of Donahue Street with connections to the pond outlet structure. Anticipate project to be in place by end of 2024.
- County will purchase two trailer mounted portable pumps

Issues:

- County solicited bids for temporary pump operations and received no bidders. Phase I permanent pump station is underway; Phase II funding is pending.

Upcoming Activities:

- Staff actively engaged with Caltrans and County of Marin to monitor series of improvement projects in Marin City.
- County continues soliciting bids to operate temporary pumps 24/7

Photo courtesy of Pacific Sun

US 101 Part-Time Transit Lane (Bus on Shoulder)

Current Phase:

Pre-Project Initiation Document (PID) Activities

Update From Prior Report:

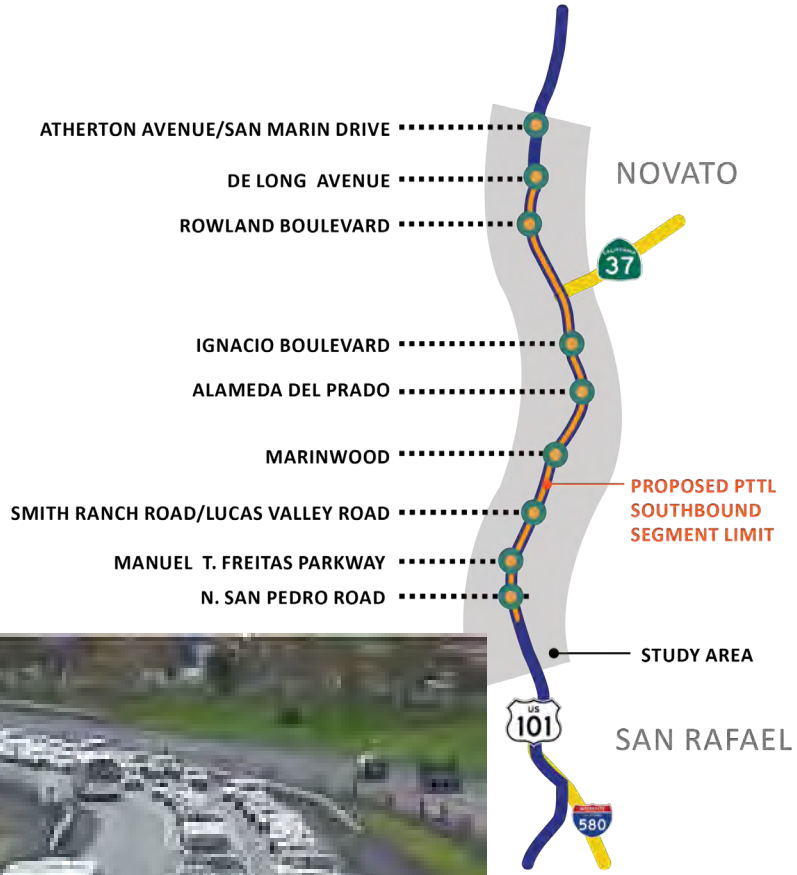
- $1.1M Grant Funds transferred to FTA and awarded funds to Marin Transit
- TAM and Marin Transit entered into funding agreement

Issues:

- None

Upcoming Activities:

- Finalize Cooperative Agreement with Caltrans for Project Oversight
- Retain consultant to prepare PID and Environmental Document



Questions?

Questions & Discussion

Transportation Authority of Marin

DATE: September 9, 2024

TO: Transportation Authority of Marin
Administration, Planning, & Projects (AP&P) Executive Committee

FROM: Anne Richman, Executive Director
Mikaela Hiatt, Associate Transportation Planner

SUBJECT: Update on the Sea Level Rise Adaptation Planning for Marin County's Transportation System Project (Discussion), Agenda Item No. 6

RECOMMENDATION

Discussion item only. The Administration, Planning & Projects (AP&P) Executive Committee reviews and provides feedback on the Sea Level Rise Adaptation Planning for Marin County's Transportation System Project.

BACKGROUND

TAM has been coordinating with partner agencies and stakeholders in Marin County and the region to advance adaptation planning for sea level rise. The Measure AA ½-Cent Transportation Sales Tax Expenditure Plan sets aside 1% of the transportation sales tax under "Category 2.3: Develop projects to address transportation impacts from sea level rise (SLR)". The expenditure plan states:

> "This funding would be utilized to support protecting and adapting Marin's roadways and related infrastructure to the effects of sea level rise and flooding. These funds can be used to serve as seed money to find solutions, attract matching grants and leverage private investments to meet the challenges and vulnerabilities identified in numerous planning efforts including those of Bay Wave, and CSMART."

On April 27, 2023, the TAM Board reviewed the scope of work and approved the contract with ARUP, the consultant to this planning effort. This effort is intended to build off previous adaptation planning efforts conducted in Marin County and the region to develop an implementation plan for TAM to support Marin County's Transportation System. At the February 22, 2024 TAM Board Meeting, TAM staff presented on the progress made to date including the completion of the Existing Plan Review Memo and the development of the Identification of Vulnerable Locations. This included a review of the 19 Focus Areas throughout the County where there was the highest concentration of sea level rise and flood risk; transportation, community, and lifeline assets exposed to impacts; and Equity Priority Communities.

DISCUSSION/ANALYSIS

Following the February Board meeting, the project team used the feedback from the Board to finalize the Vulnerable Locations Memo and transition to drafting the Adaptation Summaries.

With the information gathered from the Vulnerable Locations task, ARUP and its subconsultant WRT helped develop Deep Dive adaptation summaries for seven focus areas in Marin County. The focus area deep dives were identified by screening out the focus areas where extensive work pertaining to

sea level rise is underway, such as State Route 37 and Stinson Beach, as well as through a consolidation of the focus areas based on watersheds. The Adaptation Summaries include information on the challenges that face each focus area due to sea level rise and flooding, potential options for addressing the challenges at each of the locations within the focus areas, and the partner and stakeholder opportunities within each area.

The Adaptation Summaries have been reviewed by the Technical Advisory Committee (TAC) and through individual meetings with each of the respective cities' and towns' staff, the County of Marin, MTC, BCDC, Caltrans, Golden Gate Transit, and SMART, and were shared with Marin Transit. The TAC and each of the agencies that screened the initial draft Adaptation Summaries are currently reviewing the updated versions of the draft Adaptation Summaries.

To gather stakeholder input, TAM hosted two online focus groups on the topics of environment and equity on August 21 and 23, respectively. Local environmental advocates, active transportation advocates, and community-based organizations participated in lively discussions on the study, recommendations for public engagement strategies, and guidance on elements the project team could delve into further.

Staff will return to the Committee and Board in the coming months with additional updates on the Governance Review and Implementation Plan tasks along with the Draft and Final Report. As the County of Marin's Sea Level Rise Governance Study is underway, TAM's study intends to use the Governance Review task to continue to evaluate potential partnerships and governance structures, BCDC's guidelines for Senate Bill 272 Subregional Adaptation Plans, and funding opportunities that connect with the other elements of the Adaptation Summaries, Implementation Approach, and Final Report. This effort will support identifying next steps, stakeholder involvement, connect the Adaptation Summaries with future efforts such as the SB 272 Subregional Plans, and guide the Measure AA program development.

FISCAL CONSIDERATION

Funding for the Sea Level Rise Adaptation Planning for Marin County's Transportation System Agreement is available through Measure AA, Category 2.3 Sea Level Rise. The current contract amount is $550,000, expected to be spent over the next fiscal year.

NEXT STEPS

Staff will continue to develop Tasks 5 through 8 of the plan and present further information to the Board of Commissioners in the coming months.

ATTACHMENTS

Attachment A – Staff Presentation
Attachment B – Draft Adaptation Summaries
Attachment C – Vulnerable Locations Memo

Sea Level Rise Adaptation Planning for Marin County's Transportation System

Transportation Authority of Marin

Administration, Projects & Planning Executive Committee Meeting
September 9, 2024

Project Overview

TAM Sea Level Rise Adaptation Planning

Objectives

1. Identify potential SLR solutions for Marin roadways, communities, & critical assets
2. Guide future implementation of infrastructure & TAM funding programs *focused on SLR*

Stakeholder Engagement

TAM Sea Level Rise Adaptation Planning

Technical Advisory Committee

- 6 meetings
- Public agency partners
- Caltrans, TAM, Marin County DPW/CDA, BCDC, MTC, Sausalito, San Rafael, Corte Madera

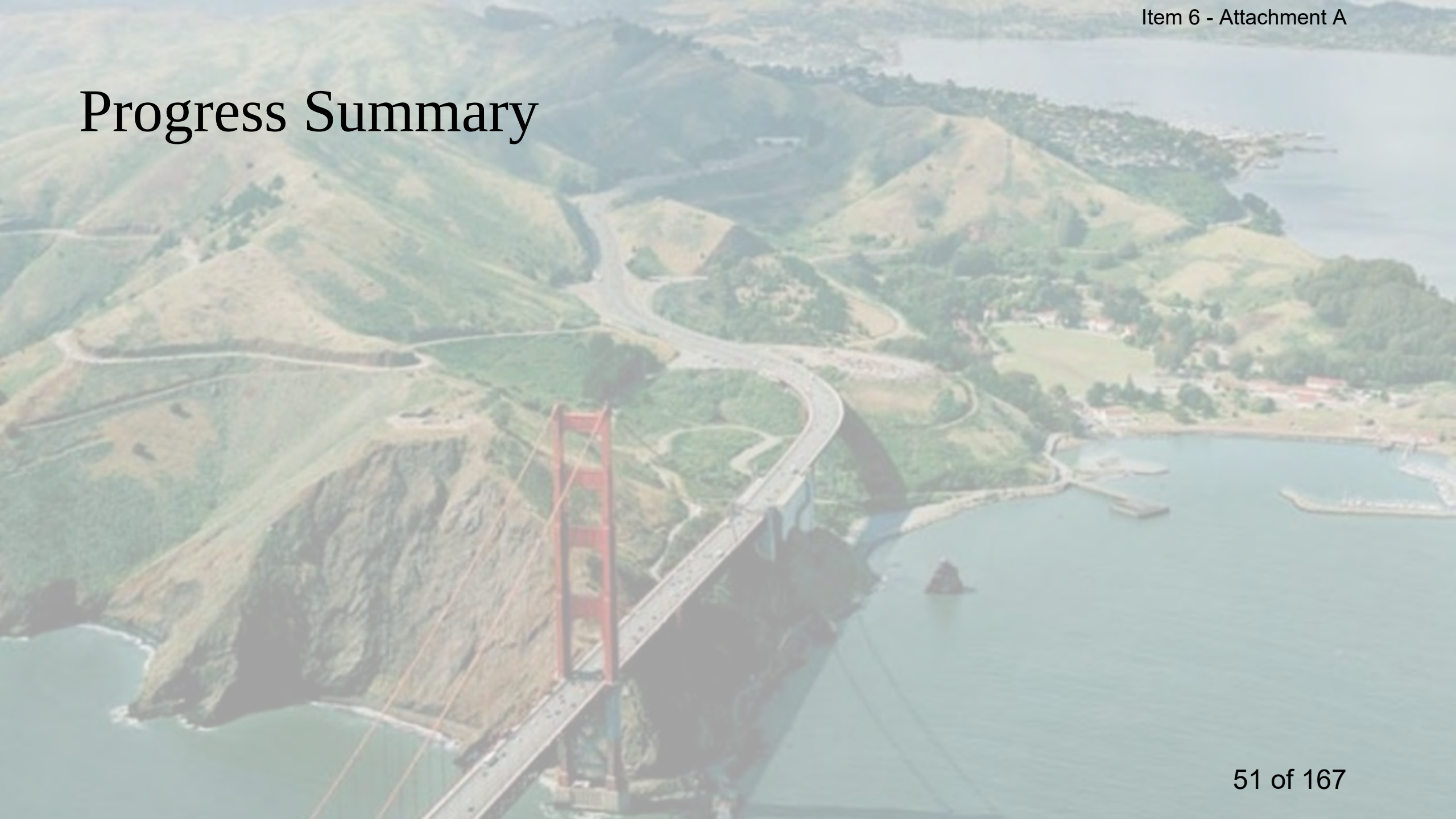
Stakeholder Focus Groups

- ~15 meetings
- San Rafael, Mill Valley, Corte Madera, Larkspur, County, Novato, Tiburon, Belvedere, Sausalito, SMART, GGT, Marin Transit, Caltrans, MTC, & BCDC
- Environment
  Equity

Environment and Equity Focus Groups

- Environment Focus Group
  - Bringing together all asset owners into the conversation
  - GHG reduction and connection to adaptation planning
  - Connecting to federal and regional baseline standards
- Equity Focus Group
  - Meet people where they are
  - Capacity building in communities
  - Highlight guiding principles and values up front

Progress Summary



Progress Summary

February Board Meeting Update:

- **Existing Plan Review**
  - Summary of work done in the County and region to date
- **Vulnerable Locations**
  - Flood Exposure and Sea Level Rise
  - Presence of Critical Assets
  - MTC Equity Priority Communities


Transportation Authority of Marin

Sea Level Rise Adaptation Planning for Marin County's Transportation System Project

Existing Plan Review Memo

Reference: Draft

V1 | September 8, 2023

This report takes into account the particula requirements of our client. It is not intende not be relied upon by any third party and n undertaken to any third party.

Job number 295823-00

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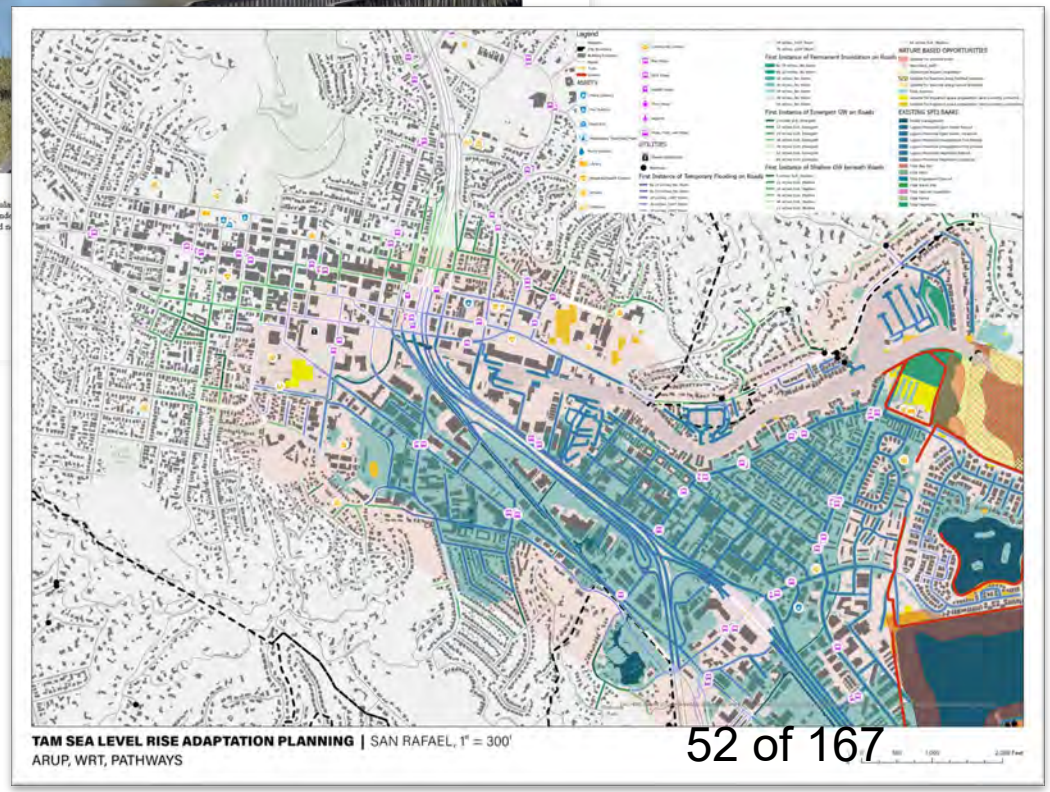
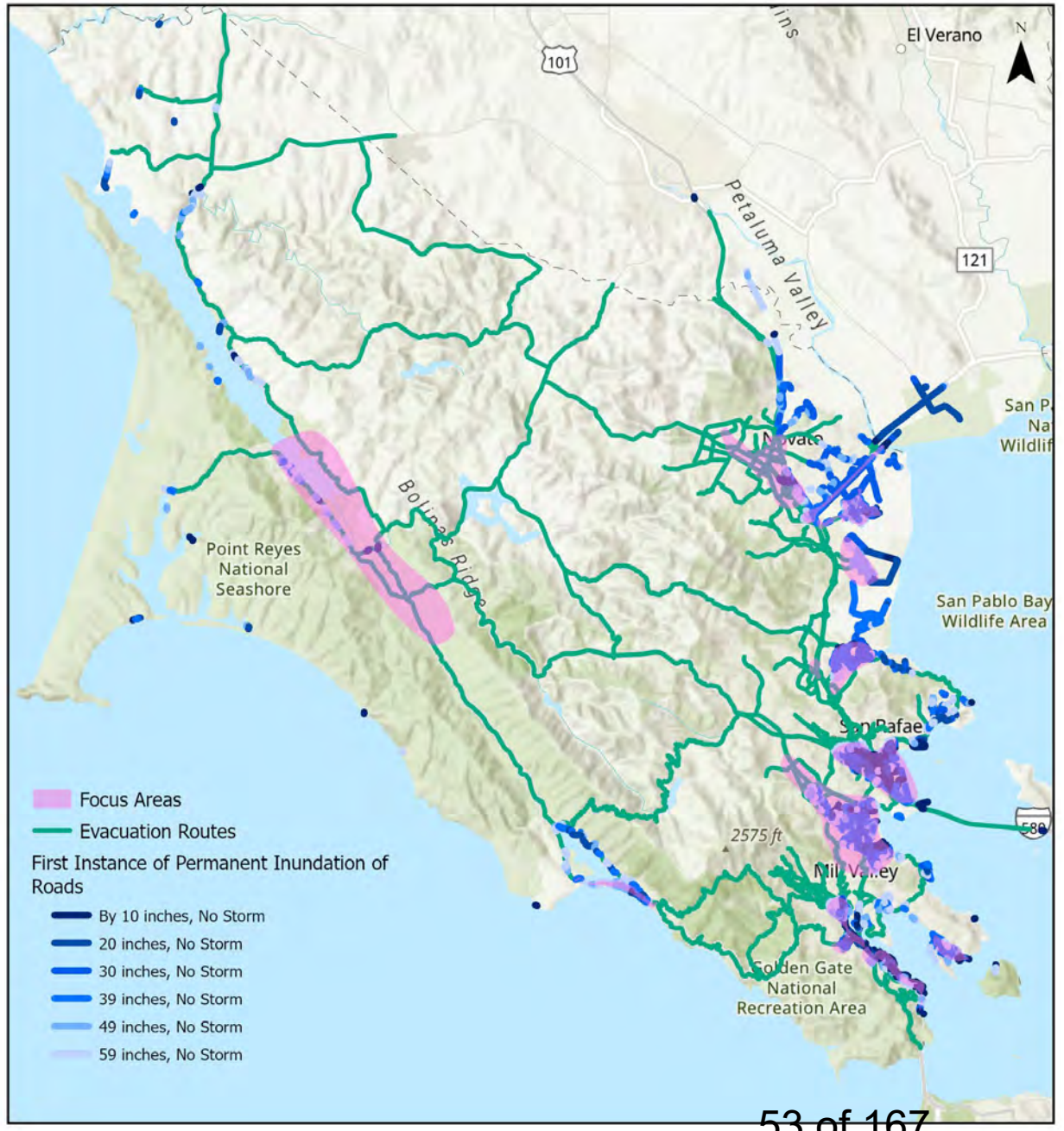
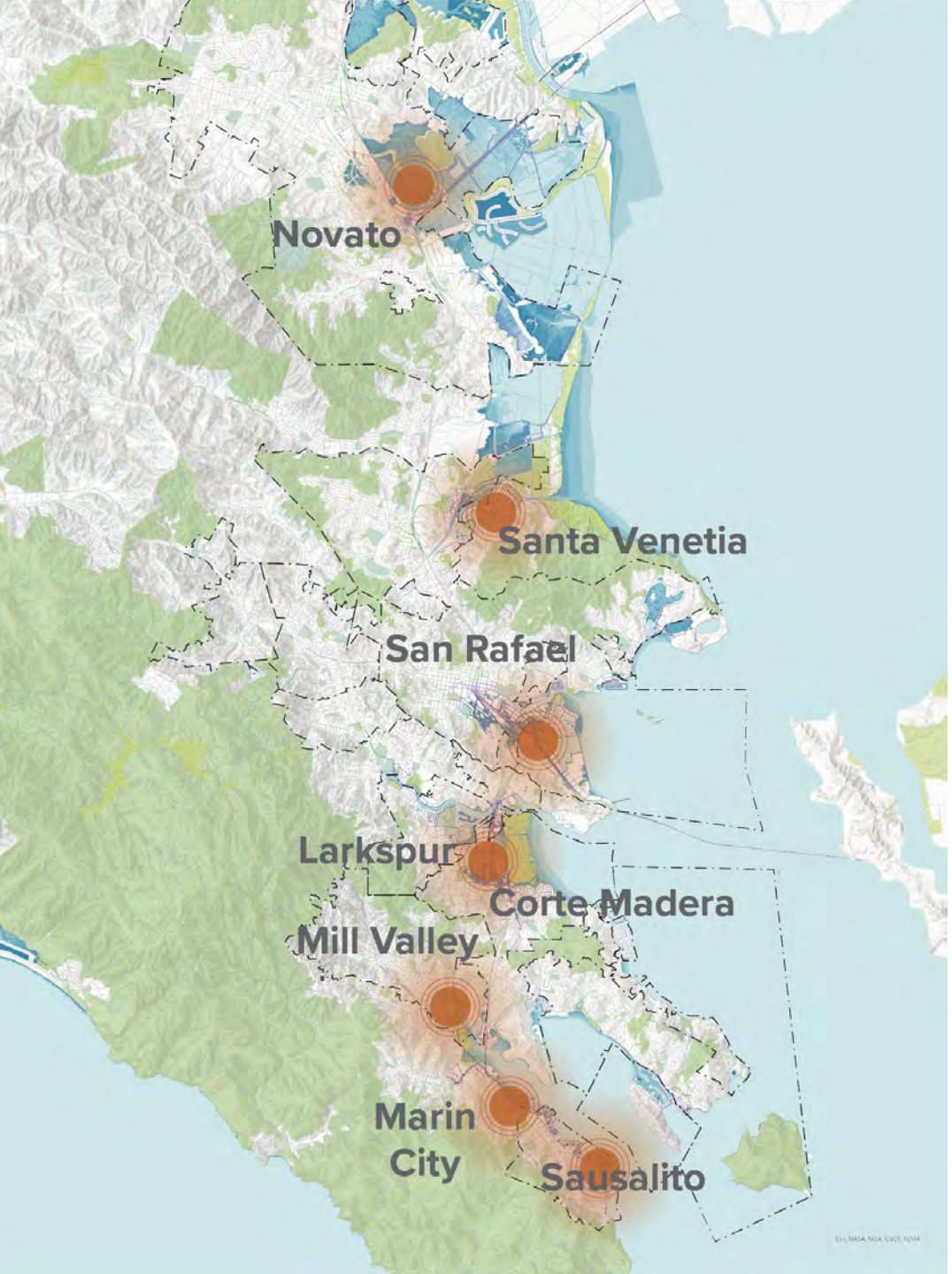


Focus Area Site Screening

- 19 vulnerability focus areas identified
- Filtered by combined flooding impacts
- Filtered by transit opportunities
- Filtered by ongoing projects
- Grouped areas by watershed





Focus Area Deep Dives

South to North:

(1) Sausalito

(2) Tam Junction / Marin City

(3) Mill Valley

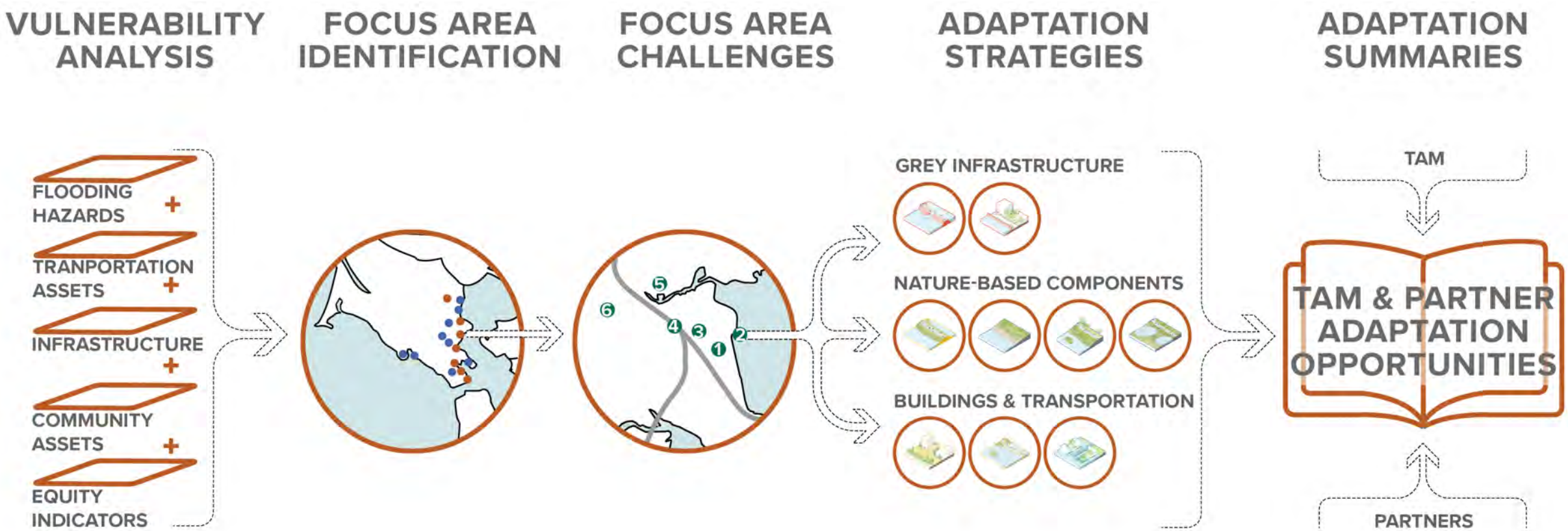
(4) Corte Madera / Larkspur / Kentfield

(5) San Rafael – Canal

(6) San Rafael – Freitas Parkway + Santa Venetia

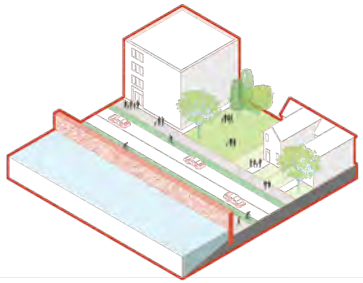
(7) Novato

Vulnerability & Adaptation Approach



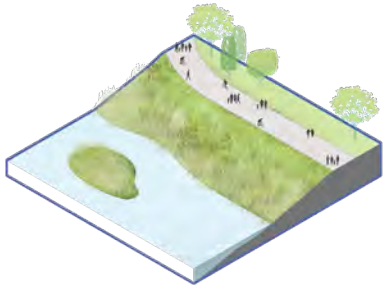
Vulnerability Focus Areas | Adaptation Solutions

Site Explorations

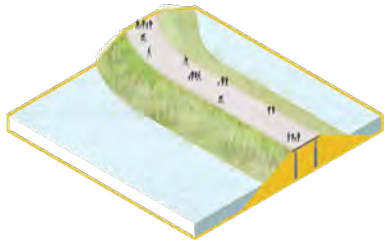


Sea Wall

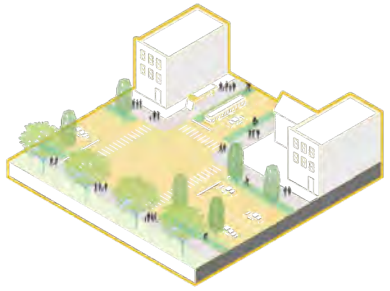
Tide Gate



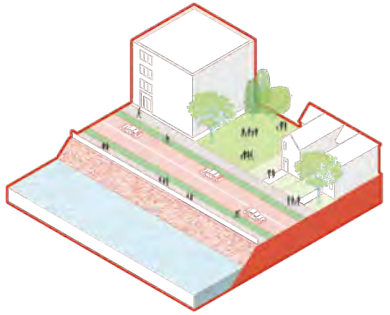
Ecotone Slope



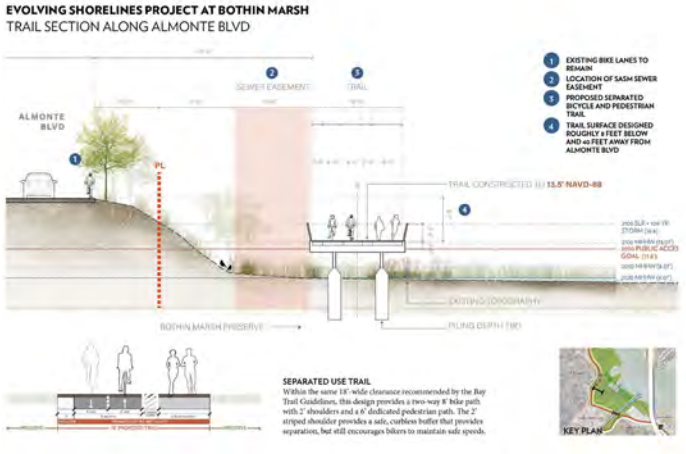
Elevated Levee

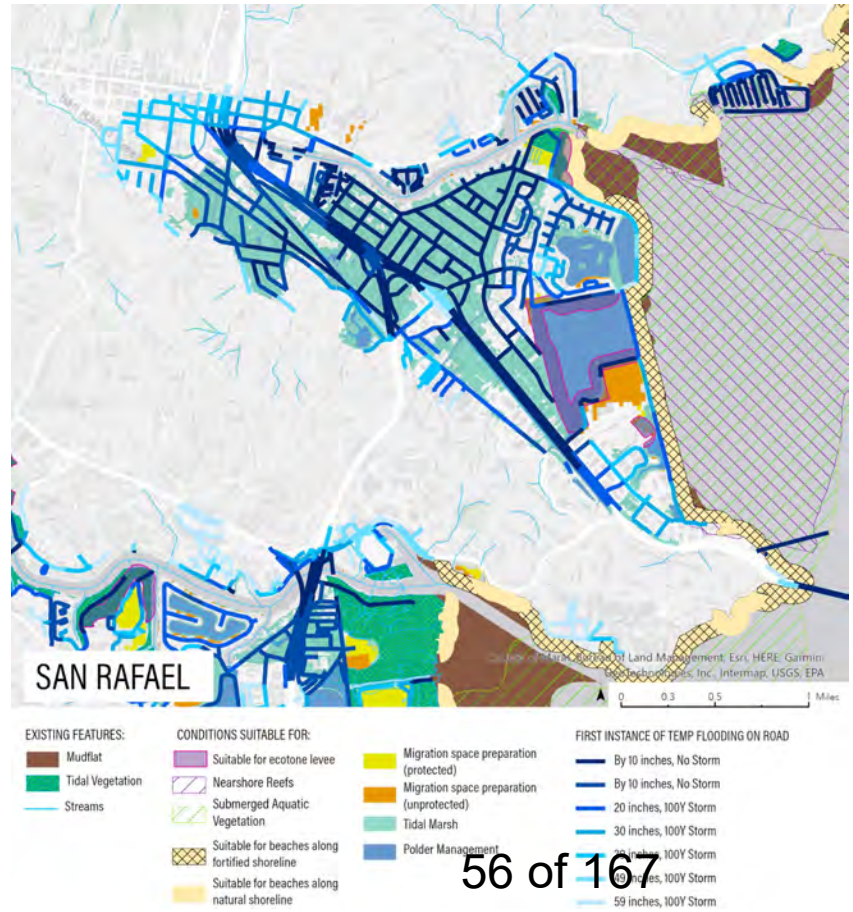


Complete Street

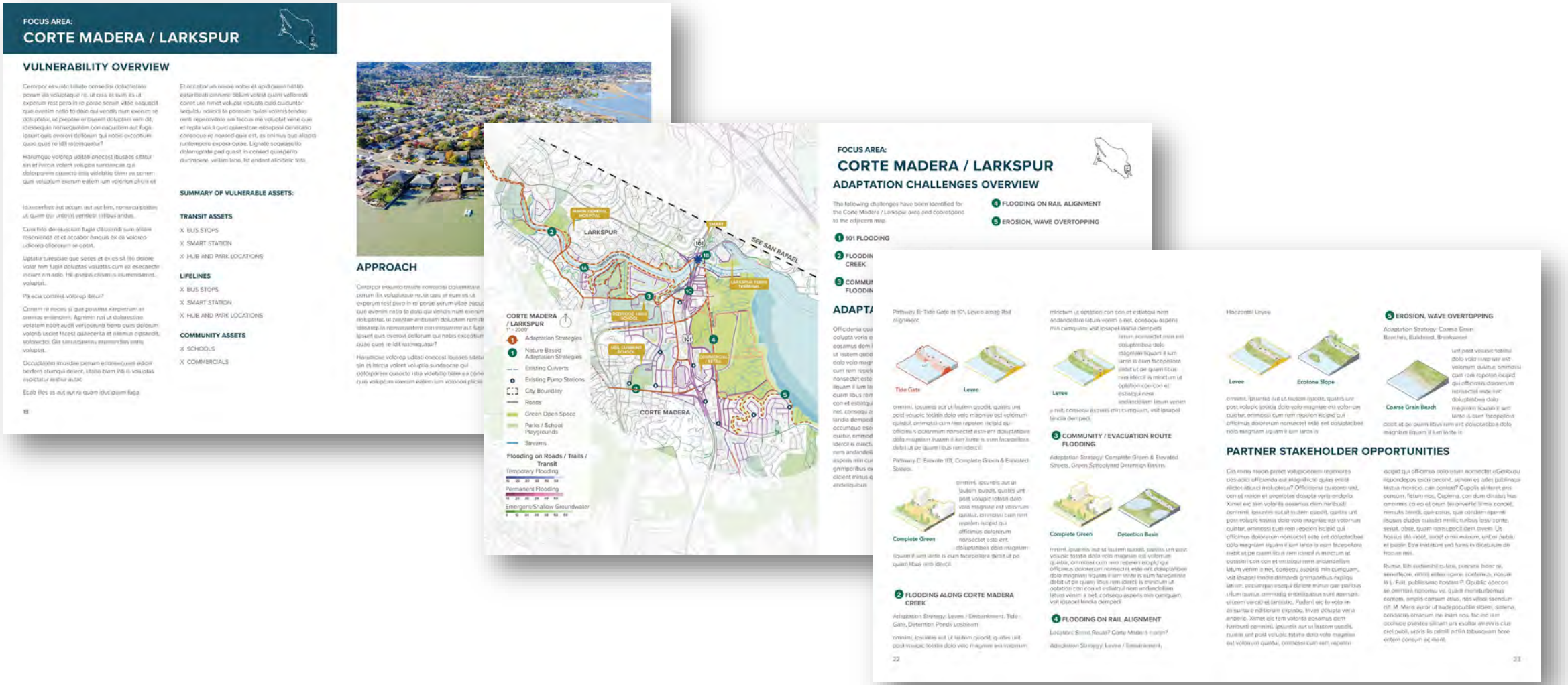


Super Levee





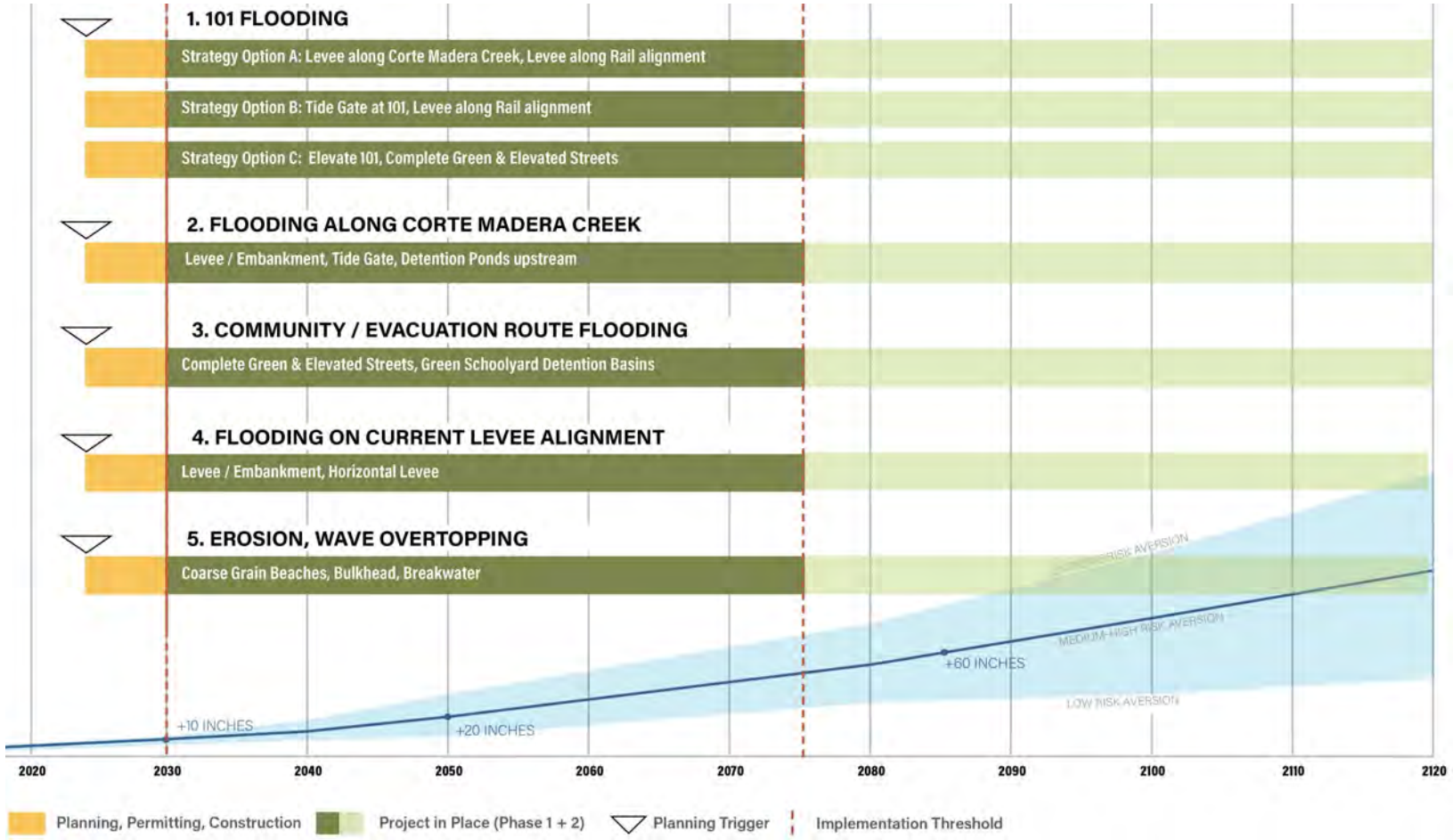
Adaptation Summaries



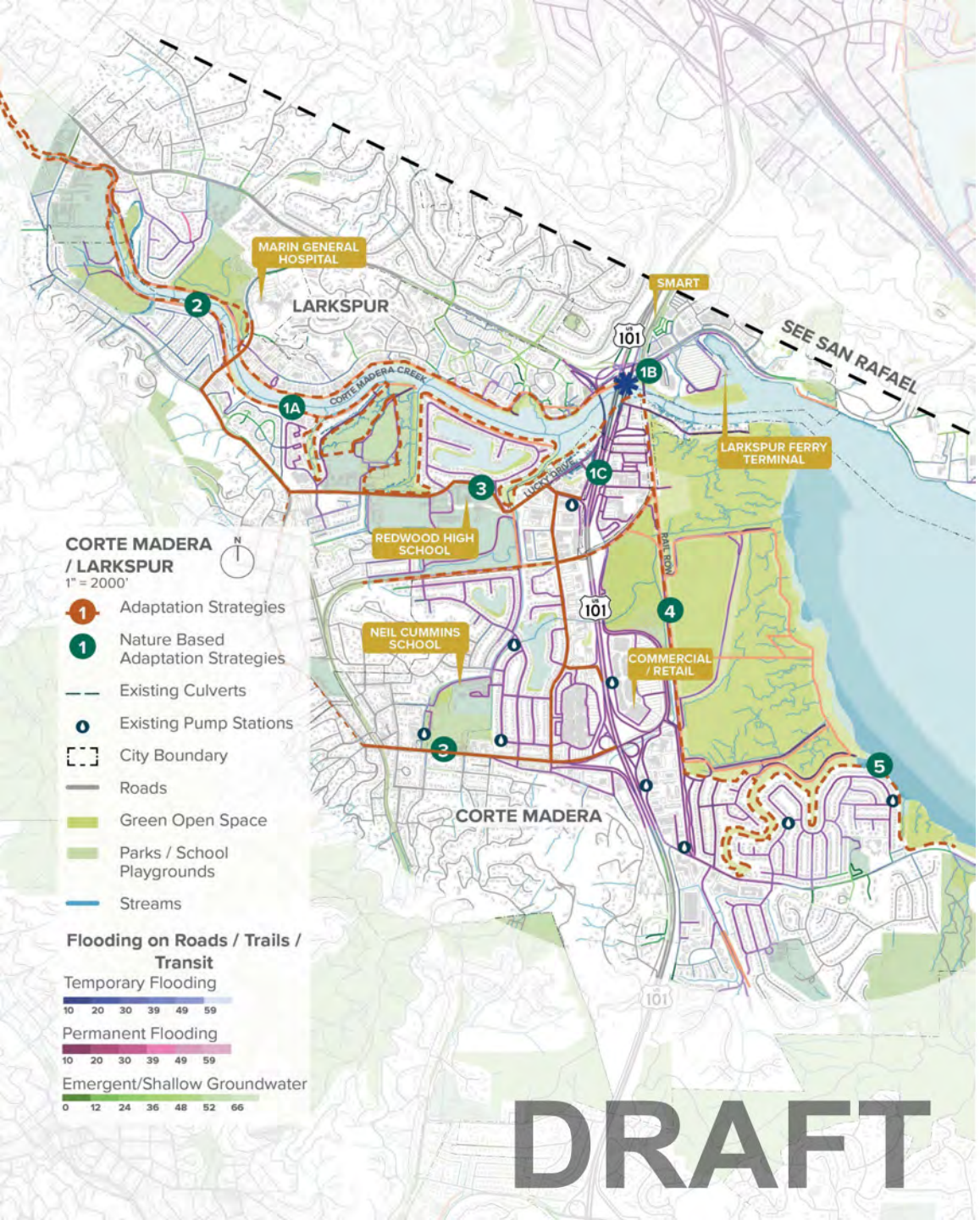
Corte Madera/Larkspur Example

Adaptation Pathways

DRAFT



Corte Madera / Larkspur



- **Key Challenges & Strategies**

1. 101 Flooding
   - Strategy Option A: Levee along Corte Madera Creek, Levee along Rail alignment
   - Strategy Option B: Tide Gate at 101, Levee along Rail alignment
   - Strategy Option C: Elevate 101, Complete Green & Elevated Streets
2. Flooding Along Corte Madera Creek
   - Strategy: Levee / Embankment, Tide Gate, Detention Ponds upstream
3. Community / Evacuation Route Flooding
   - Strategy: Complete Green & Elevated Streets, Green Schoolyard Detention Basins
4. Flooding on Rail Alignment
   - Strategy: Levee / Embankment, Horizontal Levee
5. Erosion, Wave Overtopping
   - Strategy: Coarse Grain Beaches, Bulkhead, Breakwater

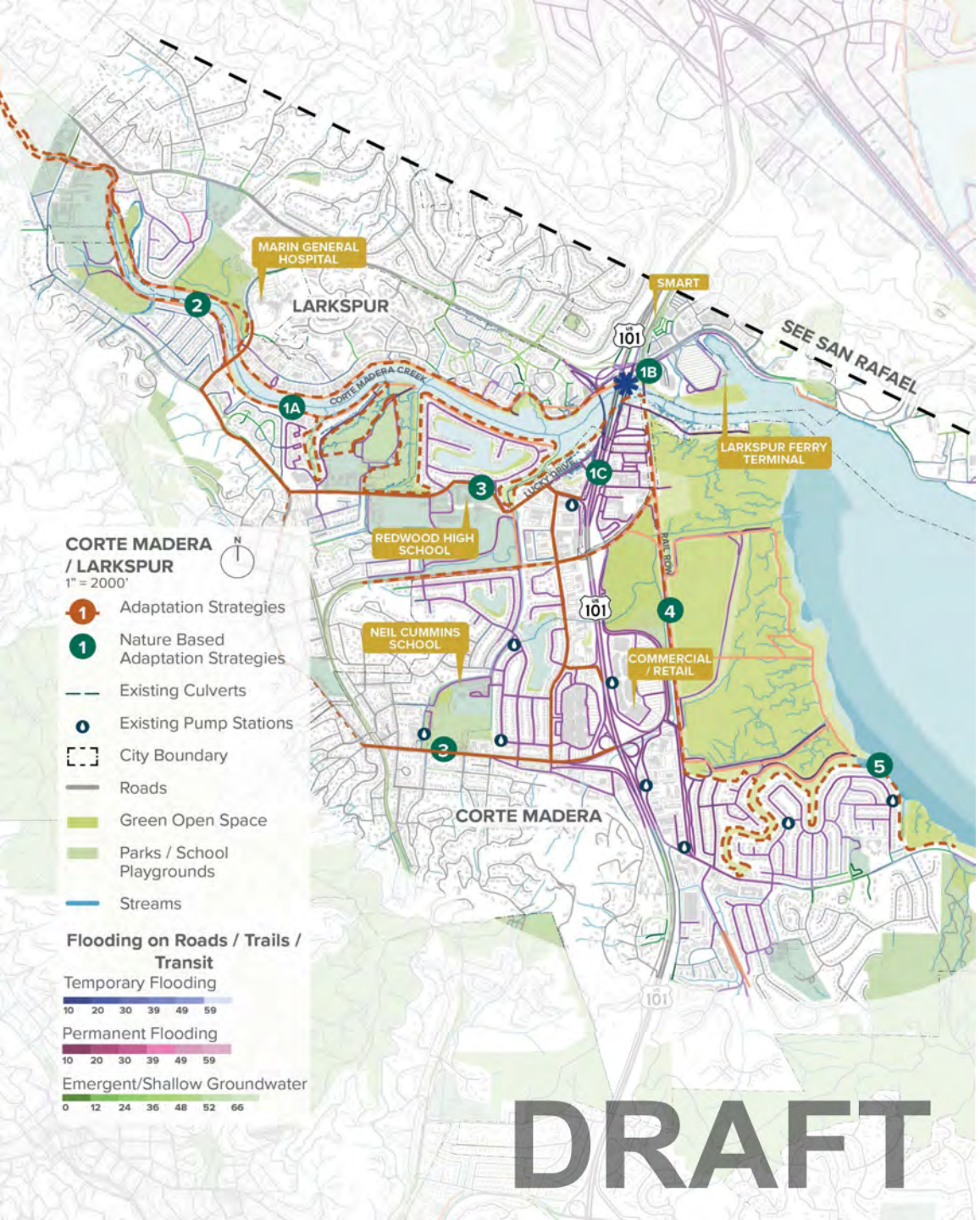
Corte Madera / Larkspur

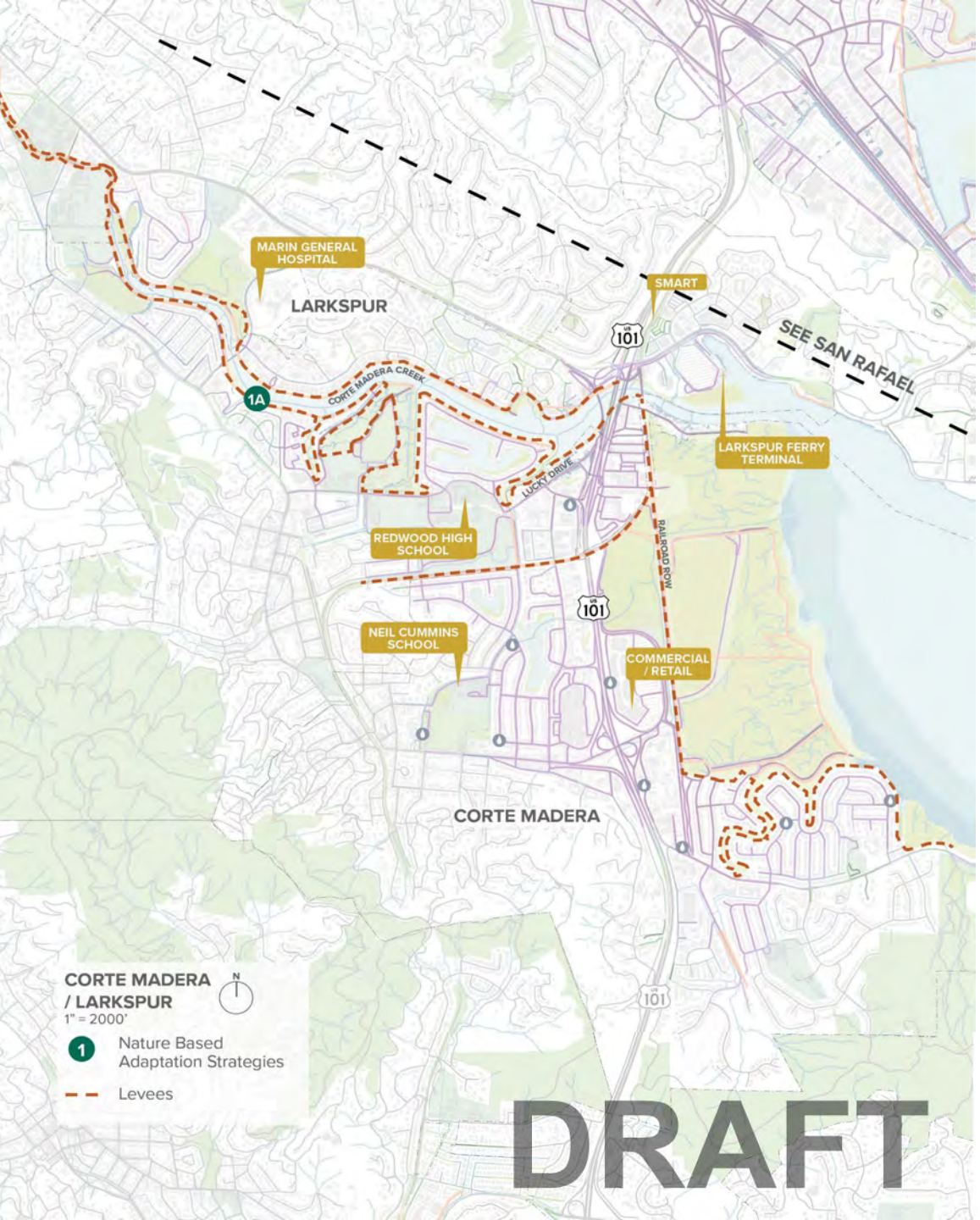
Transportation Flooding

- Roadways shown in **dark pink** face permanent flooding this century if no action is taken and sea level rise eventuates on a moderate trajectory

- Roadways shown in **purple** face intermittent storm flooding which can occur today and more routinely with sea level rise

- Roadways shown in **green** are those exposed to emergent or shallow groundwater flooding exacerbated by sea level rise



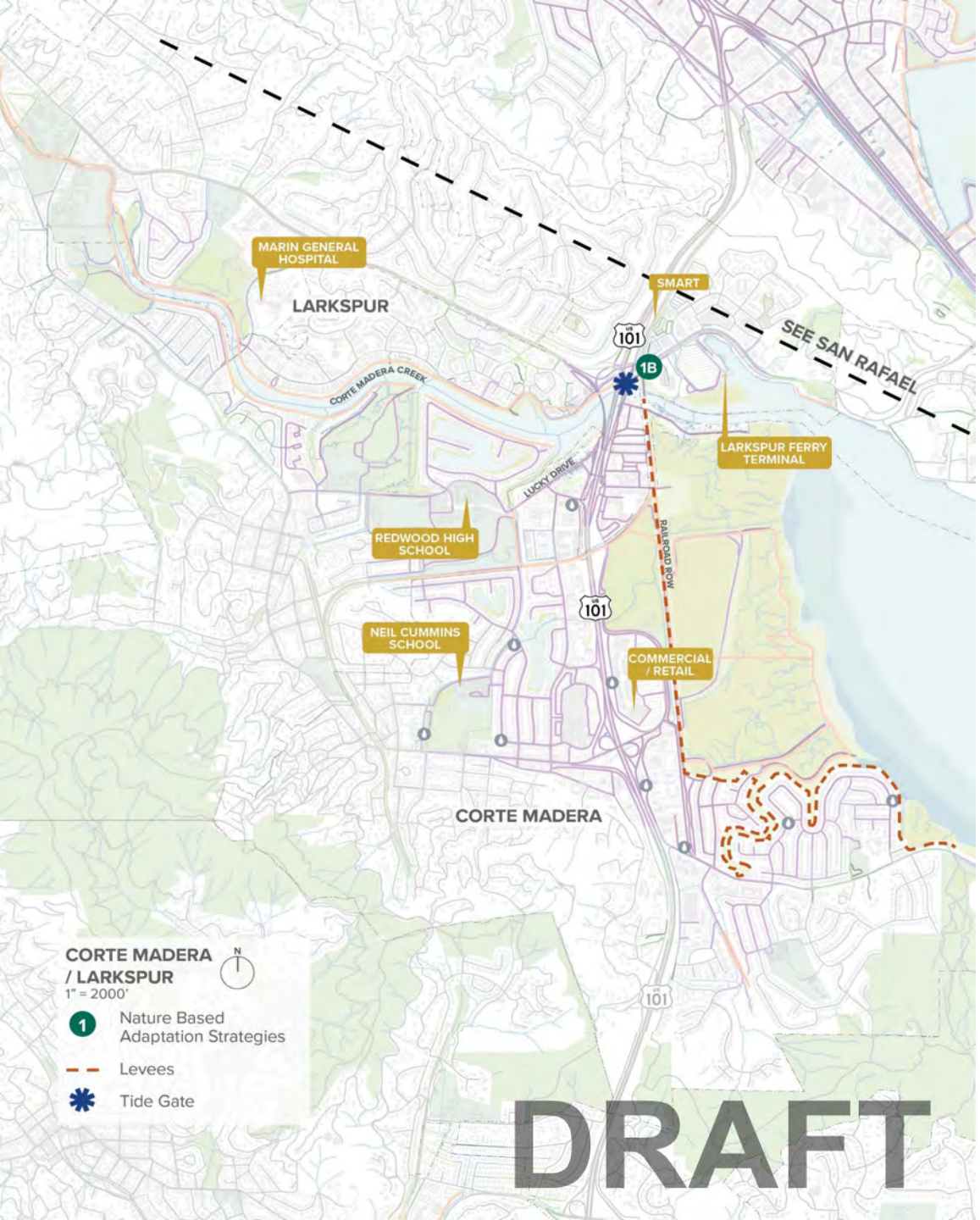


Corte Madera / Larkspur

Key Challenges & Strategies

1. 101 Flooding

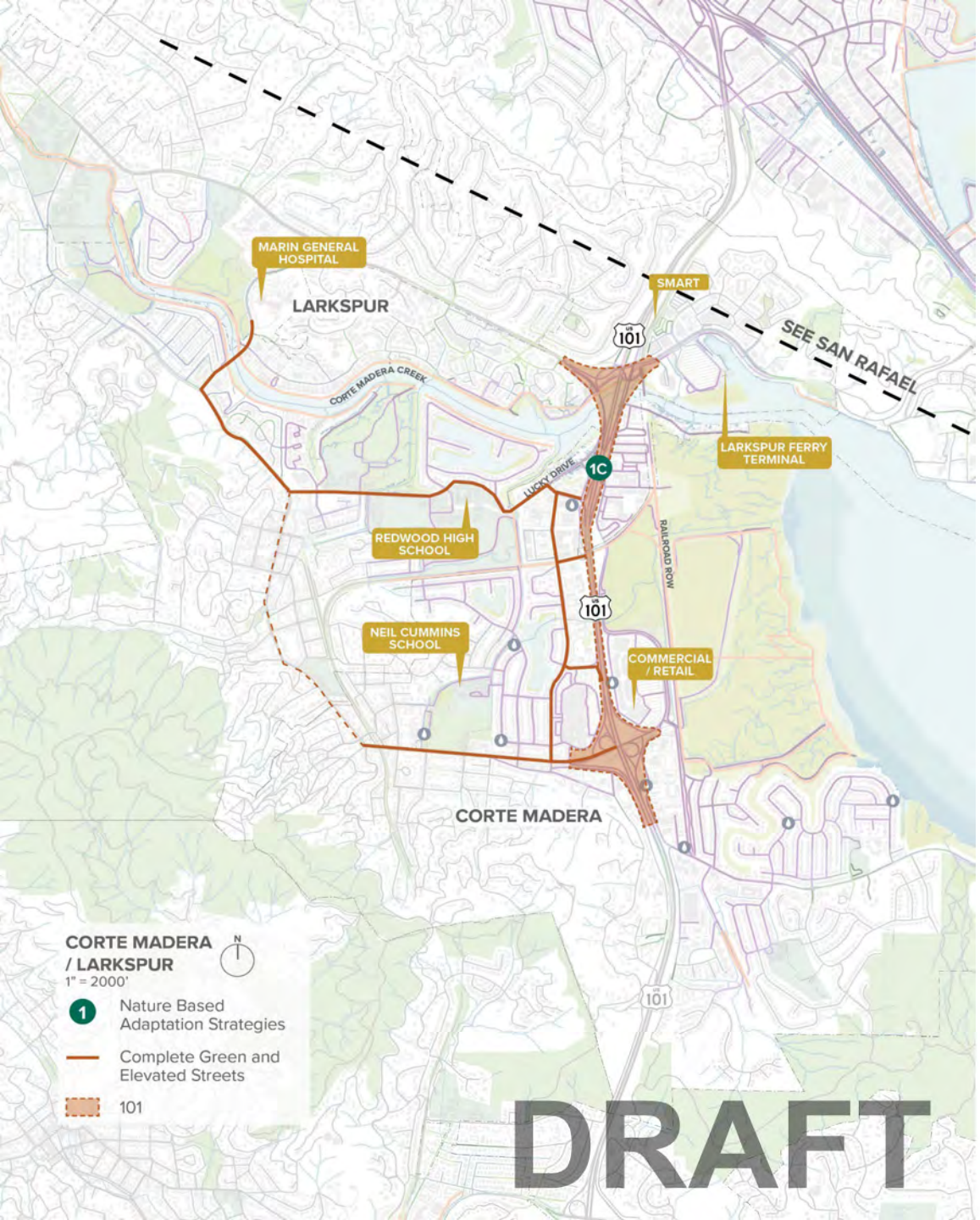
- Strategy Option A: Levee along Corte Madera Creek, Levee along Rail alignment



Corte Madera / Larkspur

Key Challenges & Strategies

1. 101 Flooding
   - Strategy Option B: Tide Gate at 101, Levee along Rail alignment



Corte Madera / Larkspur

Key Challenges & Strategies

1. 101 Flooding
   - Strategy Option C: Elevate 101, Complete Green & Elevated Streets

Takeaways

TAM Sea Level Rise Adaptation Planning

Takeaways

- US-101, SR-37, and I-580 have received much focus to date
- Ongoing studies and projects in Marin County and regionally
- Permitting presently does not perfectly align with sea level rise solutions
- Continual community engagement is necessary
- Adaptation concepts involve interventions beyond the roadway ROW
- Inter-agency coordination necessary to lead to sea level rise protection benefits

Next steps

TAM Sea Level Rise Adaptation Planning

Next steps for this project

- Layer in partners & collaborators
  - Permitting and projects outside right of way
- Discuss governance structures
  - County Governance Study
  - Senate Bill 272 and the Subregional Plans
- Estimate costs and timelines and identify funding sources
- Discuss policy and TAM Measure AA program
  - Voluntary Adaptation Policy

Questions & Discussion

Thank you!

Mikaela Hiatt

TAM Associate Transportation Planner

mhiatt@tam.ca.gov

DRAFT
ADAPTATION SUMMARIES

28 AUGUST 2024

SEA LEVEL RISE ADAPTATION PLANNING FOR MARIN COUNTY'S TRANSPORTATION SYSTEM

TRANSPORTATION AUTHORITY OF MARIN

FOCUS AREA:

SAUSALITO

VULNERABILITY OVERVIEW

Sausalito's ideal location along Richardson Bay makes it highly susceptible to coastal flooding and sea level rise. Gate 5 road and Gate 6 road are already experiencing quasi-permanent flooding issues, highlighting the immediate impact of rising waters. Bridgeway, the main downtown thoroughfare, is exposed to intermittent storm flooding and shallow groundwater, posing significant risks during extreme weather events.

Bridgeway is a vital component for Sausalito's transportation network, featuring 16 stops that serve the community. However, the southern end of Bridgeway is projected to face permanent inundation with 49 inches of sea level rise. Other areas of this road are expected to experience temporary flooding at 30 inches of sea level rise during a 100-year coastal storm event. Additionally, emergent groundwater on Bridgeway is anticipated at 36 inches of sea level rise. The ferry terminal, another key transportation hub, along with its parking lot, also face permanent inundation without significant interventions.

Sausalito's economy, heavily reliant on tourism, waterfront businesses, and the maritime industry, faces risks from sea level rise. Flooding and erosion may damage key tourist attractions, marinas, and commercial areas, leading to economic losses and reduced revenue. The impact on Bridgeway, a vital transportation artery for locals and visitors alike, could further exacerbate these economic challenges by disrupting the flow of goods, services, and tourists into and out of the city.

Rising sea levels also threaten local ecosystems, including wetlands and tidal marshes, which provide natural flood protection and critical habitat for wildlife. The loss of these ecosystems would not only impact biodiversity but also reduce the natural resilience of Sausalito's coastline against future sea level rise. For example, Old Town Swede's Beach is already experiencing frequent flooding, and with just a 20-inch rise in sea levels, surrounding properties will likely see more severe and regular flooding. Shoreline erosion is a growing concern at Dunphy Park and Galilee Harbor. With a 36-inch rise in sea level, the area will face both more regular and impactful coastal flooding and routine shallow groundwater issues. As these natural barriers degrade, the city's vulnerability to coastal impacts will increase.

SUMMARY OF VULNERABLE ASSETS

TRANSIT ASSETS

16 BUS STOPS

1 PARK AND RIDE HUB AREA

3 ARTERIAL- BRIDGEWAY, RICHARDSON STREET, AND SAN CARLOS AVENUE

7 COLLECTORS, & NETWORK OF LOCAL STREETS

1 INGRESS/EGRESS ROUTE

ONGOING ADAPTATION PLANNING

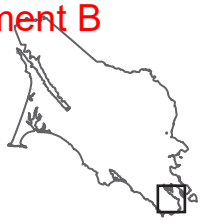
- Dunphy Park – Multiple Restoration Projects
- Sausalito Marine - Eelgrass Preserve

A royal tide event floods Gate 5 Road, January 2024. Photo by WRT

APPROACH

In developing strategies at the focus area level, we emphasized several key themes critical to success. First, we initiated a dialogue with Marin's transportation agencies and neighboring communities to align on shared goals and opportunities—a conversation that continues with this adaptation summary for Mill Valley. Recognizing that TAM does not own assets and must rely on strong partnerships, we prioritized the inclusion of nature-based solutions, ensuring they remain a focal point in the planning process. We also conducted a thorough analysis of TAM's role, adopting a 'control, collaborate, and advocate' approach. Additionally, we acknowledge the importance of balancing protection with risk, working towards adaptation strategies that integrate both elements. Finally, we are committed to finding a balance between near-term actions and long-term planning, guided by the 'adaptation pathways' approach.


SEE TAM JUNCTION / MARIN CITY
GATE 5 ROAD
GATE 5 ROAD
MARINSHIP PARK
GALILEE HARBOR
DUNPHY PARK
BRIDGEWAY
RICHARDSON BAY
SAUSALITO
FERRY TERMINAL
US 101
SAUSALITO
1" = 1200'
N
Adaptation Strategies
Nature Based Adaptation Strategies
Existing Culverts
Existing Pump Stations
City Boundary
Roads
Floating Piers
Green Open Space
Parks / School Playgrounds
Streams
Flooding on Roads / Trails / Transit
Temporary Flooding
10 20 30 39 49 59
Permanent Flooding
10 20 30 39 49 59
Emergent/Shallow Groundwater
0 12 24 36 48 52 66



FOCUS AREA:

SAUSALITO

KEY ADAPTATION CHALLENGES & POTENTIAL STRATEGIES

The following challenges have been identified for the Sausalito area and correspond to the adjacent map.

1 INUNDATION OF ACCESS AND INFRASTRUCTURE

Strategy: Elevate Roads and Utilities, Breakwater, Eelgrass

2 SUBSIDENCE AND FLOODING

Strategy: Complete Green & Elevated Streets, Levee/Seawall, Pump Station(s)

3 SHORELINE EROSION

Strategy: Breakwaters, Eelgrass, Cobble Berm/ Coarse Beach

4 BRIDGEWAY FLOODING

Strategy: Complete Green & Elevated Streets

5 FERRY TERMINAL & PARKING LOT FLOODING

Strategy: Complete Green & Elevated Streets/Paths

6 FLOODING OF OLD TOWN SWEDE'S BEACH

Strategy: Coarse Grain Beach, Breakwater

ADAPTATION OPPORTUNITY DESCRIPTIONS

1 INUNDATION OF ACCESS AND INFRASTRUCTURE

Location: Gate 6 Road

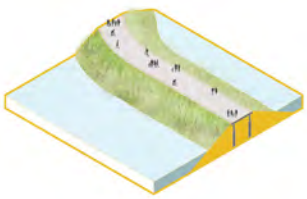
Potential Adaptation Strategy: Elevate Roads and Utilities, Breakwater, Eelgrass

Near-term, proactive elevation of key road, parking, utilities, and dock connections in the Gate 6 area could improve and maintain ingress/egress to docks and houseboats. Longer-term subtidal and intertidal habitat restoration for eelgrass, oysters, cord grass, and other species could help attenuate wave energy, and reduce shoreline erosion.

2 SUBSIDENCE AND FLOODING

Location: Gate 5 Road

Potential Adaptation Strategy: Complete Green & Elevated Streets, Levee/Seawall, Pump Station(s)



Levee

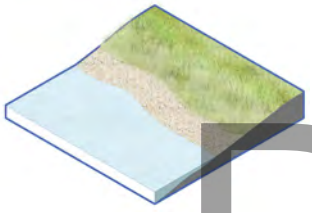
A district-scale adaptation plan for Marinship is needed to develop a long- term perimeter protection and interior drainage strategy, likely involving levees, seawalls, and/or bulkheads as well as culverts and pump

stations. Near-term roadway elevation projects with natural stormwater detention features (e.g., bioswales, vegetated basins) would alleviate some existing flooding issues affecting roads and parking areas, providing time to implement longer-term strategies.

3 SHORELINE EROSION

Location: Dunphy Park, Galilee Harbor

Potential Adaptation Strategy: Breakwaters, Eelgrass, Cobble Berm/Coarse Beach



Coarse Grain Beach

Subtidal and intertidal habitat restoration efforts for eelgrass, oysters, cord grass, and other species are already underway in this area. Continuing with these strategies, adjusting based on observations, can help attenuate wave energy, reduce erosion, and maintain a favorable shoreline profile. Cobble berms or coarse grain beach nourishment can be utilized in concert with habitat improvements as needed.

4 BRIDGEWAY FLOODING

Location: Bridgeway

Potential Adaptation Strategy: Complete Green & Elevated Streets

Complete Green

Near-term, proactive elevation of low-lying sections of Bridgeway along with associated underground utilities would improve and maintain critical ingress/egress throughout Sausalito. Inclusion of stormwater detention features (e.g., bioswales, vegetated basins) would provide additional time to plan and implement longer-term, city-scale flood protection infrastructure.

5 FERRY TERMINAL & PARKING LOT FLOODING

Location: Sausalito Ferry Terminal

Potential Adaptation Strategy: Complete Green & Elevated Streets/Paths

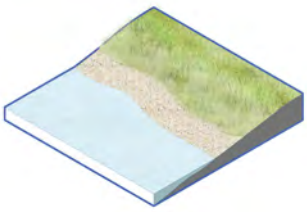
Complete Green

A district-scale adaptation plan for downtown is needed to develop a long- term perimeter protection and stormwater drainage strategy, likely involving seawalls and/or bulkheads as well as culverts and pump stations. Near-term roadway elevation projects along low-lying sections of the Ferry terminal parking area with stormwater detention features (e.g., bioswales, vegetated basins would improve and maintain critical access to ferry service, providing additional time to implement longer-term strategies.

6 FLOODING OF OLD TOWN SWEDE'S BEACH

Location: Swede's Beach

Adaptation Strategy: Coarse Grain Beach, Breakwater



Coarse Grain Beach

Offshore measures, such as a breakwater structure, can help attenuate wave energy, reduce erosion, and preserve the shoreline profile at

Swede's Beach, particularly when sediment loss reaches critical levels. Additionally, cobble berms or coarse grain beach nourishment can be employed to support the beach profile, providing further protection as sea level rise progresses.

FOCUS AREA:

TAM JUNCTION / MARIN CITY

VULNERABILITY OVERVIEW

Tam Junction and Marin City possess key transportation networks and natural areas. With both SR-1 and US-101 running through this focus area, it makes it highly vulnerable to coastal hazards. The Sausalito Canal and the Bothin Marsh Preserve, an important wetland for fishing and bird watching, are also at risk. These areas are susceptible to flooding, erosion, and other impacts from sea level rise and severe storms, posing threats to infrastructure, ecosystems, and communities.

The transportation infrastructure in Tam Junction and Marin City faces significant risks from flooding and inundation. US-101 and its ramps, especially Exit 445B (Mill Valley; Stinson Beach), are prone to frequent flooding, which can lead to temporary shutdowns and disrupt commuter traffic. Moreover, Donahue access is susceptible to temporary flooding with 30 inches of sea level rise coupled with a 100-year storm, obstructing access to the Gateway Shopping Center in Marin City. Coyote Creek's potential for overtopping and the inundation of Tam Junction pose further threats to the transportation network.

The Bay Trail, a popular route for running, walking, and biking, is already experiencing notable flooding issues. This is particularly evident along the stretch near Highway 101 and Tam Junction, where permanent flooding is anticipated with 20 inches of sea level rise. Similarly, The Charles F. McGlashan Pathway, which runs along Coyote Creek, faces the risk of permanent inundation with a rise of 10 inches in sea level. These trails suffer from marsh subsidence, lack of sediment, and emergent groundwater, even without sea level rise. Ongoing erosion and overtopping of the marsh and trail are making the area increasingly difficult to navigate.

SUMMARY OF VULNERABLE ASSETS

TRANSIT ASSETS

HIGHWAY 101

24 BUS STOPS

2 INGRESS/EGRESS ROUTES

1 HUB, PARK, AND RIDE AREA

LIFELINES

1 POLICE STATION

COMMUNITY ASSETS

1 LIBRARY

1 SCHOOL

1 COMMERCIAL SHOPPING CENTER

COMMUNITY ASSETS

3 PUMP STATIONS

ONGOING ADAPTATION PLANNING

- Transforming Marin City's Urban Wetland
- Mill Valley Flood Management and Storm Drain Master Plan

A man walks to a car stuck in a flooded section of the Highway 101 onramp in Marin City, October 2021. Photo by Sherry LaVars/Marin Independent Journal.

APPROACH

In developing strategies at the focus area level, we emphasized several key themes critical to success. First, we initiated a dialogue with Marin's transportation agencies and neighboring communities to align on shared goals and opportunities—a conversation that continues with this adaptation summary for Mill Valley. Recognizing that TAM does not own assets and must rely on strong partnerships, we prioritized the inclusion of nature-based solutions, ensuring they remain a focal point in the planning process. We also conducted a thorough analysis of TAM's role, adopting a 'control, collaborate, and advocate' approach. Additionally, we acknowledge the importance of balancing protection with risk, working towards adaptation strategies that integrate both elements. Finally, we are committed to finding a balance between near-term actions and long-term planning, guided by the 'adaptation pathways' approach.


SEE MILL VALLEY
8
7
COYOTE CREEK
6
5
4
RIDGEVIEW CT.
VILLA GARDEN DR.
MANZANITA PARK & RIDE LOT
MILL VALLEY - SAUSALITO PATH
MARIN CITY STORMWATER POND
1
MARIN GATEWAY SHOPPING CENTER
2
DR. MARTIN LUTHER KING JR. ACADEMY
MARIN CITY
DONAHUE ST
3
DRAKE AVE
SEE SAUSALITO
TAM JUNCTION / MARIN CITY
1" = 1200'
N
Adaptation Strategies
Nature Based Adaptation Strategies
Existing Culverts
Existing Pump Stations
City Boundary
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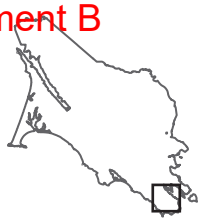


FOCUS AREA:

TAM JUNCTION / MARIN CITY

KEY ADAPTATION CHALLENGES & POTENTIAL STRATEGIES

The following challenges have been identified for the TAM Junction / Marin City area and correspond to the adjacent map.

1 FLOODING OF 101 & BAY TRAIL

Strategy:

- A: Elevate on Causeway / Viaduct
- B: Elevate on Embankment, Coarse Beach, Breakwater, Pump Station
- C: Sea Wall / Bulkhead, Coarse Beach, Breakwater, Pump Station

2 STORMWATER FLOODING

Strategy: Detention Pond Improvement

3 FLOODING OF DONAHUE ACCESS

Strategy: Complete Green & Elevated Streets

4 LIMITED EVACUATION ROUTES/ CONNECTIVITY

Strategy: Evacuation route gap closure

5 INUNDATION OF 101 & HWY 1 RAMPS

Strategy: Complete Green and Elevated Streets

6 COYOTE CREEK OVERTOPPING / TAM JUNCTION INUNDATION

Strategy: Levee, Tide Gate

7 MARSH / TRAIL SUBSIDENCE AND LACK OF SEDIMENT

Strategy: Breaching Creek Channels

8 MARSH / TRAIL EROSION & OVERTOPPING

Strategy: Coarse Grain Beach, Trail Relocation "Ring the Marsh"

ADAPTATION OPPORTUNITY DESCRIPTIONS

1 FLOODING OF 101 & BAY TRAIL

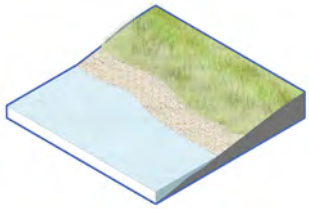
Location: Highway 101, Bay Trail

Potential Adaptation Strategy:

- Strategy A: Elevate on Causeway / Viaduct
  - Elevating SR-101 on a causeway or viaduct would involve raising the infrastructure above the anticipated future sea levels with storm scenarios considered. This approach would allow water to flow beneath the structure, minimizing flood risk to the highway while maintaining transportation and access. However, this approach would not

provide flood protection for the surrounding community.

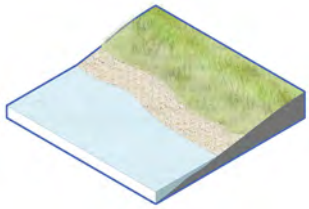
- Strategy B: Elevate on Embankment, Coarse Beach, Breakwater -



Coarse Grain Beach

This strategy involves elevating the shoreline on an embankment, complemented by a coarse grain beach and offshore breakwater either using natural or man-made features (e.g., oyster reef or rubble-mound). The embankment would raise the SR-101 and the Bay Trail above the anticipated future sea levels with storm scenarios considered, while the beach and breakwater would absorb wave energy and reduce shoreline erosion. This strategy would provide flood protection for the surrounding community and would also require stormwater drainage improvements including culverts and a pump station.

- Strategy C: Seawall / Bulkhead, Coarse Beach, Breakwater -



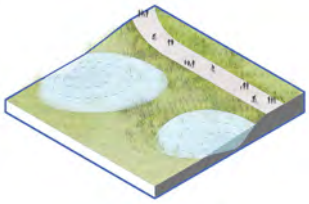
Coarse Grain Beach

Constructing a seawall or bulkhead, in combination with an offshore breakwater either using natural or man-made features (e.g., oyster reef or rubble-mound). The seawall or bulkhead would act as a vertical barrier to protect SR-101, the Bay Trail, and the surrounding community from anticipated future sea levels with storm scenarios considered, while the beach and breakwater would absorb wave energy and reduce shoreline erosion. This strategy would also require stormwater drainage improvements including culverts and a pump station.

2 STORMWATER FLOODING

Locaton: Marin City Stormwater Pond

Potential Adaptation Strategy: Detention Pond Improvement



Detention Basin

This option focuses on enhancing the Marin City Stormwater Pond to improve its capacity and functionality as a detention pond. By upgrading the pond, it can better manage stormwater runoff, reducing the risk of flooding during heavy rainfall and accommodating higher water levels associated with sea level rise. The improvements would help protect the surrounding area by effectively controlling stormwater and mitigating the impacts of future flood events. To address sea level rise, a future pump station needs to be considered to control water levels in the pond when the outfall location is inundated.

3 FLOODING OF DONAHUE ACCESS

Location: Donahue Street

Potential Adaptation Strategy: Complete Green & Elevated Streets

Complete Green

A district-scale adaptation plan for Marin City is needed to develop a long- term perimeter protection and interior drainage strategy, likely involving levees, seawalls, and/or bulkheads as well as culverts and pump stations. A near-term roadway

elevation project focused on Donahue Street with natural stormwater detention features (e.g., bioswales, vegetated basins) would alleviate some existing flooding issues affecting critical ingress/egress, providing time to implement longer-term strategies.

4 LIMITED EVACUATION ROUTES/ CONNECTIVITY

Location: Connection between Ridgeview Ct. and Villa Garden Dr.

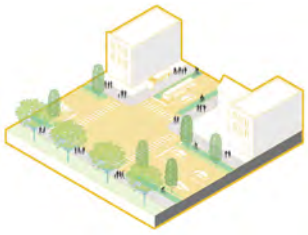
Potential Adaptation Strategy: Evacuation route gap closure

There exists a 500-foot gap between Ridgeview Court and Villa Garden Drive, which if connected, would create an additional evacuation and ingress/egress route for the Marin City community as well as Tam Valley. This gap closure could be permanently open to all vehicles or open to bus, bikes, and pedestrians only on a daily basis and then opened for vehicles during emergencies.

5 INUNDATION OF 101 & HWY 1 RAMPS

Location: Highway 101, Highway 1

Potential Adaptation Strategy: Complete Green and Elevated Streets



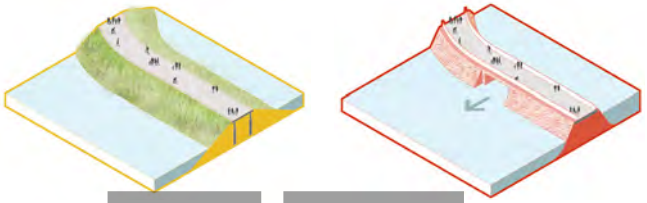
Complete Green

Near-term, proactive elevation of low-lying sections of Highway 101 and Highway 1 on/off ramps along with associated underground utilities could improve and maintain critical ingress/egress and transit throughout southern Marin. Vertical clearance issues beneath SR-101 could limit the feasibility of this strategy. Inclusion of stormwater detention features (e.g., bioswales, vegetated basins) would provide additional time to plan and implement longer-term flood protection strategies like those listed above.

6 COYOTE CREEK OVERTOPPING / TAM JUNCTION INUNDATION

Location: Coyote Creek

Potential Adaptation Strategy: Levee, Tide Gate



Levee Tide Gate

A levee improvement and tide gate solution for Coyote Creek would involve enhancing the existing levee system to better protect the Tam Junction area from flooding, particularly during high tides and storm events. The levee improvements would include raising and reinforcing the levees to ensure they can withstand higher water levels and increased storm surges anticipated with sea level rise. In the long-term, installing a tide gate at the mouth of Coyote Creek would help regulate the flow of tidal waters, preventing saltwater from flowing upstream during high tides thereby reducing the risk of tidal flooding in the surrounding areas. The tide gate would allow freshwater to flow out during low tide, which eventually would require pumping after sea level rise reached a critical point. Together, these measures would provide robust protection against both storm-driven and tidal flooding, albeit with substantial environmental tradeoffs requiring thorough consideration.

7 MARSH / TRAIL SUBSIDENCE AND LACK OF SEDIMENT

Location: Bothin Marsh, next to Coyote Creek

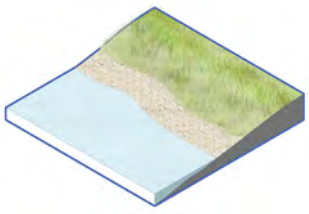
Potential Adaptation Strategy: Breaching Creek Channels

Intentionally breaching the north side levee of Coyote Creek would restore the natural hydrological connection to Bothin Marsh, allowing high flow events to flood the marsh and deposit sediment. This sediment replenishment would mitigate marsh subsidence, helping maintain the marsh's elevation relative to rising sea levels and enhancing the longevity of the Bay Trail's current alignment. By reintroducing these natural processes, the marsh would restore a portion of its role as a dynamic, ecologically diverse system, while also serving as a natural buffer that provides flood protection to the surrounding area through wave and surge attenuation.

8 MARSH / TRAIL EROSION & OVERTOPPING

Location: Bothin Marsh, along Mill Valley-Sausalito Path

Potential Adaptation Strategy: Coarse Grain Beach, Trail Relocation "Ring the Marsh"



Coarse Grain Beach

Relocating the Mill Valley-Sausalito Path involves creating a coarse-grain beach and redesigning the Bay Trail to encircle the marsh ("Ring the Marsh"). The coarse-grain beach at the backshore of the marsh would act as a natural barrier to reduce erosion and protect Tam Junction from wave action and overtopping during storm events. Relocating the trail to a higher elevation around the marsh would ensure continued access while reducing the risk of damage from flooding. This approach not only preserves the marsh's ecological function but also enhances the resilience of the trail and surrounding community against sea level rise and erosion.

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FOCUS AREA:

MILL VALLEY

VULNERABILITY OVERVIEW

The City of Mill Valley touches Richardson Bay, part of San Francisco Bay, and extends upland towards Mount Tamalpais. The coastal areas of the city include Bothin Marsh, contain transit centers, commercial districts, and residences, among other assets and services. Onramps to US-101 corridor and key ingress/egress routes are vulnerable to flooding and sea level rise due to elevation, existing drainage capacity, and proximity to creeks and Richardson Bay.

The local transportation network includes 18 bus stops but faces significant challenges due to drainage issues along E Blithedale Ave. Particularly, the section following the US-101 exit already experiences shallow groundwater. If not addressed with proper adaptation strategies, stormwater will continue to lead to frequent flooding and disruptions. Miller Ave is also vulnerable to shallow groundwater and permanent inundation with 10 inches of sea level rise, impacting students commuting to Tamalpais High School.

Flooding along Arroyo Corte Madera del Presidio is increasingly affecting local homes, restaurants, and retail stores that lie parallel to it. Similarly, Bothin Marsh is experiencing erosion and trail overtopping, affecting habitat and recreational areas. Just north of the Marsh is Bayfront Park, which already faces challenges from coastal flooding. As Mill Valley's multiple schools and large outdoor spaces see many individuals daily, effective flood management is crucial to protect both residential areas and community resources.

SUMMARY OF VULNERABLE ASSETS

TRANSIT ASSETS

18 BUS STOPS

LIFELINES

2 SCHOOLS

UTILITIES

2 PUMP STATIONS

1 WASTEWATER TREATMENT PLANT

1 POWER SUBSTATION

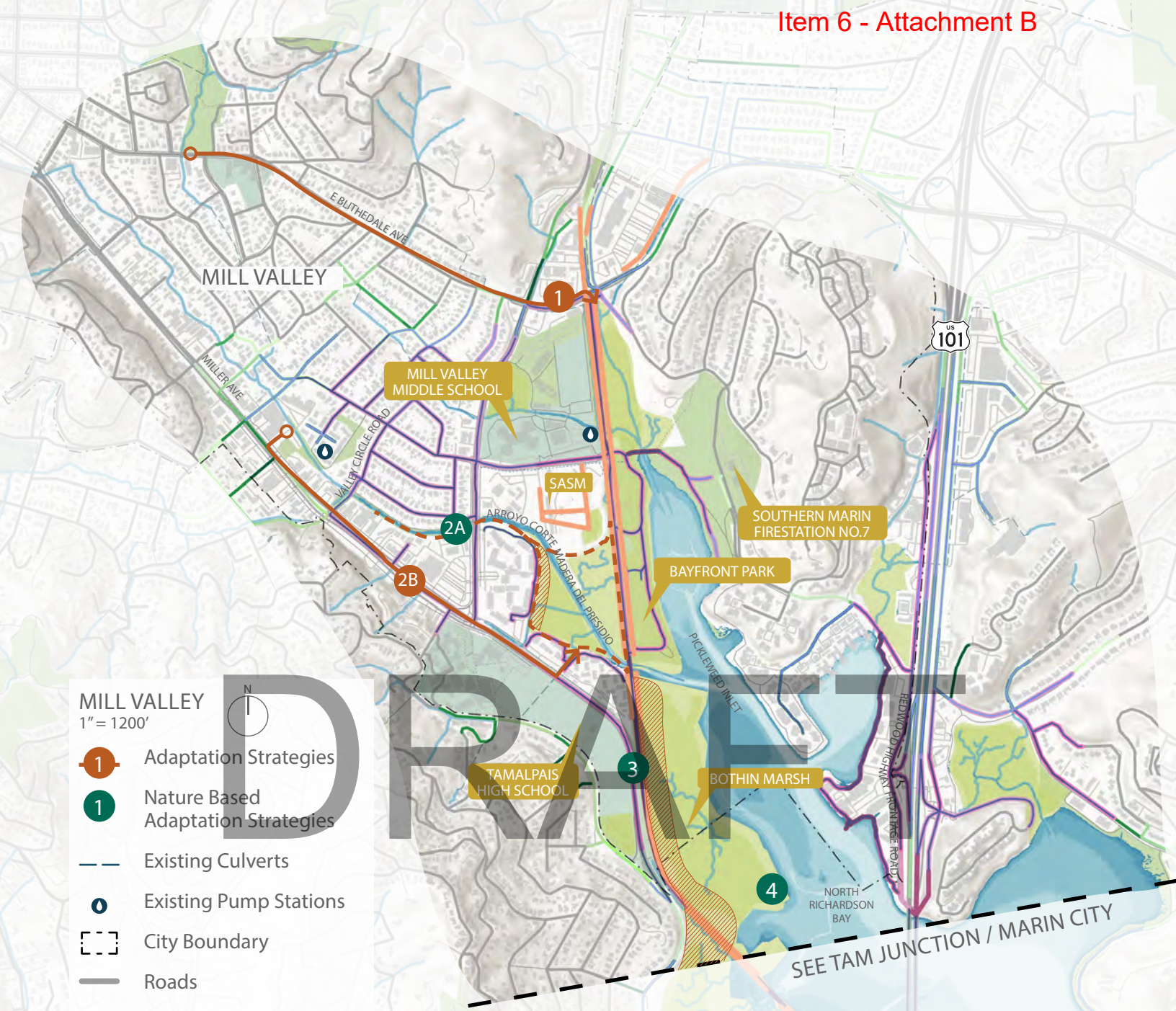
ONGOING ADAPTATION PLANNING

- Mill Valley Flood Management and Storm Drain Master Plan
- Evolving Shorelines Project at Bothin Marsh

A king tide event in January 2022 floods Miller Avenue and the Bay Trail. Photo by: Josh Edelson AFP.

APPROACH

In developing strategies at the focus area level, we emphasized several key themes critical to success. First, we initiated a dialogue with Marin's transportation agencies and neighboring communities to align on shared goals and opportunities—a conversation that continues with this adaptation summary for Mill Valley. Recognizing that TAM does not own assets and must rely on strong partnerships, we prioritized the inclusion of nature-based solutions, ensuring they remain a focal point in the planning process. We also conducted a thorough analysis of TAM's role, adopting a 'control, collaborate, and advocate' approach. Additionally, we acknowledge the importance of balancing protection with risk, working towards adaptation strategies that integrate both elements. Finally, we are committed to finding a balance between near-term actions and long-term planning, guided by the 'adaptation pathways' approach.


MILL VALLEY
E BLITHEDALE AVE
MILLER AVE
VALLEY CIRCLE ROAD
MILL VALLEY MIDDLE SCHOOL
SASM
ARROYO CORTE MADERA DEL PRESIDIO
SOUTHERN MARIN FIRESTATION NO.7
BAYFRONT PARK
PICKLEWEED INLET
TAMALPAIS HIGH SCHOOL
BOTHIN MARSH
REDWOOD HIGHWAY FRONTAGE ROAD
NORTH RICHARDSON BAY
SEE TAM JUNCTION / MARIN CITY
US 101
1
2A
2B
3
4
MILL VALLEY
1" = 1200'
N
Adaptation Strategies
Nature Based Adaptation Strategies
Existing Culverts
Existing Pump Stations
City Boundary
Roads
Green Open Space
Parks / School Playgrounds
Streams
Flooding on Roads / Trails / Transit
Temporary Flooding
10 20 30 39 49 59
Permanent Flooding
10 20 30 39 49 59
Emergent/Shallow Groundwater
0 12 24 36 48 52 66

FOCUS AREA:

MILL VALLEY

KEY ADAPTATION CHALLENGES & POTENTIAL STRATEGIES

The following challenges have been identified for the Mill Valley area and correspond to the adjacent map.

1 DRAINAGE ISSUES ALONG BLITHEDALE

Strategy: Culvert & Pump Station

2 FLOODING ALONG ARROYO CORTE MADERA DEL PRESIDIO

Strategy:

- A: Levee, Horizontal Levee/Ecotone Slope
- B: Culvert and Pump Station

3 MILLER AVENUE / BOTHIN MARSH / TRAIL FLOODING & OVERTOPPING

Strategy: Complete Green & Elevated Streets, Horizontal Levee

4 BOTHIN MARSH OPEN SPACE PRESERVE HABITAT LOSS

Strategy: Coarse Grain Beaches

ADAPTATION OPPORTUNITY DESCRIPTIONS

1 DRAINAGE ISSUES ALONG BLITHEDALE

Location: Arroyo Corte Madera del Presidio, along Blithedale, to Pickleweed Inlet / Richardson Bay

Potential Adaptation Strategy: Culvert and Pump Station

This solution includes near-term upgrades to culverts along Blithedale Avenue to enhance stormwater drainage, improving ingress, egress, and evacuation routes for Mill Valley. In the longer term, a pump station would need to be installed to manage water levels during high tides. As sea levels rise, the pump station will become essential for conveying stormwater to Richardson Bay, as a gravity-based system will no longer reliably function with future tidal inundation of the outfall.

2 FLOODING ALONG ARROYO CORTE MADERA DEL PRESIDIO

Location: Connecting from pump station near Valley Circle Road along Arroyo Corte Madera del Presidio

Potential Adaptation Strategy:

- Strategy A: Levee, Horizontal Levee/Ecotone Slope -

Ecotone Slope

This strategy involves constructing a levee along the creek to provide a physical barrier against both inland and coastal flooding. A horizontal levee, or ecotone slope, could be integrated into the design to create a gradual transition from the aquatic

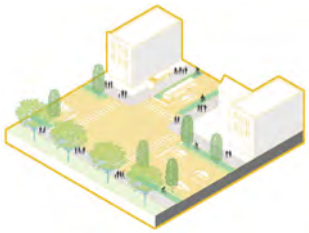
environment to upland areas. This approach enhances flood protection, supports habitat restoration, and allows species to migrate upslope as the high tide line shifts with sea level rise. The horizontal levee would also help reduce erosion and maintain natural floodplain functions.

- Strategy B: Culvert and Pump Station
  This approach focuses on enhancing the existing drainage infrastructure by upgrading culverts to re-route stormwater coming from the southern tributaries of the Arroyo Corte Madera Del Presidio drainage area and installing a pump station. The improved culverts would divert stormwater flow during heavy rainfall events to alleviate pluvial and fluvial flooding issues in the low-lying areas surrounding the existing creek alignment. he pump station would actively manage water levels, particularly during high tide or storm surge events. As sea levels rise, the pump station will become essential for conveying stormwater to Richardson Bay, as a gravity-based system will no longer reliably function with future tidal inundation of the outfall.

3 MILLER AVENUE / BOTHIN MARSH / TRAIL FLOODING & OVERTOPPING

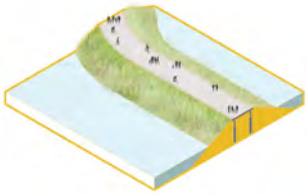
Location: Miller Avene, next to TAM High School and Bothin Marsh

Potential Adaptation Strategy: Complete Green & Elevated Streets, Horizontal Levee



Complete Green

This solution involves transforming Miller Avenue into a "Complete Green & Elevated Street" by elevating the roadway and integrating green infrastructure elements. The elevated street would be designed to remain above future flood levels, ensuring continued accessibility including during emergency evacuations. Green infrastructure, such as permeable surfaces and bio-swales, would help manage stormwater runoff.



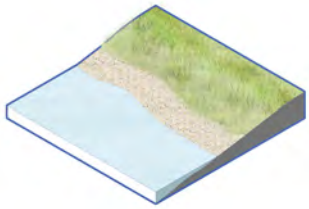
Levee

Additionally, a horizontal levee would be incorporated alongside Bothin Marsh, creating a gradual slope that transitions from the marsh to the upland areas. This horizontal levee would provide flood protection, support ecological diversity, and allow species to migrate as sea levels rise.

4 BOTHIN MARSH OPEN SPACE PRESERVE HABITAT LOSS

Location: North Richardson Bay along Redwood Highway Frontage Road

Potential Adaptation Strategy: Coarse Grain Beaches



Coarse Grain Beach

Implementing coarse grain beaches along the shoreline of Bothin Marsh would help protect and restore habitat. These beaches would be composed of larger, more stable sediments that can better withstand wave action and erosion, providing a natural buffer against sea level rise and storm surges. The coarse grain beaches would help reduce the rate of habitat loss by stabilizing the shoreline, preventing further erosion, and maintaining the marsh's ecological integrity. This approach also supports the resilience of the marsh to provide vital habitat for wildlife and other ecological functions as environmental conditions change.

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FOCUS AREA:

CORTE MADERA / LARKSPUR

VULNERABILITY OVERVIEW

The Town of Corte Madera is located on San Francisco Bay in central Marin County, along the US-101 Corridor on the San Francisco Bay. Approximately 10,000 people live in this low-lying coastal town. Historically, much of this area was marshland, which leaves most lower elevation residential and commercial areas in the Town vulnerable to coastal flooding. The City of Larkspur, located in central Marin, encompasses Corte Madera Creek and touches San Francisco Bay, exposing it to coastal and riverine flood hazards.

US-101 is critical for the region, but it faces permanent inundation with 10 inches of sea level rise. The highway connects key locations such as homes, schools, and the Town Center at Corte Madera. It is also crucial for commuters, linking to the Larkspur Ferry Terminal that connects the area to San Francisco. Moreover, 42 bus stops—both local and Golden Gate Transit—serve the area. Roadways in Larkspur also provide vital connectivity to Marin General Hospital.

Flooding along Corte Madera Creek poses a serious threat to numerous homes bordering the Creek and Larkspur Lagoon. Despite the attractive waterfront locations, these communities are highly prone to coastal flooding. Similarly, the houses in Mariner Cove and Marina Village face flooding from a 100-year storm, even without sea level rise. The current levee along the old railroad tracks has proved insufficient. With 11 schools in this focus area, any flooding would lead to significant disruptions and inconveniences, highlighting the urgent need for improved flood management.

SUMMARY OF VULNERABLE ASSETS

TRANSIT ASSETS

3 HUB, PARK, AND RIDE AREAS

2 FERRY STOPS

42 BUS STOPS

HIGHWAY 101

1 SMART STATION

LIFELINES

3 FIRE STATIONS

3 POLICE STATIONS

1 MUNICIPAL

1 HOSPITAL

COMMUNITY ASSETS

11 SCHOOLS

1 LIBRARY

UTILITIES

1 POWER SUBSTATION

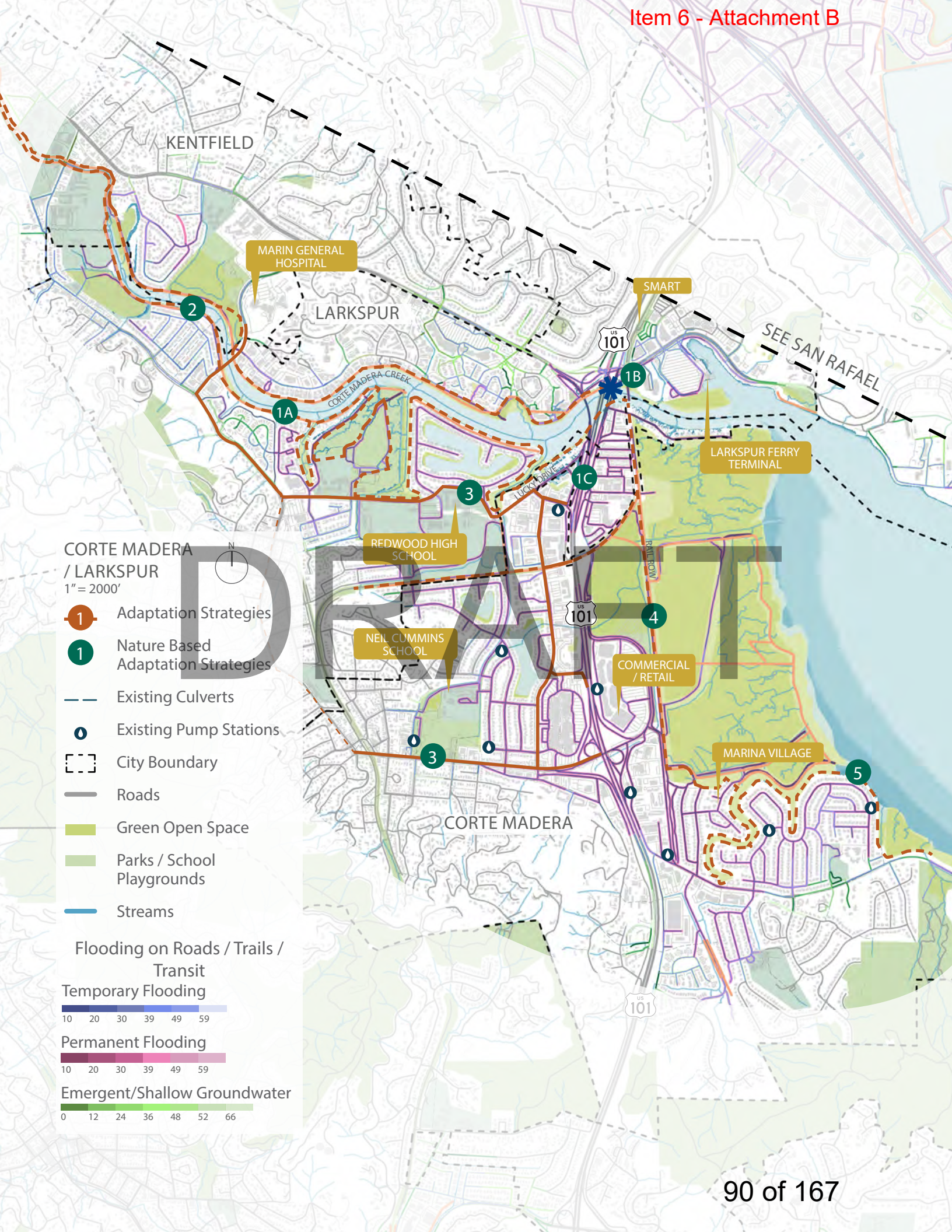
Community Flooding. Photo from Town of Corte Madera Climate Adaptation Plan

ONGOING ADAPTATION PLANNING

- The Corte Madera Climate Adaptation Assessment
- Mariner Cove & Marina Village
- Corte Madera Ecological Reserve Expansion and Restoration
- Corte Madera Creek - College of Marin "Dog Park" Habitat Restoration
- Corte Madera Creek - College of Marin Ecology Study Area Habitat Enhancement
- Corte Madera Creek - College of Marin Lot 13 Habitat Restoration
- Corte Madera Creek - Southeastern Creekside Marsh Culvert Replacement and Habitat Enhancement

APPROACH

In developing strategies at the focus area level, we emphasized several key themes critical to success. First, we initiated a dialogue with Marin's transportation agencies and neighboring communities to align on shared goals and opportunities—a conversation that continues with this adaptation summary for Mill Valley. Recognizing that TAM does not own assets and must rely on strong partnerships, we prioritized the inclusion of nature-based solutions, ensuring they remain a focal point in the planning process. We also conducted a thorough analysis of TAM's role, adopting a 'control, collaborate, and advocate' approach. Additionally, we acknowledge the importance of balancing protection with risk, working towards adaptation strategies that integrate both elements. Finally, we are committed to finding a balance between near-term actions and long-term planning, guided by the 'adaptation pathways' approach.


KENTFIELD
MARIN GENERAL HOSPITAL
LARKSPUR
SMART
SEE SAN RAFAEL
CORTE MADERA CREEK
LARKSPUR FERRY TERMINAL
LUCKY DRIVE
REDWOOD HIGH SCHOOL
RAILROW
NEIL CUMMINS SCHOOL
COMMERCIAL / RETAIL
MARINA VILLAGE
CORTE MADERA
US 101
1A
1B
1C
2
3
4
5
CORTE MADERA / LARKSPUR
1" = 2000'
Adaptation Strategies
Nature Based Adaptation Strategies
Existing Culverts
Existing Pump Stations
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Flooding on Roads / Trails / Transit
Temporary Flooding
10 20 30 39 49 59
Permanent Flooding
10 20 30 39 49 59
Emergent/Shallow Groundwater
0 12 24 36 48 52 66

FOCUS AREA:

CORTE MADERA / LARKSPUR

KEY ADAPTATION CHALLENGES & POTENTIAL STRATEGIES

The following challenges have been identified for the Corte Madera / Larkspur area and correspond to the adjacent map.

1 101 FLOODING

Strategy:

- A: Levee along Corte Madera Creek, Levee along Rail Alignment
- B: Tide Gate at 101, Levee along rail alignment
- C: Elevate 101, Complete Green & Elevated Streets

2 FLOODING ALONG CORTE MADERA CREEK

Strategy: Levee / Embankment, Tide Gate, Detention Ponds Upstream

3 COMMUNITY / EVACUATION ROUTE FLOODING

Strategy: Complete Green & Elevated Streets, Green Schoolyard Detention Basins

4 FLOODING ON CURRENT LEVEE ALIGNMENT

Strategy: Levee / Embankment, Horizontal Levee

5 EROSION, WAVE OVERTOPPING

Strategy: Coarse Grain Beaches, Bulkhead, Breakwater

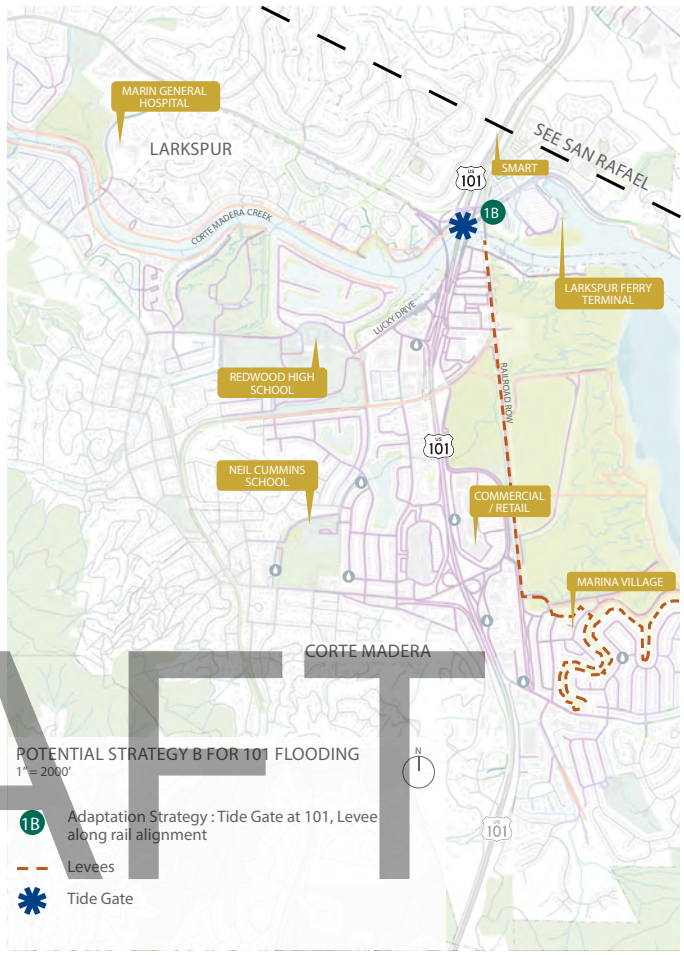
ADAPTATION OPPORTUNITY DESCRIPTIONS

1 101 FLOODING

Location: Highway 101

Potential Adaptation Strategy:

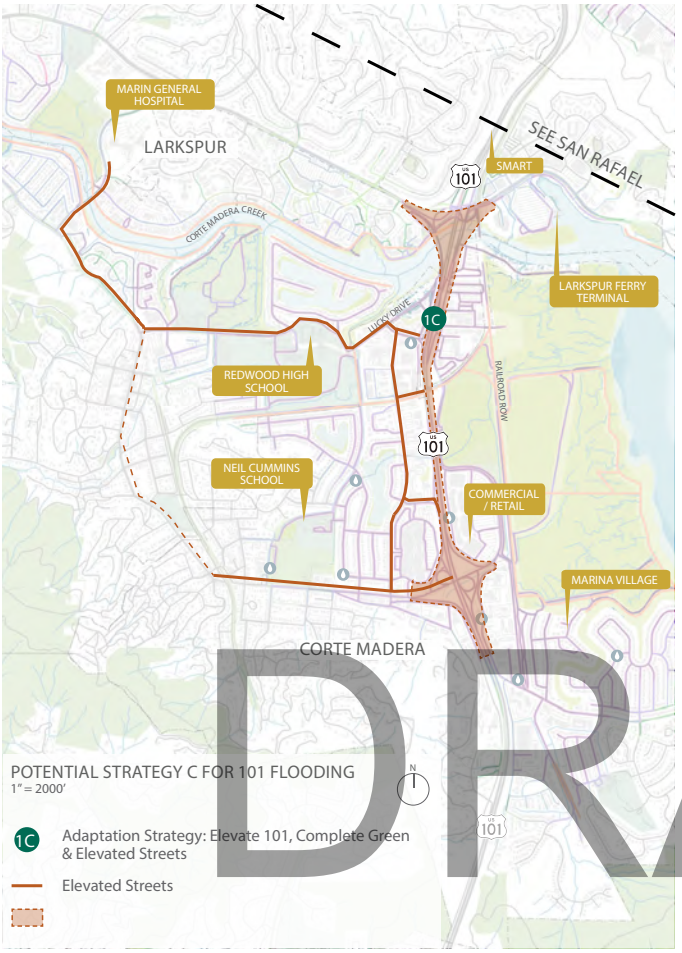
- Strategy A: Levee along Corte Madera Creek, Levee along Rail Alignment – Constructing a large system of levees along Corte Madera Creek and the former rail alignment would protect Highway 101, Corte Madera, Larkspur, as well as portions of Greenbrae and Kentfield from flooding by creating a continuous line of defense against coastal and riverine flooding. These levees would ensure the highway and nearby infrastructure remain safe and operational during storm events and high tides, while providing comprehensive flood protection for the surrounding communities. Interior drainage improvements would also be necessary to convey stormwater across levees to the creek or the bay.



Strategy A: Levee along Corte Madera Creek, Levee along Rail Alignment

Strategy B: Tide Gate at 101, levee along rail alignment

- Strategy B: Tide Gate at 101, Levee along rail alignment – Installing a tide gate at Hwy 101 and constructing a levee along the former rail alignment would protect Highway 101, Corte Madera, Larkspur, as well as portions of Greenbrae and Kentfield from flooding and shorten the line of defense compared to extending levees along Corte Madera Creek. Some levee improvements would likely be required upstream of the tide gate to reinforce both sides of the creek to ensure they can withstand inland flood events. In the long-term, installing a tide gate would help regulate the flow of tidal waters up Corte Madera Creek, thereby reducing the risk of tidal and coastal flooding in the surrounding areas. The tide gate would allow freshwater to flow out during low tide, which eventually would require pumping after sea level rise reached a critical point. These measures could have substantial environmental tradeoffs requiring thorough consideration.
- Strategy C: Elevate 101, Complete Green & Elevated Streets – Elevating Hwy 101 above anticipated flood levels using either an embankment or viaduct would provide



Strategy C: Elevate 101, Complete Green & Elevated Streets

long-term protection for the highway against sea level rise and storm surges. Elevating Tamalpais Dr, Doherty Dr, and Lucky Dr on embankments would mitigate the flooding of key evacuation routes, ensuring that these critical roadways remain accessible during flood events. Incorporating green infrastructure, such as permeable surfaces and bio-swales, would help manage stormwater runoff. Interior drainage improvements would also be necessary to convey stormwater across elevated roadways to the creek or the bay. This strategy would not protect portions of the community outboard of the elevated roadways.

2 FLOODING ALONG CORTE MADERA CREEK

Location: Corte Madera Creek

Potential Adaptation Strategy: Levee / Embankment, Tide Gate, Detention Ponds upstream

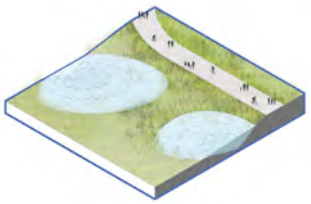
To address flooding along Corte Madera Creek, see strategies 1A and 1B to consider flood protection through levees along the creek and potentially a tide gate. To further manage riverine flooding, areas for detention ponds upstream could be identified to store water and prevent significant overland flow.

3 COMMUNITY / EVACUATION ROUTE FLOODING

Location: Redwood High School, Neil Cummins School

Potential Adaptation Strategy: Complete Green & Elevated Streets, Green Schoolyard Detention Basins

Complete Green



Detention Basin

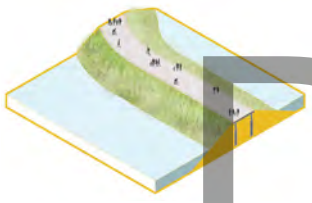
Elevating Tamalpais Dr, Doherty Dr, and Lucky Dr on embankments would mitigate the flooding of key evacuation routes, ensuring that these critical roadways remain accessible during flood events. Incorporating green infrastructure, such as permeable surfaces and bio-swales, would help manage stormwater runoff. Interior drainage improvements would also be necessary to convey

stormwater across elevated roadways to the creek or the bay. Constructing detention basins on public property, such as recreational areas or school ballfields, could temporarily capture and store excess stormwater during heavy rainfall, reducing flood risks in surrounding areas.

4 FLOODING ON CURRENT LEVEE ALIGNMENT

Location: SMART Route, Corte Madera Marsh

Potential Adaptation Strategy: Levee / Embankment, Horizontal Levee



Levee

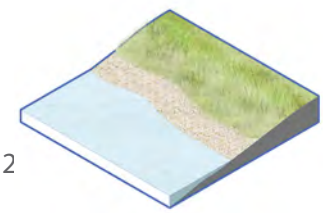
Constructing a horizontal levee along the former rail alignment would provide effective flood protection for some of the surrounding developed areas and sections of the 101 freeway. The horizontal levee would create a gradual transition from wetland to upland, providing flood protection and allowing habitat migration as sea levels rise. This strategy only provides long-term protection if tied into a district-scale flood protection system.

5 EROSION, WAVE OVERTOPPING

Location: San Clemente Creek, Corte Madera Marsh

Potential Adaptation Strategy: Coarse Grain Beaches, Bulkhead, Breakwater

Implementing coarse grain beaches along the bay facing shoreline of San Clemente Creek would help protect and restore habitat.



Coarse Grain Beach

These beaches would be composed of larger, more stable sediments that can better withstand wave action and erosion, providing a natural buffer against sea level rise and storm surges. Offshore measures, such as a breakwater structure, can help attenuate wave energy, reduce erosion, and preserve the shoreline profile. Additionally, floodwall or bulkhead structures can be used on the backshore of beaches to protect surrounding properties from flooding and overtopping.

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FOCUS AREA:

SAN RAFAEL - CANAL

VULNERABILITY OVERVIEW

The City of San Rafael is situated on San Rafael Bay, part of the San Francisco Bay. Approximately 60,000 people reside in the city, which contains wetlands and rivers (Gallinas Creek, South Fork Gallinas Creek, and San Rafael Creek) that border or cross important infrastructure. US-101 and I-580 converge in San Rafael, and this interchange is a critical asset due to it being a low-lying asset susceptible to flooding and a key connection point for regional traffic.

Flooding represents a severe threat to essential evacuation routes such as Bellam Blvd, which is expected to experience permanent inundation at 10 inches of sea level rise. US-101 and I-580 are also at risk, with I-580 facing permanent flooding under the same sea level scenario. As I-580 leads into the Richmond-San Rafael Bridge, it is crucial for maintaining connectivity between Marin County and the East Bay.

Developed areas along Kerner Blvd and Shoreline Pkwy will see temporary inundation with 10 inches of sea level rise. On the other hand, shoreline erosion is leading to noticeable trail overtopping, which impacts the key recreational spot San Rafael Bay Shoreline Path. Jean and John Starkweather Shoreline Park also experiences stormwater flooding, which is further exacerbated by 10 inches of sea level rise and emergent groundwater.

SUMMARY OF VULNERABLE ASSETS:

TRANSIT ASSETS

HIGHWAY 101 & HIGHWAY 580

RICHMOND-SAN RAFAEL BRIDGE

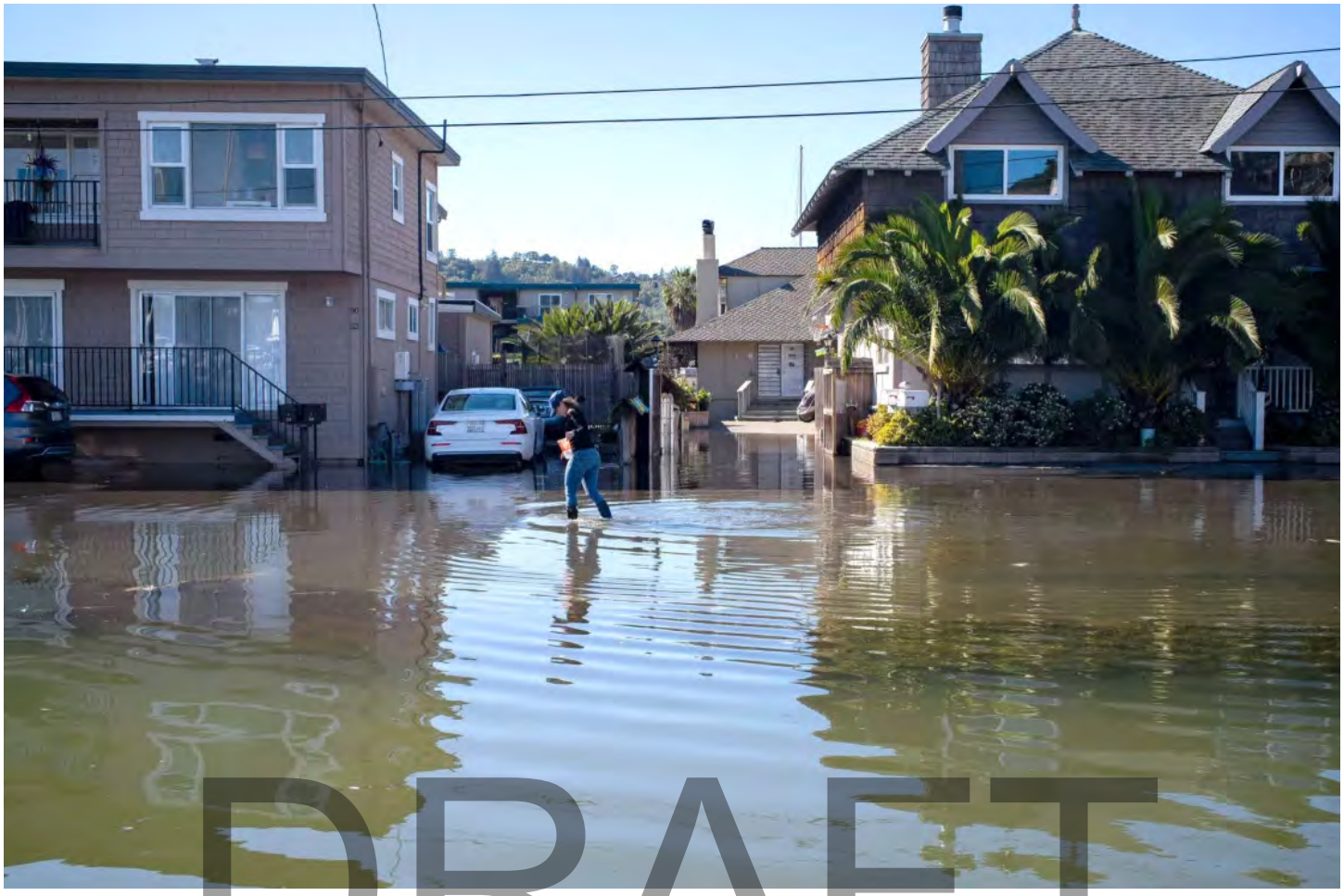
71 BUS STOPS

1 SMART STATION

4 HUB & PARK LOCATIONS

ONGOING ADAPTATION PLANNING

- San Quentin Pump Station Reconstruction
- Spinnaker Marsh Restoration
- Tiscornia Marsh Restoration and Sea Level Rise Adaptation Project
- Sea Level Rise Adaptation Transportation Infrastructure (US-101)



A king tide event in the San Rafael Canal neighborhood. Photo by George Alfaro/Kneedeep Times.

APPROACH

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US 101
TRANSIT CENTER
SAN RAFAEL HIGH SCHOOL
MARIN YACHT CLUB
3RD STREET
2ND STREET
SMART
4B
5
4C
LOWRIE YACHT HARBOR
SAN RAFAEL CREEK
PICKLEWEED COMMUNITY CENTER
5
JAMES B DAVIDSON MIDDLE SCHOOL
CANAL STREET
KERNER BLVD
4A
SAN RAFAEL
3
BELLAM BLVD
US 101
2
INTERSTATE 580
5
1
SF BAY TRAIL
HOME DEPOT
SMART
SEE CORTE MADERA/ LARKSPUR
DRAFT
SAN RAFAEL
1″ = 1800′
N
Adaptation Strategies
Nature Based Adaptation Strategies
Existing Culverts
Existing Pump Stations
City Boundary
Roads
Green Open Space
Parks / School Playgrounds
Streams
Flooding on Roads / Trails / Transit
Temporary Flooding
10 20 30 39 49 59
Permanent Flooding
10 20 30 39 49 59
Emergent/Shallow Groundwater
0 12 24 36 48 52 66

FOCUS AREA:

SAN RAFAEL - CANAL

KEY ADAPTATION CHALLENGES & POTENTIAL STRATEGIES

The following challenges have been identified for the San Rafael area and correspond to the adjacent map.

1 FLOODING OF DEVELOPED AREAS

Strategy: Horizontal Levee, Detention Pond

2 SHORELINE EROSION & TRAIL OVERTOPPING

Strategy: Levee, Coarse Beach, Breakwater

3 FLOODING OF EVACUATION ROUTES

Strategy: Elevate on Embankment

4 101 & 580 FLOOD HAZARD

Strategy:

- A: Elevate Transportation Assets (Highways, SMART rail, major roads)
- B: Tide Gate Upstream (Grand Ave OR Ped Crossing) + floodwalls along San Rafael Creek
- C: Tide Gate Downstream (Pickleweed Park)

5 STORMWATER FLOODING

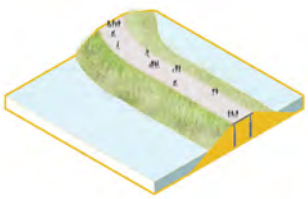
Strategy: Green Schoolyard Detention Ponds/Basins

ADAPTATION OPPORTUNITY DESCRIPTIONS

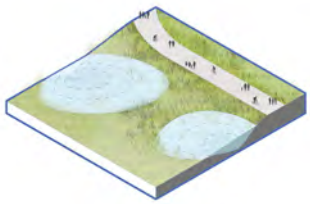
1 FLOODING OF DEVELOPED AREAS

Location: Marsh north of Home Depot

Potential Adaptation Strategy: Horizontal Levee, Detention Pond



Levee



Detention Basin

Constructing a horizontal levee and detention pond improvements north of the Home Depot property would provide effective flood protection for some of the surrounding developed areas and sections of the 580 freeway. The horizontal levee would create a gradual transition from wetland to upland, providing flood protection and allowing habitat migration as sea levels rise. The detention pond would capture and store stormwater runoff, reducing flooding risks by managing peak flows during heavy rainfall or high tides. These strategies only provide long-term protection if tied into a district-scale flood protection system.

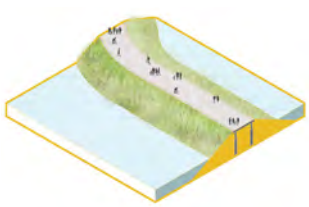
2 SHORELINE EROSION AND TRAIL OVERTOPPING

Location: Along the SF Bay Trail Shoreline

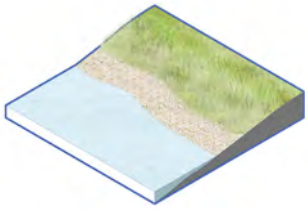
Potential Adaptation Strategy: Levee, Coarse Beach, Breakwater

A district-scale adaptation plan for the canal district

is needed to develop a long- term perimeter protection and interior drainage strategy, likely involving levees and seawalls as well as culverts and pump stations.



Levee



Coarse Grain Beach

Constructing a levee, coarse beach, and breakwater along the existing Bay Trail alignment offers a solution to address shoreline erosion and coastal storm overtopping. The levee would act as a barrier against rising sea levels and storm surges, protecting the trail and the community, if tied into a districtwide flood protection system. A coarse beach in front of the levee would help absorb wave energy and reduce erosion, while an offshore breakwater would further dissipate wave forces before they reach the shore, enhancing some subtidal habitat areas.

3 FLOODING OF EVACUATION ROUTES

Location: Bellam Blvd, Canal St, Kerner Blvd

Potential Adaptation Strategy: Elevate on Embankment

Elevating Bellam Blvd, Canal St, and Kerner Blvd on an embankment would mitigate the flooding of key evacuation routes, ensuring that these critical roadways remain accessible during flood events, including those caused by heavy rainfall, storm surges, or sea level rise. While this strategy is best exemplified by Bellam Blvd, it can be adapted to other vulnerable evacuation routes in the area, enhancing overall community resilience. Incorporating green infrastructure, such as permeable surfaces and bio-swales, would help manage stormwater runoff.

4 101 & 580 FLOOD HAZARD

Location:

- A. San Rafael creek - Grand Ave,
- B. San Rafael creek,
- C. Marin Yacht club- levee improvement along bay trail

Potential Adaptation Strategy:

- Strategy A: Elevate Transportation Assets (Highways, SMART rail, major roads) - Elevating key transportation infrastructure, such as Hwy 101 and 580, the SMART rail, the San Rafael Transit Hub and major roads would protect the assets themselves from flooding. By raising these assets above anticipated flood levels, this strategy ensures continued operation and connectivity during extreme weather events or rising sea levels, reducing the risk of closures and disruptions and safeguarding access and mobility for the community. However, this approach would not provide flood protection for the surrounding community.
- Strategy B: Tide Gate Upstream (Grand Ave, Ped Crossing) + floodwalls along San Rafael Creek - Installing a tide gate upstream on the San Rafael Canal near Grand Ave and constructing floodwalls along San Rafael Creek up to Pickleweed Park, would better protect central San Rafael and the Canal District from flooding, particularly during high tides and storm events. The floodwall improvements would include raising and reinforcing both sides of the canal to ensure they can withstand higher water levels and increased storm surges anticipated with sea level rise. In the long-term, installing a tide gate would help regulate the flow of tidal

Strategy A, B & C for 101 & 580 Flooding

- waters up San Rafael Creek, thereby reducing the risk of tidal flooding in the surrounding areas. The tide gate would allow freshwater to flow out during low tide, which eventually would require pumping after sea level rise reached a critical point. These measures could have substantial environmental tradeoffs requiring thorough consideration.
- Strategy C: Tide Gate Downstream (Pickleweed Park) - Installing a tide gate downstream on the San Rafael Canal near Pickleweed Park, would better protect central San Rafael and the Canal District from flooding, particularly during high tides and storm events. Some floodwall improvements would likely be required upstream of the tide gate to reinforce both sides of the canal to ensure they can withstand inland flood events. In the long-term, installing a tide gate would help regulate the flow of tidal waters up San Rafael Creek, thereby reducing the risk of tidal flooding in the surrounding areas. The tide gate would allow freshwater to flow out during low tide, which eventually would require pumping after sea level rise reached a critical point. These measures could have substantial environmental tradeoffs requiring thorough consideration.

5 STORMWATER FLOODING

Location: San Rafael High School, James B Davidson Middle School

Potential Adaptation Strategy: Green Schoolyard Detention Ponds/Basins

Constructing detention basins on public property, such as recreational areas or school ballfields, could temporarily capture and store excess stormwater during heavy rainfall, reducing flood risks in surrounding areas. By integrating green infrastructure into these spaces, the basins would not only manage stormwater effectively but also offer educational and ecological benefits, as well as water quality improvements.

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FOCUS AREA:

SANTA VENETIA

VULNERABILITY OVERVIEW

Santa Venetia, situated in Eastern Marin along San Pablo Bay, is home to approximately 4,200 residents. Gallinas Creek—which connects to San Pablo Bay and branches out through Santa Venetia—poses a significant risk of overtopping, impacting surrounding communities. The area is particularly vulnerable to flooding due to its historical development on marshland, leading to challenges with both groundwater emergence and creek-related inundation.

The 2-mile stretch of US-101 running through Santa Venetia and its access roads are affected by shallow groundwater, even in the absence of sea level rise. This poses a challenge for maintaining road integrity and safety. Additionally, essential transportation assets—the SMART route, 19 bus stops, and the San Rafael Airport—are vulnerable to both groundwater and permanent flooding, which can disrupt transportation and daily commutes. Flooding of evacuation routes and surrounding communities further complicates emergency response and accessibility.

Community impacts are exacerbated by the overtopping of Gallinas Creek, causing frequent flooding in neighborhoods and roads. With a 20-inch rise in sea level, the area is anticipated to face permanent flooding, significantly affecting residential properties and infrastructure. The community must prepare for these changes by implementing flood mitigation measures and improving drainage systems to protect homes and roads from frequent and severe flooding events.

SUMMARY OF VULNERABLE ASSETS

TRANSIT ASSETS

HIGHWAY 101

19 BUS STOPS

1 AIRPORT

1 INGRESS/EGRESS ROUTE

LIFELINES

1 FIRESTATION

2 POLICE STATIONS

UTILITIES

9 PUMP STATIONS

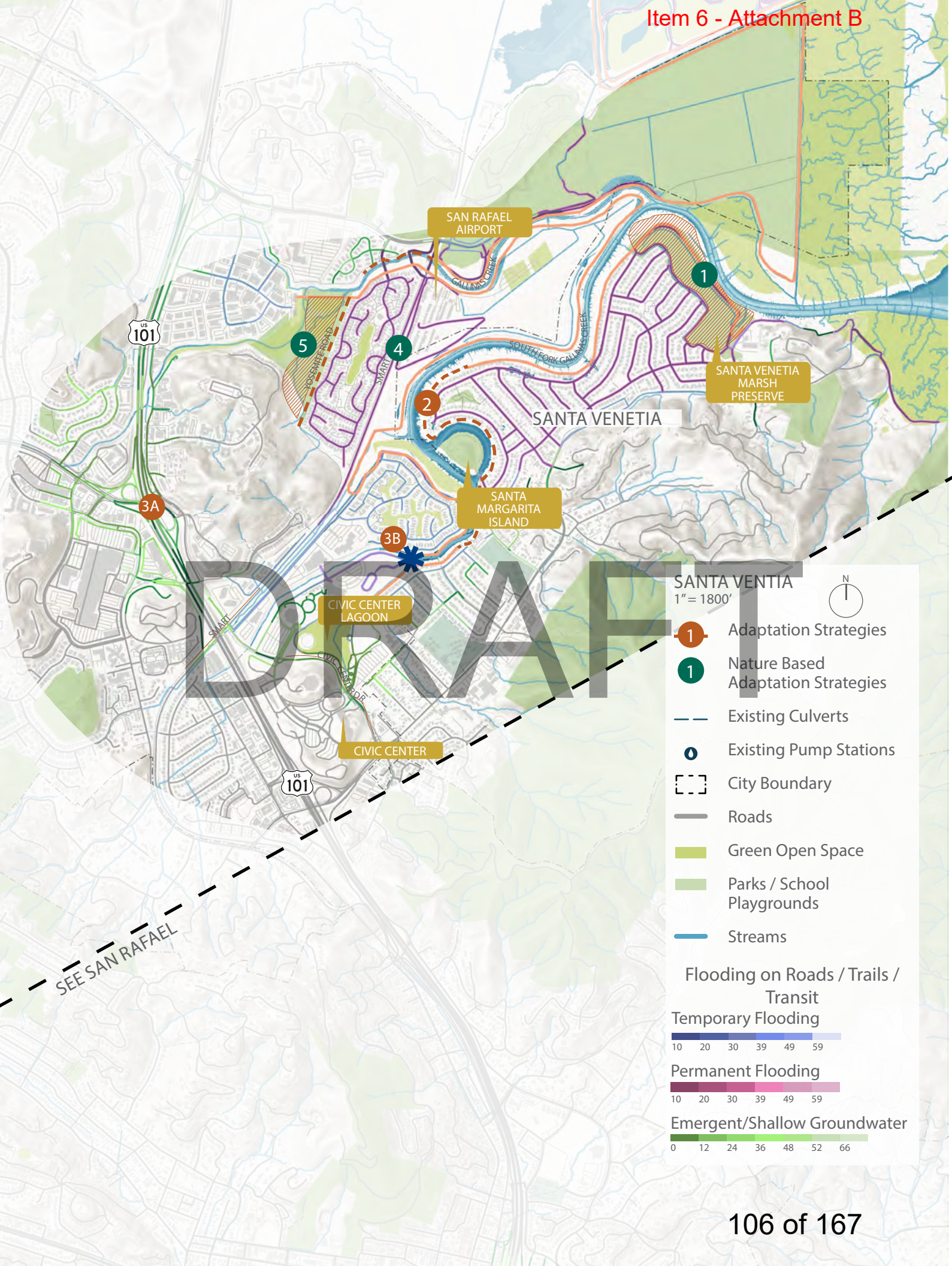
ONGOING ADAPTATION PLANNING

- McInnis Marsh Habitat Restoration
- Proposed Santa Venetia Levee Upgrade

Water in Las Gallinas Creek approaches homes in the Santa Venetia November, 2020. Photo by Alan Dep/ Marin Independent Journal.

APPROACH

In developing strategies at the focus area level, we emphasized several key themes critical to success. First, we initiated a dialogue with Marin's transportation agencies and neighboring communities to align on shared goals and opportunities—a conversation that continues with this adaptation summary for Mill Valley. Recognizing that TAM does not own assets and must rely on strong partnerships, we prioritized the inclusion of nature-based solutions, ensuring they remain a focal point in the planning process. We also conducted a thorough analysis of TAM's role, adopting a 'control, collaborate, and advocate' approach. Additionally, we acknowledge the importance of balancing protection with risk, working towards adaptation strategies that integrate both elements. Finally, we are committed to finding a balance between near-term actions and long-term planning, guided by the 'adaptation pathways' approach.


SAN RAFAEL AIRPORT
GALLINAS CREEK
SOUTH FORK GALLINAS CREEK
SANTA VENETIA MARSH PRESERVE
SANTA VENETIA
SANTA MARGARITA ISLAND
YOSEMITE ROAD
SMART
CIVIC CENTER LAGOON
CIVIC CENTER DR
CIVIC CENTER
US 101
3A
3B
SEE SAN RAFAEL
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SANTA VENTIA
1" = 1800'
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Adaptation Strategies
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Temporary Flooding
10 20 30 39 49 59
Permanent Flooding
10 20 30 39 49 59
Emergent/Shallow Groundwater
0 12 24 36 48 52 66

FOCUS AREA:

SANTA VENETIA

KEY ADAPTATION CHALLENGES & POTENTIAL STRATEGIES

The following challenges have been identified for the Santa Venetia area and correspond to the adjacent map.

1 CREEK OVERTOPPING

Strategy: Horizontal Levee

2 NEIGHBORHOOD / ROAD FLOODING

Strategy: Bulkhead / Sheet Pile

3 GROUNDWATER EMERGENCE AT 101 AND ACCESS ROADS

Strategy:

- A: Complete Green & Elevated Streets, Pump Station
- B: Tide Gate

4 FLOOD HAZARDS ON SMART ROUTE & COMMUNITY

Strategy: Elevate Transit on Embankment, Horizontal Levee

5 FLOODING OF EVACUATION ROUTE & COMMUNITY

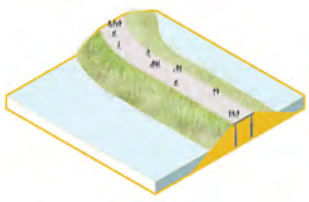
Strategy: Horizontal Levee, Elevation of Roads on Embankment

ADAPTATION OPPORTUNITY DESCRIPTIONS

1 CREEK OVERTOPPING

Location: Along Santa Venetia marsh preserve and Yosemite Road

Potential Adaptation Strategy: Horizontal Levee



Levee

Constructing a horizontal levee along the eastern perimeter of the Santa Venetia neighborhood would provide flood protection if connected into perimeter defenses along the South Fork Gallinas Creek. The horizontal levee would create a gradual transition from wetland to upland, allowing habitat migration as sea levels rise. A horizontal levee could also be used to protect the neighborhood between North Fork Gallinas Creek and the SMART rail alignment (accessed by Yosemite Rd.). This levee would have similar benefits if tied into a complete perimeter defense systems for this neighborhood.

2 NEIGHBORHOOD / ROAD FLOODING

Location: San Rafael Runway, along the South Fork Gallinas Greek

Potential Adaptation Strategy: Bulkhead / Sheet Pile

Installing a sheet pile wall would increase flood protection along the South Fork Gallinas Creek, benefitting much of the Santa Venetia neighborhood if tied into a complete perimeter protection system. Sheet pile walls are recommended due to space

constraints between private property boundaries and the creek. Existing plans are in development considering a similar concept for this location.

3 GROUNDWATER EMERGENCE AT 101 AND ACCESS ROADS

Location: Civic Center Dr, near Duck Pond and on 101

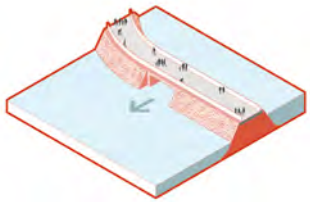
Potential Adaptation Strategy:

- Strategy A: Complete Green & Elevated Streets, Pump Station -

Complete Green

Elevating low-lying segments of Civic Center Dr between Freitas Pkwy and N San Pedro Rd would mitigate some flood risk for Highway 101 in this area and protect key evacuation routes, ensuring that these critical roadways remain accessible during flood events, including those caused by heavy rainfall, storm surges, or sea level rise. While this strategy is best exemplified by Civic Center Dr, it can be adapted to other vulnerable evacuation routes in the area, enhancing overall community resilience. Incorporating green infrastructure, such as permeable surfaces and bio-swales, would help manage stormwater runoff. This strategy also require stormwater drainage improvements including culverts and a pump station to convey stormwater from upland areas to the bay during intense rainfall events.

- Strategy B: Tide Gate -



Tide Gate

Installing a tide gate upstream on the South Fork Gallinas Creek near Civic Center Dr and constructing floodwalls and levees along the creek up to its connection with the bay, would better protect Highway 101 and the Civic Center and Santa Venetia district from flooding, particularly during high tides and storm events. The floodwall/levee improvements would include raising and reinforcing both sides of the creek to ensure they can withstand higher water levels and increased storm surges anticipated with sea level rise. In the long-term, installing a tide gate would help regulate the flow of tidal waters up the creek into Terra Linda, thereby reducing the risk of tidal flooding in the surrounding areas. The tide gate would allow freshwater to flow out during low tide, which eventually would require pumping after sea level rise reached a critical point. These measures could have substantial environmental tradeoffs requiring thorough consideration.

4 FLOOD HAZARDS ON SMART ROUTE & COMMUNITY

Location: SMART Route

Potential Adaptation Strategy: Elevate Transit on Embankment, Horizontal Levee

Elevate Transit on Embankment, Horizontal Levee

In the long-term, low-lying sections of the SMART rail alignment may need to be elevated onto an enhanced embankment or protected with floodwalls. Augmenting the existing embankment to create a horizontal levee can also be considered in sections

where space between the alignment and nearby properties and waterways would allow for this. The horizontal levee would create a gradual transition from wetland to upland, allowing habitat migration as sea levels rise.

5 FLOODING OF EVACUATION ROUTE & COMMUNITY

Location: Yosemite Road

Potential Adaptation Strategy: Horizontal Levee, Elevation of Roads on Embankment

Yosemite Road is currently the only ingress/egress route for daily traffic or emergency evacuation from the neighborhood here adjacent to the San Rafael Airport. Elevating Yosemite Rd and installing perimeter flood protection for this community would provide life safety and property protection benefits. Utilizing an embankment would mitigate the flooding of this evacuation route, ensuring that the community's critical roadway and bridge remain accessible during flood events, including those caused by heavy rainfall, storm surges, or sea level rise. While this strategy is best exemplified by Yosemite Dr, it can be adapted to other low-lying sections of evacuation routes in the area, enhancing overall community resilience. Bridge replacement should also be considered for Yosemite Road.

FOCUS AREA:

NOVATO

VULNERABILITY OVERVIEW

The northernmost city in Marin, Novato sits on San Pablo Bay, part of San Francisco Bay. The city includes wetland areas and Novato Creek, which runs through the main commercial district. SR-37 and US-101 meet in the city. This interchange is a critical transportation asset vulnerable to sea level rise.

The transportation network in Novato is widely impacted by flooding, particularly affecting the SMART route. Rush Creek, which drains along the SMART rail alignment, is poorly maintained and contributes to frequent flooding. Additionally, groundwater emergence on US-101 complicates travel and infrastructure stability. The area is served by 27 bus stops, which are crucial for local transit. However, the combined issues of flooding and groundwater emergence highlight the urgent need for enhanced drainage and maintenance to ensure reliable transportation throughout the region.

Marsh subsidence and a lack of sediment east of US-101 contribute to the vulnerability of the extensive marshlands, including those surrounding Deer Island. Groundwater emergence around Scottsdale Marsh affects key community locations such as Lynwood Elementary School and Vintage Oaks Shopping Center. Mitigation efforts are essential to protect these vital community assets and ensure the resilience of the local environment and infrastructure.

SUMMARY OF VULNERABLE ASSETS

TRANSIT ASSETS

27 BUS STOPS

LIFELINES

1 HOSPITAL / HEALTHCENTER

COMMUNITY ASSETS

1 LIBRARY

6 SCHOOLS

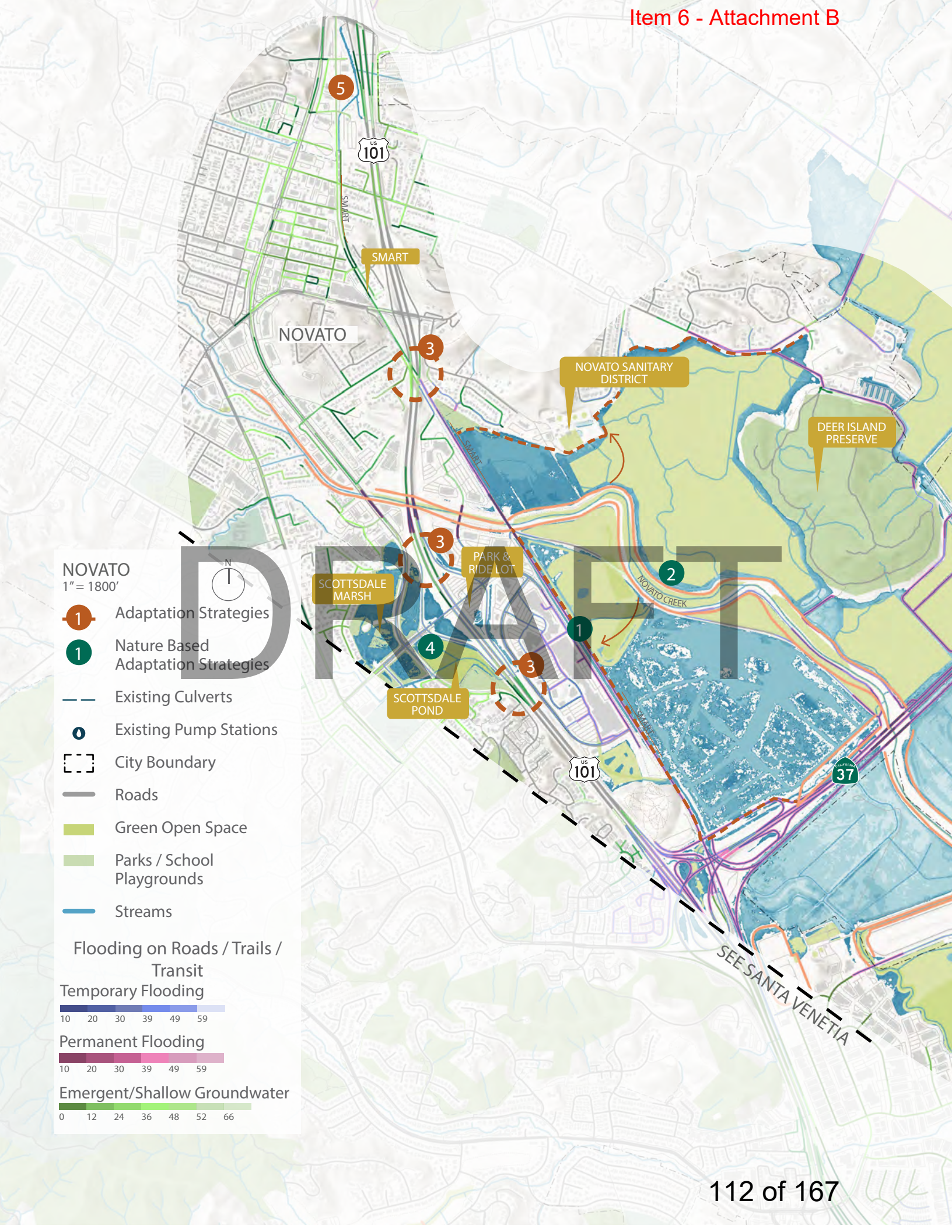
ONGOING ADAPTATION PLANNING

- Novato Baylands and Flood Protection
- Deer Island Basin Complex Tidal Wetlands Restoration
- Sea Level Rise Adaptation Transportation Infrastructure | SR-37
- Hamilton Levee
- Novato Creek Sediment Removal and Wetland Enhancement Project

A truck sits in flood water along westbound Highway 37 near Highway 101 in Novato, February 2019. Photo by Alan Dep/Marin Independent Journal.

APPROACH

In developing strategies at the focus area level, we emphasized several key themes critical to success. First, we initiated a dialogue with Marin's transportation agencies and neighboring communities to align on shared goals and opportunities—a conversation that continues with this adaptation summary for Mill Valley. Recognizing that TAM does not own assets and must rely on strong partnerships, we prioritized the inclusion of nature-based solutions, ensuring they remain a focal point in the planning process. We also conducted a thorough analysis of TAM's role, adopting a 'control, collaborate, and advocate' approach. Additionally, we acknowledge the importance of balancing protection with risk, working towards adaptation strategies that integrate both elements. Finally, we are committed to finding a balance between near-term actions and long-term planning, guided by the 'adaptation pathways' approach.


NOVATO
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NOVATO
SMART
NOVATO SANITARY DISTRICT
DEER ISLAND PRESERVE
PARK & RIDE LOT
SCOTTSDALE MARSH
SCOTTSDALE POND
NOVATO CREEK
US 101
CALIFORNIA 37
SEE SANTA VENETIA
DRAFT

FOCUS AREA:

NOVATO

KEY ADAPTATION CHALLENGES & POTENTIAL STRATEGIES

The following challenges have been identified for the Novato area and correspond to the adjacent map.

1 FLOODING OF SMART ROUTE

Strategy: Elevate Transit on Embankment, Horizontal Levee, Relocation of levees along the perimeter of Novato Creek Marsh

2 MARSH SUBSIDENCE & LACK OF SEDIMENT

Strategy: Breaching Creek Channels

3 GROUNDWATER EMERGENCE ON 101

Strategy: Pump Station, Levee / Embankment

4 GROUNDWATER EMERGENCE AROUND SCOTTSDALE MARSH

Strategy: Detention Ponds, Pump Station / Culvert

5 FLOODING OF SMART ROUTE ALONG RUSH CREEK

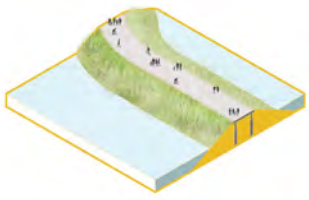
Strategy: Improve Drainage Capacity via Detention Ponds, Pump Station / Culvert

ADAPTATION OPPORTUNITY DESCRIPTIONS

1 FLOODING OF SMART ROUTE

Location: SMART Route

Potential Adaptation Strategy: Elevate Transit on Embankment, Horizontal Levee, Relocation of levees along the perimeter of Novato Creek Marsh



Levee

In the long-term, low-lying sections of the SMART rail alignment may need to be elevated onto an enhanced embankment or protected with floodwalls or levees. Augmenting the existing embankment to create a horizontal levee can also be considered in sections where space between the alignment and nearby properties and waterways would allow for this. The horizontal levee would create a gradual transition from wetland to upland, allowing habitat migration as sea levels rise. Relocating the existing levees along the south side of Novato Creek to adjacent the SMART rail alignment will open up substantial wetland restoration opportunities in the Novato Creek Unit of the Petaluma Marsh Wildlife Area. This strategy would require protection of Highway 37, likely utilizing levees, in the segment between Highway 101 and the bridge across Novato Creek.

2 MARSH SUBSIDENCE & LACK OF SEDIMENT

Location: Along Novato Creek

Potential Adaptation Strategy: Breaching Creek Channels

Strategically breaching the existing levees along the

north side of Novato Creek in the areas west and south of the Deer Island Preserve would allow for floodplain and wetland restoration opportunities. This strategy could require additional levees around the perimeter of the existing open space area to protect the Novato Sanitary District property as well as other adjacent properties with existing development. Reconnecting the creek and tidal flows to this area of open space would bring both brackish water and sediment which could help improve habitat for certain native species. Adaptive management practices could be used to monitor improvements over time and augment restoration efforts as needed.

3 GROUNDWATER EMERGENCE ON 101

Location: Along 101

Potential Adaptation Strategy: Pump Station, Levee / Embankment

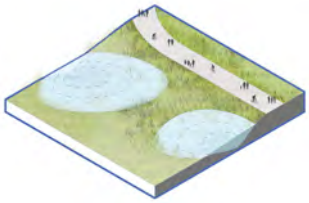
Levee

Elevating Highway 101 on an embankment in the areas surrounding Novato Creek could mitigate risks from future emergent groundwater. Impermeable cutoff walls, if located strategically, combined with pumps could also help to manage emergent groundwater issues in problem areas. This strategy would require more robust investigation.

4 GROUNDWATER EMERGENCE AROUND SCOTTSDALE MARSH

Location: Scottsdale Pond

Potential Adaptation Strategy: Detention Ponds, Pump Station / Culvert



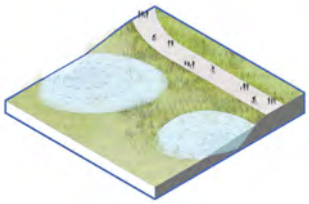
Detention Basin

A groundwater management strategy is likely required for mitigating future roadway flooding from emergent groundwater and stormwater accumulation in the area surrounding the current Scottsdale Pond. Enhancing this area's ability to function as a stormwater detention pond could alleviate flood risks during intense rainfall events. Considering cutoff walls along with pumps and culverts could also be investigated to help manage emergent groundwater.

5 FLOODING OF SMART ROUTE ALONG RUSH CREEK

Location: Along Rush Creek

Potential Adaptation Strategy: Improve Drainage Capacity via Detention Ponds, Pump Station / Culvert



Detention Basin

Improving drainage capacity along the SMART route at Rush Creek could mitigate flood risk, particularly with respect to emergent groundwater. Strategies to manage drainage may include a combination of identifying areas to detain water and building a series of pump stations and culverts to move water.

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Job number

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USA
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1. Executive Summary

Sea level rise affects everyone in Marin County, from those living close to the shoreline to those living in the hills. Even those with property outside of the inundation zone will be affected by service disruptions due to the flooding of wastewater treatment plants and hospitals, and most relevant to TAM's interests, delays when flooding impacts key transportation routes, such as Highways 101 and 37. The impacts are likely to be felt most acutely by those with fewer resources, such as underserved and marginalized communities.

Marin County has been a leader in California and across the nation on understanding and preparing for its vulnerability to sea level rise (see Existing Plan Review Memo). To date, there have been several important efforts to identify exposure and hazards, as well as begin to map solutions, including countywide projects such as BayWAVE and C-SMART, in combination with existing and burgeoning city efforts in Sausalito, Corte Madera, San Rafael, and many others.

With the passage of Measure AA, the Transportation Authority of Marin (TAM) now has dedicated, on-going funds for sea level rise protection, estimated at approximately $250,000 annually based on the current revenue projection. These funds have a wide array of eligibility and potential uses and can be used to respond to the various needs identified in vulnerability assessments prepared by BayWAVE, C-SMART, and Caltrans. TAM has contracted Arup, Pathways Climate Institute, and WRT to support its inaugural efforts to identify vulnerable areas in the County, develop area-specific sea level rise adaptation strategies, and create an implementation plan for TAM.

Following a review of existing work in and around Marin County, this next phase of the project (Task 3) updates the understanding of coastal flood vulnerability in Marin County, with a focus on the transportation system. Since the last countywide assessments were conducted, information was released on how sea level rise will also impact shallow groundwater tables, commonly referred to as groundwater rise. Groundwater rise projections are assessed in combination with permanent overland inundation from rising sea levels, as well as an analysis of current and future temporary 100-year flood exposure from both coastal storm surge and waves, as well as coastal/fluvial/pluvial impacts identified by FEMA floodplain mapping.

One important goal of this flood hazard analysis is to use the latest science to both reaffirm known locations of current and future coastal flood vulnerability and identify any new potential flood hazard locations. The focus areas can then be used to spur discussion within TAM and across Marin County to identify ongoing or planned transportation improvements and adaptation plans and increase coordination among stakeholders to implement measures that reduce the County's transportation flood vulnerability. Through this analysis, the consultant team identified 15 focus areas and provided information on the flood related hazards for each, the timing of impact on roads, impacts to multimodal transit and bike routes, and identification of key community and lifeline assets within each focus area to connect the transportation system to the communities they serve.

1.1 Purpose

This memorandum summarizes methods developed to identify Marin County coastal flood focus areas and to identify and present focus area locations, along with exposure statistics, focusing on transportation and transit assets. This memo will:

1. Define the multi-hazard, multi-stakeholder driven methodology to identify focus area locations
2. Discuss identified focus area locations
3. Discuss online data viewer that will be used for TAM and Technical Advisory Committee (TAC) and Focus Group discussions
4. Describe how focus area analysis can inform subsequent tasks and future TAM projects

For this project, ***focus areas*** are defined as locations that are vulnerable to sea level rise coastal hazards and fluvial/pluvial flood exposure, with implications to both Marin's transportation assets, as well as to important community and lifeline assets.

1.2 Approach & Outcomes

In recognition of the wealth of work that Marin County has already undertaken to map and understand its vulnerability to coastal flood hazards, the goal of Task 3 is to update known vulnerabilities, refine with the latest scientific information, and propose a suite of focus areas that will support future discussions for adaptation planning across Marin County, with a focus on the County's transportation assets. The exposure analysis, including the delineated focus areas, is provided in GIS geodatabases and through an online Web Map to increase uptake across the entire county. The focus areas are intended to spur future discussions on shared coastal flood hazard exposure, guide conversations about ongoing and planned transportation and adaptation projects, and encourage multi-stakeholder coordination as the County works to prepare and implement flood hazard adaptation measures. The boundaries for the focus areas should be interpreted as general boundaries and not strict boundaries.

2. Focus Area Location Identification Methodology

2.1 Data Collection and Management

The consultant team worked with TAM and the TAC to collect and collate a suite of countywide assets for the flood exposure and vulnerability assessment. In turn, building on past efforts, the consultant team updated a countywide exposure analysis and included an additional sea level rise flood projection as well as new scientific flood on exposure to sea-level rise driven groundwater rise. The following section describes the methods to collect and vet the different data sources.

2.1.1 Marin County Asset Data

TAM, in collaboration with the TAC and county representatives, solicited, collected, and shared the best available information on Countywide assets, such as roadways, facilities, and community infrastructure. Prior to the passage of Measure AA, which explicitly funds and empowers TAM to assess transportation vulnerability to sea level rise, Marin County's Department of Public Works led a project that assessed sea level rise impacts to Marin County transportation assets, with the goal of providing project-level information on coastal flood vulnerability and to support adaptation planning. The first iteration of the County's exposure analysis was completed as TAM's study was beginning. The consultant team leveraged DPW's work collecting and cataloguing key County assets, which allowed the consultant to use the most recently vetted and reviewed asset information in this analysis.

Created as part of the Existing Plan Review, an ArcGIS online group repository was developed for coordination and sharing of data among the consultants (Figure 1). Accompanying excel files categorized each layer type as a point, line, or polygon and described relevant attribute characteristics, such as the number of assets within a specific category (e.g., 6 assets within the SMART layer or 549 assets within the Marin Transit Stops layer).

Once all the GIS data layers were compiled, the consultant team identified which assets would be appropriate for exposure analysis. The consultant team developed asset-based GIS geodatabases that could then be used for the exposure analysis (see section 3.1.1). Table 1 lists the full suite of assets included in the analysis.

Table 1 List of Assets

Layer Category	Layer Name	shape	data source
Active Transportation - Bike	Bikeways	polyline	TAM / TAC
Active Transportation - Trails	Trails	polyline	County SLR Transportation Tool
Airport	Airports	point	TAM / TAC
Community Assets	School Locations	point	County SLR Transportation Tool
County Assets	City and County Facilities	point	County SLR Transportation Tool
	County Facilities	point	TAM / TAC
	Publicly Owned Parcels	polygon	County SLR Transportation Tool
Emergency Response	Sand/Sandbag Provision Locations	point	County SLR Transportation Tool
	Tsunami Evacuation Zones	polygon	County SLR Transportation Tool
Equity	Equity Priority Communities	polygon	MTC Equity Priority Communities
Lifelines	Fire Stations	point	County SLR Transportation Tool
	Hospitals	point	County SLR Transportation Tool
	Law Enforcement	point	TAM / TAC
	Medical Facilities	point	TAM / TAC
Roads	HOV Lanes	polyline	TAM / TAC
	Marin County Roads	polyline	TAM / TAC
	Road Tunnels	polyline	TAM / TAC
Transit	Bus Routes OSM	polyline	TAM / TAC
	Bus Stops OSM	point	TAM / TAC
	GGT Ferry Stops	point	TAM / TAC
	GGT Routes	polyline	TAM / TAC
	GGT Stops	point	TAM / TAC
	Hubs and Park and Rides	point	TAM / TAC
	Marin Transit Routes	polyline	TAM / TAC
	Marin Transit Stops	point	TAM / TAC
	SMART Route	polyline	TAM / TAC
	SMART Stops	point	TAM / TAC
	Transit Hubs	point	TAM / TAC
Utilities	Channels	polyline	TAM / TAC
	Channels	line	TAM / TAC
	Manholes	point	County SLR Transportation Tool
	PGE Substations	point	TAM / TAC
	Pipes	polyline	TAM / TAC
	Pipes	line	TAM / TAC
	Pump Stations	point	County SLR Transportation Tool
	Pump Stations	point	TAM / TAC
	Stormwater Catchment Basins	point	County SLR Transportation Tool
	Stormwater Drainage Structures	point	County SLR Transportation Tool
	Wastewater Facilities	point	County SLR Transportation Tool
	Wastewater Treatment Facilities	point	TAM / TAC

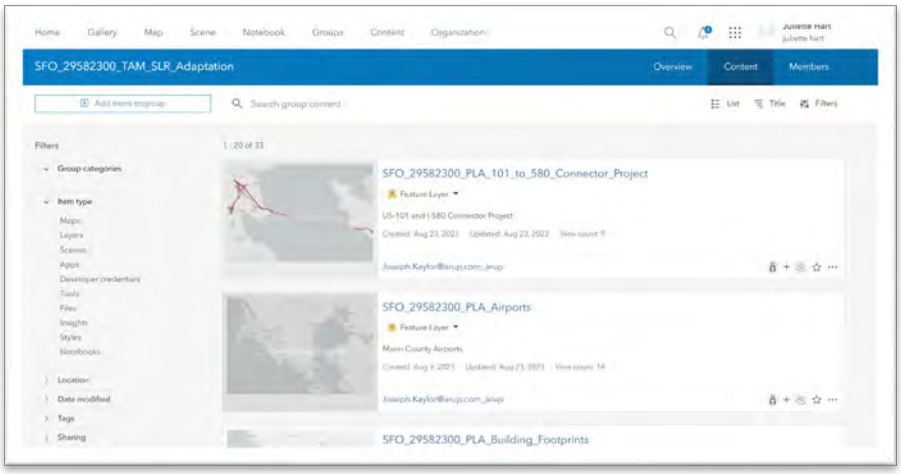


Figure 1 Screenshot of ArcGIS group repository that includes all vetted Marin County transportation and asset information.

2.1.2 Climate Hazard Data

Climate hazards assessed for this study include: permanent sea-level rise inundation, temporary coastal flooding from 1-percent annual chance (100-year) coastal storm event today and with sea level rise, 100-year and 0.2-percent annual chance (500-year) FEMA special flood hazard area (which combines coastal, fluvial and pluvial flood exposure based on historical conditions), and sea level rise-driven shallow and emergent groundwater. Table 2 provides an overview of the data sources, projections, and justification for the selected projections.

Table 2: List of Data Sources

Climate Hazard	Data Source	Projections	Justification & Constraints
SLR – Permanent Inundation	USGS Coastal Storm Modeling System (CoSMoS)	10 in (0.25 m) 20 in (0.5 m) 39 in (1 m) 59 in. (1.5 m)	For consistency with BayWAVE and C-SMART, this analysis repeated the use of the 10, 20 and 59 in projections of SLR. On current greenhouse gas (GHG) emissions trajectories (see Figure 2), recent federal sea level rise projections indicate we are likely to experience 39 in of SLR by 2070 – 2090. Thirty-nine inches of SLR also provides a mid-range projection between 20 in and 59 in and correlates with marked increases in flooding in most of the focus areas.
SLR – Temporary Flooding (100-year Coastal Storm)	USGS Coastal Storm Modeling System (CoSMoS)	0 in + 100 yr storm 10 in + 100 yr storm 20 in + 100 yr storm 39 in + 100 yr storm 59 in + 100 yr storm	The 0 in + 100-year storm scenario provides a projection of flood exposure from a 100-year coastal event at today's current spring astronomical tide. For consistency with the SLR flood exposure, analysis was also conducted for the 100-year coastal storm with 10, 20, 39, 59 in of SLR.

SLR-induced Shallow groundwater (GW) – SF Bay	Adapting to Rising Tides (ART) Shallow Groundwater	12 in (1 ft) 24 in (2 ft) 36 in (3 ft) 66 in (5.5 ft)	For the SF Bay region, the ART shallow GW projections were used. To best align to the SLR amounts used for the CoSMoS tidal and storm surge flooding, the closest available ART scenarios were used. While not exact matches, the projections are close enough to the CoSMoS SLR projections, given the associated uncertainty in both projections (CoSMoS and ART).
SLR-induced Shallow groundwater (GW) – Ocean	CoSMoS – Groundwater (GW)	10 in 20 in 39 in 59 in	For the open Pacific coast, CoSMoS-GW is available; the ART Shallow GW modeling is not. Here the team selected the SLR-induced GW projections that match the SLR projections used to project flood exposure from SLR and the 100-year storm events.
FEMA Special Flood Hazard Area	FEMA	100-year floodplain 500-year floodplain	To understand current flood exposure from the combination of coastal, fluvial and pluvial impacts, the 100-year and 500- year floodplain extents were analyzed. The FEMA floodplain is based on historical conditions and does not consider climate change. While no future changes in the fluvial and pluvial floodplain due to climate change are available, the 500-year floodplain can represent potential increases in the 100-year floodplain.

The modeling information used in this analysis all derive from authoritative and trusted data sources that are industry standard for assessing exposure to coastal flood hazards.

- Two data sources - the FEMA floodplain extents and the USGS Coastal Storm Modeling System – are developed by federal institutions and follow vetted, tested, and peer-reviewed methodologies. CoSMoS was funded in part by the CA Ocean Protection Council, along with internal funding from the USGS. It is recommended as one of the trusted resources for coastal hazard analysis for the entire coast of California – both oceanside and bayside.
- The Adapting to Rising Tides (ART) Shallow Groundwater Modeling was developed by Pathways Climate Institute and the San Francisco Estuary Institute (SFEI), two recognized and trusted science-based entities that serve the San Francisco Bay Area. The SF Bay Conservation and Development Commission (BCDC) promotes and recommends the use of the ART Shallow Groundwater modeling for assessing the impacts to shallow groundwater tables wherever it is available in the SF Bay area. Moreover, Marin County played an integral role in both providing information and reviewing the model results during the development of the model. ART does not provide shallow groundwater projections for the open Pacific coast of Marin County. For this, the consultant team turned to the USGS CoSMoS-Groundwater (GW) modeling. CoSMoS-GW was developed for the entire coast of California and was

developed using a model-based approach. While different than the data-driven approach used in the ART modeling, CoSMoS-GW (also funded by USGS and the CA OPC) provides reliable, authoritative, and trusted projections for shallow groundwater rise, important for assessing impacts to the Stinson Beach and Inverness focus areas.

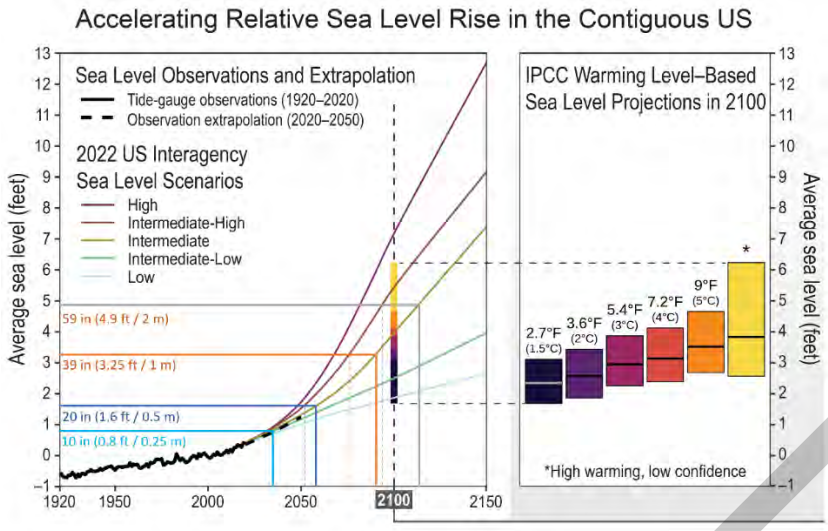


Figure 2: Federal sea level rise projections for the U.S. The colored lines in the left panel provide sea level rise projections from 1920 to 2150 under a range of greenhouse gas emissions scenarios. The black line indicates observations and a linear extrapolation of current observations from 2023 to 2050. We are currently tracking on the "Intermediate" projection curves. Assuming the world continues tracking on this Intermediate curve, the consultant team highlighted when the different SLR scenarios used in this project are expected to be reached: ~2040 for 10 inches; ~2060 for 20 inches; ~2090 for 39 inches; and ~2110 for 59 inches. This figure also allows the reader to extrapolate different timeframes of sea level rise based on different emissions trajectories. If globally, our emissions accelerate and we begin tracking on the intermediate-high curve, we are likely to experience higher rates of sea level rise sooner. The State of California, through the CA Ocean Protection Council is currently updating its recommended sea level rise proejctsions. They are expected to follow the federal sea level rise projections.

2.1.3 Technical Advisory Committee Engagement

TAM invited representatives from Marin County, cities in the County, Caltrans, MTC, and BCDC to serve on the Technical Advisory Committee (TAC). The role of the TAC is to provide thought leadership and feedback throughout the course of the project. TAM worked with the TAC to identify relevant asset data sets to include in the exposure analysis. The consultant team presented the proposed analysis methodology to the TAC at the first TAC meeting (Oct. 12, 2023). Feedback from the TAC was incorporated and included into the updated methodology development. The TAC reviewed early versions of this memo and provided feedback on the identified focus areas. Feedback from the TAC was incorporated to develop the final suite of focus areas.

2.1.4 Data Limitations and Assumptions

The coastal flood hazard exposure analysis builds off prior Marin County analysis and existing spatial data sets, adding new information on shallow groundwater rise and additional sea level rise scenarios to refine the understanding of both extent and timing of impacts. By building off prior analyses and data sets, several assumptions and limitations apply.

The topographic Digital Elevation Model (DEM) supporting the coastal flood hazard maps represent 2009-2011 conditions, therefore any new urban development or shoreline improvements may not be captured in the current maps. The DEM and all derived data layers have a horizontal resolution of 2 meters. The elevation data has a vertical accuracy of approximately 18 cm. The horizontal accuracy of the 2010 lidar (the bulk of the topography) has a root mean square error (RMSE) of 1m. Additional localized modifications to the DEM were implemented for the ART mapping products in 2018. Newer shoreline LiDAR information could be incorporated in subsequent discussions regarding future adaptation (Task 4), but was not incorporated during the exposure

analysis due to the heavy computational resources required for a county-wide implementation. Future efforts may elect to analyze this information, but was not included in the current project scope.

Travel demand and capacity (e.g., detour length and annual average daily traffic) was not considered in the exposure analysis to identify individual road segment criticality or delineation of the focus areas. Efforts to integrate TAM's model into County SLR planning efforts and tools are encouraged.

Asset locations were primarily represented as GIS point data, meaning the full footprint of several assets including hospitals, schools, community centers and other county facilities and were not captured in the overlay of the coastal hazards. The exposure analysis assigned a Yes or No attribute to these assets, rather than an area or percentage of the asset exposed to each of the flood hazards.

For the exposure analysis, the linear road network was segmented into 1/10th mile sections to assign an average depth of permanent inundation from sea level rise or temporary flooding from coastal storm surge and sea level rise. Due to the road segmentation, if any portion of each 1/10th mile segment overlaps with the flood hazard extents, the segment is identified as exposed.

The connections between assets within and across communities (e.g., local and regional road network dependencies on hospitals) were considered qualitatively in the development of the focus areas. Additional information on regional reliance on assets, or interdependencies and cascading impacts of assets (e.g., PGE stations) could refine the delineation of the focus areas and further inform the adaptation planning.

Elevated portions of roadways (bridges and overpasses) were manually identified to the best extent possible and removed from the exposure analysis, however some elevated segments may still remain in the resultant GIS outputs with the hazard exposure information.

2.2 Coastal Flood Hazard Exposure Analysis Methodology

2.2.1 Exposure Analysis

The exposure assessment was completed in GIS by overlaying the individual asset layers in the sector-based geodatabases with the hazard layers described in Table 2. The exposure assessment was based on how each asset is represented:

- For ***point assets*** (e.g., bus stops, pump stations), the assessment evaluated whether each asset was within the inundation zone for each of the hazard scenarios.
- For ***linear assets*** (e.g., roadways, SMART routes, channels), the length and percentage of the asset within the hazard zones were calculated. Roadways were divided into 528-foot (1/10th mile) segments and tagged with inundation statistics for each of the hazard scenarios, such as the first instance of exposure for SLR inundation and groundwater emergence.
- For ***polygon assets*** (e.g., parks, large facilities, EPC zones), the area and the percentage of the asset within the SLR inundation zones were calculated.

2.2.2 ArcGIS Geodatabase and Online Data Viewer

The exposure information was added to the GIS geodatabases to allow asset managers to identify when (and by how much) each asset would be exposed to flood hazards for each scenario. These geodatabases were provided to TAM for their use and dissemination, as appropriate.

Because not all agencies have access to desktop ArcGIS applications, all the coastal hazard projections and asset data, as well as the identified focus areas, are available through an ArcGIS Web Map (Figure 3).

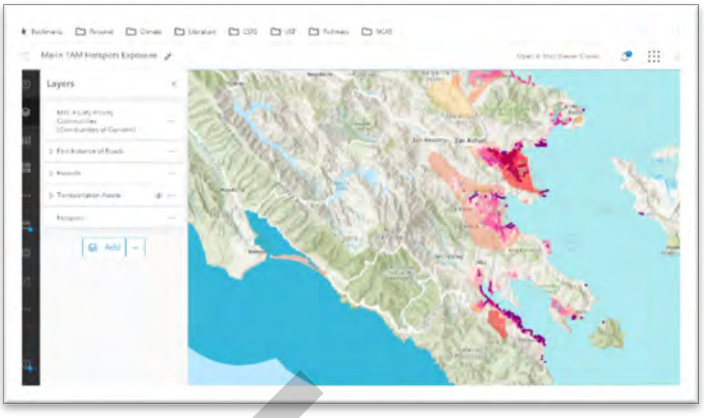


Figure 3 Screenshot of ArcGIS Web Map

2.3 Methodology to Delineate Vulnerability Focus Areas

Upon completion of the exposure analysis, the consultant team reviewed the exposure maps and statistics to propose an initial suite of focus areas. Initial outlining of the focus areas was based on extent of exposure for each of the different types of hazards. The team then used a series of questions to guide an iterative process to refine the proposed focus areas (Figure 4).

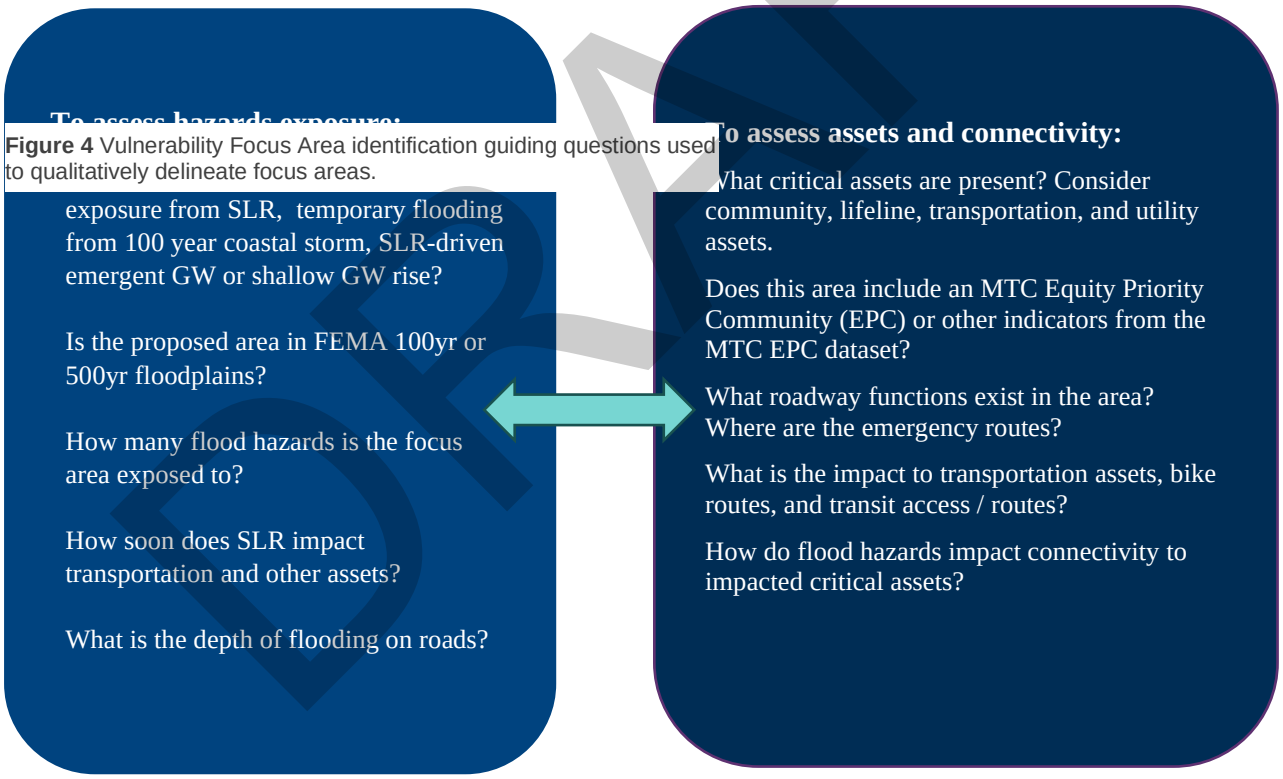


Figure 4 Vulnerability Focus Area identification guiding questions used to qualitatively delineate focus areas.

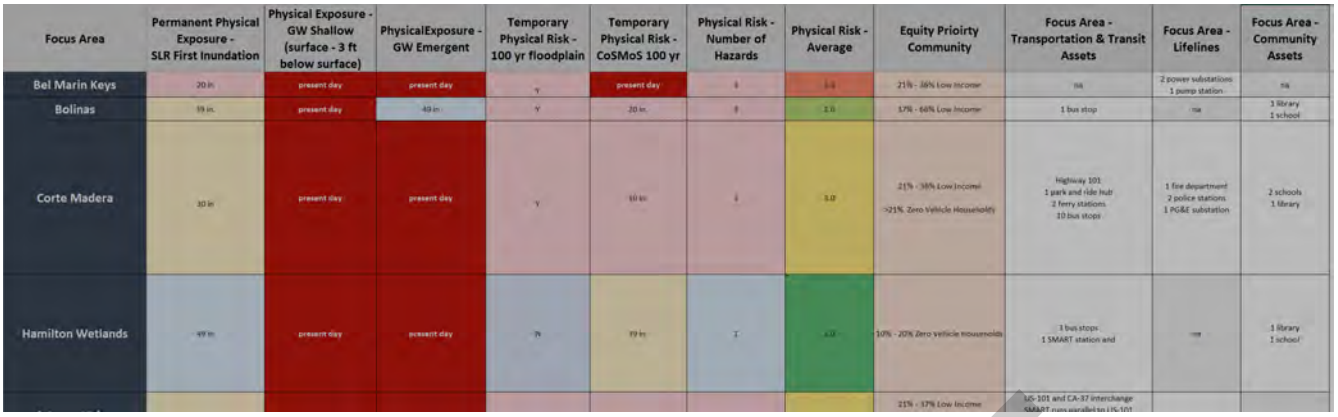
The initial focus areas were reviewed by TAM and presented to the TAC at the second TAC meeting (December 12, 2023). Feedback from these discussions helped refine the proposed suite of 15 focus areas.

3. Identified Focus Areas

3.1 Overview of Proposed Focus Areas

Following the methodology described above, 15 focus areas were identified (Figure 5). They ranged in their size, the number of hazards they experience (though most of them experience all three), the impact to transportation and transit assets, and the approximate number of lifelines and community assets included. The associated Appendix A: Hazard Matrix excel file (Figure 6) provides an overview of each of the focus areas and a subset of their exposure statistics.

Figure 5 Map of 15 vulnerability focus areas.

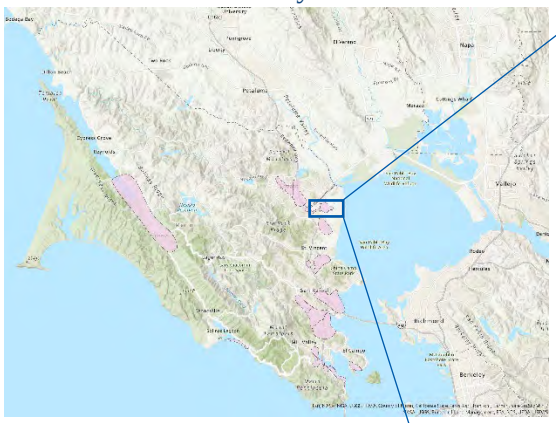


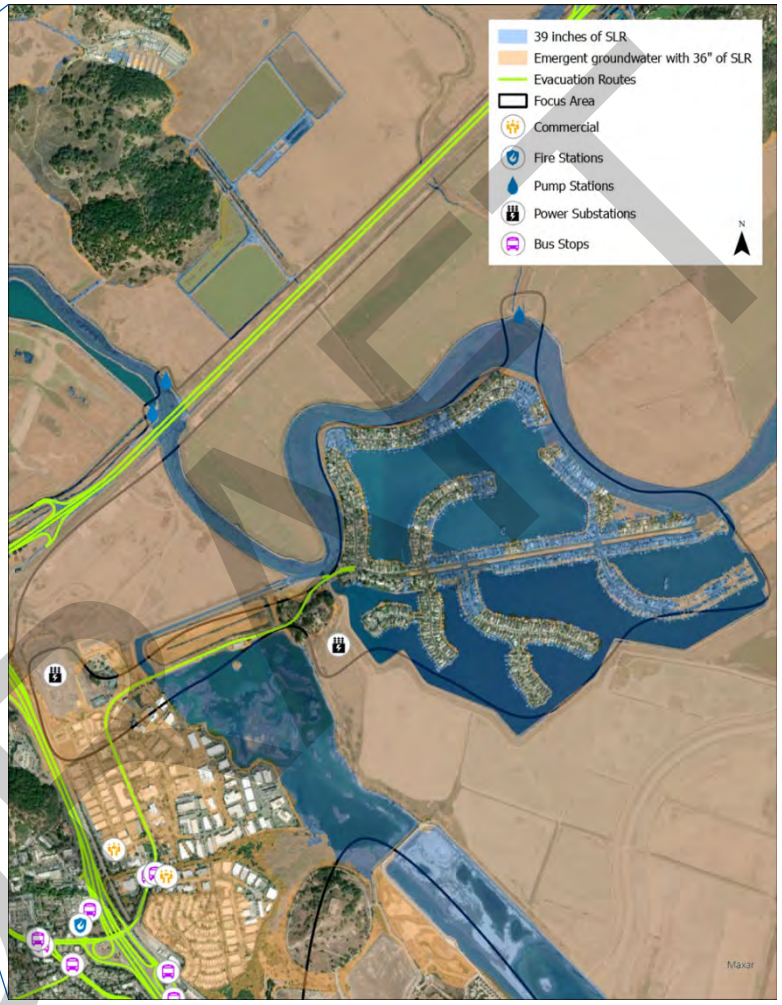
Focus Area	Permanent Physical Exposure - SLR First Inundation	Physical Exposure - GW Shallow (surface - 3 ft below surface)	PhysicalExposure - GW Emergent	Temporary Physical Risk - 100 yr floodplain	Temporary Physical Risk - CoSMoS 100 yr	Physical Risk - Number of Hazards	Physical Risk - Average	Equity Prioirty Community	Focus Area - Transportation & Transit Assets	Focus Area - Lifelines	Focus Area - Community Assets
Bel Marin Keys	20 in	present day	present day	Y	present day	3	3.5	21% - 36% Low Income	na	2 power substations 1 pump station	na
Bolinas	19 in.	present day	49 in	Y	20 in.	3	2.5	37% - 64% Low Income	1 bus stop	na	1 library 1 school
Corte Madera	10 in	present day	present day	Y	10 in	3	3.0	21% - 36% Low Income >21% Zero Vehicle Households	Highway 101 1 park and ride hub 2 ferry stations 10 bus stops	1 fire department 2 police stations 1 PG&E substation	2 schools 1 library
Hamilton Wetlands	49 in	present day	present day	N	19 in	1	2.0	10% - 20% Zero Vehicle Households	1 bus stops 1 SMART station and	na	1 library 1 school
								21% - 37% Low Income	US-101 and CA-37 interchange SMART runs parallel to US-101		

Figure 6: Screenshot of Focus Area Hazard Matrix. This matrix provides summary information about each focus area.

In the following section, we provide high level overviews of each of the focus areas and list a suite of exposure statistics that help provide contextual information about the selected sites. There are any number of queries that can be asked of the exposure data; therefore these descriptions are intended to provide one possible set of answers to one possible set of questions. It is expected that as TAM and County partners begin the work of developing adaptation and implementation plans, the exposure analysis can be queried to help with identification of the different flood impacts to asset, properties, and people, and help advance discussions relevant to each site.

3.1.1 Bel Marin Keys Focus Area

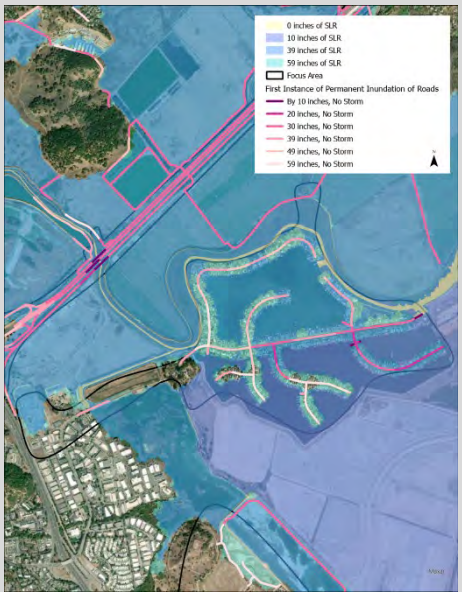




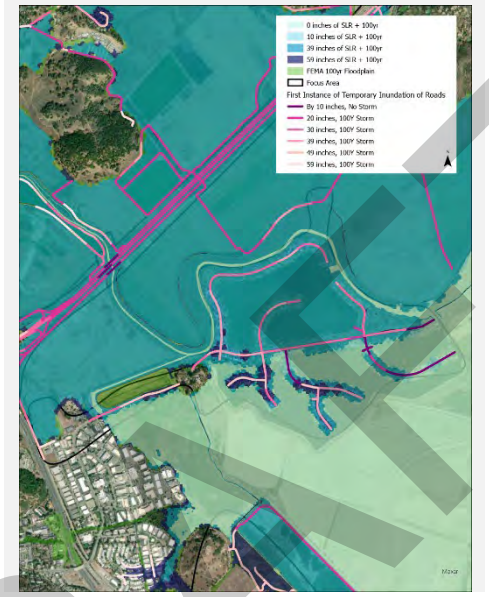
The site includes:

- 2 power substations
- 1 pump station
- 1 ingress/egress route

Permanent Inundation Exposure



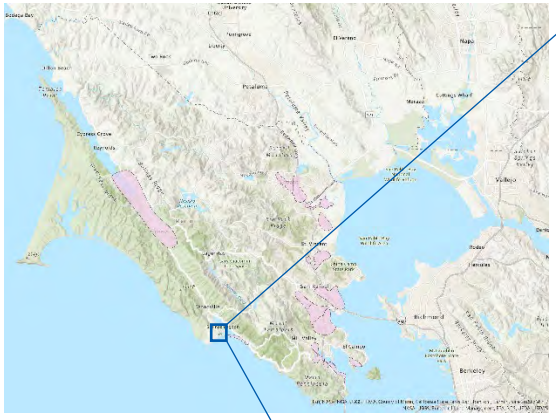
Temporary Flood Exposure



Groundwater Rise Exposure

Focus Area	Permanent Physical Exposure - SLR First Inundation	Physical Exposure - GW Shallow (surface - 3 ft below surface)	PhysicalExposure - GW Emergent	Temporary Physical Risk - 100 yr floodplain	Temporary Physical Risk - CoSMoS 100 yr	Physical Risk - Number of Hazards	Physical Risk - Average	Equity Prioirty Community
Bel Marin Keys	20 in	present day	present day	In FEMA 100 yr Floodplain	present day	3	3.3	21% - 36% Low Income

3.1.2 Bolinas Focus Area

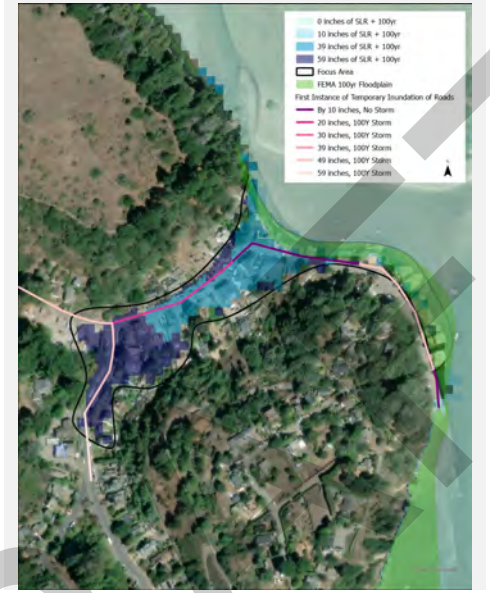


This site includes:

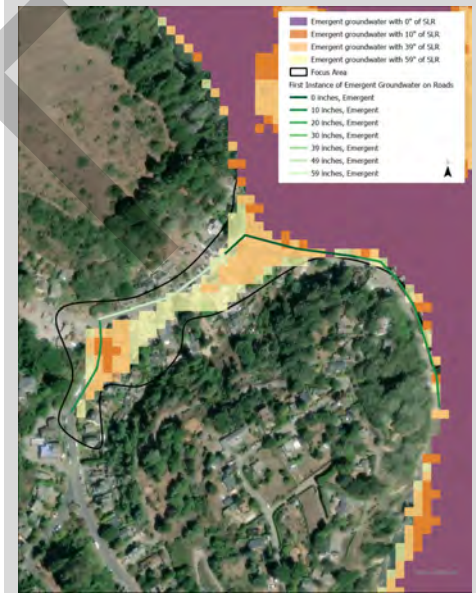
- 1 bus stop
- 1 library
- 1 school
- 1 ingress/egress route

Permanent Inundation Exposure

Temporary Flood Exposure

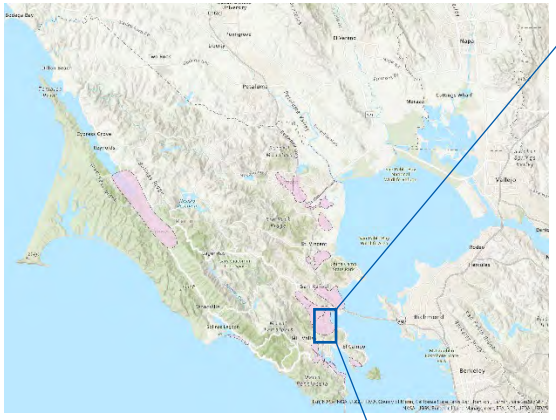


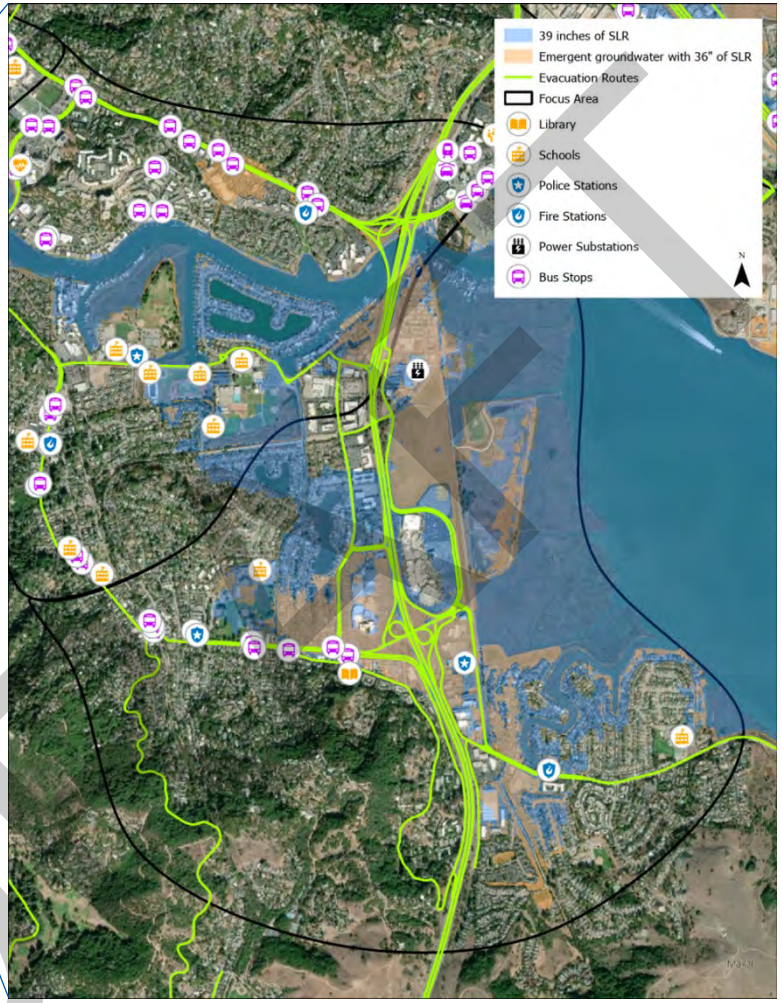
Groundwater Rise Exposure



Focus Area	Permanent Physical Exposure - SLR First Inundation	Physical Exposure - GW Shallow (surface - 3 ft below surface)	PhysicalExposure - GW Emergent	Temporary Physical Risk - 100 yr floodplain	Temporary Physical Risk - CoSMoS 100 yr	Physical Risk - Number of Hazards	Physical Risk - Average
Bolinas	39 in.	present day	49 in	In FEMA 100 yr Floodplain	20 in.	3	2.6

3.1.3 Corte Madera Focus Area

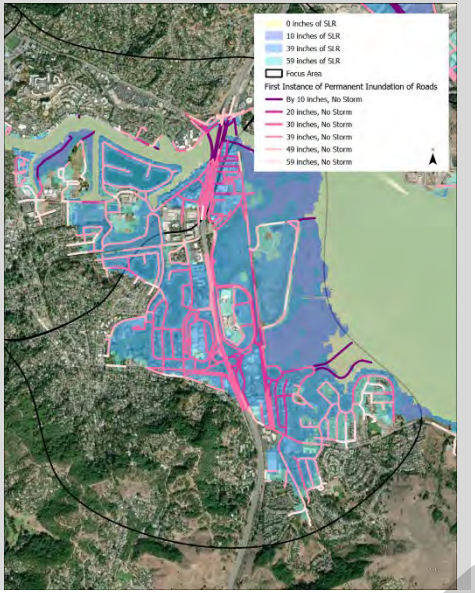




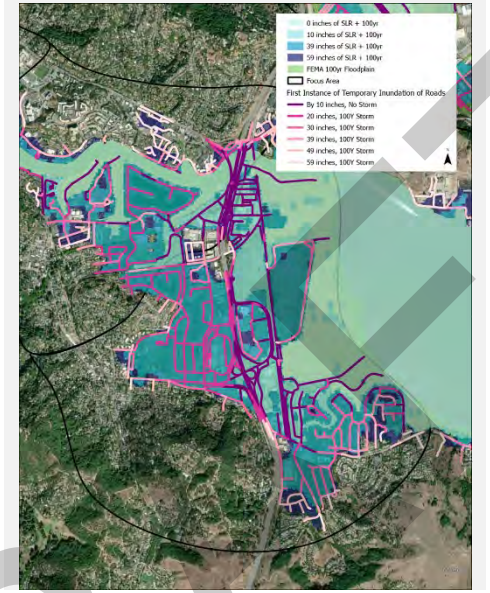
The site includes:

- 1 fire station
- 2 schools
- 1 library
- 2 police stations
- 1 hub, park, and ride area
- 2 ferry stops
- 1 power substation
- 10 bus stops, including local and Golden Gate Transit (GGT)
- Highway 101

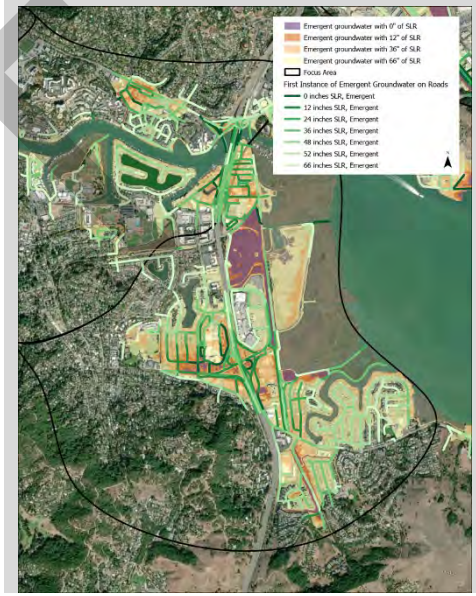
Permanent Inundation Exposure



Temporary Flood Exposure

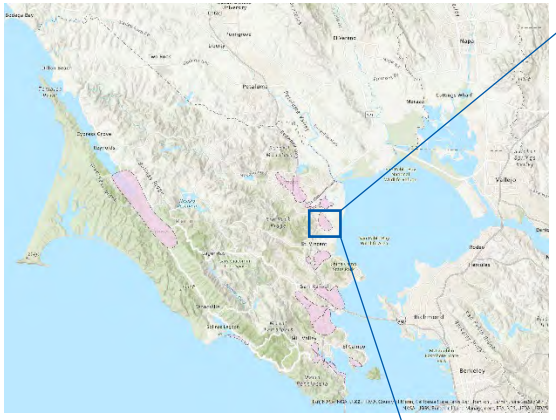


Groundwater Rise Exposure



Focus Area	Permanent Physical Exposure - SLR First Inundation	Physical Exposure - GW Shallow (surface - 3 ft below surface)	PhysicalExposure - GW Emergent	Temporary Physical Risk - 100 yr floodplain	Temporary Physical Risk - CoSMoS 100 yr	Physical Risk - Number of Hazards	Physical Risk - Average	Equity Prioirty Community
Corte Madera	30 in	present day	present day	In FEMA 100 yr Floodplain	10 in.	3	3.0	21% - 36% Low Income >21% Zero Vehicle Households

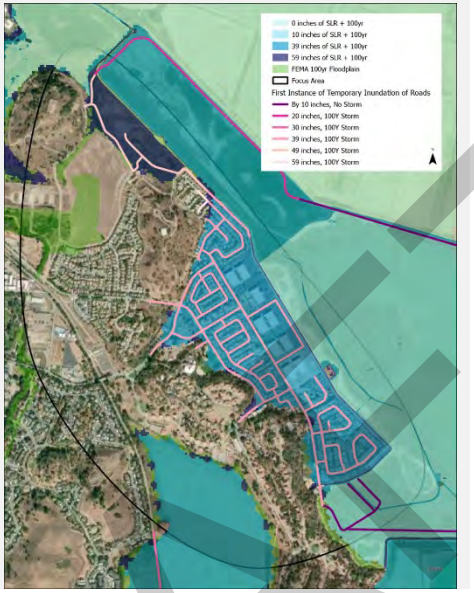
3.1.4 Hamilton Wetlands Focus Area



The site includes:

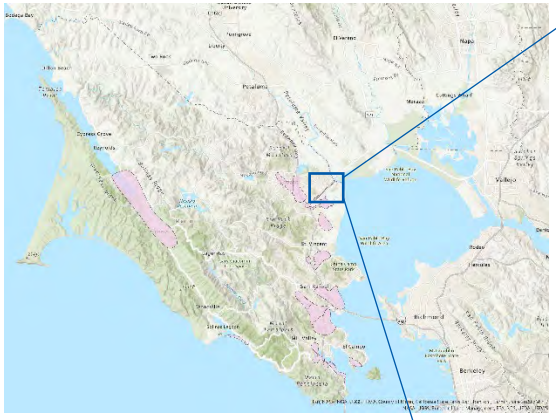
- Highway 101
- 1 library
- 3 bus stops
- 1 school
- 1 SMART station
- 1 ingress/egress route

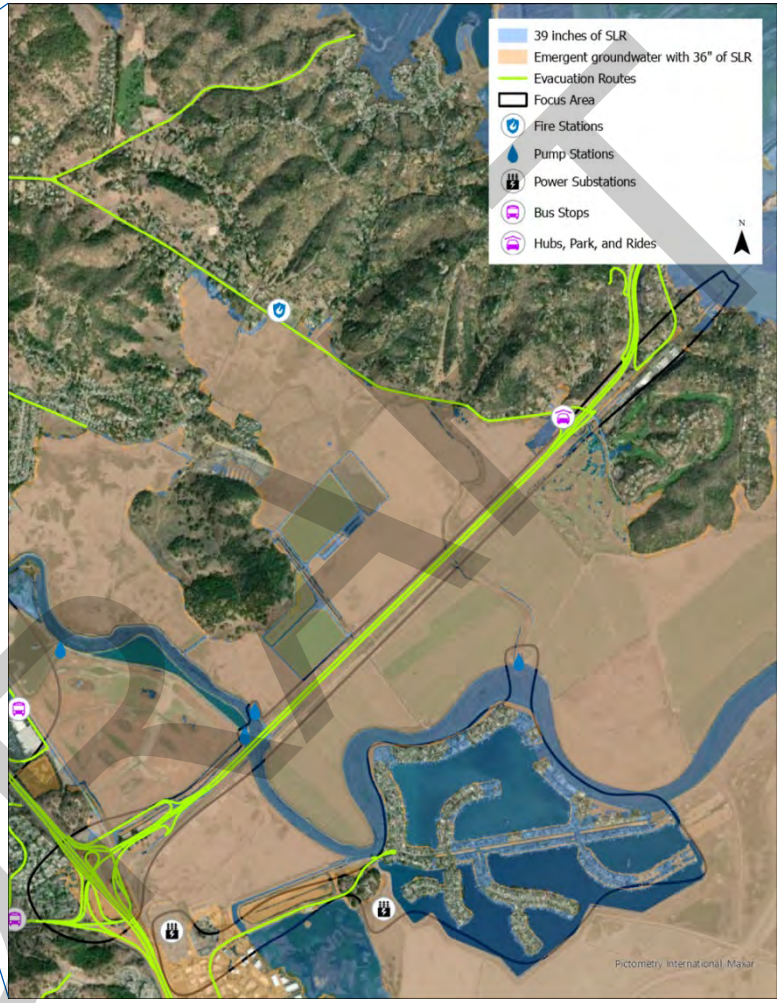
Permanent Inundation Exposure	Temporary Flood Exposure	Groundwater Rise Exposure



Focus Area	Permanent Physical Exposure - SLR First Inundation	Physical Exposure - GW Shallow (surface - 3 ft below surface)	PhysicalExposure - GW Emergent	Temporary Physical Risk - 100 yr floodplain	Temporary Physical Risk - CoSMoS 100 yr	Physical Risk - Number of Hazards	Physical Risk - Average	Equity Prioirty Community
Hamilton Wetlands	49 in	present day	present day	NOT in FEMA 100 yr Floodplain	39 in.	1	2.0	10% - 20% Zero Vehicle Households

3.1.5 Highway 37 / 101 Focus Area

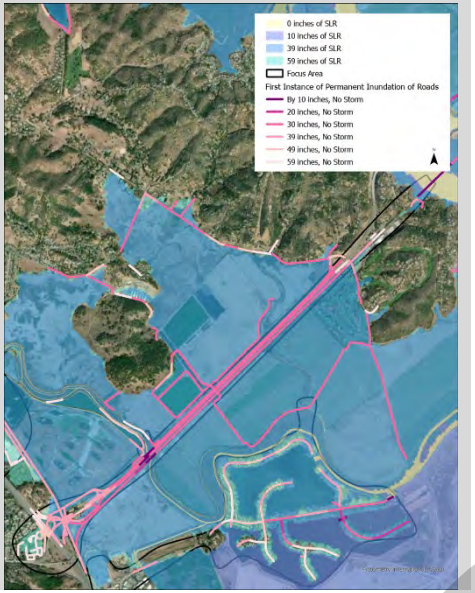




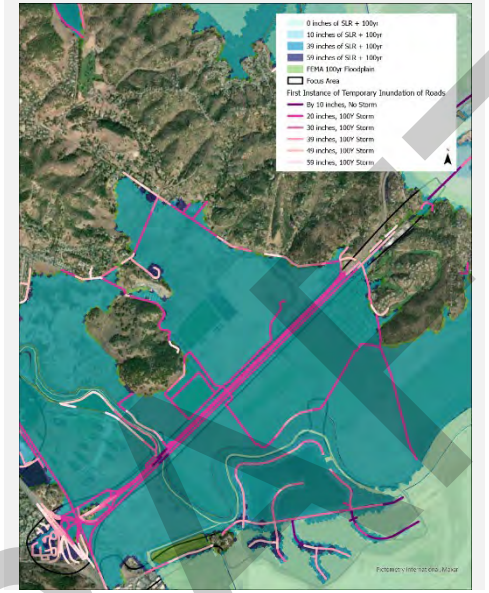
The site includes:

- Highway 37 and Highway 101
- 2 pump stations
- 1 park, hub, and ride area
- 1 ingress/egress route

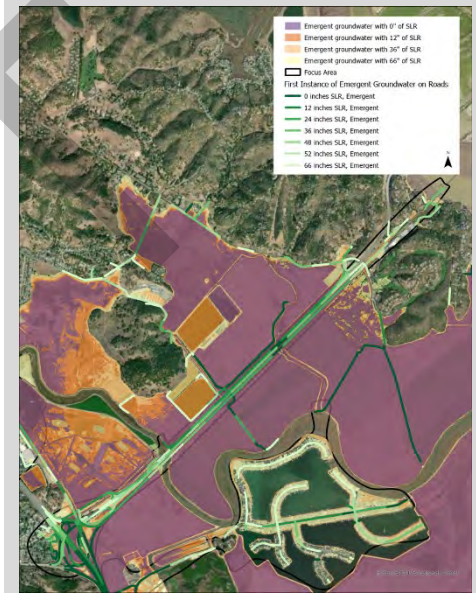
Permanent Inundation Exposure



Temporary Flood Exposure

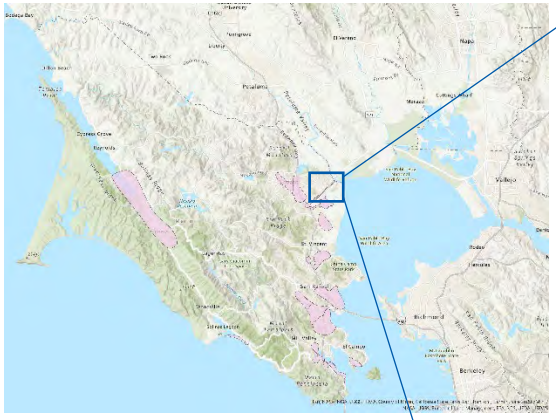


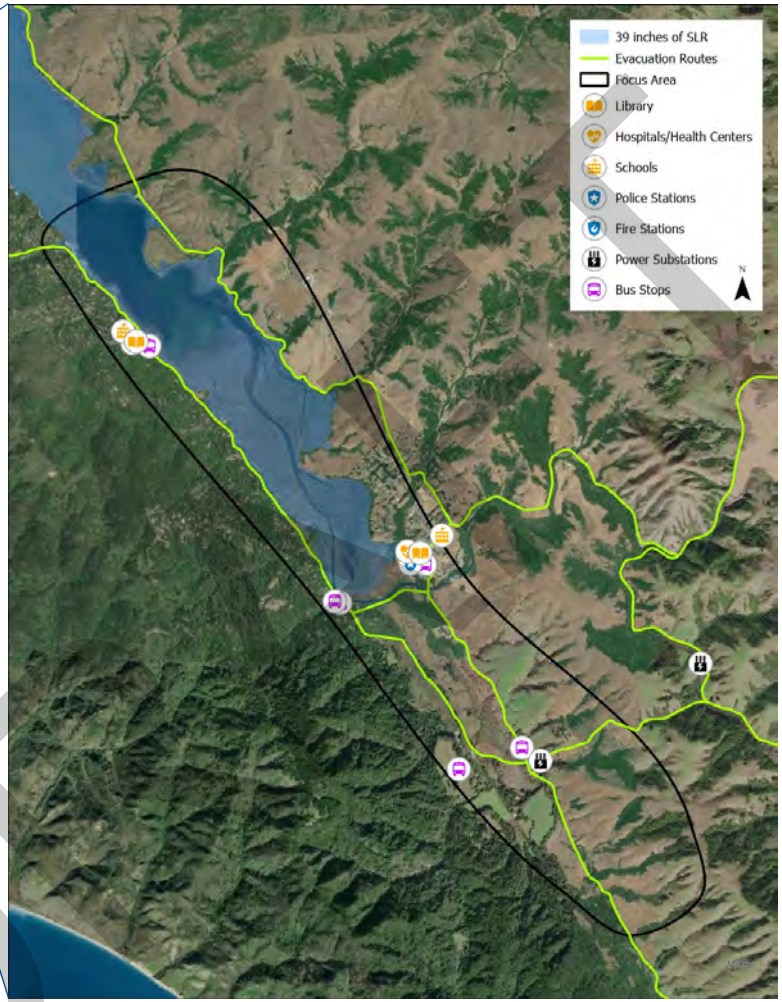
Groundwater Rise Exposure



Focus Area	Permanent Physical Exposure - SLR First Inundation	Physical Exposure - GW Shallow (surface - 3 ft below surface)	PhysicalExposure - GW Emergent	Temporary Physical Risk - 100 yr floodplain	Temporary Physical Risk - CoSMoS 100 yr	Physical Risk - Number of Hazards	Physical Risk - Average	Equity Prioirty Community
Highway 37/101	30 in	present day	present day	In FEMA 100 yr Floodplain	20 in.	3	3.0	21% - 37% Low Income 10% - 20% Zero Vehicle Households

3.1.6 Inverness Focus Area

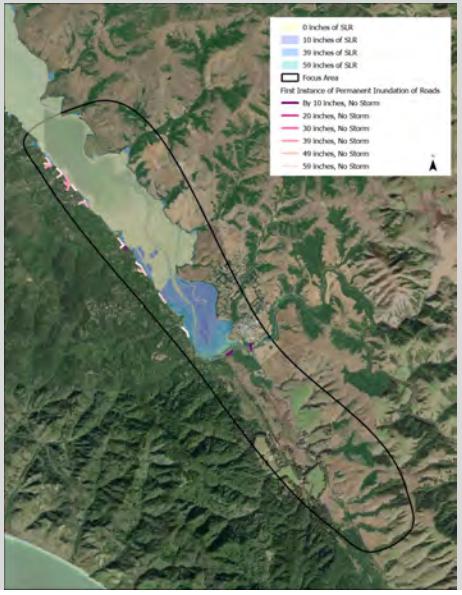




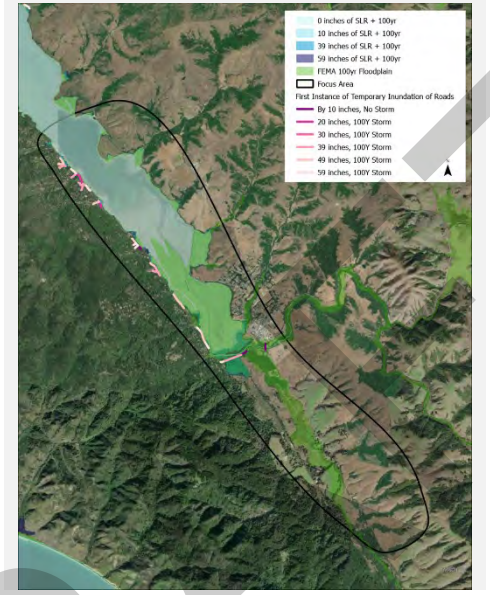
This site includes:

- 1 power substation
- 6 bus stops (no GGT bus stops)
- 1 school
- 1 police station
- 1 fire station
- 2 libraries
- 1 health center/hospital
- 1 ingress/egress route

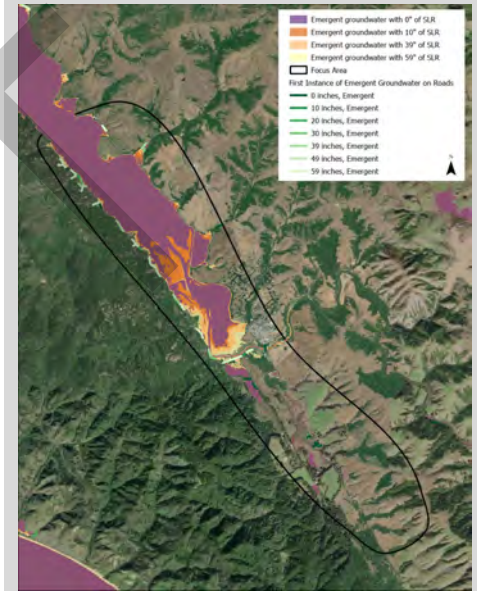
Permanent Inundation Exposure



Temporary Flood Exposure

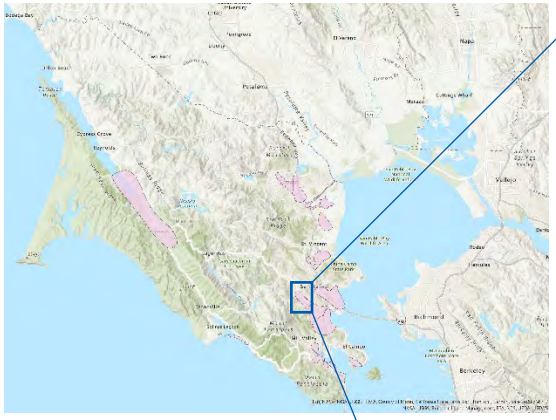


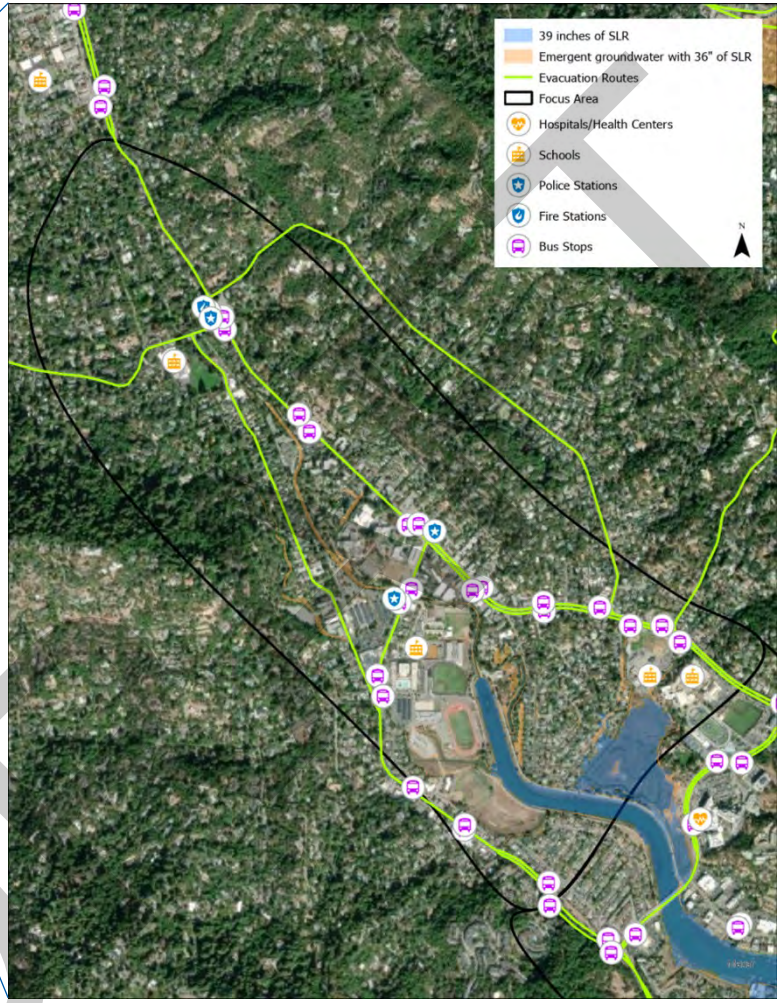
Groundwater Rise Exposure



Focus Area	Permanent Physical Exposure - SLR First Inundation	Physical Exposure - GW Shallow (surface - 3 ft below surface)	Physical Exposure - GW Emergent	Temporary Physical Risk - 100 yr floodplain	Temporary Physical Risk - CoSMoS 100 yr	Physical Risk - Number of Hazards	Physical Risk - Average	Equity Priority Community Factors
Inverness	30 in	not impacted	not impacted	Y	20 in.	2	1.7	18% - 23% Low Income

3.1.7 Kentfield Focus Area

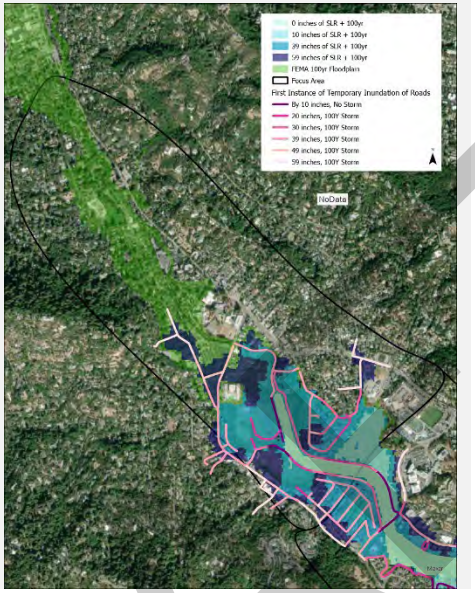


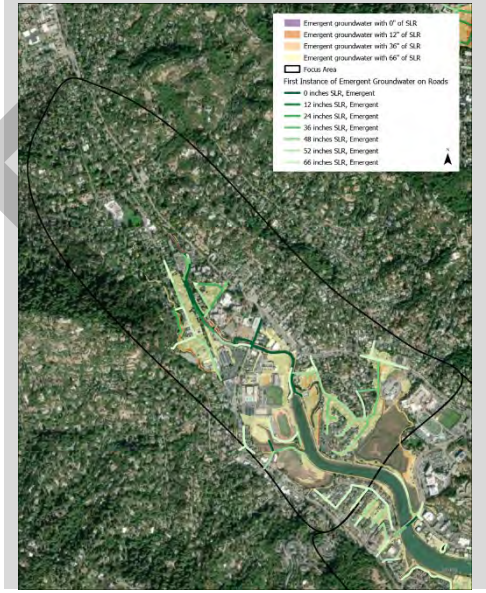


The site includes:

- 4 schools
- 2 fire stations
- 3 police stations
- 1 municipal
- 21 bus stops
- 1 ingress/egress route

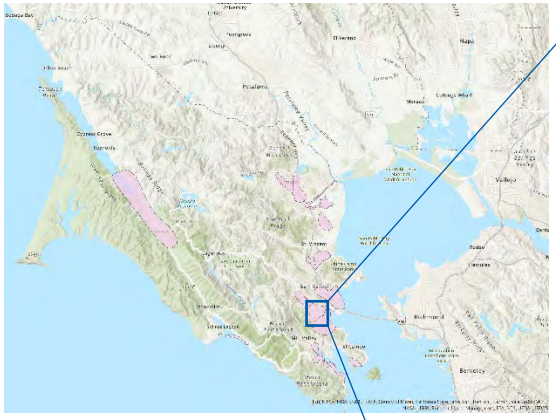
Permanent Inundation Exposure | **Temporary Flood Exposure** | **Groundwater Rise Exposure**

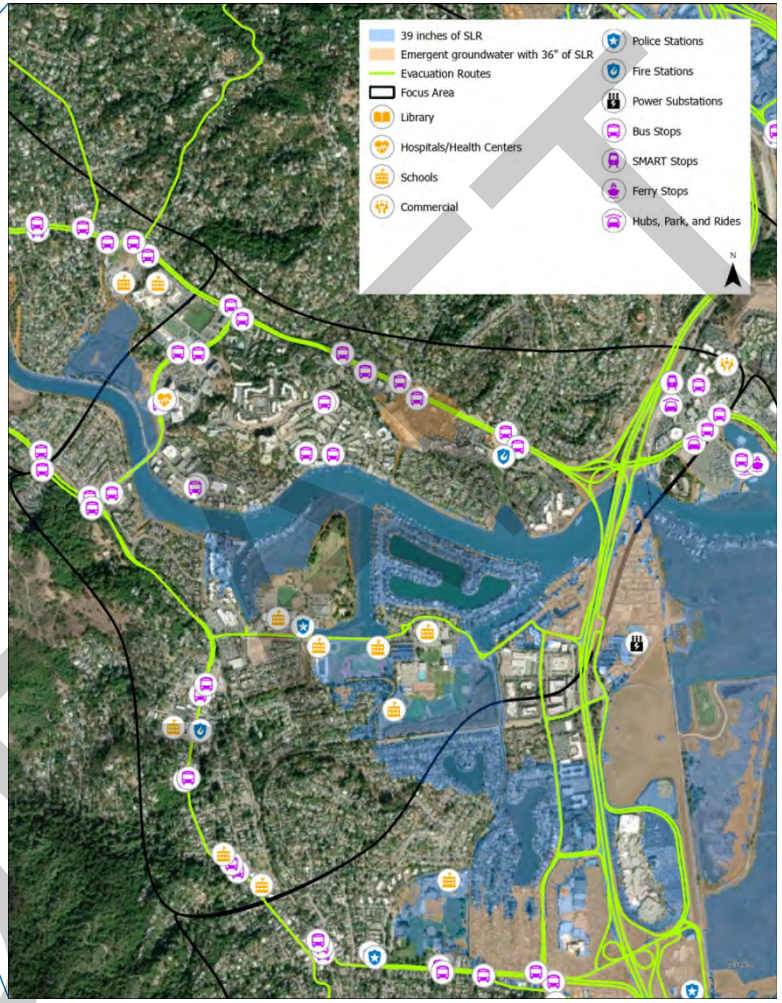




Focus Area	Permanent Physical Exposure - SLR First Inundation	Physical Exposure - GW Shallow (surface - 3 ft below surface)	PhysicalExposure - GW Emergent	Temporary Physical Risk - 100 yr floodplain	Temporary Physical Risk - CoSMoS 100 yr	Physical Risk - Number of Hazards	Physical Risk - Average	Equity Prioirty Community
Kentfield	49 in	present day	48 in.	In FEMA 100 yr Floodplain	30 in	3	2.3	No

3.1.8 Larkspur Focus Area

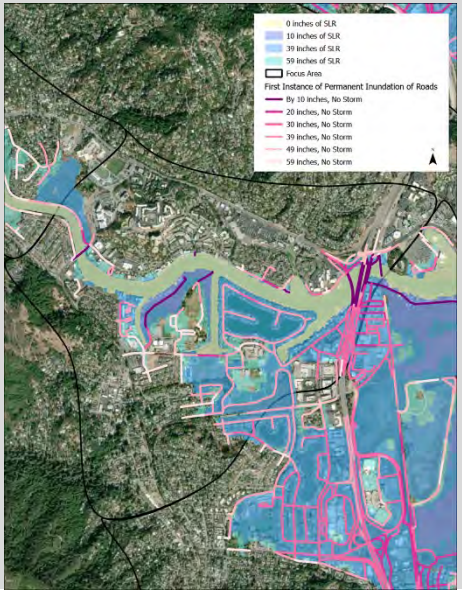


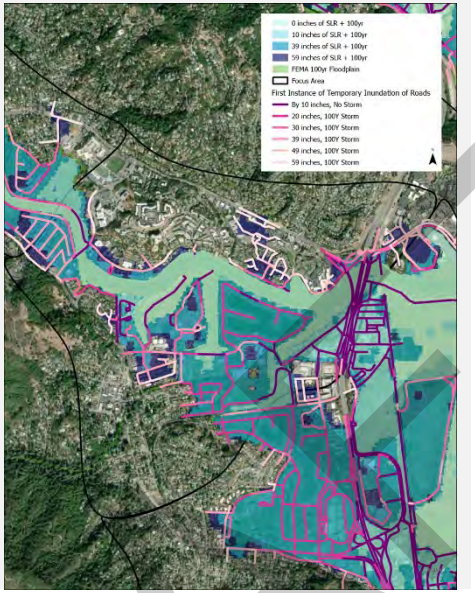


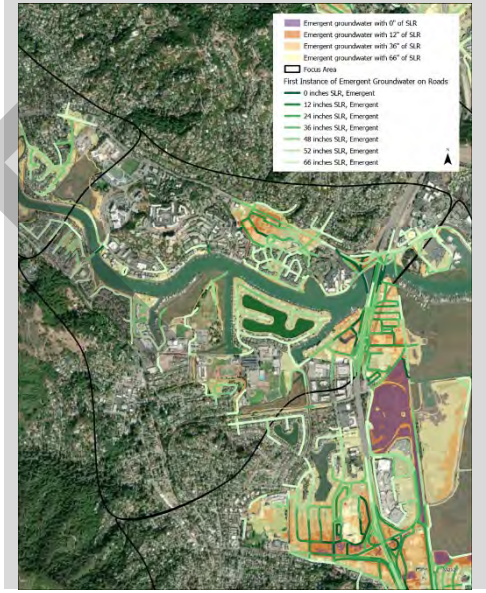
The site includes:

- 1 hospital
- 9 schools
- 1 commercial
- 1 police station
- 2 fire stations
- 1 municipal
- Highway 101
- 32 bus stops, including local and Golden Gate Transit (GGT)
- 1 SMART station
- 2 hub, park, and ride areas

Permanent Inundation Exposure | **Temporary Flood Exposure** | **Groundwater Rise Exposure**

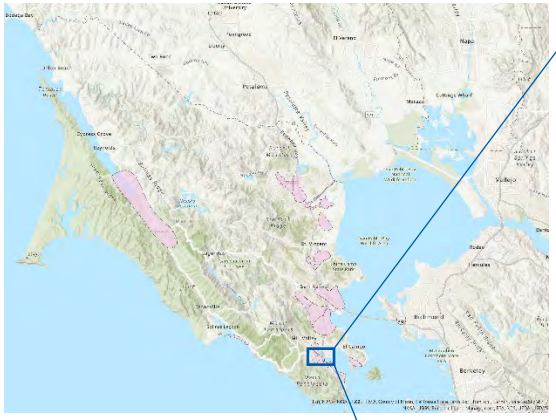


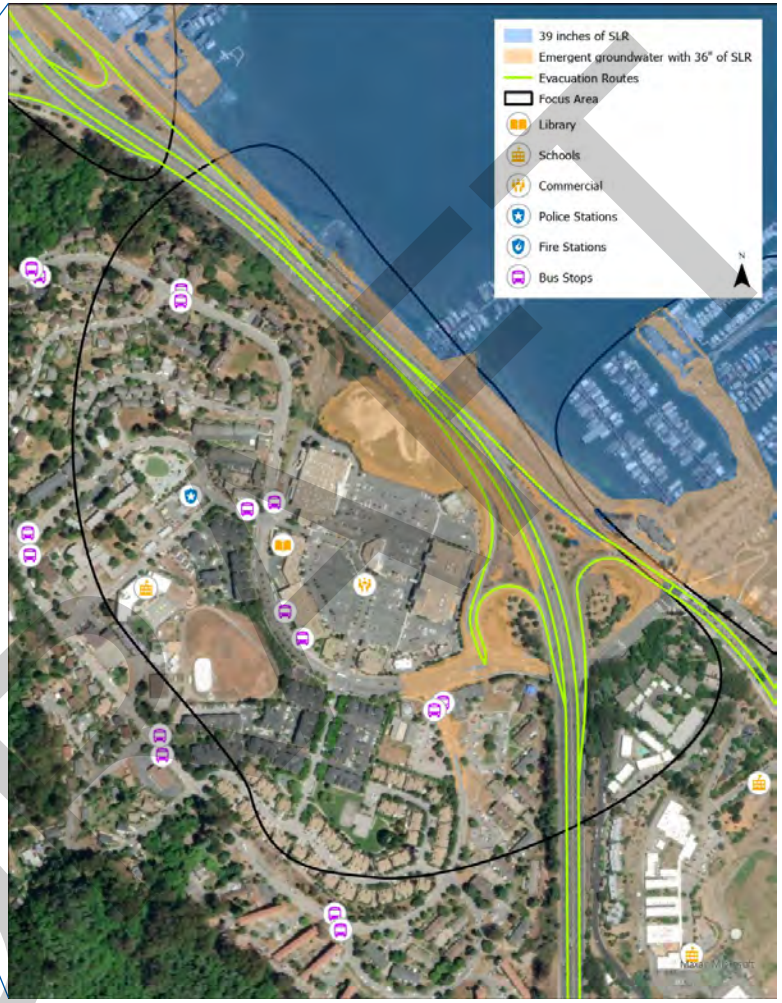




Focus Area	Permanent Physical Exposure - SLR First Inundation	Physical Exposure - GW Shallow (surface - 3 ft below surface)	PhysicalExposure - GW Emergent	Temporary Physical Risk - 100 yr floodplain	Temporary Physical Risk - CoSMoS 100 yr	Physical Risk - Number of Hazards	Physical Risk - Average	Equity Prioirty Community
Larkspur (Hospital)	39 in.	12 in	52 in	In FEMA 100 yr Floodplain	10 in.	3	2.5	21% - 36% low income

3.1.9 Marin City Focus Area

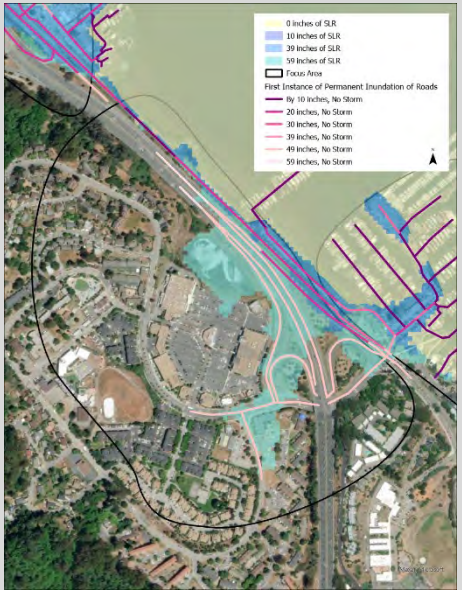




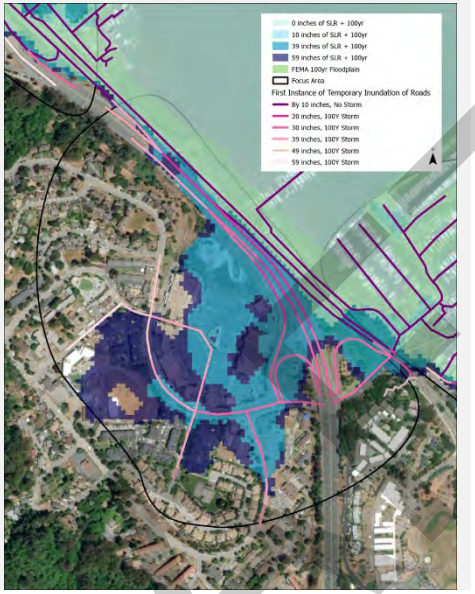
This site includes:

- Highway 101
- 10 bus stops including local and Golden Gate Transit (GGT)
- 1 library
- 1 school
- 1 police station
- 1 commercial shopping center
- 1 ingress/egress route

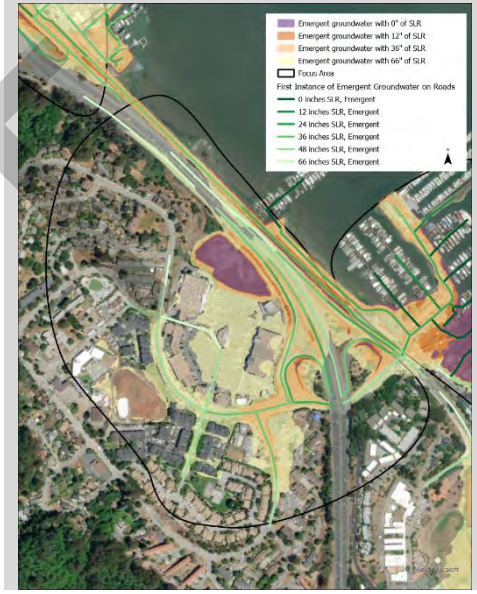
Permanent Inundation Exposure



Temporary Flood Exposure

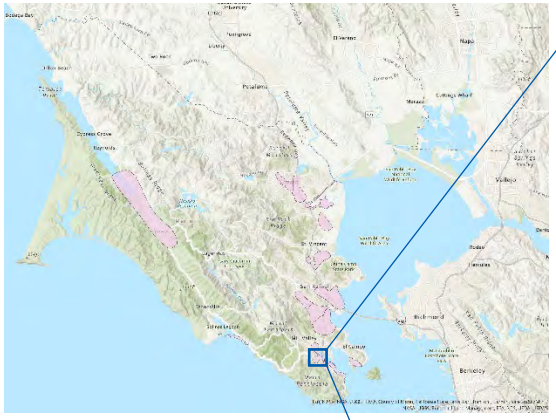


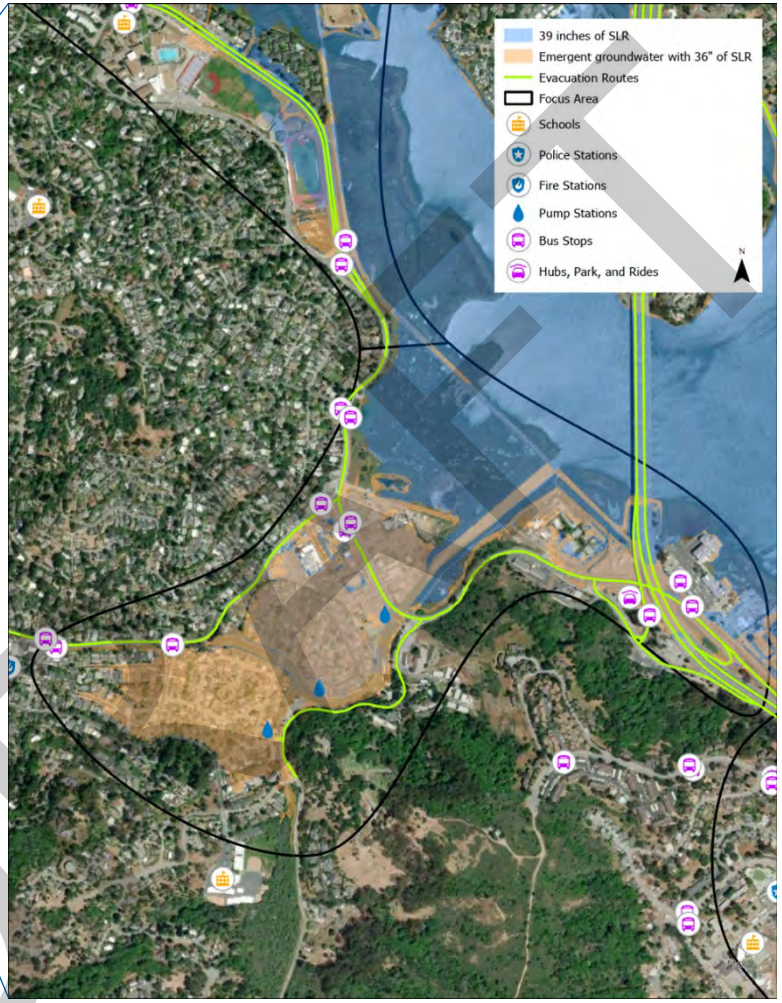
Groundwater Rise Exposure



Focus Area	Permanent Physical Exposure - SLR First Inundation	Physical Exposure - GW Shallow (surface - 3 ft below surface)	PhysicalExposure - GW Emergent	Temporary Physical Risk - 100 yr floodplain	Temporary Physical Risk - CoSMoS 100 yr	Physical Risk - Number of Hazards	Physical Risk - Average	Equity Prioirty Community
Marin City	20 in	present day	12 in	In FEMA 100 yr Floodplain	present day	3	2.7	Highest MTC Equity Priority Area >66% Low Income 10% - 20% Zero Vehicle Households

3.1.10 Mill Valley – Manzanita / Tam Junction Focus Area

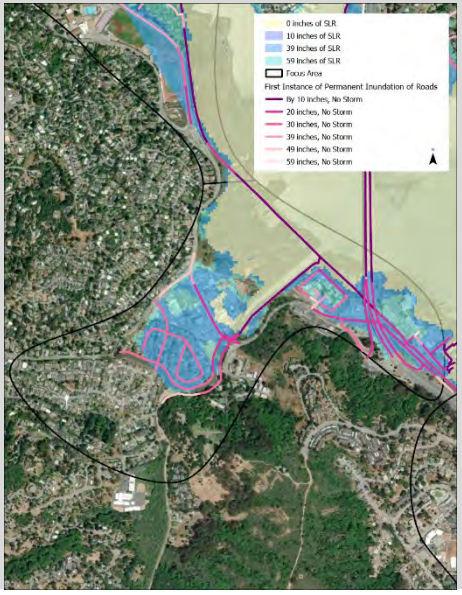


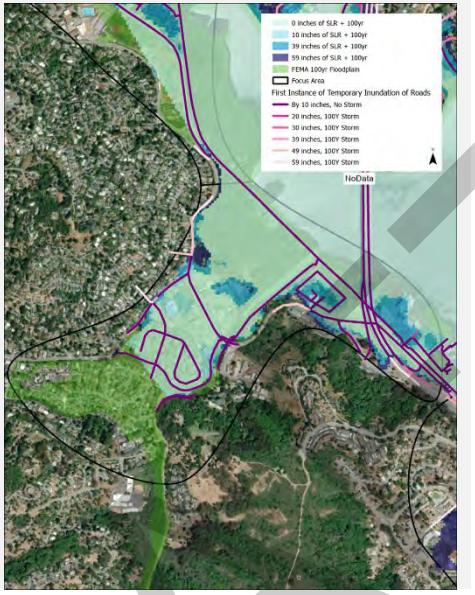


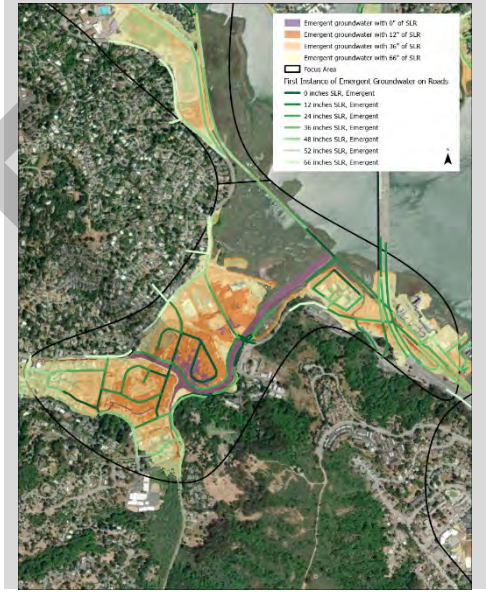
This site includes:

- 3 pump stations
- 14 bus stops, including local and Golden Gate Transit (GGT)
- 1 hub, park, and ride area
- 1 ingress/egress route

Permanent Inundation Exposure | **Temporary Flood Exposure** | **Groundwater Rise Exposure**

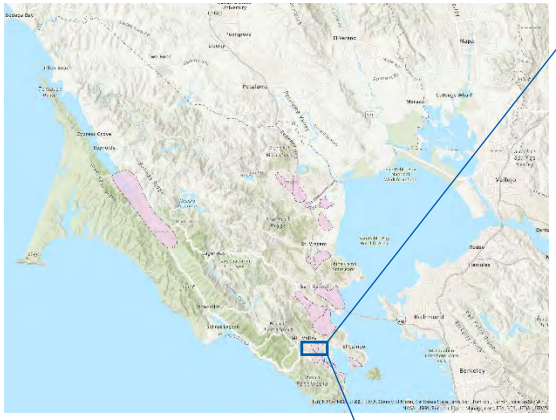






Focus Area	Permanent Physical Exposure - SLR First Inundation	Physical Exposure - GW Shallow (surface - 3 ft below surface)	PhysicalExposure - GW Emergent	Temporary Physical Risk - 100 yr floodplain	Temporary Physical Risk - CoSMoS 100 yr	Physical Risk - Number of Hazards	Physical Risk - Average	Equity Prioirty Community
Mill Valley - Manzanita / Tam Valley	By 10 in	present day	present day	In FEMA 100 yr Floodplain	present day	3	3.3	No

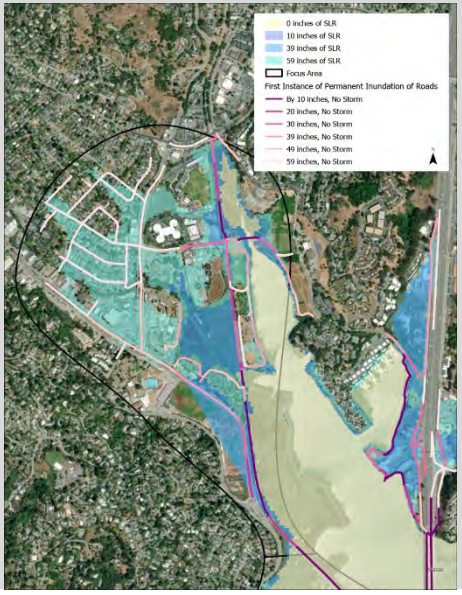
3.1.11 Mill Valley – Miller Ave Focus Area

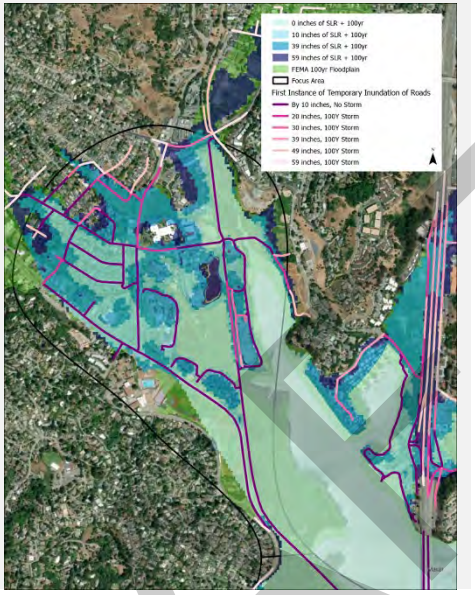


This site includes:

- 18 bus stops, including local and Golden Gate Transit (GGT)
- 2 pump stations
- 1 wastewater treatment plant
- 1 power substation
- 2 schools

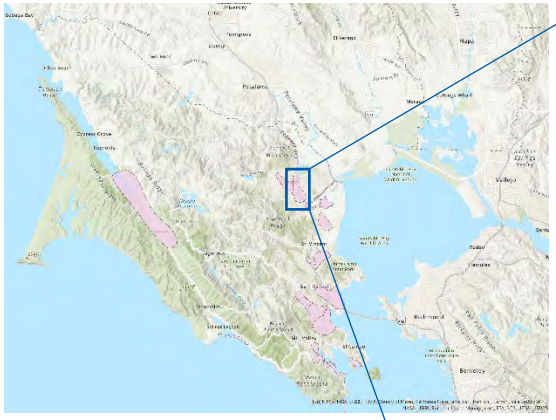
Permanent Inundation Exposure | **Temporary Flood Exposure** | **Groundwater Rise Exposure**

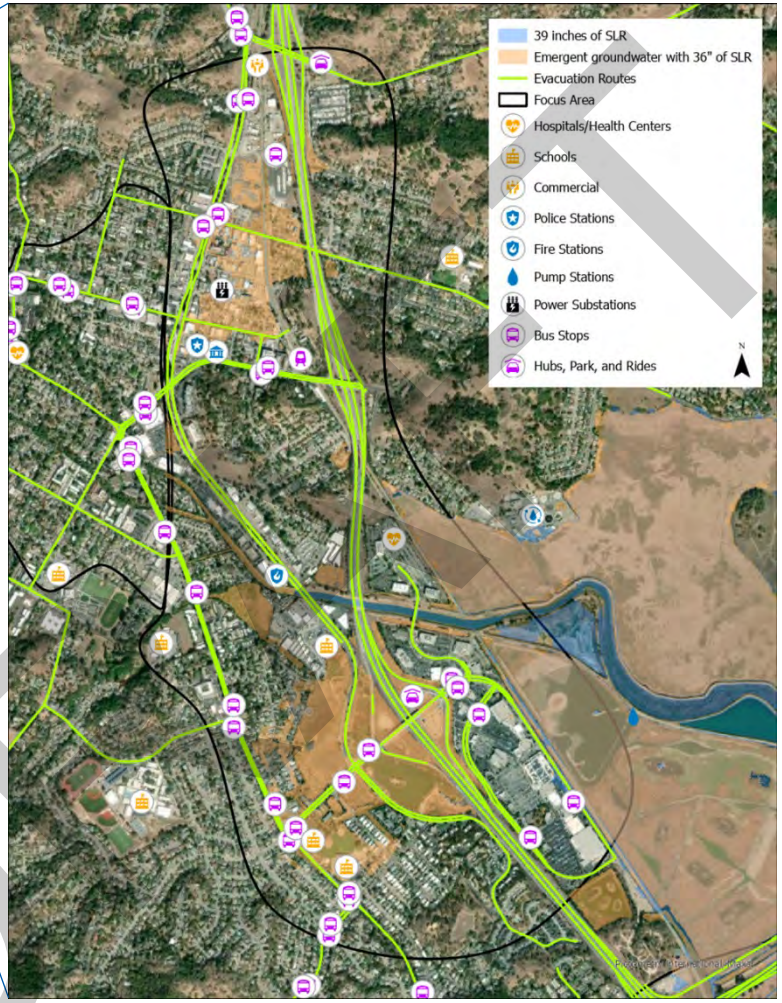




Focus Area	Permanent Physical Exposure - SLR First Inundation	Physical Exposure - GW Shallow (surface - 3 ft below surface)	PhysicalExposure - GW Emergent	Temporary Physical Risk - 100 yr floodplain	Temporary Physical Risk - CoSMoS 100 yr	Physical Risk - Number of Hazards	Physical Risk - Average	Equity Prioirty Community
Mill Valley - Miller Ave	By 10 in	present day	present day	In FEMA 100 yr Floodplain	present day	3	3.3	10% - 20% Zero Vehicle Households

3.1.12 Novato - Downtown Focus Area

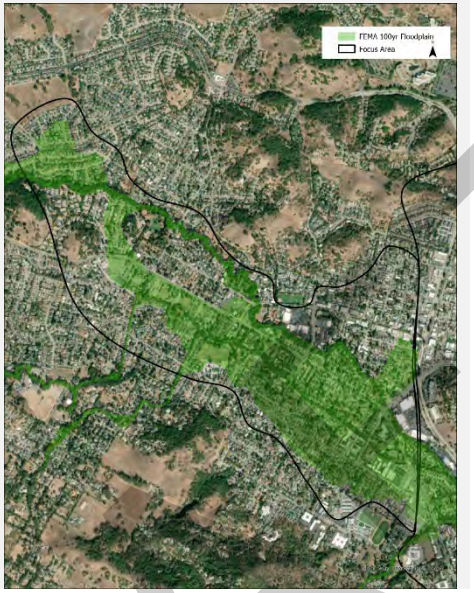


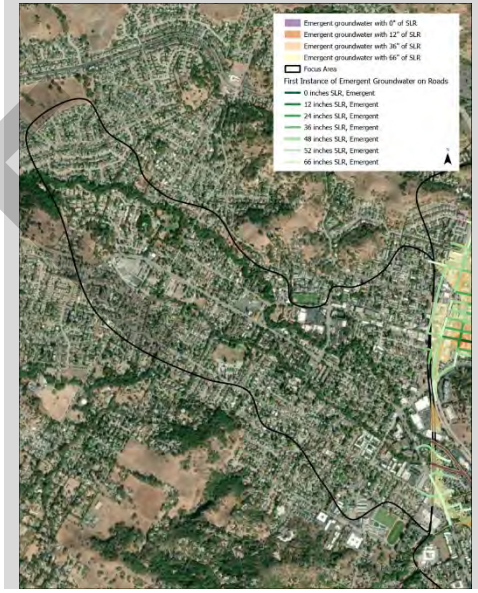


The site includes:

- 1 library
- 1 hospital/health center
- 6 schools
- 27 bus stops

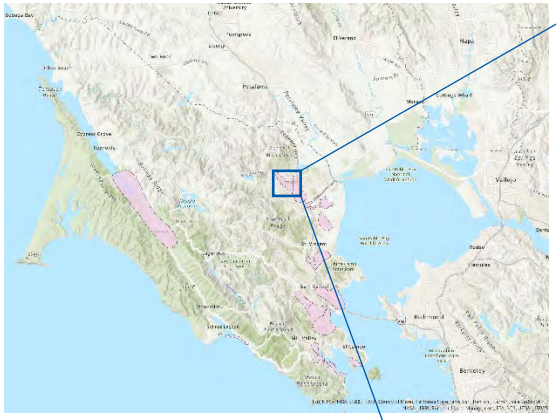
Permanent Inundation Exposure | **Temporary Flood Exposure** | **Groundwater Rise Exposure**

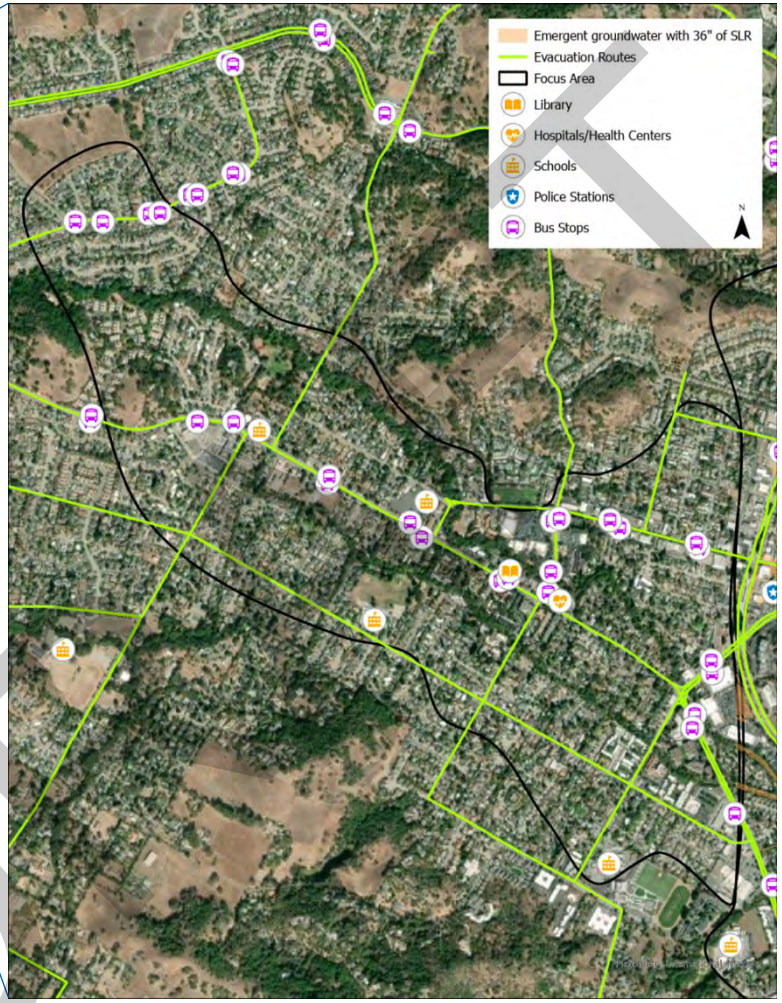




Focus Area	Permanent Physical Exposure - SLR First Inundation	Physical Exposure - GW Shallow (surface - 3 ft below surface)	PhysicalExposure - GW Emergent	Temporary Physical Risk - 100 yr floodplain	Temporary Physical Risk - CoSMoS 100 yr	Physical Risk - Number of Hazards	Physical Risk - Average	Equity Prioirty Community
Novato - Downtown	not impacted	not impacted	not impacted	In FEMA 100 yr Floodplain	not impacted	1	0.7	37% - 66% Low Income >21% Zero Vehicle Households

3.1.13 Novato – West Focus Area

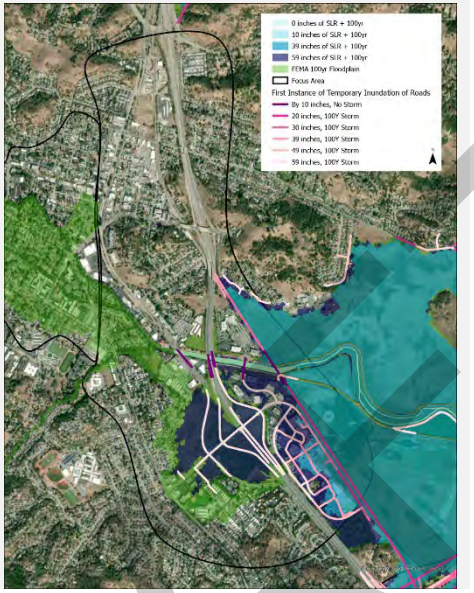


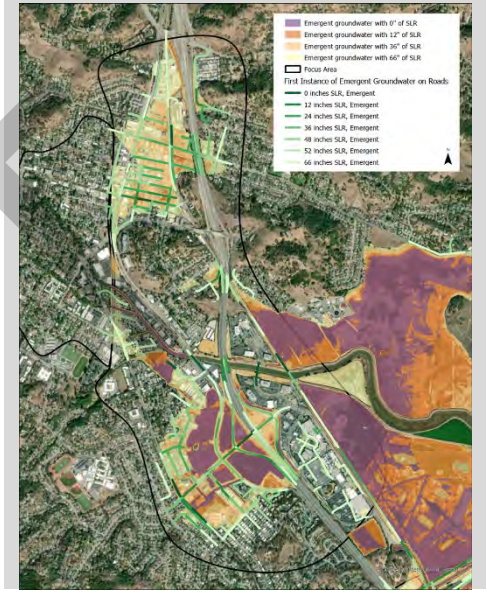


The site includes:

- 40 bus stops, including local and Golden Gate Transit (GGT)
- 1 hospital/health center
- 4 schools
- 1 power substation
- 1 fire station
- 1 police station
- 1 municipal
- 1 commercial
- 1 park, ride, and hub area
- 1 SMART station
- 1 ingress/egress route

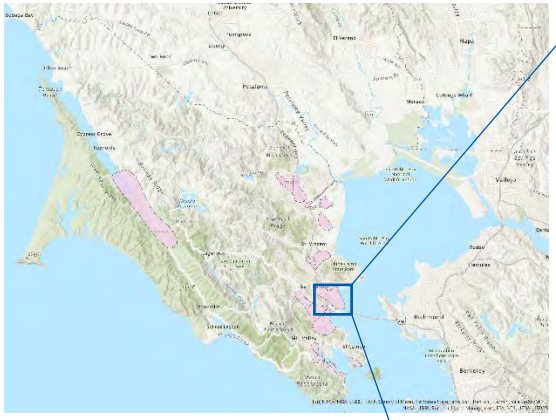
Permanent Inundation Exposure	Temporary Flood Exposure	Groundwater Rise Exposure

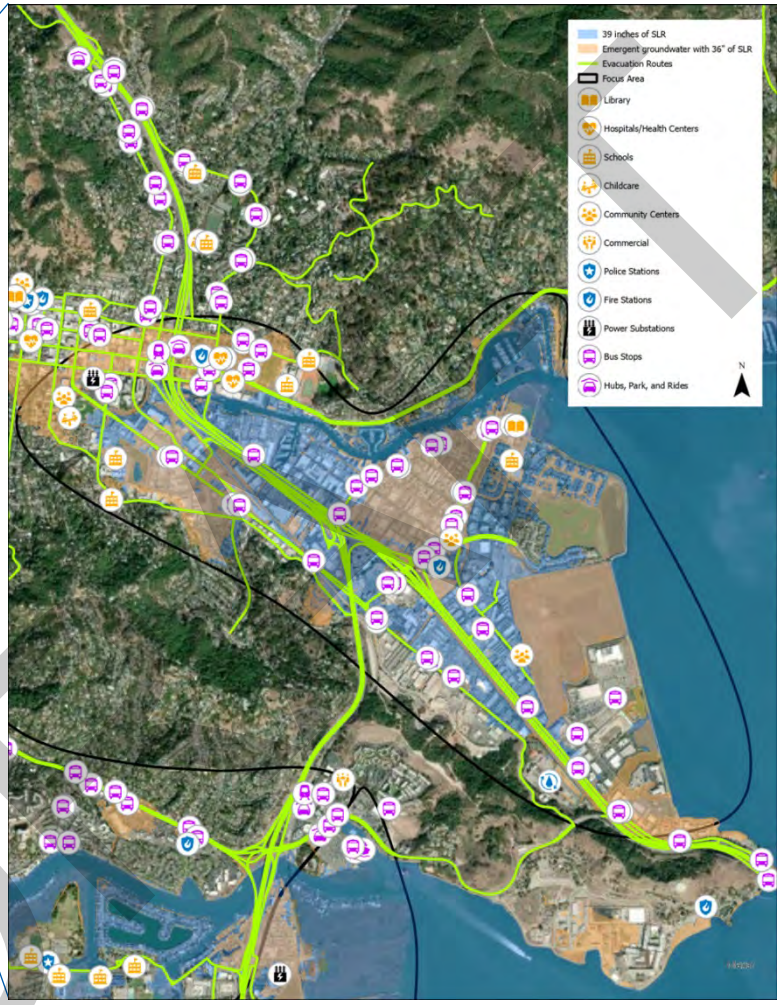




Focus Area	Permanent Physical Exposure - SLR First Inundation	Physical Exposure - GW Shallow (surface - 3 ft below surface)	PhysicalExposure - GW Emergent	Temporary Physical Risk - 100 yr floodplain	Temporary Physical Risk - CoSMoS 100 yr	Physical Risk - Number of Hazards	Physical Risk - Average	Equity Prioirty Community
Novato - West	**By 10 in**	**present day**	24 in.	In FEMA 100 yr Floodplain	20 in.	3	3.2	21% - 36% Low Income >21% Zero Vehicle Households

3.1.14 San Rafael – Canal Neighborhood Focus Area

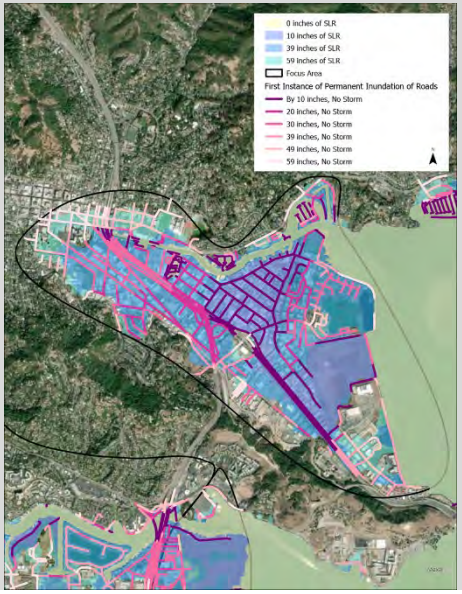




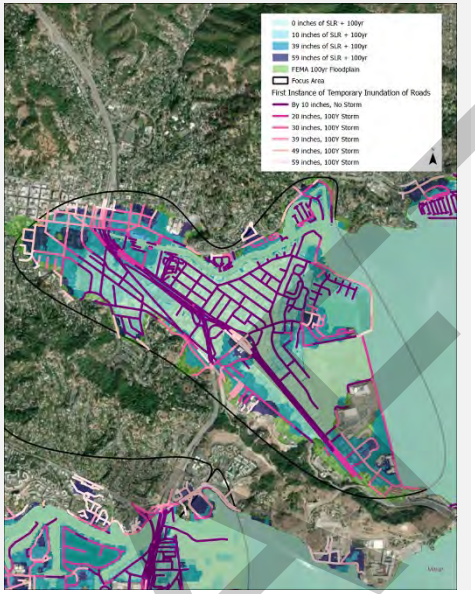
This site includes:

- Highway 101 and Highway 580
- Richmond-San Rafael Bridge is less than a mile away from the southern end of focus area.
- 71 bus stops, including local and Golden Gate Transit (GGT)
- 1 SMART station
- 4 hub and park locations
-

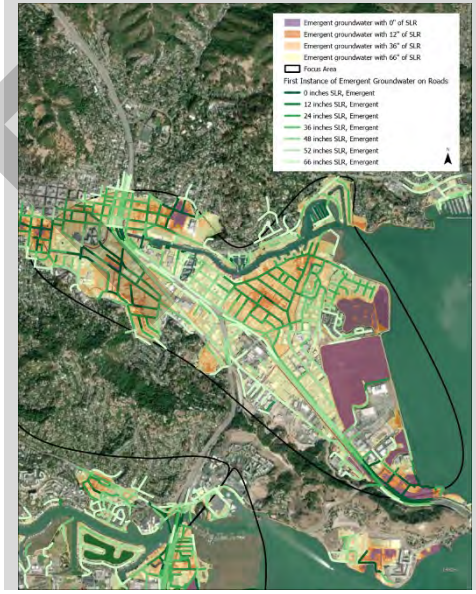
Permanent Inundation Exposure



Temporary Flood Exposure

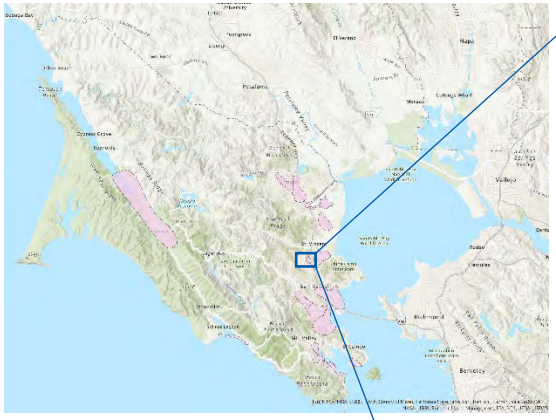


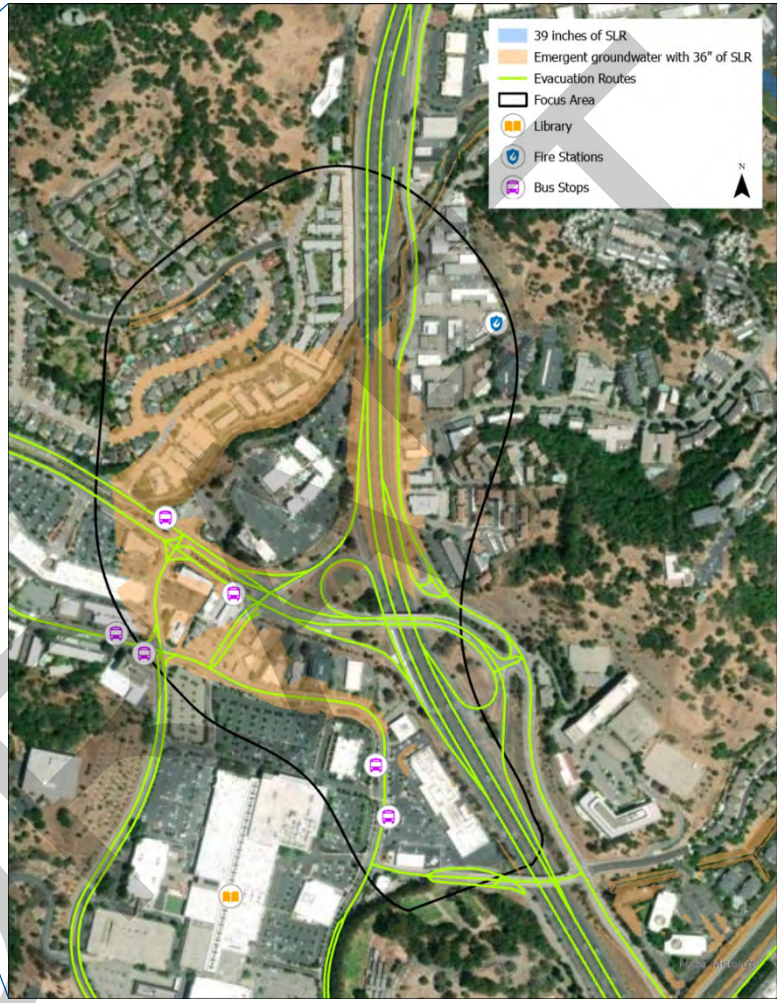
Groundwater Rise Exposure



Focus Area	Permanent Physical Exposure - SLR First Inundation	Physical Exposure - GW Shallow (surface - 3 ft below surface)	PhysicalExposure - GW Emergent	Temporary Physical Risk - 100 yr floodplain	Temporary Physical Risk - CoSMoS 100 yr	Physical Risk - Number of Hazards	Physical Risk - Average	Equity Prioirty Community
San Rafael - Canal Neighborhood	By 10 in	present day	12 in	In FEMA 100 yr Floodplain	present day	3	3.3	Highest MTC Equity Priority Area >66% Low Income >21% Zero Vehicle Households

3.1.15 San Rafael North Focus Area

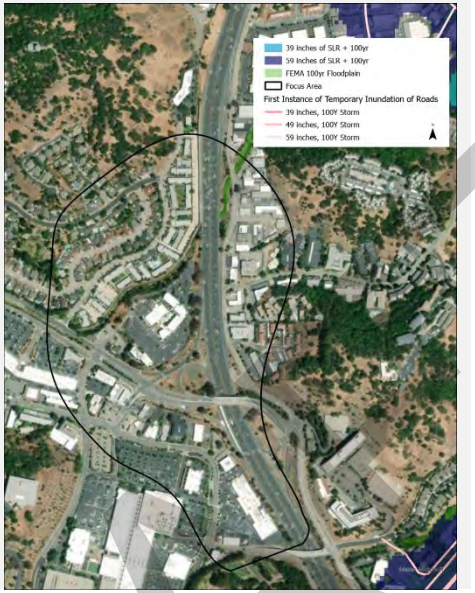


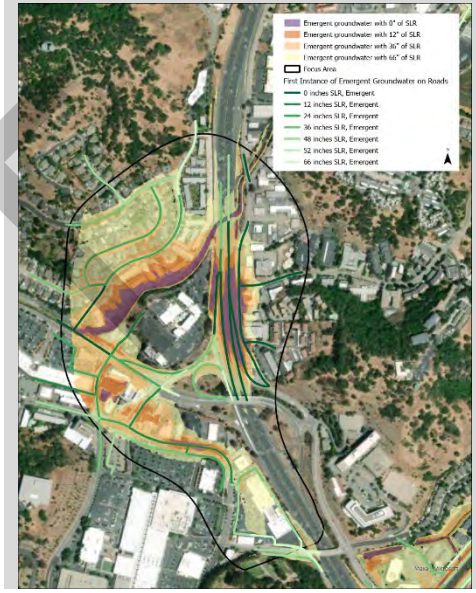


The site includes:

- Highway 101
- 1 fire station
- 6 bus stops, including local and Golden Gate Transit (GGT)

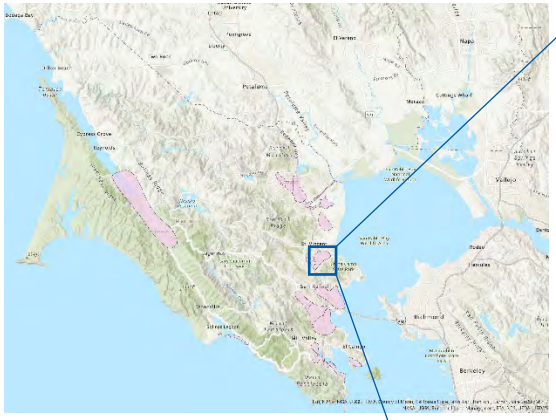
Permanent Inundation Exposure	Temporary Flood Exposure	Groundwater Rise Exposure

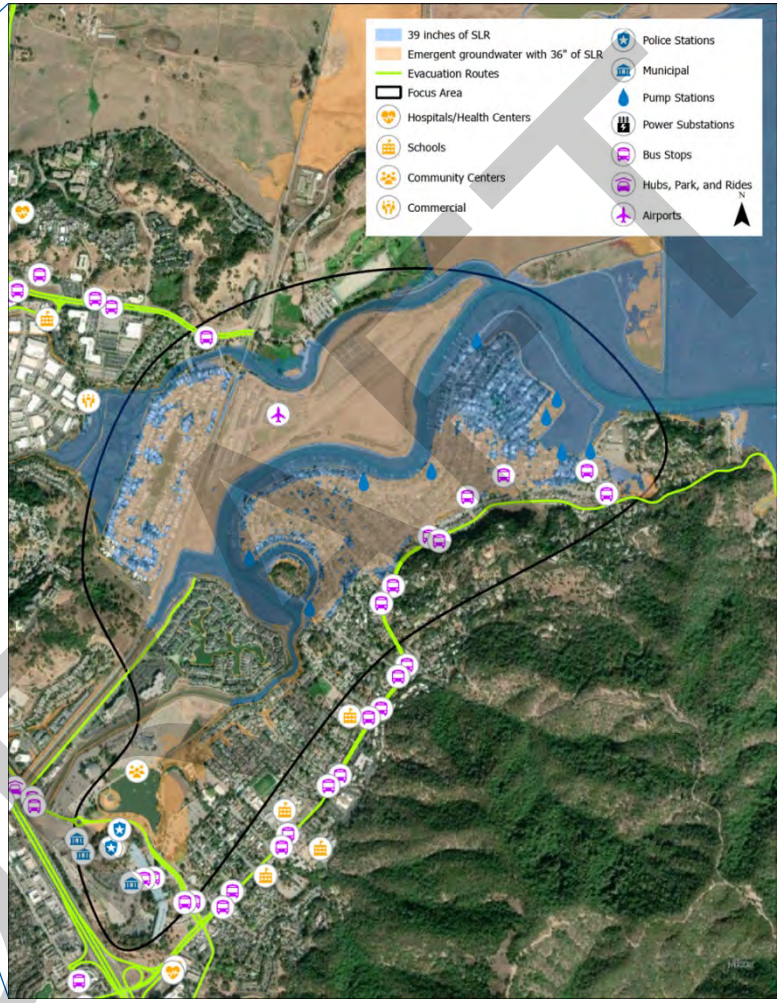




Focus Area	Permanent Physical Exposure - SLR First Inundation	Physical Exposure - GW Shallow (surface - 3 ft below surface)	PhysicalExposure - GW Emergent	Temporary Physical Risk - 100 yr floodplain	Temporary Physical Risk - CoSMoS 100 yr	Physical Risk - Number of Hazards	Physical Risk - Average	Equity Prioirty Community
San Rafael - North	not impacted	present day	present day	In FEMA 100 yr Floodplain	not impacted	2	2.0	**High MTC Equity Priority Area 37% - 65% Low Income >21% Zero Vehicle Households**

3.1.16 Santa Venetia Focus Area

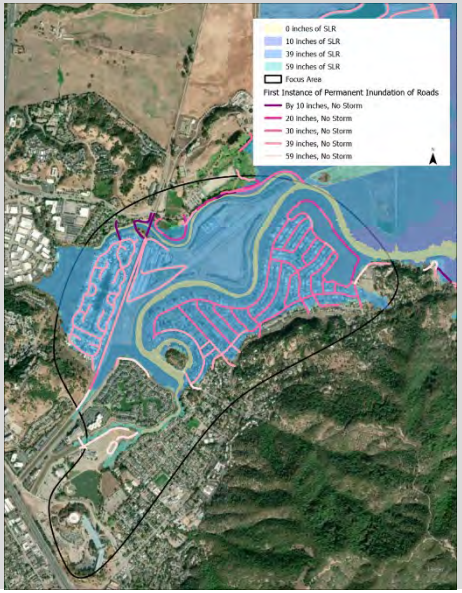


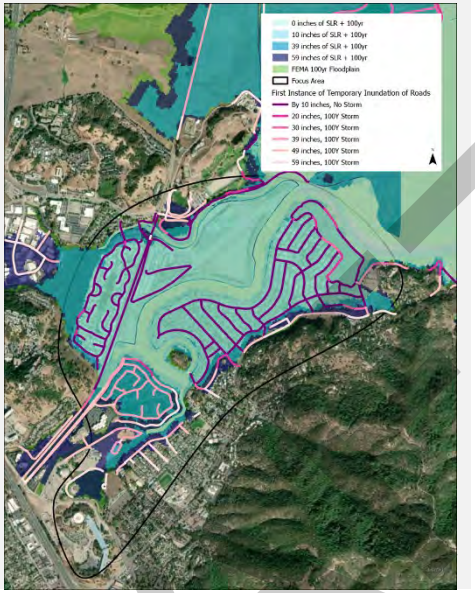


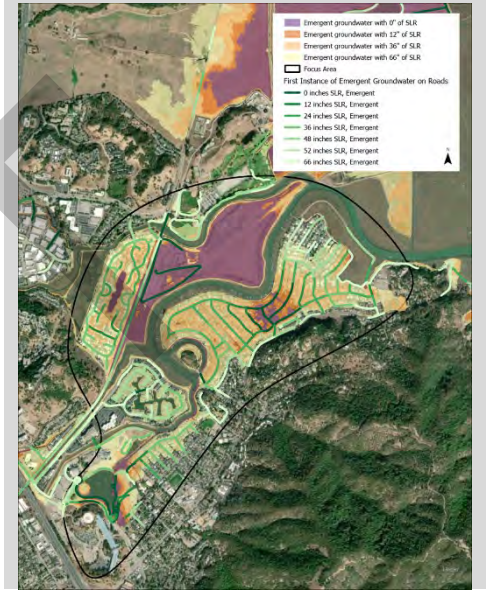
The site includes:

- 13 bus stops
- 1 airport
- 2 police stations
- 9 pump stations
- 1 ingress/egress route

Permanent Inundation Exposure	Temporary Flood Exposure	Groundwater Rise Exposure

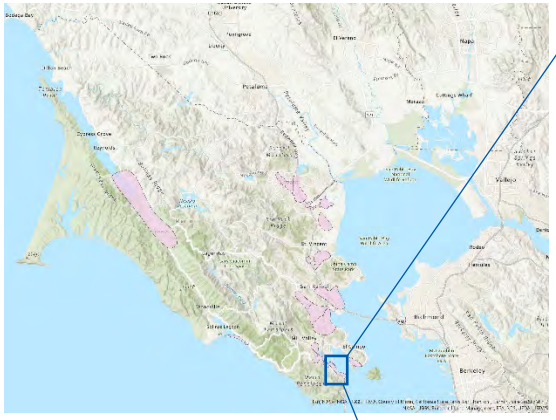






Focus Area	Permanent Physical Exposure - SLR First Inundation	Physical Exposure - GW Shallow (surface - 3 ft below surface)	PhysicalExposure - GW Emergent	Temporary Physical Risk - 100 yr floodplain	Temporary Physical Risk - CoSMoS 100 yr	Physical Risk - Number of Hazards	Physical Risk - Average	Equity Prioirty Community
Santa Venita	30 in.	present day	12 in.	In FEMA 100 yr Floodplain	10 in.	3	2.9	12% - 20% Low Income 10% - 20% Zero Vehicle Households

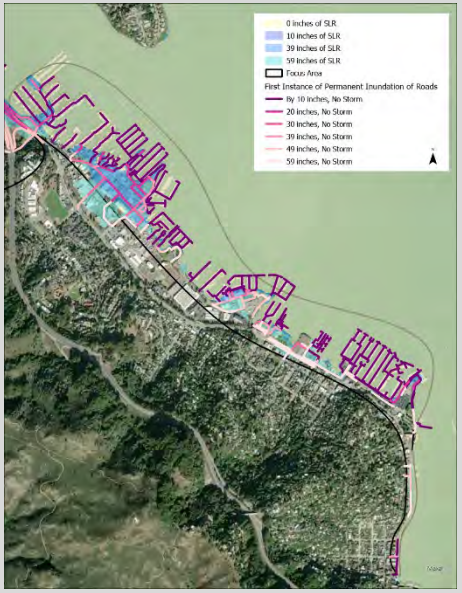
3.1.17 Sausalito Focus Area



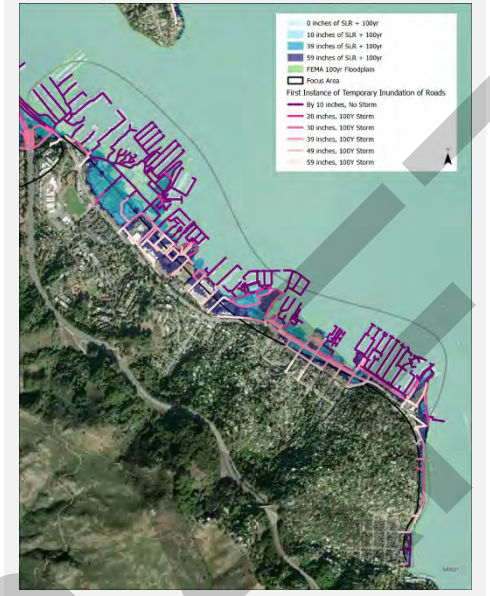
This site includes:

- 16 bus stops
- 1 park and ride hub area
- 3 arterials, Bridgeway, Richardson Street, and San Carlos Avenue, 7 collectors, and a network of local streets
- 1 ingress/egress route

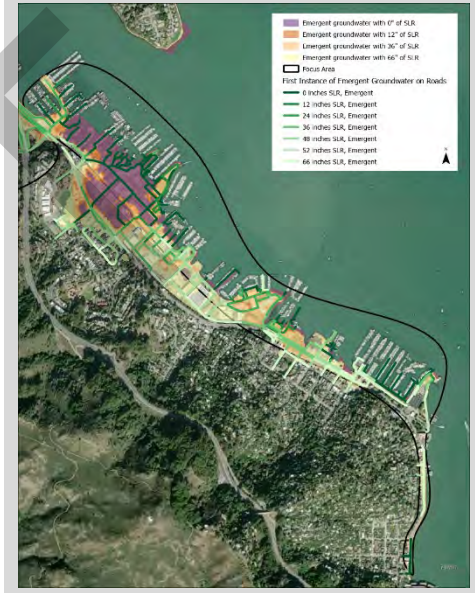
(A) Permanent Inundation Exposure



(B) Temporary Flood Exposure

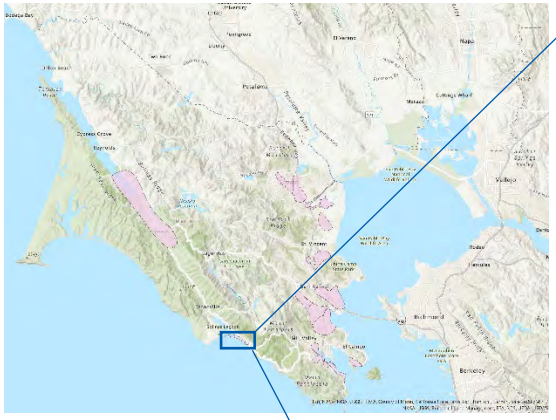


(C) Groundwater Rise Exposure



Focus Area	Permanent Physical Exposure - SLR First Inundation	Physical Exposure - GW Shallow (surface - 3 ft below surface)	PhysicalExposure - GW Emergent	Temporary Physical Risk - 100 yr floodplain	Temporary Physical Risk - CoSMoS 100 yr	Physical Risk - Number of Hazards	Physical Risk - Average	Equity Prioirty Community
Sausalito	30 in.	present day	present day	In FEMA 100 yr Floodplain	present day	3	3.1	No

3.1.18 Stinson Beach Focus Area

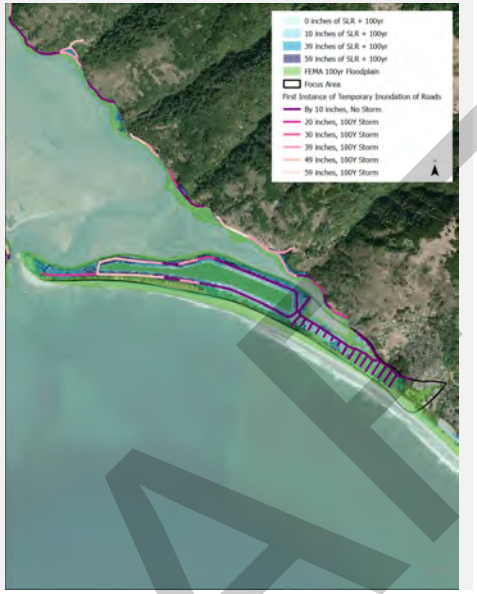


This site includes:

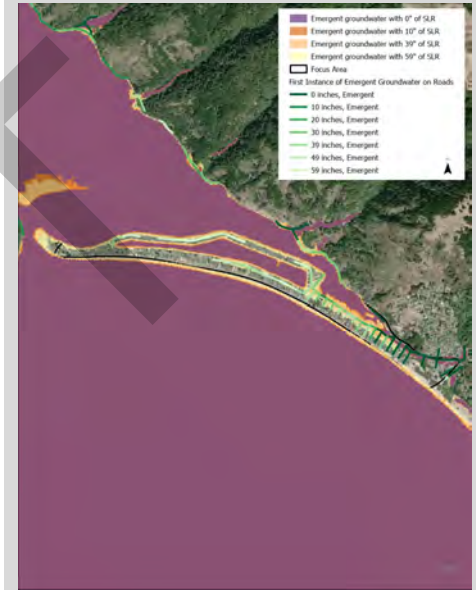
- 3 bus stops
- 1 fire station
- 1 library
- 1 ingress/egress route

Permanent Inundation Exposure

Temporary Flood Exposure

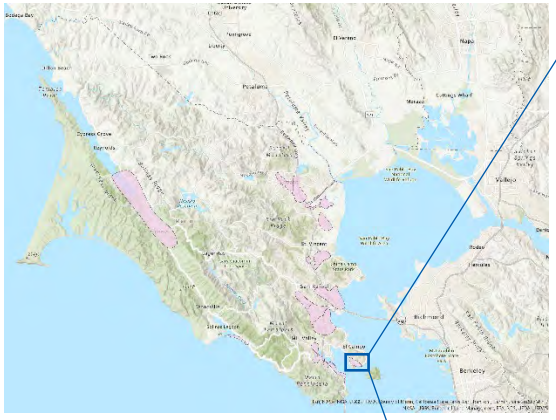


Groundwater Rise Exposure



Focus Area	Permanent Physical Exposure - SLR First Inundation	Physical Exposure - GW Shallow (surface - 3 ft below surface)	PhysicalExposure - GW Emergent	Temporary Physical Risk - 100 yr floodplain	Temporary Physical Risk - CoSMoS 100 yr	Physical Risk - Number of Hazards	Physical Risk - Average	Equity Prioirty Community
Stinson Beach	By 10 in	present day	36 in	In FEMA 100 yr Floodplain	10 in.	3	3.2	37% - 66% Low Income

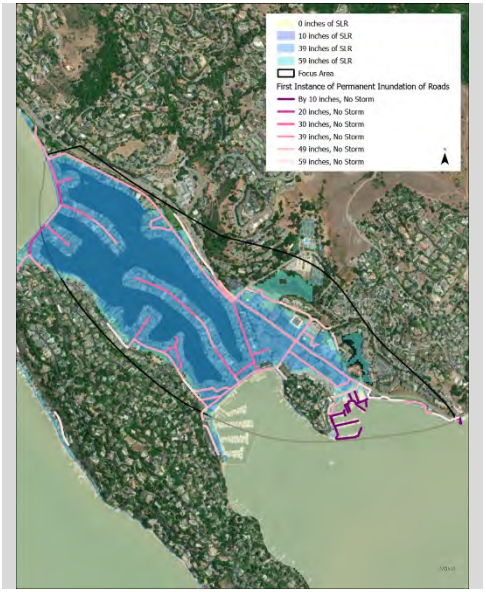
3.1.19 Tiburon Focus Area

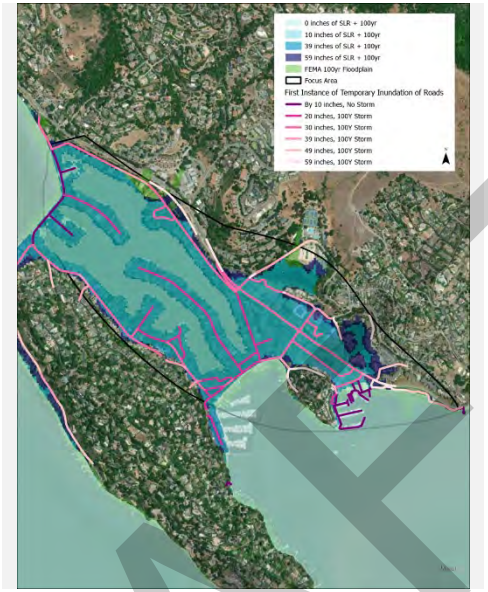


The site includes:

- 8 bus stops
- 2 municipal
- 1 fire station
- 1 police station
- 1 hub, park, and ride area
- 1 ferry stop
- 1 ingress/egress route

Permanent Inundation Exposure	Temporary Flood Exposure	Groundwater Rise Exposure





Focus Area	Permanent Physical Exposure - SLR First Inundation	Physical Exposure - GW Shallow (surface - 3 ft below surface)	PhysicalExposure - GW Emergent	Temporary Physical Risk - 100 yr floodplain	Temporary Physical Risk - CoSMoS 100 yr	Physical Risk - Number of Hazards	Physical Risk - Average	Equity Prioirty Community
Tiburon	30 in.	present day	present day	In FEMA 100 yr Floodplain	20 in.	3	2.8	No

4. Next Steps

The process to designate the focus areas is an important step in refining and reconfirming locations across the entirety of Marin County that are vulnerable to coastal flood exposure, including vulnerability of permanent inundation due to sea level rise, temporary flooding from current day high tides, pluvial and fluvial flood exposure, and sea level rise-driven groundwater rise.

Through the creation of the GIS geodatabases that provide asset-level information on flood exposure, as well as the Web Map, updated climate hazard exposure information is now available to TAM, the TAC and City/County of Marin for their own adaptation efforts. In the focus area profile sheets, the consultant team provides initial overview of each of the focus areas. The associated Focus Area Hazard Matrix excel file provides summary information for each focus are. There are any number of questions that can be asked of the exposure analysis. The focus area provide one way to organize this information and bound it within an identified geography.

These focus areas will now drive discussion for the next phase of the project, Task 4, and will support TAM and the TAC to begin to map out adaptation opportunities across the Marin County.

5. Appendix A: Hazard Matrix

(See associated excel file: Focus Area Hazard Matrix – TAC Review.xlsx)